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Tests of Informational Efficiency of China's Stock Market

A thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy

by

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To the Peoples of China and Australia

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Abbreviation Used in Text and Notes

ADPR	Average Dividend Price Ratio
AMEX	American Stock Exchange
CAPM	Capital Asset Pricing Model
CAR	Cumulative Abnormal Return
CRSP	Centre for Research in Security Prices
CSRC	China Securities Regulatory Commission
DJIA	Dow Jones Industrial Average Index
DPR	Dividend Price Ratio
EMH	Efficient Market Hypothesis
GDP	Gross Domestic Product
NET	National Electronic Trading
NYSE	New York Stock Exchange
OTC	Over-the-Counter
PBC	People's Bank of China
RMB	Renmin Bi, Chinese Currency
S&P 500	Standard and Poor's Index of 500 Stocks
SCSC	State Council Securities Committee
SHEs	Shareholding Enterprises
SOEs	State-owned Enterprises
SSE	Shanghai Stock Exchange Composite Index (Shanghai Market Index)
SSE-A	Shanghai Stock Exchange A-shares Index
SSE-B	Shanghai Stock Exchange B-shares Index
STAQ	State Trading Automatic Quoting
SZS	Shenzhen Stock Exchange Component Index (Shenzhen Market Index)
SZS-A	Shenzhen Stock Exchange A-shares Index
SZS-B	Shenzhen Stock Exchange B-shares Index
WTO	World Trade Organisation

Abstract

This thesis investigates the efficiency of the new emerging market of China in accordance with the theoretical framework of the Efficient Market Hypothesis (EMH), focusing on weak form and semi-strong form market efficiency. Empirical tests have been intensively conducted on the random walk hypothesis, the presence of market seasonality and the price reaction to the announcement of public information. To obtain a complete picture of the efficiency of China's Stock Market, studies were applied to indices and individual securities for the A-shares, B-shares, the shares listed in the Shanghai market and Shenzhen market, respectively. Daily, weekly and monthly data frequencies were analysed.

Empirical results show that the serial correlation of daily returns on market indices is statistically significant. The serial correlated return patterns are more significant in B-shares than in A-shares. Furthermore, the returns on market indices display more serial correlation than the returns on sector indices. The returns on sector indices are more correlated than the returns on individual shares' prices. As the intervals, in which the returns are calculated, extend from a day to a week and then to a month, the magnitudes of serial correlation decline. In summary, the stock prices of both the Shanghai and Shenzhen markets do not follow a random walk.

The day-of-the-week effects on China's Stock Market exhibit a pattern similar to those on the Australian and Japanese markets. The mean return on Tuesdays, rather than on Mondays, is the lowest of the week. The month-of-the-year effects on China's Stock

Market present a unique pattern that differs from the general pattern on most of world's markets. Mean returns in December and January are negative. Positive and Significant mean returns occur in August. The holiday effects display a certain variation between the Shanghai and Shenzhen markets. The analyses suggest that even if some of the test-statistics for the seasonal patterns are not statistically significant, they are "economically significant." For this particular sample of data, abnormal profits would have been made from a trading strategy.

Based on four main events (non-dividend issue, cash dividend issue, bonus issue and rights issue) and two types of announcements (proposal and approval), thirty-seven samples (portfolios) were constructed for the event studies which are tests of the semi-strong form efficiency. The studies show that China's share traders receive the announcement of zero-dividend issue as 'bad' news. A-shares traders are pessimistic in responding to the announcement of cash dividend proposals. The traders' attitudes toward the announcements of bonus and rights issues depend on the specific scheme of the issues. Whether an announcement is followed by a further announcement of a new event also affects stock price behaviour. The underreaction or overreaction of stock prices to the announcement has been found in twenty of thirty-seven samples.

This thesis illustrates that China' Stock Market are neither weak form nor semi-strong form efficient. The efficiency of China's Stock Market will be improved by enforcement of market regulation, promotion of informational transparency, mitigation of government intervention, and so forth.

Research Declaration

I declare that this thesis contains no material which has been accepted for the award of any other degree or diploma in any university and that, to the best of my knowledge and belief, the thesis does not contain material previously published and written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Shiguang Ma

September 2000

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I claim full responsibility for the remaining errors in this thesis.

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Chapter 1 Introduction

1.1 Background of the study

The initial emergence of stock markets in the world can be traced back over hundreds of years to when industrialisation and innovation took hold in Europe. The rapid economic growth in the past one hundred years gave rise to the explosive development of stock markets, while the enhancement of stock markets has been important in promoting the growth of the world economy. The modern market economy depends critically upon a soundly-operated stock market.

Firstly, the stock market offers guidance to the management of listed companies; stock prices provide information on the current cost of capital, which is important in determining the appropriate capital magnitude and structure of companies. Secondly, the stock market provides the direction of investment for investors; stock prices are the signals of capital demand as evaluated by the market. Thirdly, the stock market is accessible to a vast number of investors, many of whom invest only minuscule amounts of capital that are then aggregated into a mass quantity for the companies by the market (Baumol 1965). Next, because many investors move their investments between companies regularly and wish to be able to withdraw their funds at will, the stock market makes it possible for the long-term capital demand to be financed by a sequence of short-term capital supply. Finally, the shareholders act as supervisors who monitor company performance.

Share ownership requires private ownership, and as such there were no stock markets in the Peoples' Republic of China (China, or P. R. China) for more than thirty years after the country was established in 1949. The socialist ideology kept the stock market out of the centrally-planned economy. Even during the initial period of economic reform in the 1980s, shares were issued for the purpose of raising capital only, without the attendant creation of a stock market. However, the stock market gradually emerged as China transformed itself from a centrally-planned economy into a market-oriented economy. As a result of the black market and over-the-counter trading, the formal stock markets in China were established in 1990 and 1991.[1]

Currently, China's economy is a hybrid with both government intervention and market adjustment, due to the persistent dominance of public ownership in China. This hybrid economy is characterised by a series of significant segmentations in China's Stock Market. For example, the market is segmented by market location, by share accessibility, by ownership and by trading ability. Also, the provincial involvement in the market is uneven. The provinces in the eastern costal regions, where the economy is relatively developed, account for a large part of the market.

Nevertheless, China's Stock Market has been developing rapidly. The number of listed shares was just 75 at the end of 1992, but had risen to 931 by 1998, increasing by a factor of 12 times. Similarly, the market capitalisation rose from 104.81 billion RMB[2] at the end of 1992 to 1950.56 billion RMB by 1998, increasing by 18 fold. However, China's Stock Market is still a small market compared with the scale of its economy and markets elsewhere. For example, in 1998, the ratio of float market capitalisation to

[1] In this study, China's Stock Market excludes the markets in Taiwan and Hong Kong.
[2] Renmin Bi (RMB) is Chinese currency. One U.S. dollar was equal to about 8.3 yuan RMB in 1998.

Gross Domestic Product (GDP) was less than 10%, much smaller than the ratios for the U.S., Japan, Germany, Taiwan and Thailand.[3] China's comparatively small stock market promises potentially huge expansion as China continually implements economic reform. In particular, China's Stock Market will soon be opened to the world, as China will be a formal member of the World Trade Organisation (WTO).

The fast growth and unique features of China's Stock Market has received increasing attention from industrial administrations and research academics not only in China but also overseas. For example, one of the key negotiation issues between China and the U.S. (and the countries of the European Community) for China entering the WTO is the requirement that China open its financial market. Furthermore, a series of papers have been published on market orientation (Mookerjee and Yu 1995), market efficiency (Hsiao 1996), and market organisation (Yao 1998).

1.2 Discussion of the theory and methodologies used in this study

That the stock market plays an important role in the economy does not mean that it always contributes to prosperity. It has been frequently documented in the financial literature that an inefficient market cannot benefit the economy as much as an efficient market. Therefore, market efficiency is the centrepiece of financial studies.

The concept of stock market efficiency initially referred to allocational efficiency, which means that the stock market should allocate capital into the most productive

[3] See Section 2.8.2 in Chapter 2.

sectors (Baumol 1965). The preconditions for allocational efficiency are operational efficiency and informational efficiency. Operational efficiency refers to the high liquidity of shares in a well-organised market (Juttner 1990), whereas informational efficiency refers to the full and appropriate reflection of information on stock prices (Fama 1970). The Capital Asset Pricing Model, as developed by Sharpe (1964), Lintner (1965) and Mossin (1966) states that in an efficient market the risk-adjusted expected returns on all securities are equal.

Fama (1970) classified informational efficiency into three categories in his Efficient Market Hypothesis (EMH): weak form efficiency; semi-strong form efficiency and strong form efficiency. In a weak form efficient market, historical information has been fully incorporated into stock prices. In a semi-strong form efficient market, stock prices also reflect all public information. In a strong form efficient market, even inside information does not permit abnormally high returns. The EMH has provided a testable framework that has been extensively applied in the literature. Market anomalies, such as seasonal effects and firm size effects, were put forward in the late-1970s. These market anomalies are inconsistent with market efficiency. The study of market anomalies has demonstrated a deficiency of the EMH and has enriched the efficient market theory.

There are several approaches to testing the weak form efficiency of stock markets. The most effective approaches are to test the random walk of stock prices and trading strategies. The day-of-the-week, the month-of-the-year and holiday effects are the dominant seasonal market anomalies that can be exploited using trading strategies. The event study is the most useful test of semi-strong form efficiency of the stock market.

This study focuses on the informational efficiency of China's Stock Market according to the theoretical framework of the EMH. The weak form efficiency of China's Stock Market will be examined by testing the random walk of stock prices using the serial correlation coefficient test, the variance ratio test and the runs test. The seasonal effects in China's Stock Market will be tested using dummy regression models. An event study will be employed using the market model, the market adjusted model and the mean return model to test semi-strong form efficiency in China's Stock Market.

In making the selection of theory and methodologies in this study, it has been taken into account the following substantial grounds of argument. Firstly, the vast empirical literature has proven the testability of market efficiency in terms of the theoretical framework of the EMH. Even though the EMH has suffered from the debates over stock return anomalies that are inconsistent with weak form of efficiency, there does not yet exist a superior theory able to replace the EMH. The test of market anomalies is a supplement to the study of the EMH. Next, the EMH theory and above-mentioned methodologies have been employed in studies of developed markets, developing markets and emerging markets. The abundance of empirical results provides useful benchmarks for comparative analysis in this study. Finally, the difficulties with the availability and quality of the data concerning China's Stock Market restricts the choice of more complicated models that require more economic variables.

Data limitations exist because China's Stock Market has been operating for only ten years and more than half of the individual shares have been listed for less than four years. Due to the frequent changes in market regulations for the first several years, the data may contain content that is not appropriate for more sensitive tests. Moreover, the statistical records of transactions are often simplistic or short of details. In particular, some macroeconomic indicators that would be considered as appropriate dependent or independent variables in the relevant models are artificial. For example, the interest rates were planned by the authority in China, instead of being formed by the market. If they were considered as the risk-free returns to be applied in the Capital Asset Pricing Model, then the test results would be invalid.[4]

1.3 Motivation for the study

Undoubtedly, China's Stock Market plays a very important role in China's economy, and will promote its internationalisation. Study of China's Stock Market has a strategic significance not only for China but also for the world economy. Recently, China's Stock Market has attracted some empirical studies of market efficiency.

However, there is no equivalent database in China to the CRSP (Centre for Research in Security Prices) in the U.S.. Studies regarding individual shares for China's Stock Market requires that the individual share prices be adjusted for dividend issues by the researchers themselves. As a result of this huge requirement for fundamental work, no studies have yet focused on large samples of individual shares that are listed in both the Shanghai and Shenzhen markets. Thus, these empirical studies of the weak form efficiency of China's Stock Market have concentrated on one market (Hsiao 1996), on tests of indices (Laurence *et al* 1997, Su and Fleisher 1998, Song *et al* 1998, Mookerjee and Yu 1999) or on tests of several individual shares (Fang 1997, Poon 1998). No formal studies of semi-strong form efficiency of China's Stock Market, by

[4] See footnote 1 in Chapter 7.

way of an event study, have been published to date.[5] Detailed analyses of the seasonal anomalies of China's Stock Market are also still absent.[6] Therefore, systematic empirical studies on the market efficiency of China's Stock Market remains a frontier area.

This study seeks to address this new area by breaking though the painstaking data work. The substantial proposition of this thesis is to undertake a systematic study of the weak form efficiency, semi-strong form efficiency and seasonality of China's Stock Market. Thus, the data to be employed are market indices, sector indices and individual share prices at intervals of days, weeks and months. Further, empirical studies will be conducted respectively on the Shanghai market and the Shenzhen market, on Chinese-resident-accessible A-shares and on foreign-investor-accessible B-shares.

Compared to previous empirical studies on the efficiency of China's Stock Market, three improvements will be made in this study. Firstly, a database will be created for individual shares that have been adjusted for all relevant events. Secondly, the study will provide a full and detailed picture of weak form efficiency, semi-strong form efficiency and the seasonality of China's Stock Market. Finally, various comparative analyses will illustrate the differences in the behaviour between the Shanghai and Shenzhen markets, between the A-shares and B-shares, and between China's markets and foreign markets.

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[5] See footnote 1 in Chapter 7.
[6] See footnote 1 in Chapter 6.

1.4 Scope of the thesis

Chapter 1 has discussed why this thesis on the efficiency of China's Stock Market was proposed. In this chapter the selected theories, methodologies and the motivation for the study are detailed. Chapter 2 provides an outline of China's Stock Market, which gives the necessary perspective to understand and evaluate this thesis. The chapter starts with a discussion on the historical reasons for the stock market emergence, and the rapid development after the Shanghai and Shenzhen stock exchanges were formally established. The market structures are profiled in terms of their accessibility to Chinese residents and foreign investors, the industrial categories, the ownership of the shares and the provincial location of listed companies. The institutional framework and market regulations are described, and the market performance of Shanghai and Shenzhen shares, A-shares and B-shares are highlighted.

Chapter 3 contains two main parts. The first part presents the theoretical framework of this study. After showing the relation between allocational efficiency, operational efficiency and informational efficiency, it focuses on the EMH framework of weak form, semi-strong form and strong form efficient markets. Market anomalies are also discussed. Thus the property of comparative market efficiency is disclosed. The second part of the chapter reviews the empirical literature examining weak form efficiency, semi-strong form efficiency, strong form efficiency and seasonal effects. Although only a small portion of the vast literature is surveyed, the review seeks to provide a clear perspective of previous research that is relevant to the forthcoming studies in this thesis.

At the beginning of Chapter 4, the statistical foundation for the selection of methodologies and the design of data processing is briefly discussed. In this chapter the fair game, martingale and random walk models are clarified with reference to both stock prices and returns. Accordingly, the serial correlation coefficient test, the variance ratio test and the runs test are presented as appropriate methods of assessing the random walk hypothesis. Dummy variable models are presented for the seasonality tests. The event study is considered using the market model, the market adjusted model and the mean adjusted model with both parametric and non-parametric tests. The latter part of the chapter formulates the data processing procedures.

The empirical tests of the random walk hypothesis are presented in the three sections of Chapter 5. These sections relate to the serial correlation coefficient test, the runs test and the variance ratio test respectively. The tests are diverse but are reported in a similar structure in each section. Therefore, the results can be easily grasped for different markets (Shanghai and Shenzhen), for different shares (A-shares and B-shares), for different data (main market indices, sector indices and individual share prices), and for different time horizons (daily data, weekly data and monthly data). This arrangement is not only beneficial for the comparative analyses among the above categories, but are also favourable for the comparative analyses of China's Stock Market with foreign markets.

Also the seasonality is examined in the three main sections of Chapter 6, which are the day-of-the-week effect tests, the month-of-the-year effect tests and the holiday effect tests. The first aim of this chapter is to display the seasonal patterns of the Shanghai and Shenzhen markets for both the A-shares and B-shares, and determine whether the seasonality is different for the various markets and shares in China. The second aim of this chapter is to determine, by comparing with the seasonal patterns of world markets, whether the seasonal patterns of China's Stock Market is similar to the general pattern of world stock markets. The third aim is to discuss the alternative hypothesis of seasonal effects in an attempt to understand the origins of the seasonality in China's Stock Market.

Chapter 7 contributes a large body of event studies on China's stocks. Having discussed the availability and appropriateness of the data, the schedule of event announcements and the criteria of efficient market assessment, the events studied in this chapter are proposed as an event tree. The trunk is the event study itself. The second level branches of the tree are four main events: zero-dividend issues, cash dividend issues, bonus issues and rights issues. The third level branches of the tree are two sorts of announcements: event proposals and approvals. The fourth level branches are two types of shares: A-shares and B-shares. The fifth level branches are the specific samples. Based on such a skeleton, the event studies are first conducted on zero-dividend announcements with 7 samples. Next, the studies are undertaken on cash dividend announcements with 12 samples. Then, the studies are applied to bonus announcements with 11 samples. The last studies are on rights announcements with 7 samples. Accordingly, the reactions of stock returns to specific announcements are detected in detail and the market efficiency is tested.

Chapter 8 seeks to link the findings of each chapter and summarises the main conclusion of the study. Furthermore, it intends to indicate the causes of the inefficiency in China's Stock Market and puts forward suggestions for the improvement of China's Stock Market efficiency. Finally, the limitations of this study are discussed along with a sketch of the future prospects for study in this area.

Chapter 2 China's Stock Market: Emergence, Development and Perspective

2.1 Introduction

Prior to 1977, "socialist ideology" strictly dominated policy in the People's Republic of China. The issuing and trading of stocks were prohibited owing to the Chinese government's fear of private ownership and dividends coming from "capital," rather than from "work." Since 1978, however, China has executed economic reforms, designed to strengthen China's economy by transforming the centrally-planned economy into a market-oriented economy. The economic reforms initially created unprecedented economic prosperity. However, the partial reforms could not sustain economic development indefinitely. The period of economic expansion was dampened by budgetary deficits, scarceness of capital supply and inefficient operation of state-owned enterprises (SOEs). Under these circumstances, China's government permitted the issues of bonds and stocks, attempting to replenish the capital deficits and improve the efficiency of the SOEs.

The original goal of China's government in permitting the issues of securities was to raise funds rather than establish a trading market for the securities holders. However, a primary market cannot exist and operate soundly if there is no a secondary market. Having experienced black-market trading and over-the-counter transactions, the bonds and stocks were finally allowed to trade in the Shanghai and Shenzhen stock exchanges. These exchanges were established in late 1990 and early 1991, when

China's Stock Market was officially established. Since 1990, China's Stock Market has been growing rapidly. It is expected that China's Stock Market has enormous prospects, which will impact widely on its investment, trade and national economy, even the world stock market. However, since China's Stock Market emerged and has been growing as a hybrid with planned and market-oriented components, consequently, it has features which differ significantly from those of modern-style stock markets.

The most pronounced feature is the complicated structure of China's stocks. Stocks are classified by accessibility into A-shares, B-shares, H-shares and N-shares. A-shares are available for Chinese residents, while B-shares, H-shares and N-shares are available for foreign investors. A-shares and B-shares are listed on the Shanghai and Shenzhen stock exchanges, which usually exhibit different performance. H-shares and N-shares are listed on Hong Kong and overseas stock markets. With respect to ownership, stocks are grouped as state-owned shares, legal person shares, social public shares, employee's shares and so forth. State-owned shares account for the dominant proportion of all shares. Social public shares are the sole marketable shares on the Shanghai and Shenzhen stock exchanges. The industrial structure of listed companies, the provincial distribution of listed companies, and the institutional framework present distinguishing features of China's Stock Market as well.

This chapter provides an overview of China's Stock Market, which is fundamental to understand empirical tests in this thesis. Besides this introduction, section 2.2 of this chapter will sketch the background of the emergence of China's Stock Market. Section 2.3 discusses the development of this market. Section 2.4 presents the structure of

China's stocks. Section 2.5 discusses industrial categories and the provincial distribution of the shares. Section 2.6 outlines the institutional framework and market regulations. Market performance will be examined in Section 2.7. Future prospects for the market will be forecasted in Section 2.8. A brief conclusion in Section 2.9 closes the chapter.

As in the other countries, stocks have more significant influence on the Chinese economy than bonds do, as stocks not only refer to capital but are also related to ownership. This Chapter, as well as rest of the thesis, will concentrate on the investigation of China's Stock Market. However, bonds and stocks cannot be isolated in an emerging market. Therefore, when considering both bonds and stocks, we will refer to the "securities market" or "China's Securities Market." After this chapter, we will mainly apply the concept of "China's stock markets", since you will know that there are Shanghai and Shenzhen markets, A-shares and B-shares Markets in China.

2.2 Emergence of China's Stock Market

2.2.1 Gestation of China's Stock Market

In December 1978, China initiated economic reforms in an attempt to establish a "socialist market economy" by modifying the centrally-planned management through a market-oriented readjustment. The reform mainly involved the diversification of the ownership system, the introduction of foreign capital and technology, and improvements in the efficiency of the SOEs. The initial economic reform resulted in an unprecedented industrial productivity and a remarkable increase in living standards.

However, due to the rigid restrictions of "socialism," the effect of rudimentary implementation of economic reforms gradually declined in successive years. Two critical obstacles to the economic development were the unchangeably inefficient operation of SOEs and the scarcity of capital. The inefficient SOEs led to a decrease in revenue and a number of money-losing SOEs, which were sustained by the loans from the state banks. Meanwhile, the scarcity of capital resulted in monetisation of public sector deficits and ongoing inflation.

In order to stimulate the supplies of capital and to eliminate inflationary pressure, as well as to promote the profitable management of SOEs, the authorities embarked on an aggressive set of policies. The policies were to develop special economic zones in the coastal cities, to provide favourable conditions for foreign investment, to allow issues of bonds including treasury bonds and financial bonds initially and enterprise bonds thereafter, to permit SOEs to experiment in the shareholding system, and so forth.

The first issue of securities, under the new economic reforms, was exclusively treasury bonds, on a compulsively basis, sold to enterprises and individuals in 1981. To make the treasury bonds more attractive to investors, the maturity terms of the bonds were changed over subsequent years and the interest rate schedules were set up in a variety of ways for enterprises and individuals. The interest rates of the treasury bonds for individuals were usually higher than that for enterprises and slightly higher than that available on bank deposits of corresponding maturity. For example, in 1988, the annual interest rates of treasury bonds was 6% for enterprises and 10% for individuals, and in 1989 the annual rate on treasury bonds for individual was 14% in comparison with 10.1% of a one year bank deposit.

From 1985, the government diversified bond issues. The fiscal bonds were to offset the state budget deficits. The state key construction bonds were to finance special investments in key infrastructure projects, including energy, transportation, and raw material extraction. The state construction bonds were to finance general investments that the existing revenues did not cover. The finance bonds were to provide supplementary funds for the state banks. In addition, special state bonds, state investment company bonds, state enterprise bonds, local enterprise bonds and house building bonds were issued. Until 1993, there had even existed 17 sorts of bonds in China. The overall bond issues reached 417.60 billion Reminbi yuan (RMB) and the outstanding bonds was 278.17 billion RMB.

The idea behind shareholding system reform originated in the rural sectors in 1979 when the central government consented to "teams," the collective production units in China's countryside, forming joint-stock enterprises by absorbing funds from collectives and individuals. The successful operation of joint-stock town-village enterprises and the experience of foreign shareholding systems inspired Chinese economic theorists. In 1984, the persistent advocation by Chinese economic theorists successfully persuaded the government to extend the shareholding system to the cities.

In September 1984, the first shareholding enterprise, Beijing Tianqiao Department Store Company, was established in Beijing by the issue of three-year maturity equities. Thereafter, Feile Acoustics Company launched an offer of nonredeemable equities to the public in Shanghai. In the following year, Shanghai Yanzhong Industrial Company and Guangzhou Fushan First Radio Factory raised all of their capital through the issuance of stocks. The initial practices of shareholding enterprises (SHEs) was followed by a small number of SOEs in Beijing, Shanghai, Tianjin, Guangzhou, Shenzhen, Shenyang and Wuhan, and then swept over all the major Chinese cities. There were 3880 SHEs (excluding joint venture firms and rural enterprises) constructed by the end of 1998 (Ma 1998).

The objective of the Chinese government's permission to issue bonds and stocks was initially to broaden the sources of capital, and to improve the operation of SOEs by attracting supervision by the shareholders. However, the trading of both bonds and stocks between holders was prohibited. In the absence of a secondary market, the holders of bonds and stocks had the right only to receive interest annually. Except for the maturity, there was no clear differentiation between bonds and stocks at that time. This created a problem in an environment of high inflation, because entities and individuals were unwilling to subscribe to the illiquid bonds and stocks. Therefore, prior to 1986 when over-the-counter (OTC) market opened, the bonds were allocated on a compulsory basis to enterprises and individuals. The enterprises sold stocks to their employees in the same mandatory way.

2.2.2 Evolution of China's Stock Market until its formal emergence

Historically speaking, securities tend to be the outcome of an advanced market mechanism. It is difficult to imagine the existence of securities without a secondary securities market. Not surprisingly, on China's case, as soon as the bonds and stocks were issued, a black-market emerged with illegal securities transactions between individual holders. When the holders of securities needed cash urgently, and the potential buyers of securities wanted to make large profits by holding the securities to maturity, the sellers and buyers negotiated prices for black-market trading. The black-market trading had a distinctive style. For instance, some buyers set up a sign saying, "purchasing bonds," on the roadside and secreted themselves in the corner of street. While looking for sellers, they simultaneously prepared to escape from police detection. Nevertheless, the negotiated prices were very low. Even bonds of a three-year maturity were sold below their par values at the end of the second year.[1] The stocks were transferred according to their par values regardless of the dividend yields. As a consequence, buyers were highly rewarded for the risk of being fined. By contrast, the sellers lost out in that the bonds and stocks were earmarked as a burden on enterprises and individuals.

In order to eliminate the black-market trading and fulfill public liquidity requirements, the Shanghai Branch of the People's Bank of China (PBC) decided to allow security transfers on a public basis. The proposal was that the sellers and buyers met each other individually before they went to the Shanghai Trust and Investment Company to legalise and record the transaction of the bonds, or went to the original issuing agency to transfer the accounts of the stocks. The price of a security was set uniformly by the Shanghai PBC branch based on the par value of the security plus the cumulative interests on a current saving deposit account of the bank. This was the beginning of official trading activity in Chinese securities.

[1] All of the bonds issued in China were not coupon bonds that payed interest periodically. The sellers of the bonds used to pay principal and cumulative interests to final holders at maturity.

Apparently, such security trading activity was extremely restrictive and remained in a primitive form. To complete a transaction, the seller or buyer had to seek out a trading counterpart themself, and then they needed to go to the bank or original issuing agency to finalise the transaction. Meanwhile, the prices were fixed, almost independent of the levels of demand and supply. In fact, black-market trading was still popular, in an alternative way, due to the extra restrictions on official trading. The black-market traders legalised their transactions by using official prices, and settled negotiated prices privately. Some of the transactions that had not been legalised resulted in many disputes between traders.

In September 1986, the Shanghai Branch of PBC authorised the Shanghai Trust and Investment Company to organise a special department to deal with the business of securities transactions, in other words, to act as an intermediate agency for buying and selling securities. The first OTC market in China was thereby established. Within less than one year, there were fifteen financial companies and institutions which had set up securities trading counters in Shanghai and Shenzhen. The prices of securities were decided by the par value plus the anticipated dividends and deposit interest. Some of the factors that might affect the levels of the dividends and interests were gradually taken into account in determining the trading prices of stocks.

Considering the development of securities trading, a set of "Provisional Regulations for the Counter-Trading of Securities" was formulated by the Shanghai Branch of PBC in January 1987 (Yu 1997). According to the regulations, all securities trading would be conducted through the OTC dealers authorised by the PBC. The restrictions on security prices in trading were freed, allowing for a fully negotiated price between the seller and buyer in accordance with market demand and supply. Meanwhile, the financial institutions that had an affiliated OTC department were allowed to engage in security trading for profits on their own accounts. Due to the OTC opening, the turnover value of stocks increased from 0.58 million RMB in 1986 to 7.77 million RMB in 1989 in the Shanghai market. Likewise, the turnover value of bonds increased from 0.69 million RMB in 1986 to 802.88 million RMB in 1989 (Xu 1998).

The security prices on the OTC markets were not determined on the basis of auction, so the prices of securities could not reflect an accurate balance of demand and supply. This condition created the action of "scalping-trading." The "scalpers" were usually familiar with the securities and well informed. They used to cheat their trading counterparts by hiding or exaggerating the relevant message to reach a negotiated price to their favour. The prices, therefore, were artificially manipulated, which usually led to a 20 percent range in daily price fluctuations. Apart from Shanghai and Shenzhen, the other cities of China had not been authorised to organise OTC markets. Residents living in other provinces were expected to travel to Shanghai or Shenzhen for their securities trading.

A national stock market held strong appeal and so the Shanghai Stock Exchange was established in December 1990. The Shenzhen Stock Exchange was constructed in April 1991. The establishment of the Shanghai and Shenzhen stock exchanges terminated the black-market trading, OTC trading and private trading in the securities. Those securities trading were no longer involved in face to face selling and buying. Security trading, thereafter, was completely concentrated on the stock exchanges, with competitive asking-bidding, united settlements, and account transfers. The foundations of the two stock exchanges made it possible to trade securities in other cities that were connected to the stock exchanges through an electronic transaction system. Therefore, the formal securities market emerged in China after the two stock exchanges were opened.

2.3 Development of China's Stock Market

2.3.1 Shanghai and Shenzhen stock markets

The Shanghai Stock Exchange is located in Shanghai. Shanghai is the largest city in China, with 12 million people, and is prominent in many categories of industries in China. Shanghai has enjoyed a reputation as the birthplace of China's financial industry and is the most important financial centre in China. SOEs are the main component of the firms in Shanghai. Shanghai is also a well-known city in the world. Particularly, Shanghai was more distinct than Tokyo and Hong Kong before 1949. The Chinese government established the first stock exchange in Shanghai to utilise the advantages of Shanghai, to promote the SOEs using the capital inflow from the securities market, and to establish its competitive capability in Asia.

The first block of listed companies in the Shanghai Stock Exchange was selected from the Shanghai local SHEs that were transformed from SOEs previously. By the end of 1991, the market capitalisation of 8 local stocks reached 2.94 billion RMB. By the end of 1992, the number of listed stocks increased to 42, of which 2 came from the other provinces. The total market capitalisation of the 42 securities was 55.84 billion RMB. From 1994, the number of non-Shanghai located stocks surpassed that of local stocks in the market. In 1998, there were 477 stocks listed on the Shanghai Stock Exchange with a market capitalisation of 1062.59 billion RMB.

Table 2-1 Overview of the Shanghai Securities Market

	1991	1992	1993	1994	1995	1996	1997	1998
Number of Listed Securities								
Stocks	8	42	190	203	220	329	422	477
Bonds		46	33	24	28	22	21	20
Funds			1	12	12	15	15	19
Overall	8	88	224	239	260	366	458	516
Total Turnover value (billion RMB)								
Stocks	0.08	2.47	246.77	573.51	310.34	911.38	1376.16	1238.54
Bonds	0.38	0.77	8.67	52.04	193.67	1740.27	1539.60	2125.72
Funds			1.21	11.74	30.57	49.74	21.95	60.53
Overall	0.46	3.24	256.65	637.29	534.58	2701.39	2937.71	3424.79
Market Capitalisation (billion RMB)								
Stocks	2.94	55.84	220.62	260.01	252.57	547.79	921.81	1062.59
Capitalisation of Negotiable Securities (billion RMB)								
Stocks	0.27	4.60	29.42	48.20	58.70	138.96	249.42	294.05
Number of Investors (10 thousands)								
Stocks	11	111	425	575	685	1208	1713	1999

Source: Calculated with the data in: *Shanghai Securities Yearbook 1993*, Shanghai Shehui Kexue Chubanshe (Shanghai Social Science Press). *Shanghai Securities Yearbook 1995*, Shanghai Shehui Kexue Chubanshe (Shanghai Social Science Press). *Shanghai Stock Exchange Statistics Annual 1997*, Shanghai Caijing Daxue Chubanshe (Publish House of Shanghai University of Finance and Economics). *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *China Securities Market Annual Report 1994*, Zhongguo Jinrong Chubanshe (China Finance Publish House). *99's Zhongguo Gupiao Jijin Touzi Bidu (99's Necessary Manual of Investment in Stocks and Funds of China)*, Guangdong Jingji Chubanshe (Guangdong Jingji Publish House).

In the beginning of 1992, bonds were allowed to trade through the Shanghai Stock Exchange. In the following year, (mutual) funds were allowed to trade on the stock exchange as well. The total number and turnover value of the stocks, bonds and funds in the Shanghai market were 244 and 256.65 billion RMB in 1993, but had grown to 516 and 3424.79 billion RMB in 1998. This represents an increase of 111.47% and 1234.42% over the six years. Trading in stocks dominated initially, but bond trading has dominated in the recent years.

Shenzhen Stock Exchange is located in Guangdong province near Hong Kong. As the earliest and biggest special economic zone in China, Shenzhen was exclusively given favourable policies by the central government. The Joint-venture is a major characteristic of the firms in Shenzhen. Since the securities market is able to attract capital and provide an important function in a market economy, setting up a stock exchange in Shenzhen was a step toward further economic reforms. Besides, Shenzhen has a sound background in developing securities market for many joint-venture companies operating in a modern managerial manner.

Table 2-2 Overview of the Shenzhen Securities Market

	1991	1992	1993	1994	1995	1996	1997	1998
Number of Listed Securities								
Stocks	6	33	95	142	161	270	399	454
Bonds	1	5	9	47	15	19	20	17
Funds				8	10	10	10	10
Overall	7	38	104	197	186	299	429	481
Total Turnover value (billion RMB)								
Stocks	3.53	43.41	128.67	239.26	93.3	1203.21	1674.50	1111.35
Bonds	0.00	0.01	2.44	346.59	773.94	61.68	108.08	39.52
Funds				24.02	20.45	106.91	58.84	41.16
Overall	3.53	43.42	131.11	609.87	887.69	1371.8	1841.42	1192.03
Market Capitalisation (billion RMB)								
Stocks	7.98	48.97	133.53	109.05	94.86	436.45	831.11	887.97
Capitalisation of Negotiable Securities (billion RMB)								
Stocks	3.78	17.06	43.77	38.19	35.12	145.83	269.10	279.81
Number of Investors (10 thousands)								
Stocks	26	105	353	483	555	1090	1610	1901

Source: Calculated with the data in: *Shenzhen Stock Exchange Fact Book 1995*, Xinan Caijing Daxue Chubanshe (Publish House of South West University of Finance and Economics). *Shenzhen Stock Exchange Fact Book 1997*, China Statistical Publish House. *Shenzhen Stock Exchange Fact Book 1998*, Zhongguo Jinrong Chubanshe (China Finance Publish House). *China Securities Market Annual Report 1994*, Zhongguo Jinrong Chubanshe (China Finance Publish House).

In the first year after the Shenzhen Stock Exchange opened, there were only 6 local Shenzhen stocks. The stock market capitalisation was 3.53 billion RMB. In December 1993, 95 stocks were listed on the Shenzhen Stock Exchange with market capitalisation of 128.67 billion RMB, of which 47 originated in other provinces. As the case with Shanghai Stock Exchange, more stocks listed rapidly on the Shenzhen Stock Exchange in the successive years. By the end of 1998, there were 545 listed stocks and the market capitalisation reached 887.97 billion RMB.

Bonds were traded on the Shenzhen Stock Exchange since the market opened in 1991. Funds trading appeared in the Shenzhen market in 1994, about two years later than in the Shanghai market. By the end of 1994, the combined number and total turnover value of stocks, bonds and funds in the Shenzhen market were 197 and 609.97 billion RMB respectively. These number and value increased to 481 and 1192.03 in 1998, doubling in four years. Basically, stock trading dominated the Shenzhen market every year except for the years of 1994 and 1995.

The size of the Shanghai market was intended by the government to be the larger than that of the Shenzhen market. From Tables 2-1 and 2-2 it still can be known, firstly, the numbers of listed stocks in the Shanghai market each year were larger than those in the Shenzhen market. The market capitalisation of the Shanghai stocks dominated that of the Shenzhen stocks as well. Secondly, the numbers of listed bonds and funds in Shanghai market were larger than those in the Shenzhen market every year except for 1993 for funds and 1994 for bonds. Nevertheless, as a whole, there were more securities listed on the Shanghai market than there were listed on the Shenzhen market.

Finally, investors registered accounts in the Shanghai market exceeded that in the Shenzhen market.

However, the Shenzhen market did not always under-perform the Shanghai market. In 1994 and 1995, the turnover value of bonds traded on the Shenzhen market were 346.59 and 773.94 billion RMB respectively. By contrast, 52.04 and 193.67 billion RMB in Shanghai market. More remarkably, due to favourable expectations of taking over Hong Kong, the turnover values of stocks in the Shenzhen market suddenly increased to 1202.21 and 1674.5 billion RMB in 1996 and 1997 respectively, whereas they were 911.38 and 1376.16 in the Shanghai market in the equivalent years.

2.3.2 Other components of China's Stock Market

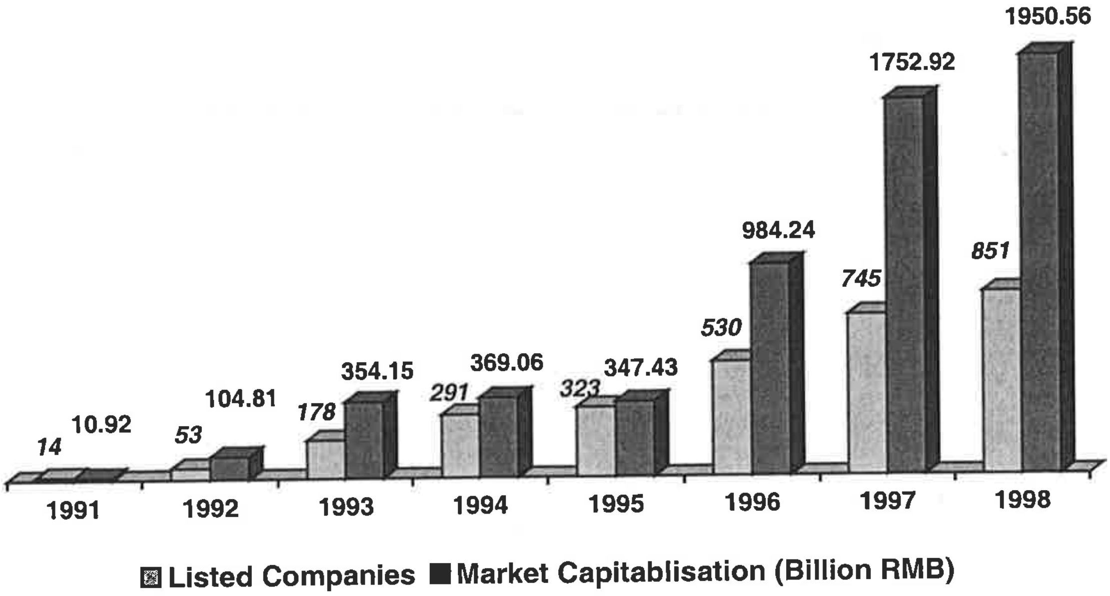
It is apparent that the stock exchange primarily benefited the local economy, since the companies initially listed were all local enterprises. This is true, even though, the nationwide issuances of stocks occurred rapidly with the official clause that any enterprises could apply for a listing subject to the qualification of appropriate financial status. The local benefits of stock exchange are thus still prominent. For example in 1998, the capital raised for Shanghai on the Shanghai market accounted for 36.92 % of the total 31 of all provinces, while that raised for Guangdong province on Shenzhen market accounted for 21.43% of the total. Therefore intense competition for the third stock exchange ensued between Tianjin, Wuhan, Shenyang and Chengdu, but was denied eventually by the central government due to concerns about lack of control.

In step with the shareholding system trials in Shanghai and Shenzhen, many provinces in China have experienced similar reforms. However, most of the SHEs that were created in those provinces were not listed on the Shanghai and Shenzhen stock exchanges due to poor financial status. How could the shareholders deal those stocks? As an alternative measure, following strong requests from shareholders, six securities trading centres were set up in Tianjin, Wuhan, Dailian, Shenyang, Guangzhou and Haian. Some unlisted stocks and funds were allowed to trade in the securities trading centres. These trading centres were significantly smaller, and were restricted by not processing transactions from other provinces. Until 1998, the numbers of outstanding securities were 19 in Tianjin, 12 in Wuhan, 7 in Dalian, 8 in Shenyang, 25 in Guangzhou and 21 in Hainan.

Trading on legal person shares are prohibited on the Shanghai and Shenzhen stock exchanges. To satisfy the requirements of legal person investors, the government authorised the connection of the State Trading Automatic Quoting (STAQ) system in Beijing in 1992 and the National Electronic Trading (NET) system in Beijing in 1993. By the end of 1998, 14 legal person shares were listed on STAQ and NET. Besides the domestic securities market, some companies in China have their stocks listed on overseas stock markets.

China's Stock Market has grown rapidly. As shown in Figure 2-1, for the period from 1991 to 1998, the number of listed companies in the Shanghai and the Shenzhen stock exchanges increased from 14 to 851. The corresponding market capitalisation increased from 10.92 million RMB to 1950.56 million RMB in the same period. Moreover, China's stocks are also traded offshore. However, from the viewpoint of the impact on China's economy, the Shanghai and Shenzhen markets are dominant. As previously mentioned, the "China's Stock Market" will refer to the Shanghai and Shenzhen markets in this thesis in the absence of special clarification. In particular, this study will focus more on the shares listed on the two stock exchanges.

Figure 2-1. The Develpment of China's Stock Market



Source: As Tables 2-1 and 2-2.

Note: This figure refers to the stocks listed on the Shanghai and Shenzhen stock exchanges only.

2.4 Structure of China's stocks

2.4.1 A-shares and B-shares

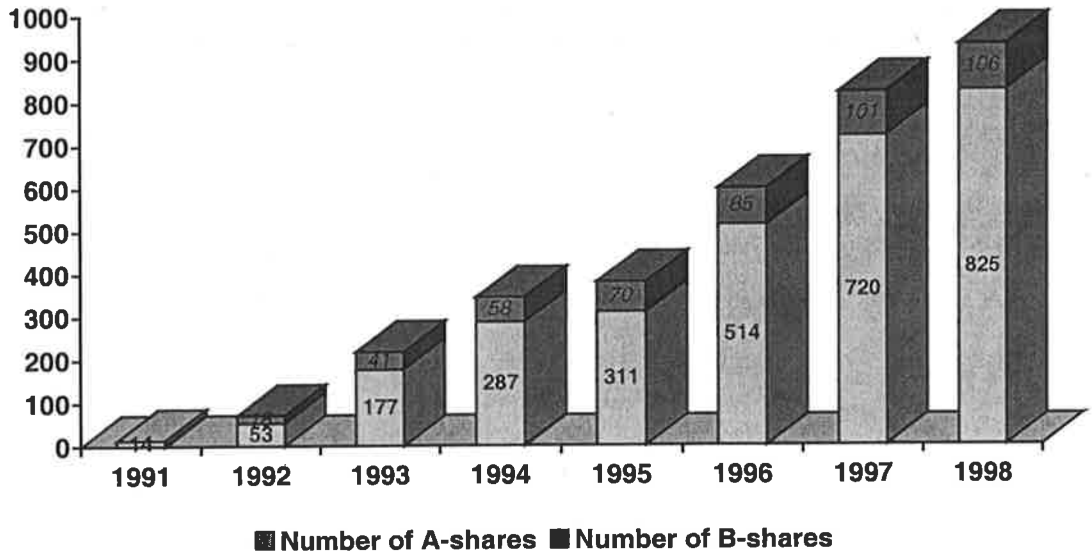
When the Shanghai and Shenzhen stock exchanges initially opened, the stocks were only issued to the Chinese residents. Since the end of 1991, in order to attract more foreign investment, the Chinese government allowed a few companies to issue stocks to foreign investors. Thus, the stocks listed on the Shanghai and Shenzhen markets are classified as A-shares and B-shares. A-shares are allowed to trade among Chinese citizens with domestic currency, RMB. B-shares are restricted to foreign investors with U.S. Dollars in the Shanghai market and Hong Kong Yuan in the Shenzhen market. However, despite the restriction, some Chinese residents trade B-shares using the accounts of their foreign relatives.

B-shares are usually issued by large size companies, and most of these had previously issued A-shares. In 1998, of the companies that issued B-shares, forty-one of fifty-two in the Shanghai market and forty-one of fifty-four in the Shenzhen market also had A-shares on issue. Perhaps, the most unique feature was the big gap in the prices of the dual issued A-shares and B-shares. The B-shares subscription prices were significantly lower than that of the equivalent A-shares. Moreover, dividends and bonuses used to be allocated according to different policies for A-shares and B-shares, though this different treatment has been abolished recently.

The A-shares market has increased more rapidly than the B-shares market. For example, in 1998, the overall number of newly listed A-shares in China was 105, but that of B-shares was only 5. The uneven development for years resulted in absolute domination of A-shares on both the Shanghai and Shenzhen stock exchanges, which is represented in Figure 2-2. Table 2-3 indicates again, that the total listed A-shares accounted for more than 87% in 1997 and 1998 on each market, while B-shares accounted for less than 13%. Furthermore, the total issued capital of A-shares was dramatically higher than that of the B-shares, with over 92.78% of each market in 1997 and 1998. By contrast, the total issued capital of the B-shares accounted for less than 7.3%. However, the proportion of issued capital that is tradeable is greater for

B-shares than it is for A-shares. This can be seen by referring to the total float capital of B-shares, which accounted for more than 16.54% of each market, comparatively larger than the equivalent percentages of listed B-shares and total issued B-shares capital.

Figure 2-2. A-shares and B-shares of China's Stock Market



Source: *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *Shenzhen Stock Exchange Fact Book 1998*, Zhongguo Jinrong Chubanshe (China Finance Publish House). *China Securities Market Annual Report 1994*, Zhongguo Jinrong Chubanshe (China Finance Publish House).

The shares of the Chinese domestic companies listed on the Hong Kong stock market are called H-shares. H-shares are issued by large and competitive Chinese companies through Hong Kong underwriting institutions and according to the rules of the Hong Kong Stock Exchange. The companies issuing H-shares are controlled by their parent institutions in mainland China, which hold over 50% of the shares. The shares of the Chinese domestic companies listed on markets outside of mainland China and Hong

Kong are called N-shares. The issues of N-shares intended not only for absorbing investment, but also for gaining international experience for China's Stock Market. Until September 1999, there were 40 Chinese stocks traded on the Hong Kong stock market, 3 traded on the New York stock market, 2 in Australia, 1 in Singapore and 1 in Britain. The total capital gathered from overseas was about U.S. 14.68 billion dollars. The companies listed overseas are usually more advanced in management and financial status than their counterparts in domestic markets. However, foreign firms have not been able to list on either Shanghai or Shenzhen markets. Likewise, Chinese residents have been kept from purchasing stocks in overseas markets.

Table 2-3 The Structure of A-shares and B-shares

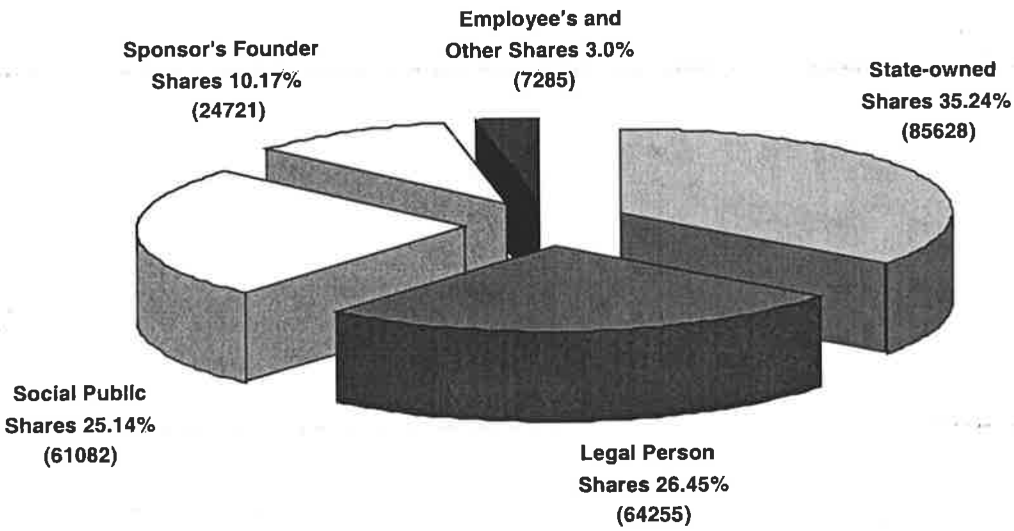
	1997	1998	1997	1998	1997	1998
	Shanghai Market		**Shenzhen Market**		**Overall**	
Number of Listed Shares						
A-shares	372	425	348	400	720	825
(%)	*88.15*	*89.10*	*87.22*	*88.11*	*87.70*	*88.61*
B-shares	50	52	51	54	101	106
(%)	*11.85*	*10.90*	*12.78*	*11.89*	*12.30*	*11.39*
Total Issued Capital (Million Shares)						
A-shares	90776.32	120611.3	73837.13	99785.6	164613.5	220396.9
(%)	*93.07*	*94.20*	*92.78*	*93.69*	*92.94*	*93.97*
B-shares	6761.17	7423.45	5748.57	6714.99	12509.74	14138.44
(%)	*6.93*	*5.80*	*7.22*	*6.31*	*7.06*	*6.03*
Float Capital (Million Shares)						
A-shares	21621.55	30471.91	22460.61	30069.43	44082.16	60541.34
(%)	*76.10*	*80.41*	*81.88*	*83.46*	*78.94*	*81.90*
B-shares	6790.27	7421.55	4971.51	5960.71	11761.78	13382.26
(%)	*23.90*	*19.59*	*18.12*	*16.54*	*21.06*	*18.10*

Source: *99's Zhongguo Gupiao Jijin Touzi Bidu (99's Necessary Manual of Investment in Stocks and Funds of China)*, Guangdong Jingji Chubanshe (Guangdong Jingji Publish House). *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *Shenzhen Stock Exchange Fact Book 1997*, China Statistical Publish Houses. *Shenzhen Stock Exchange Fact Book 1998*, Zhongguo Jinrong Chubanshe (China Finance Publish House).

2.4.2 Classification of shares in ownership

The shares of the listed companies on both the Shanghai and Shenzhen stock exchanges involve a complex ownership structure. They can be classified as state-owned shares, legal person shares, employee's shares, social public shares, sponsor's founder shares and other shares. Among them, only the social public shares are marketable on either the Shanghai or the Shenzhen Stock Exchanges. A few legal person shares have been allowed to trade the through STAQ and NET systems. The remaining shares are non-negotiable. Figure 2-3 shows us the structure of the ownership of the stocks of China's Stock Market.

Figure 2-3. Ownership of the Shares in China's Stock Market (1998)



Source: Calculated with data in Table 2-4.

Note: The data in parentheses are millions of shares.

State-owned shares are the shares converted from state-owned assets when the SOEs undertook shareholding reforms. In 1998, state-owned shares of listed companies on the Shanghai and Shenzhen markets reached 85628 million, which accounted for 35.24% of the total shares. The state-owned shares make up the largest component of the overall shares in comparison with other classes. However, this component has gradually declined in recent years, since that the state lacked the funds to purchase the new shares, while the rights issued to existing shareholders, has diluted the proportion of state-owned shares.

Legal person shares are converted from the assets of institutions or enterprises, which joined the shareholding companies before they were listed. Legal person shares are the second largest component of the overall shares in the Shanghai and Shenzhen markets, accounting for 26.45% of the total market. Legal person shares can be further divided as domestic legal person shares and overseas legal person shares. Because some institutions or enterprises holding domestic legal person shares are the agents of state assets, some of the domestic legal person shares have the status of state-owned shares. Some legal person shares, after being approved by the authority, can only be negotiated on the STAQ and NET instead of on the Shanghai and Shenzhen markets.

The shares owned by the staff of listed companies are employee's shares. Since the prices of shares in the primary and secondary markets in China differ widely, the staff of listed companies used to obtain a big gain when their shares were listed. To even the unfair gap between the individual investors, the government promulgated a three year waiting period on the employee's shares, which means that the employee's shares cannot be traded until the corresponding shares have been listed on the market for at least three years. Moreover, the issuance of employee's shares was abolished in 1999.

Therefore, the existing employee's shares are those issued to the staff in the conversion of the shareholding enterprises before they are listed. Employee's shares remain only a small proportion of all shares.

Social public shares are the shares sold to the public. As previously mentioned, the public shares are the exclusive tradeable shares in the Shanghai and Shenzhen stock exchanges. In fact, with the dilution of state-owned shares and legal person shares that were affiliated with the state, the proportion of social public shares has been enlarged to be 25.14% of overall shares. Growth in the number of public shares on issue is foreseen, since only the public shares generate new capital for the listed company; the capital represented by other classes of shares is involved in the company already.

A listed company is usually sponsored by an existing entity, which takes responsibility for establishing the newly listed company. Thus, the assets, intellectual property and devotion of the sponsor convert to sponsor's founder shares. Ten point seventeen percent of shares in the whole market were sponsor's founder shares. The rest of the shares outside the classifications above fill in the "other shares" class. The other shares and employees' shares accounted for 3.00% of the total shares.

Table 2-4 reveals that there are no significant differences in the proportion of the shares ownership between the Shanghai and Shenzhen markets. The state-owned shares were the main component in both the Shanghai and Shenzhen market, accounting for about 35% of the total number of shares. The legal person shares and Social public shares were about 25% each. The similar structure of share ownership reflects the uniform requirement for the listed companies, and the rigid control over ownership exercised by the authority.

Table 2-4. Classification of Share Ownership (1998)

	Shanghai Market		Shenzhen Market	
(Million Shares)		*(%)*		*(%)*
State-owned Shares	44812	*34.17*	40816	*36.50*
Legal Person Shares	35088	*26.75*	29167	*26.08*
Employee's Share	2152	*1.64*	3112	*2.78*
Social Public Shares	30629	*23.35*	30453	*27.23*
Sponsor's Founder Shares	16502	*12.58*	8219	*7.35*
Other Shares	1968	*1.50*	53	*0.05*
Total	131151	*100.00*	111820	*100.00*

Source: *99's Zhongguo Gupiao Jijin Touzi Bidu (99's Necessary Manual of Investment in Stocks and Funds of China)*, Guangdong Jingji Chubanshe (Guangdong Jingji Publish House).

2.5 Industrial categories and provincial distribution of the shares

2.5.1 Industrial categories of the shares

The investment in China's Stock Market is spread across different industrial sectors. The industrial categories of the listed companies and the total issued capital in 1998 are represented in Table 2-5, which shows that manufacturing was the biggest sector of listed companies in both the Shanghai and Shenzhen stock markets. Across the two markets, the 537 manufacturing companies account for 63.10% of all listed companies. Following manufacturing were the sectors of miscellaneous and commerce; 134 and 86 companies accounting for 15.75% and 10.11% of the whole market respectively. The number of listed companies in property and finance industries were the smallest with 3.17% and 0.35% proportions of the total listed companies respectively.

Table 2-5. Industrial Categories of Shares (1998)

	Shanghai Market		Shenzhen Market		Overall	
Listed Companies						
		(%)		*(%)*		*(%)*
Manufacturing	257	*58.68*	280	*67.80*	537	*63.10*
Miscellaneous	84	*19.18*	50	*12.11*	134	*15.75*
Commerce	49	*11.19*	37	*8.96*	86	*10.11*
Utilities	39	*8.90*	25	*6.05*	64	*7.52*
Properties	9	*2.05*	18	*4.36*	27	*3.17*
Finance	-	-	3	*0.73*	3	*0.35*
Total	438	*100.00*	413	*100.00*	851	*100.00*
Total Issued Capital (Million Shares)						
		(%)		*(%)*		*(%)*
Manufacturing	88154	*62.28*	78451	*70.38*	166605	*65.85*
Utilities	22791	*16.10*	9567	*8.58*	32358	*12.79*
Miscellaneous	17294	*12.22*	10271	*9.21*	27565	*10.89*
Commerce	9068	*6.41*	5961	*5.35*	15029	*5.94*
Properties	4234	*2.99*	5167	*4.64*	9401	*3.72*
Finance	-	-	2052	*1.84*	2052	*0.81*
Total	141541	*100.00*	111469	*100.00*	253010	*100.00*

Source: *99's Zhongguo Gupiao Jijin Touzi Bidu* (*99's Necessary Manual of Investment in Stocks and Funds of China*), Guangdong Jingji Chubanshe (Guangdong Jingji Publish House). *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *Shenzhen Stock Exchange Fact Book 1998*, Zhongguo Jinrong Chubanshe (China Finance Publish House).

The listed companies in manufacturing and utilities were typically larger companies, in that they issued shares more than other companies did on average. This can be seen from the different proportions of the listed companies and issued capital. The total issued capital of the manufacturing and utility companies were 166605 and 32358 million shares respectively in 1998, occupying 65.85% and 12.79% of the whole market. These proportions of total issued capital were comparatively large in relative to the proportions of listed companies 63.10% and 7.52%. Conversely, the listed companies of the miscellaneous and commerce sectors were normally small size companies. The total issued capital of the miscellaneous and commerce companies accounted for 10.89% and 5.94%, small in comparison with the corresponding 15.75% and 10.11% of the listed companies.

The number of listed companies and total issued capital in miscellaneous, commerce, utilities were greater in the Shanghai markets than in the Shenzhen markets, both in terms of absolute magnitudes, and also from their relative levels within the market. By contrast, the number of companies and total issued capital in properties and finance were smaller in the Shanghai market than in the Shenzhen market. In addition, the number of listed companies in manufacturing in the Shanghai market were smaller than in the Shenzhen market, but the level of total issued capital in manufacturing in the Shanghai market was larger than in the Shenzhen market. This means that more large regional SOEs listed on the Shanghai markets rather than in the Shenzhen market. Nevertheless, the authority did not publicly emphasise different industrial polices on the two markets.

The industrial structure of China's Stock Market was mainly determined by the underlying industrial structure of the economy. The three largest industries of manufacturing, miscellaneous and commerce have the most companies listed. The current industrial structure of stock markets also reflects the government policies of industry control and monopoly ownership. Accordingly there are no companies in rail transportation or telecommunication, nor are there any large banks listed on either the Shanghai or Shenzhen Stock Exchanges. The Chinese government has proposed to adjust China's industrial structure frequently and promulgated "The List of Prior

Developing Industries and Products"[2] in 1997, but the stock market did not contribute to this strategy.

The different industrial structure implied by the stock markets and government industry policy has resulted from different emphases. The stock market should safeguard the interest of investors. Thus for a company to qualify to list, it has to have attained a certain level of profit for several years prior to listing on the market. On the other hand, the government considers the economic equilibrium of the country to be important. The sectors advocated by the government, such as agriculture and infrastructure, are key industries but usually low performing or operating with insufficient capital. Thus, only a few of them are qualified to list. Nevertheless, some of them have been listed on the markets, they hardly operate soundly. For example, in the detailed breakdown of 21 industries of listed companies in 1998, the yield on net capital was negative in agriculture and forestry, property, common machinery, commerce and tourism, respectively. The percentages of companies reporting losses was 13.33% in agriculture and forestry, 21.88% in property, 12.96% in general machinery, and 6.19% in commerce and tourism. By contrast, there were no companies in finance, wine and food, paper, chemistry and petroleum reporting losses.

2.5.2 Provincial distribution of the listed companies

Historically speaking, China's economy has been uneven in terms of geographical distribution. The east or east-coastal areas are much more prosperous than the inland

[2] This list was confirmed by China 's State Council in 29 December 1997 and promulgated by China's State Planning Commission in 31 December 1997. See Sun Jian, 1999, *Chanye Huigu and Jiazhi Fenxi (Industry Review and Value Analysis)*, Zhongguo Jinyong yu Jingji Chuban She (China Finance and Economic Publish House).

area. Considering the possibility of war,[3] China's government had implemented a policy of even development by the migration of many factories from eastern provinces into inland provinces before 1978. Experiences have shown that this policy was implemented without consideration of the high cost of product transportation and the unwilling migration of the workers. Contrary to the government's desire, the economy of the inland provinces did not develop, but the policy caused economic growth to be depressed in the eastern area.

The "even area development" policy has been replaced by a strategy of "encourage the flourishing eastern area, then help along the inland area." The current provincial distribution of the listed companies and shares reflects the new strategy. We can see from the last column of Table 2-6 and by considering Figure 2-4, that except for Sichuan which is also a relatively strong economic province, all provinces having more than 30 listed companies are in the east and east-costal area. In particular, Shanghai and Guangdong, the provinces where the two stock exchanges are located, host 120 and 110 listed companies respectively, which account for 13.94% and 12.78% of the whole Chinese stock market. Meanwhile, the numbers of listed companies in the inland provinces of Guizhou, Neimeng, Qinghai and Xizang are merely 8, 7, 7 and 5, respectively.

To facilitate the analysis of the provincial distribution of China's Stock Market, according to the economic development and the geographical location of provinces, the 31 provinces (excluding Hong Kong and Taiwan) are grouped into the Coastal

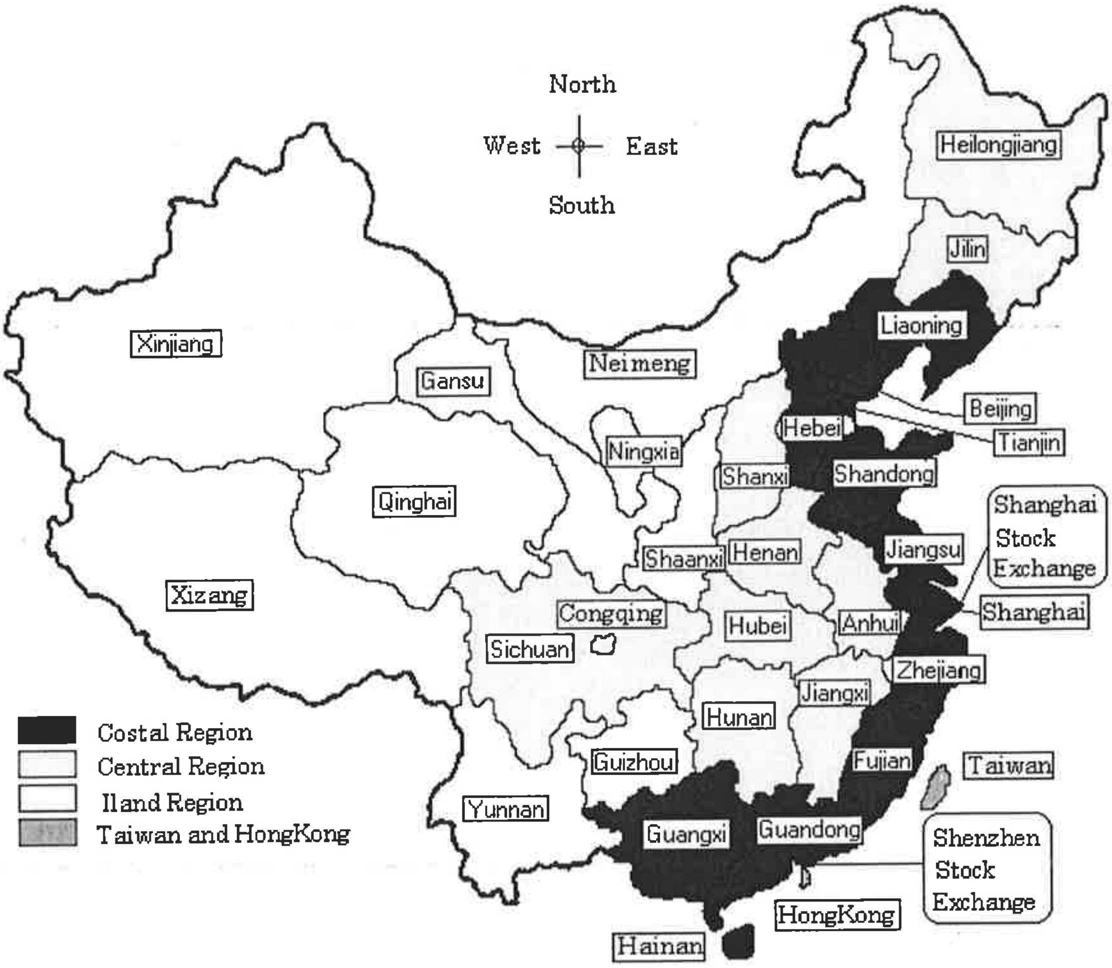
[3] The Soviet Union and the United States were the imaginary enemy countries of China in 1960s and 1970s. There were military conflicts on the Sino-Soviet border in 1967.

Table 2-6. Provincial Distribution of the Shares (1998)

Provinces	Shanghai Market: Number of Listed Companies	Shanghai Market: Float Capital (Million Shares)	Shanghai Market: Total Issued Capital (Million Shares)	Shenzhen Market: Number of Listed Companies	Shenzhen Market: Transaction Value (Million RMB)	Shenzhen Market: Number of Investors (Thousand)	Overall: Number of Listed Companies
Anhui	6	958.90	5722.23	11	20215.14	244.04	17
Beijing	19	1294.03	3971.62	17	168223.50	723.45	36
Congqing	8	508.29	1775.20	10	39211.64	410.31	18
Fujian	19	1103.21	3773.51	15	66150.73	554.41	34
Gansu	5	331.38	927.97	5	13141.79	153.73	10
Guangdong	8	1113.04	3552.54	102	829867.45	4549.50	110
Guangxi	1	30.00	90.42	9	30525.55	262.90	10
Guizhou	3	99.25	370.03	5	8056.13	85.95	8
Hainan	4	256.48	1075.24	18	45525.37	378.46	22
Hebei	9	1037.40	3432.76	12	19922.62	366.13	21
Henan	9	592.05	2140.40	8	52704.90	502.98	17
Heilongjang	16	1639.79	4412.66	6	27056.57	433.27	22
Hubei	18	1157.23	3396.74	21	71942.21	366.13	39
Hunan	5	296.07	1058.76	17	56152.09	556.43	22
Jilin	12	798.00	2117.09	14	24405.45	323.46	26
Jiangsu	23	1577.49	7013.49	17	87034.94	1359.89	40
Jiangxi	4	170.90	463.77	8	33719.07	310.98	12
Liaoning	19	1633.70	5008.54	27	73292.98	779.09	46
Neimeng	8	789.30	2454.41	6	6861.80	117.70	14
Ningxia	2	83.25	210.00	5	3592.29	53.94	7
Qinghai	4	155.25	612.86	3	1816.55	27.88	7
Shandong	23	2210.63	9316.49	21	46851.69	896.87	44
Shanxi	5	302.50	1183.44	7	15390.72	281.43	12
Shaanxi	7	414.42	1268.85	11	47314.07	484.94	18
Shanghai	120	13639.48	48359.86	0	171108.62	1563.05	120
Sichuan	25	1831.41	5475.74	26	115968.25	1213.50	51
Tianjin	8	672.46	2508.86	4	37541.45	313.91	12
Xizang	2	52.86	168.92	3	588.31	9.62	5
Xinjiang	8	362.97	1018.19	4	19825.42	241.53	12
Yunnan	7	305.50	1185.49	6	11920.97	112.89	13
Zhejiang	31	2555.44	7924.72	5	83480.74	725.26	36
Hong Kong	0	0	0	0	2119.70	na	0
All	438	37972.67	131990.79	423	2231528.71	18403.63	861

Source: As Table 2-5.

Figure 2-4. Provincial Distribution of Listed Companies



Region (12 provinces), the Central Region (10 provinces) and the Inland Region (9 provinces).[4] As shown in Table 2-7, the listed companies are concentrated in the Coastal Region. The 531 listed companies from Coastal Region account for 61.67% of

[4] The Coastal Region includes 12 eastern, relatively developed and open provinces: Liaoning, Beijing, Hebei, Tianjin, Shandong, Jiangsu, Zhejiang, Shanghai, Fujian, Guangdong, Hainan and Guangxi. The Central Region includes 10 central and intermediately developed provinces: Heilongjiang, Jilin, Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan, Sichuan and Congqing. The Inland Region includes 9 west and less developed provinces: Neimeng, Shaanxi, Ningxia, Gansu, Qinghai, Guizhou, Yunnan, Xinjian, Xizang.

the all listed companies of the country. The 236 listed companies, or about 27.41% of listed companies of the country, come from Central Region. Only 94 companies are scattered in Inland Region, sharing 10.92% of the market.

Table 2-7. Provincial Distribution of Shares (1998, By Divisions and Regions)

	Shanghai Market			Shenzhen Market			Overall
Provinces	Number of Listed Companies	Float Capital (Million Shares)	Total Issued Capital (Million Shares)	Number of Listed Companies	Transaction Value (Million RMB)	Number of Investors (Thousand)	Number of Listed Companies
By Region							
Coastal Region	284	27123.36	96028.04	247	1661645.34	12472.92	531
(% of All)	*64.84*	*71.43*	*72.75*	*58.39*	*74.46*	*67.77*	*61.67*
Central Region	108	8255.13	27746.02	128	456766.04	4642.53	236
(% of All)	*24.66*	*21.74*	*21.02*	*30.26*	*20.47*	*25.23*	*27.41*
Inland Region	46	2594.18	8216.73	48	113117.33	1288.18	94
(% of All)	*10.50*	*6.83*	*6.23*	*11.35*	*5.07*	*7.00*	*10.92*
By divisions							
North-East	47	4071.49	11538.28	47	124755.00	1535.82	94
(% of All)	*10.73*	*10.72*	*8.74*	*11.11*	*5.59*	*8.35*	*10.92*
North China	49	4095.69	13551.09	46	247940.09	1802.62	95
(% of All)	*11.19*	*10.79*	*10.27*	*10.87*	*11.11*	*9.79*	*11.03*
East China	226	22216.05	82574.06	77	508560.93	5654.50	303
(% of All)	*51.60*	*58.51*	*62.56*	*18.20*	*22.79*	*30.72*	*35.19*
South-Central	45	3444.86	11314.10	175	1088837.27	6616.40	220
(% of All)	*10.27*	*9.07*	*8.57*	*41.37*	*48.79*	*35.95*	*25.55*
West-Central	45	2797.31	8975.39	50	175745.30	1832.27	95
(% of All)	*10.27*	*7.37*	*6.80*	*11.82*	*7.88*	*9.96*	*11.03*
North-West	26	1347.27	4037.87	28	85690.12	962.02	54
(% of All)	*5.94*	*3.55*	*3.06*	*6.62*	*3.84*	*5.23*	*6.27*
All	**438**	**37972.67**	**131990.79**	**423**	**2231528.71**	**18403.63**	**861**

Source: As Table 2-5.

The percentage of listed companies from the Coastal Region was slightly larger in the Shanghai market than in the Shenzhen market. Whereas the percentage of listed companies from the Central Region and Inland Region were a little bigger in the Shenzhen market than in the Shanghai market. However, there were no significant differences in the regional distribution of the listed companies between the two markets. Also, the same structure of regional distribution can be seen with respect to float capital and total issued capital reported in Table-2-7 for the Shanghai market. Another interesting phenomenon is that the capabilities of production and investment match each other in each of the three regions. For example, in the Shenzhen market in Table 2-7, 61.67% of listed companies come from the most productive Coastal Region, whereas, 67.77% of investors lived in this area and generated 74.46% of the transaction value. By contrast, 10.92% of the listed companies were located in the undeveloped Inland Region where 7.00% of the investors lived, accounting for 5.07% of the transaction value.

Returning to Table 2-6, we note several features in provincial distribution of the listed companies. Firstly, all of the 120 Shanghai local companies were listed only on the Shanghai Stock Exchange, leaving none on the Shenzhen Stock Exchange. However, this does not mean that the Shanghai investors were investing exclusively in the Shanghai market, as 1563.05 thousand Shanghai investors trade Shenzhen stocks worth 171108.62 million RMB. Whereas only 8 of 102 Guangdong local companies were listed on the Shanghai Stock Exchange. There were no Shenzhen local companies listed on the Shanghai Stock Exchange, as Shenzhen is a city of Guangdong province.

Furthermore, the companies of the neighbouring provinces of Shanghai tend to be listed on the Shanghai Stock Exchange. Similarly, the companies of the neighbouring provinces of Shenzhen tend to be listed on the Shenzhen Stock Exchange. Table 2-7 also illustrates the data grouped by administrative division, which had been employed by the Chinese government previously for state administration.[5] 51.60% of the listed companies in the Shanghai market are located in East China where Shanghai is located. On the other hand, 41.37% of the listed companies in the Shenzhen market domiciled come from Central-South China where Shenzhen is located. The other figures in the table demonstrate the same evidence. The other divisions had companies registered evenly in the Shanghai and Shenzhen markets.

2.6 Institutional framework and market regulations

2.6.1 Institutional framework

Since China's Securities Market originated from the treasury bonds circulation and SOEs reforms, a number of top government institutions were involved in the establishment of market. These are: the Peoples' Bank of China (PBC), the State Committee of Structural Reforms, the State Planning Commission, the Ministry of Finance, the Ministry of Foreign Trade, the State Administration for Industry and Commerce, the State Administration of Tax, the State Administration of National Assets, and the State Administration of Foreign Exchange Control. The municipal (or provincial) authorities relative to the markets participated in the administration as well.

In March 1987, the Chinese State Council announced that PBC was to be the primary

[5] The six administrative divisions were officially outlined and graded as intermediates between provinces and central government before 1966, which are still popularly cited so far in social science. North-East China includes Heilongjiang, Jilin and Liaoning. North China includes Beijing, Hebei, Tianjin, Shanxi and Neimeng. East China consists of Shangdong, Anhui, Jiangsu, Shanghai, Zhejiang, Jiangxi and Fujian. Central-South China consists of Henan, Hubei, Hunan, Guangdong Hainan and Guangxi. South-West China comprises Sichuan, Congqing, Guizhou, Yunnan and Xizang. North-West China comprise Shaanxi, Ningxia, Guansu, Qinghai and Xinjiang.

administrator of China's Securities Market.[6] The major tasks of PBC were to approve the issue of securities, to assess the qualification of securities for circulation, to authorise the establishment of securities institutions and to supervise securities business departments. Meanwhile, the State Committee of Structural Reforms took charge of reform for SOEs, and approval of the transformation from SOEs to SHEs. The State Administration of National Assets was entrusted with the role of management of state-owned shares. The Ministry of Finance formulated regulations for finance and accounting for the listed companies. The Ministry of Foreign Trade and the State Administration of Exchange Control were responsible for the foreign invested shares. The State Planning Commission coordinated the actions of these institutions.

Although the PBC was appointed as the primary administrator, control of the stock market was widely spread. Thus, conflicts emerged between administrative departments with different emphases, reducing the effectiveness with which the stock market was managed. As a consequence, in October 1992, the State Council Securities Committee (SCSC), the fist department dealing specially with the stock markets, was organised including the senior politicians of fourteen government ministries and committees, such as the PBC, the State Planning Committee and so forth. The functions of SCSC were to make principal provisions for the development of the market. To realise these goals of SCSC, the China Securities Regulatory Commission (CSRC) was established in October 1992.

[6] "Guowuyuan Guanyu JiaQiang Gupiao Zhaiquan Guanli De Tongzhi (State Council Notice on Enforcing Control of Stocks and Bonds)," Chinese State Council, 28 March 1987, in *Jirong Shichang Caozuo Quanshu* (*Full Reference of Financial Market*), China Statistical Publish House, 1994.

The CSRC implemented specific administration on securities markets on behalf of the SCSC. The CSRC is responsible for drawing up regulatory rules, regulating security issues for listing and trading, examining and supervising the business of securities entities, granting licenses for securities companies, approving lawyers and accounting houses related to securities business, approving and supervising companies that are listing abroad, investigating and punishing violations of market regulations, and preparing statistical data and market analysis to the central government. However, the PBC and the State Planning Commission were still involved in the administration of the securities market, but their impact was gradually declining. The CSRC took over all of the responsibilities of the SCSC when the SCSC was dismantled in 1998.

The central government's administrative model for the securities market has been replicated by local governments. There is a securities supervisory office in each municipality, which is coordinated by the local branch of the PBC and the local planning commission. The securities supervisory offices are in charge of supervising local listed enterprises and security entities, and in implementing the regulations of the CSRC. The direct leadership from the local government used to cause enhanced local benefits via a reduced supervisory function. Therefore, the central government announced in 1998 that the local securities offices would be led directly by the CSRC, instead of local governments.

The Shanghai Stock Exchange was assembled by the Shanghai branch of PBC and the Shanghai municipal government. Similarly, the Shenzhen Stock Exchange was assembled by the Shenzhen branch of PBC and Shenzhen municipal governments. Municipal governments nominated the Board of Directors and general managers, and held influence over routine operations of the stock exchanges. To reduce the frequency of the local government interventions on the stock exchange, the CSRC began to assign general managers directly to the Shanghai and Shenzhen stock exchanges from 1998.

Apart from the official organisation, the Securities Association of China, a self-regulatory non-governmental organisation, was founded in August 1991. The main functions of the Securities Association of China are to self-regulate, arbitrate disputes, and provide training and consultation to members. However, the Securities Association of China holds little power and is seldom able to affect securities market administration.

The PBC, which was initially in charge of securities circulation, established Junan, Huaxia, Guotai and Nanfan, the current largest securities companies in China.[7] Starting at that time, a number of securities companies and trust and investment companies that mainly dealt with the securities business, had been founded by banks, the Ministry of Finance, local governments and other entities. Some of those non-bank financial institutions were involved with frequent scandals and illegal transactions. One of the reasons was the confused boundary between business and supervisory sectors. Therefore, the central government promulgated legislation to separate the companies from the administrative sectors, and to close some companies that violated the law or were exposed to high debt risks. As a result, the membership of the Shanghai Stock Exchange declined from 553 in 1995 to 333 in 1998. Similarly, the

[7] Guotai merged with Junan in 1999, entitled Guotai-Junan Securities Companies, following a severe violation of the law by Junan Company. Another one of the largest securities companies is Shenyin-Wanguo Securities Company, incorporated with Shenyin and Wanguo securities companies following the same case.

membership of the Shenzhen Stock Exchange declined from 542 in 1996 to 329 in 1998.

By the end of 1998, there were 317 securities companies or trust and investment companies in China that were members of the Shanghai Stock Exchange. About 2388 brokerage houses serviced 19.99 million investors trading the securities listed on the Shanghai market. There were 331 securities companies or trust and investment companies in China that were members of the Shenzhen Stock Exchange. About 2052 brokerage houses serviced 19.11 million investors trading the securities listed on the Shenzhen market.[8] All of the brokerage houses are operated by either the securities companies or the trust and investment companies as their branch of profit sections. The relationships among the securities dealing institutions and customers can be sketched in Figure 2-5.

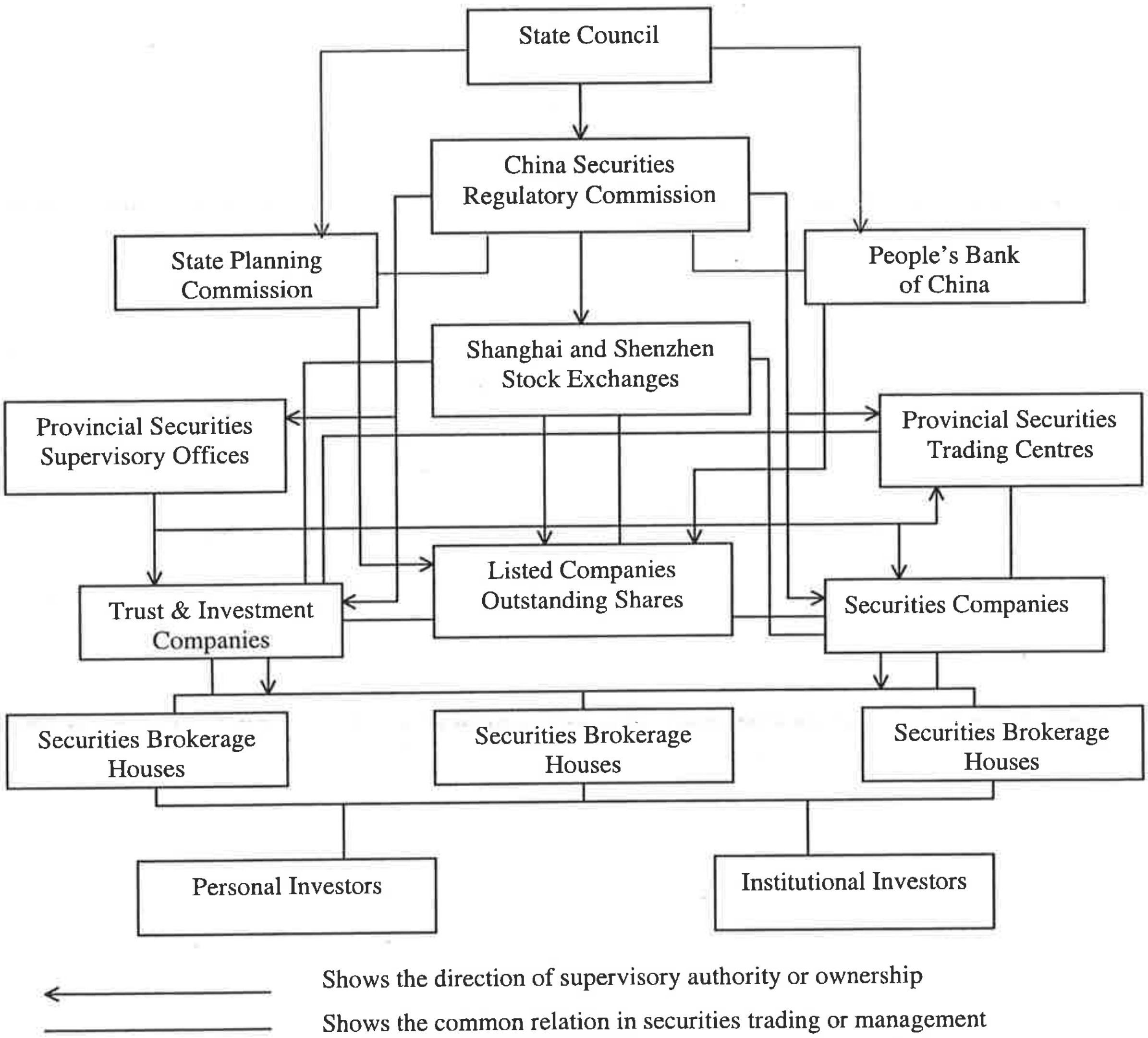
2.6.2 Market regulations

As we know, the Shanghai and Shenzhen municipalities participated in assemblies of the Shanghai and Shenzhen stock exchanges to encourage listing of local enterprises. They formulated market regulation independently without a uniform benchmark designed by a specific authority. The market regulations of the Shanghai and Shenzhen stock exchanges varied greatly in the initial years in the rules of company listing, routine operation, microstructure and so forth (Rajen and Yu 1995). To facilitate

[8] Approximately, all the securities companies are dual members of Shanghai and Shenzhen stock exchanges. Each brokage house services the securities trading for both the Shanghai and Shenzhen markets simultaneously. Each investor opens two accounts in the Shanghai and Shenzhen markets respectively.

market administration and share trading, regulations have been consolidated across the two markets gradually since the CSRC was assigned power.

Figure 2-5. Institutional Framework of China's Stock Market



For instance, before April 1993, major listing standards on the Shanghai market were as follows.[9] The paid-up capital should be greater than or equal to 50 million RMB.

[9] "Shanghaishi Gupiao Faxing Yu Jiaoyi Guanli Zhanxing Banfa (Provisional Clauses for Stock Listing and Trading on the Shanghai Market)," Shanghai Municipality, April 1991, in *China's Securities Market Annual Report 1993,* Zhongguo JinRong Chubanshe (China Finance Press).

There were, at least, 1000 shareholders and each of them owned the share worth no less than 1000 RMB. Publicly held shares should be more than 25% of the total shares issued. Profit must be made in the previous three years and with a profit rate greater than 10% in the past two years. The ratio of net physical capital to gross physical capital should be more than 30%. By contrast, the major listing requirements on the Shenzhen market were as follows.[10] The paid-up capital should not be less than 10 millions RMB. The ratio of net physical capital to total physical capital must be larger than 25%. At least 800 shareholders were involved. The initiator of the new company had no less than 35% of total shares. Since April 1993 the asymmetrical clauses between the two markets have been united by the CSRC, generally in terms of the standards on the Shanghai market.[11]

The different regulations in the two markets were remarkable in microstructure. In the Shanghai Market, prior to 24th November 1992, investors who bought A-shares on one day could not sell them until the next day (t+1). In the period from 25th December 1992 to 31st December 1994, investors could sell A-shares in the same day they bought (t+0). Prior to 1st November 1993, investors could not sell B-shares until three days after purchasing (t+3). In the period from 2nd November 1993 to 31st December 1994, the B-shares were traded on the t+0 rule. In the Shenzhen Stock Market, from 15th June to 31st December 1993, A-shares were traded on a t+1 rule and B-shares were traded on a t+3 rule. From 1st January 1994 to 31st December 1995, the trading for A-shares and B-shares were on the t+0 and t+1 rules respectively. Since 1st January 1995, the

[10] "Shenzhenshi Gupiao Faxing Yu Jiaoyi Guanli Zhanxing Banfa (Provisional Clauses for Stock Listing and Trading on the Shenzhen Market)," Shenzhen Municipality, June 1991, in *China's Securities Market Annual Report 1993,* Zhongguo JinRong Chubanshe (China Finance Press).

[11] "Gupiao Jiaoyi Guanli Zhanxing Tiaoli (Provisional Clauses for Stock Trading Management)," State Council, April 1993, in Chen Gong and et al 1996, *Zhonggou Zhengquan Fagui Zonghui* (*Collection of China's Law on Securities*), Renmin Daxue Chubanshe (People's University of China Publish House).

transactions have been unified to t+1 and t+3 rules for A-shares and B-shares respectively on both the Shanghai and Shenzhen markets.

Initially, the trading time in the Shanghai Stock Exchange was 9.30 to 11.00 in the morning and 1.30 to 3.00 in the afternoon, Monday through Friday. The trading time in Shenzhen Stock Exchange was 9.30 to 11.00 in the morning and 2.00 to 3.30 in the afternoon, Monday through Friday, and 9.00 to 11.00 in the morning on Saturday (before 1st February 1992 only). Recently, the trading time in the two markets was united as 10.00 to 11.30 in the morning and 1.30 to 3.00 in the afternoon, Monday through Friday. Markets are closed during public holidays. However, the duration of market closure around holidays was determined individually by the Shanghai and Shenzhen stock exchanges before the CSRC took charge of this in 1994.

Before 20th May 1992, the Shanghai Stock Exchange set a daily price limit of ±5%, later the price limit was reduced to ±1%. After 20th May 1992, the Shanghai Stock Exchange lifted the price limit, allowing the price of change freely. The Shenzhen Stock Exchange applied ±10%, ±5%, and +1% to –5% asymmetrical price limit in different periods before it removed the limit in the middle of 1992. Finally on 16th December 1996, at the request of the CSRC, both the Shanghai and Shenzhen markets implemented a 10% limit on both price increase and decrease for A-shares and B-shares alike.

2.7 Market performance

2.7.1 Price fluctuations

Stock prices in China have experienced huge fluctuations since the Shanghai and Shenzhen stock exchanges were established. The range of the fluctuations of the Shanghai Stock Exchange Composite Index (SSE) and Shenzhen Stock Exchange Component Index (SZS), reported in Table 2-8, were generally the reflection of extraordinary price shocks. The peak values were 2.79, 4.88, 3.23 and 2.45 times the bottom values for the SSE in 1991, 1992, 1994 and 1996, while, the peak values were 3.04, 3.18, 2.41 and 4.84 times the bottom values for SZS in the equivalent years. The deviations of the index were also large in other years for the two markets. The stock price fluctuations of the Shanghai or Shenzhen markets were unusual in comparison with those of other well-performing markets. For example, the highest index values were only 1.66 times the lowest index values in the U.S. market over four years recently (Chen 1998).

Table 2-8. The Ranges of Stock Prices

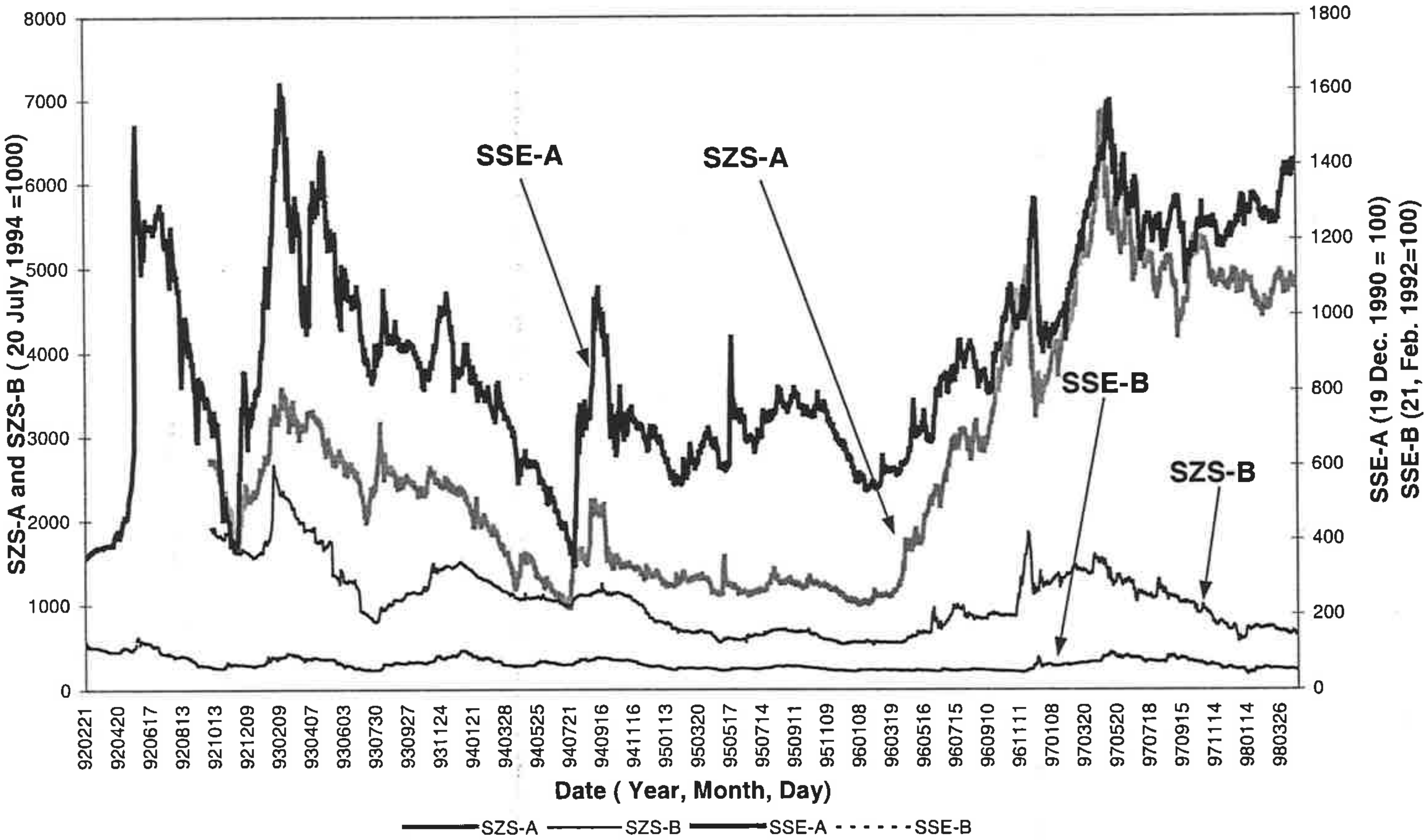
	1991	1992	1993	1994	1995	1996	1997	1998
Shanghai Stock Exchange Composite Index (SSE)								
Highest	292.75	1429.01	1536.82	1052.94	926.41	1258.69	1510.18	1422.95
Lowest	104.96	292.76	778.33	325.89	524.43	512.83	870.80	1043.02
Highest/Lowest	2.79	4.88	1.97	3.23	1.77	2.45	1.73	1.36
Shenzhen Stock Exchange Component Index (SZS)								
Highest	1206.32	2918.09	3422.22	2271.39	1415.23	4501.92	6019.23	4317.71
Lowest	396.52	917.37	1688.18	944.02	982.82	930.06	3063.99	2946.27
Highest/Lowest	3.04	3.18	2.03	2.41	1.44	4.84	1.96	1.47

Source: *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *Shenzhen Stock Exchange Fact Book 1998*, Zhongguo Jinrong Chubanshe (China Finance Publish House). The data of Shenzhen Stock Component Index, from the years of 1991 to 1994, were cited from the database of Newland Information Consulting Company.

Speculative trading was one of the causes of these extraordinary price shocks. As a whole for the first four years, 1991 to 1994, the share traders focused their interest on the Shanghai market as they thought that Shanghai would be one of the largest stock markets in Asia. Thereafter, the stock price fluctuation of the Shanghai market was much more severe than that of the Shenzhen market. The highest SSE value of 1536.82 was 14.64 times the lowest SSE value of 104.94 in this period. By contrast, the highest SZS value of 3422.22 was 8.63 times the lowest SZS value of 396.52. For the next four years, 1995 to 1998, under the overwhelming expectation of taking over Hong Kong, more share traders gathered their stakes in the Shenzhen market. Thus, the stock prices of the Shenzhen market exhibited more volatility than the stock prices of the Shanghai market. The highest SZS value of 6019.23 was 6.74 times the lowest SZS value of 930.06, while, the highest SSE value of 1510.18 was 2.94 times the lowest SSE value of 512.83.

The huge price fluctuations are a special characteristic of China's immature stock markets, in which the shareholders were overly sensitive to the government's frequent administrative intervention. The shareholders fell into extreme "happiness" to buy the shares or "sorrow" to sell the shares as they received "good" news or "bad" news of relevant policies came from the government. The remarkable peaks and troughs in trajectories of the indices, particularly in those of A-shares indices in Figure 2-6, coincide with various administrative proclamations. The advent of the first peak of stock prices in May 1992 followed the important speech of former Chinese leader

Figure 2-6. Trends of A-shares and B-shares Indices in SSE and SZS



Deng Xiao Ping[12] and the lift of the stock price limits in May 1992. The prices dropped in November 1992 due to the temporary recovery of political conservatism. The next price peak in February 1993 was introduced by the approval of institutional investment in the stock market. The prompt extension of listed companies and normalisation of financial regulation led to a new price trough in July 1994. Thereafter, the three clauses of market saving policies, "stopping the listing of new companies, raising capital for securities institutions and the proposed founding of fund companies," stimulated prices to reach a peak in September 1994. The prices declined gradually in February 1995 when the government announced that a number of companies would be listed and an increased quantity of government bonds would be issued. The provisional halt to government bond transactions caused stock prices to jump in May 1995. The price decline in January 1996 should be attributed to expanding outstanding shares. Three reductions of the deposit interest rates in 1996 pushed the prices higher in November 1996. Government cautions relative to market risks cooled the prices down to another low in December 1996. The second historical peak of occurred in May 1997 due to official advocation of future prosperity when Hong Kong returned to China.[13]

2.7.2 Behaviour of A-shares and B-shares

As indicated previously, China's Stock Market was distinctly segmented with A-shares restricted to the Chinese citizens and B-shares restricted to foreign investors. Despite some Chinese citizens being able to access B-shares via the accounts of their friends

[12] Owing to the Event of Tiananmen Square in 1989, the reasonableness of the economic reform was argued again. The paramount leader Deng Xiao Ping justified this dispute with his profile speech for further reforms during his Southern Tour in China in January 1992.
[13] Hong Kong was returned to China from the U. K. in the 1st July 1997.

and relatives who held foreign passports or permanent visas, the market segmentation is broadly reflected in the following characteristics.

Firstly, A-shares have been priced considerably higher than B-shares since their listing dates. On average, A-shares prices were about one and a half times their B-shares counterparts. By contrast, foreign investor accessed shares were more expensive than domestic resident shares on most of the world's segmented markets, such as in Thailand (Bailey and Jagtiani 1994) and in Mexico (Domowitz and *et al* 1997). However, the large discrepancy between A-shares and B-shares prices did not imply arbitrage opportunities due to the inconvertibility of the Chinese currency (Fernald and Rogers 1998).

Next, it can be seen in Figure 2-6, that A-shares prices were much more volatile than the B-shares prices. This was indicated as well in Fang's (1997) study by a relatively large standard deviation of A-shares returns and a relatively small standard deviation of B-shares returns. In addition, the A-shares were traded at a substantial premium, as the Shanghai Stock Exchange A-shares Index (SSE-A) and Shenzhen Stock Exchange A-shares Index (SZS-A) sketched radically higher than their base values of 100 and 1000 over the whole period. By contrast, the B-shares were traded at a negative yield, as the Shanghai Stock Exchange B-shares Index (SSE-B) and the Shenzhen Stock Exchange B-shares Index (SZS-B) plotted below the base values of 100 and 1000.

Thirdly, the A-shares were successively overvalued in the three years of 1996, 1997, and 1998. This can be seen in Table 2-9, in which the price-earning ratio (P/E ratio) were 32.65, 43.43 and 34.38 for Shanghai A-shares and 38.88, 42.66 and 32.31 for Shenzhen A-shares. Comparatively, a reasonable P/E ratio in a mature market was about 20 (Chen 1998). On the other hand, the B-shares were explicitly undervalued in the equivalent three years. The P/E ratios of Shanghai B-shares were 14.04, 11.99 and 6.04 in 1996, 1997 and 1998. Likewise, the P/E ratios of Shenzhen B-shares were 14.07, 11.99 and 5.71. The A-shares' P/E ratios were almost 2 to 6 times the B-shares' P/E ratio.

Table 2-9. Price Earning (P/E) Ratio and Turnover Rate

	1995	1996	1997	1998
Shanghai Stock Exchange				
A-shares P/E Ratio	16.32	32.65	43.43	34.38
B-shares P/E Ratio	8.00	14.04	11.99	6.04
A-shares Turnover Rate (%)	519.41	760.03	534.99	355.30
B-shares Turnover Rate (%)	56.26	62.57	73.47	57.31
Shenzhen Stock Exchange				
A-shares P/E Ratio	9.80	38.88	42.66	32.31
B-shares P/E Ratio	6.01	14.07	10.67	5.71
A-shares Turnover Rate (%)	229.91	1135.67	579.36	333.99
B-shares Turnover Rate (%)	23.68	122.15	78.47	31.95

Source: *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai People's Press (Shanghai Renmin Chubanshe). *Shanghai Stock Exchange Statistics Annual 1997*, Shanghai University of Finance and Economics Publish House (Shanghai Caijing Daxue Chubanshe). *Shenzhen Stock Exchange Fact Book 1998*, China Finance Press (Zhongguo Jinrong Chubanshe). *Shenzhen Stock Exchange Fact Book 1996*, Economics Science Press (Jingji Kexue Chubanshe).

Finally, the A-shares market was much more active and speculative, whereas the B-shares market was comparatively "thin" with discontinuous trading. Table 2-9 shows, in the period from 1995 to 1998, that the turnover rates of A-shares were over 355% for the Shanghai market and over 229% for the Shenzhen market. The turnover rates of A-shares were especially astonishing with values of 760% and 1135.67% in 1996, which implied that the A-shares were, on average, transacted 7.6 times per year in the Shanghai market and 11.35 times per year in the Shenzhen market! The normal average turnover rate in a mature market should be about 30% (Chen 1998). In comparison with the world stock markets, the turnover rates of B-shares were reasonable. In comparison with A-shares, the B-shares were typically inactive in the trading in that the B-shares turnover rates were only about one-tenth that of the A-shares turnover rates.

The restrictions on ownership and the non-convertible Chinese currency resulted in a "thin" and illiquid B-share market. The Chinese share traders usually bought shares for high capital returns rather than dividends. Despite this fact, the dividend ratio of B-shares was high given the low subscription price; the Chinese investors who kept foreign investor accounts did not trade B-shares heavily due to the unfavourable realisation of capital gains. The true foreign investors were not interested in illiquid shares either, and were suspicious of the real performance of the listed companies because these investors faced imperfect information disclosures and an unfamiliar accounting system.

2.8 Prospects for China's Stock Market

2.8.1 Main effects of China's Stock Market on the economy

China's Stock Market has generated increasingly important effects on China's economy. The most important role that needs to be highlighted is that it has raised a considerable amount of capital since 1992. Table 2-10 indicates that the total capital raised via issuing A-shares and B-shares through the Shanghai and Shenzhen markets was 9409 million RMB in 1992, and 75222 million RMB in 1998, growing 799.47% in the six year period. By the end of 1998, issuances of A-shares and B-shares had accumulated capital to 273969 million RMB for the listed companies, equivalent to 9.55% of the total investment in physical assets of the country in 1998.

As the capability of raising capital expanded, as shown in Table 2-10, the importance of the stock market to the national economy increased as well. In 1992, the ratio of market capitalisation to the country's GDP was 3.93% for the Shanghai and Shenzhen markets combined. In 1998, this ratio reached 25.63%. From 1992 to 1998, GDP increased by 368.91%; meanwhile, the A-shares and B-shares market capitalisation increased by 1950.56%. The products of the listed companies accounted for an increasing portion of the gross output of the country, and most strikingly in the export sectors.

Table 2-10. Raised Capital and Stock Market Deepening

	1992	1993	1994	1995	1996	1997	1998	Overall
Shanghai Market	7672	15471	8352	7063	20222	47460	38918	145158
Shenzhen Market	1737	15983	5453	4823	14682	49829	36304	128811
Total	9409	31454	13805	11886	34904	97289	75222	273969
Shanghai Market	2.09	6.37	5.56	4.32	7.98	12.33	13.76	-
Shenzhen Market	1.84	3.86	2.34	1.63	5.45	11.22	11.87	-
Total	3.93	10.23	7.9	5.95	13.43	23.55	25.63	-

Source: *99's Zhongguo Gupiao Jijin Touzi Bidu* (*99's Necessary Manual of Investment in Stocks and Funds of China*), Guangdong Jingji Chubanshe (Guangdong Jingji Publish House). *Shanghai Stock Exchange Statistics Annual 1997,* Shanghai Caijing Daxue Chubanshe (Publish House of Shanghai University of Finance and Economics). *Shanghai Stock Exchange Statistics Annual 1999*, Shanghai Renmin Chubanshe (Shanghai People's Press). *Shenzhen Stock Exchange Fact Book 1996,* Economics Science Press (Jingji Kexue Chubanshe). *Shenzhen Stock Exchange Fact Book 1998*, China Finance Press (Zhongguo Jinrong Chubanshe).

Before the stock market emerged, the conversion of deposits into investments through the medium of banks was practically the only capital financing measure in China. Since the owners of SOEs also owned the banks, the supply of loans used to be inevitably determined by bureaucratic and careless assessments. Thus, the domestic banks faced the risk of bad loans, which had accumulated to 30% or more of non-performing assets of the banks. Once the banks enforced the control of loan supply by relatively strict assessments, the bulk of residents' saving deposits accumulated as idle balance on which the banks paid interest. In 1996 the total of urban savings deposits was to 3852.08 billion RMB, and increasing by 20% in the following years. Stock markets saved the domestic banks from this dilemma, and to some extent, accelerated the conversion of savings deposits to investment. In addition, the shareholders monitoring of firm activity has promoted the effective utilisation of these investments.

The stock market has diversified the channels of financing capital available not only from within the home country but also from foreign countries. Before the market opened, foreign investment inflows were mainly generated from foreign bank loans, foreign government debts and foreign direct investment. Since the government institutions used to provide guarantees before foreign loans were confirmed, the government had to accept the risks of currency exchange rate fluctuation and default risks for the enterprise. Issuances of B-shares, H-shares and N-shares for financing listed companies released this heavy burden for the government and made up for, to a certain extent, the deficiencies of foreign capital inflow. Meanwhile, the efficiency of partially foreign owned companies was improved owing to supervision by the foreign shareholders. By the end of December 1998, issuing B-shares and H-shares (including N-shares) had raised 46.20 billion and 100.60 billion U.S. dollars in capital.

2.8.2 Prospects for China's Stock Market

Though China's Stock Market has grown astonishingly, it is still small compared with its economic scale and most of the stock markets in the world. For example, in 1998, the ratio of stock market capitalisation to GDP was 25.63%. After the discount of unmarketable shares, the ratio of float market capitalisation to GDP was less than 10%. In contrast, the ratios of float market capitalisation to GDP in developed markets, such as U.S., Japan, Germany, were 244%, 178%, 133% in 1996 (Huang 1999). Even for the emerging markets, the ratios were 100.47% in Taiwan, 55.02% in Thailand, and 38.86% in Mexico.

Among the 400 thousand large and medium size enterprises in China, only about 880 had been listed by the end of 1998. Banks loans were still the main source of financing capital for enterprises in China. From 1995 to 1998, bank loans accounted for 80% of total financed capital each year. Even in the stock market's most prosperous year, 1997, the capital raised by issuing shares was no more than 23.2% of total new capital inflow, significantly lower than that in developed markets. Furthermore, of 1220 million Chinese residents, only 39.1 million of them have participated in the stock markets, this percentage of 3.20% is also small compared to those in developed countries.

Nevertheless, China's Stock Market has a huge potential for expansion due to the following reasons. Firstly, by learning from developed countries and the experiences of previously unsuccessful SOEs' reforms, China's central authority considers shareholding as a key direction for enterprise reforms. Secondly, there will be a sufficient supply of securities with so many unlisted enterprises in China. Thirdly, comparatively, there is a huge demand for shares coming from urban and rural residents. Until the end of 1998, total urban and rural resident savings deposits had surpassed 5000 billion RMB yuan, eight times the capital they invested in securities. More and more Chinese residents are becoming interested in stock investment. Finally, as the result of reforms in the social allocation system, the distribution of housing directly to staff will be totally replaced by monetary distribution; entity insurance covers will be replaced by the social insurance system.[14] All of these will accelerate the development of China's Stock Market.

As well as the domestic promotion of China's Stock Market, the international environment is obviously favourable to the development of China's Stock Market. As we know, the Asian financial crisis in 1998 did not directly affect China's Stock Market, thus the progress of China's Stock Market may have not been slowed. Instead, the neighbouring countries' experience provides a lesson for China's government in successfully regulating the market. Predominantly, the hardest obstacle to China to enter the World Trade Organisation (WTO) was resolved by a final negotiation between China and the U. S. in November 1999, which means China is expected to join the WTO in the year 2000. As one of the primary clauses of the negotiation, China's financial market will be required to open to the world. Therefore, it is likely that China's Stock Market will expand to become an important part of the world's capital market.

[14] By the year 1978, when China's economic reform started, many products were not treated as commodities. For instance, houses were distributed directly to the staff by the enterprises instead of exchanging through markets. Enterprises also took care of health cover, pension allowance and other social welfare for their staff. Currently, this allocation system still performs in some enterprises and institutions in China.

2.9 Conclusion

The bonds and stocks issued in China originated from China's economic reforms. After years of gestation, China's stock market formally emerged in 1990 and 1991, when the Shanghai and Shenzhen stock exchanges were constructed. In the period of gestation, China's Stock Market had experienced an evolution from a black-market to an OTC market and finally to a formal market. As the progeny of the socialist-market-economy, China's Stock Market contains a hybrid characteristic of centrally-planned economy and market-oriented economy.

There are A-shares for the domestic residents and B-shares for foreign investors in China's Stock Market. A-shares prices are overvalued and trade at a premium, whereas, B-shares are undervalued and trade on negative yield. A-shares prices fluctuate widely, but B-shares prices are relative steady due to inactive trading. Furthermore, the shares display a complicated structure of ownership. The state-owned shares and legal person shares account for the dominant proportion of the market. Only social public shares can be freely traded, while the remaining shares are unmarketable in the stock exchanges. Several legal person shares are allowed to trade on the STAQ or NET.

The industrial categories of the shares are inconsistent with the government's scheme of industrial structure, as the enterprises, which are granted priority for development, are usually not qualified for listing on the stock exchange due to their financial status. The coastal provinces have attracted more capital via the stock markets than inland provinces, in that about 70% of listed companies come from coastal provinces. The initially institutional framework of China's Stock Market showed too much administrative intervention from the government. However, the market supervisory system and trading regulation have been improved since the market opened.

China's Stock Market's lack of involvement in the Asian financial crisis and the recent entry of China into the WTO will promote China's Stock Market development. However, China's Stock Market confronts the following issues for its maturation process: to normalise accounting systems so that they coincide with international accounting standards, to enforce the regulation of information disclosure, to finalise the convertibility of the A-shares and B-shares, and to permit the trading of legal person shares and state-owned-shares. Each of the issues mentioned above is a major topic for further research.

Chapter 3 Theoretical Perspectives and a Brief Overview of the Literature

3.1 Introduction

Structurally, the stock market consists of the stock exchange, firms and shareholders; its function is to facilitate share trading. Intrinsically, the stock market creates links between participants in the economy. It provides channels to connect consumers and producers, savers and borrowers, managers and owners, sellers and buyers. Through these channels, the stock market plays a critical role in the capital resource allocation of a modern economy; a modern economy cannot function well in the absence of a stock market.

The fact that a stock market possesses the potential to be a capital resource allocator does not imply that it must perform the job of capital allocation well. Observing the practices of stock markets, we find that some of them do not allocate the capital to the industrial sectors experiencing high growth in product demand, or cannot introduce capital to sectors that demand it sufficiently quickly. In such situations, the stock market allocates capital resources inefficiently and the rate of expansion of the economy has suffered. An allocationally efficient stock market should allocate capital resources into the most productive sectors as soon as possible. Allocational efficiency of a stock market should consist of both internal efficiency and external efficiency, in other words, operational efficiency and informational efficiency.

A stock market is said to be operationally efficient when it possesses liquidity, the condition of the market is orderly and the market's organisation is of a high quality (Juttner 1990). The liquidity of a stock market refers to the fact that the stocks can be bought and sold in a short space of time, and at representative market prices that reflect the intrinsic value of the stock. An orderly market is one which operates under reasonable circumstances, being a continuity of trading, the absence of price manipulation and so forth. High-quality market organisation implies a well-functioning market system, which includes a market-determined price setting procedure and a transaction settlement process. In such an operationally efficient market, the buyers and sellers of securities can transact at prices that are as low as possible, given the costs associated with providing these serves (West 1975).

Informational efficiency requires that stock prices reflect all available information at all times (Fama 1970), which includes historical information, public information and private information. Only when the prices reflect this information, can prices provide correct signals for efficient capital allocation. If there exists a monopoly of information in the market, the monopolists should exploit the abnormally high returns. In this case, the stock prices may be distorted and provide an inappropriate signal for capital allocation.

Operational and informational efficiency are inherently related to each other. An operationally inefficient stock market may inhibit the spread of information, which would undoubtedly block capital movements. Empirical studies, particularly, statistical tests on the efficiency of stock markets are usually undertaken to study the informational efficiency. When the tests pass the criteria, the market is defined as an efficient market. Such statistical tests have been widely applied in the body of literature known as "Efficient Market Theory." That is because informational efficiency is fully incorporated in allocational efficiency concerning stock markets, some of the prerequisites of informational efficiency are met by the condition of operational efficiency; and the transaction data of stocks is available and suitable for the tests of informational efficiency of stock markets. But, it is clear that allocational efficiency, operational efficiency and informational efficiency are different categories with respect to stock markets. Nevertheless, this study will test the efficiency of China's Stock Market by focusing on tests of informational efficiency.

Fama (1970) provided a useful framework with his Efficient Market Hypothesis (EMH) for studying the informational efficiency of stock markets. He suggested three classifications of market efficiency according to different information sets available to market participants. EMH has been broadly tested on many stock markets. Also, EMH has been challenged by frequent finding of market anomalies, such as seasonality and firm size effects. Even Fama (1991) revised his classification of informational efficiency in a later article in light of the conflicting evidence. However, the original version of EMH is so engraved that it is still popular in the finance literature and textbooks. This study implements the original version of EMH in testing of China's Stock Market. Therefore the plethora of the empirical results tested on other markets can be used as a comparative benchmark for this study.

The efficient market theory and the relevant empirical studies are a popularly interesting area for research. Since the beginning of the century, a vast number of studies have been published. A complete review of the literature on efficient market is beyond the scope of this chapter. The review of the literature in this chapter provides only a brief outline of the studies on market efficiency, as they relate to this research.

The remainder of the chapter is arranged as follows. Section 3.2 discusses the efficient market theory and points to the relativity of market efficiency. Section 3.3 discusses the EMH and market anomalies. Section 3.4 reviews the literature on weak form efficiency. Section 3.5 reviews the literature on seasonality. Section 3.6 reviews the literature on semi-strong form efficiency. Section 3.7 reviews the literature on strong form efficiency. Section 3.8 provides a conclusion for this chapter.

3.2 Informational efficiency

As stated above, internal efficiency refers to the internal mechanisms of the market. A sound mechanism is a determinant of smooth market operation. However, external efficiency relates to the outside influences on the market. Of those influences, information has the greatest effect on pricing. Usually, following the release of information, the share prices are adjusted up or down, and share returns rise and fall. The prices of shares act as signals for capital allocation into the most productive sectors. Therefore, external efficiency pertains to price efficiency, or in other words, informational efficiency relates to the impact of information on market prices. The core of the efficient market theory is about "what" "when" and "how" information is used to determine prices on the markets.

3.2.1 Definition of an efficient stock market

As Fama (1970) explained, a perfectly efficient stock market is a market in which the prices of stocks fully reflect all available information at any time. Suppose that a stock market is efficient with respect to an information set ϕ. Every participant of the market can access the information set ϕ, and trade shares on the basis of ϕ. Then the information is incorporated totally into the prices, and every share price is adjusted to be equal to its (investment) market value (Sharpe 1985). Therefore, no one can monopolise information to gain a comparative advantage over others, and no one can discover a regular pattern to get abnormally high profits.

An efficient market requires that prices react to new information instantaneously. In practice this means that when new information becomes available in the market, it should be fully reflected in the prices immediately. The prices should be updated to a new equilibrium level by the new information. If the market processes the new information slowly, i.e., the prices do not react to the new information instantaneously; there will exist a trading rule allowing some share traders to generate abnormally high profits. In this case, some share traders purchase the shares immediately after the companies announce unanticipated "good" news, or they sell the shares immediately after the companies announce unanticipated "bad" news. After a period, prices will eventually fully reflect the news, allowing share traders to trade in the converse way to monetise profits.

An efficient market also requires that prices react to information without bias. This means that when new information is announced in the markets, it should be reflected in prices correctly. Prices should adjust to the new information by moving to an appropriate equilibrium price level and then they should be stable until further information arrives. Otherwise, the prices have overreacted to the information, if the prices are higher than the appropriate equilibrium level; or the prices have underreacted to the new information, if the prices are below than the appropriate equilibrium level. Both overreaction and underreaction permit profitable trading strategies. Suppose that prices always overreact to favourable news after the announcement, then traders should sell the shares immediately and buy them back when the prices decline to their appropriate equilibrium level. In a similar way, the traders should buy the shares that have underreacted to the favourable news, and sell them when their prices rise to the appropriate equilibrium level.

3.2.2 Conditions of a perfectly efficient stock market

The theoretical perfectly efficient market rests on a strong set of assumptions: market equilibrium prices must be independent of the distribution of available information and information assessment across market participants. Therefore, all the issues that make different investors value assets differently are treated as of negligible importance.

Several conditions are necessary for this strong set of assumptions. Firstly, there are no transaction costs in trading. The participants of the market can trade shares at any time without having to consider transaction costs. Secondly, all relevant information is freely available to all market participants. This implies that no matter whether the market participant is a large or a small shareholder, a financial institution or an individual investor, all of them are confronted with the same information. The wealth and social positions of market participants do not provide preferential access to information. Finally, all of the participants are equivalent in the preference for profit maximisation, risk aversion and sufficient knowledge of the market. Then they will all agree on the implications of current information for the current price and the distribution of future prices of each security (Fama 1970).

However, because the conditions of the theoretical perfectly efficient stock market are too strict to be satisfied in current markets, the theoretical perfectly efficient stock market is very difficult to support with empirical evidence. For example, even though the transaction costs have gradually declined in most markets recently, there are always transaction costs accompanying share trading. Market participants have to consider transaction costs before they trade the shares, particularly when trading fees are greater than the returns that can be expected by trading the shares. In addition, not all information is freely accessible and not all investors are fully informed. Generally, financial institutions have advantages over individual investors in access to special information. They also can reduce the average expense of information per share by heavy trading. Furthermore, the quality of knowledge concerning shares and the market among investors is usually heterogenous. Typically, new non-professional participants of the market pay "tuition fees" through losses on the market. Another cause that prevents the market from perfect efficiency is that the short sale is limited by market regulation. Without the ability to sell short, share prices adjust slowly back to market value.

Grossman (1976), and Grossman and Stiglitz (1980) argued that the perfectly informationally efficient market is an impossibility. If all the conditions of perfect efficiency are realised in the market, the expected profits will be distributed based only on the value of investments. The return for gathering information is zero. In this case, there would be little incentive for the investors for information gathering and share trading, so the market would eventually collapse. Alternatively, imperfectly efficient market encourages investors to contribute their effort to gathering and trading on information. Hence a non-degenerate market equilibrium will arise only when there exist sufficient profit opportunities, i.e. the imperfectly efficient market compensates investors for the cost of trading and information collecting.

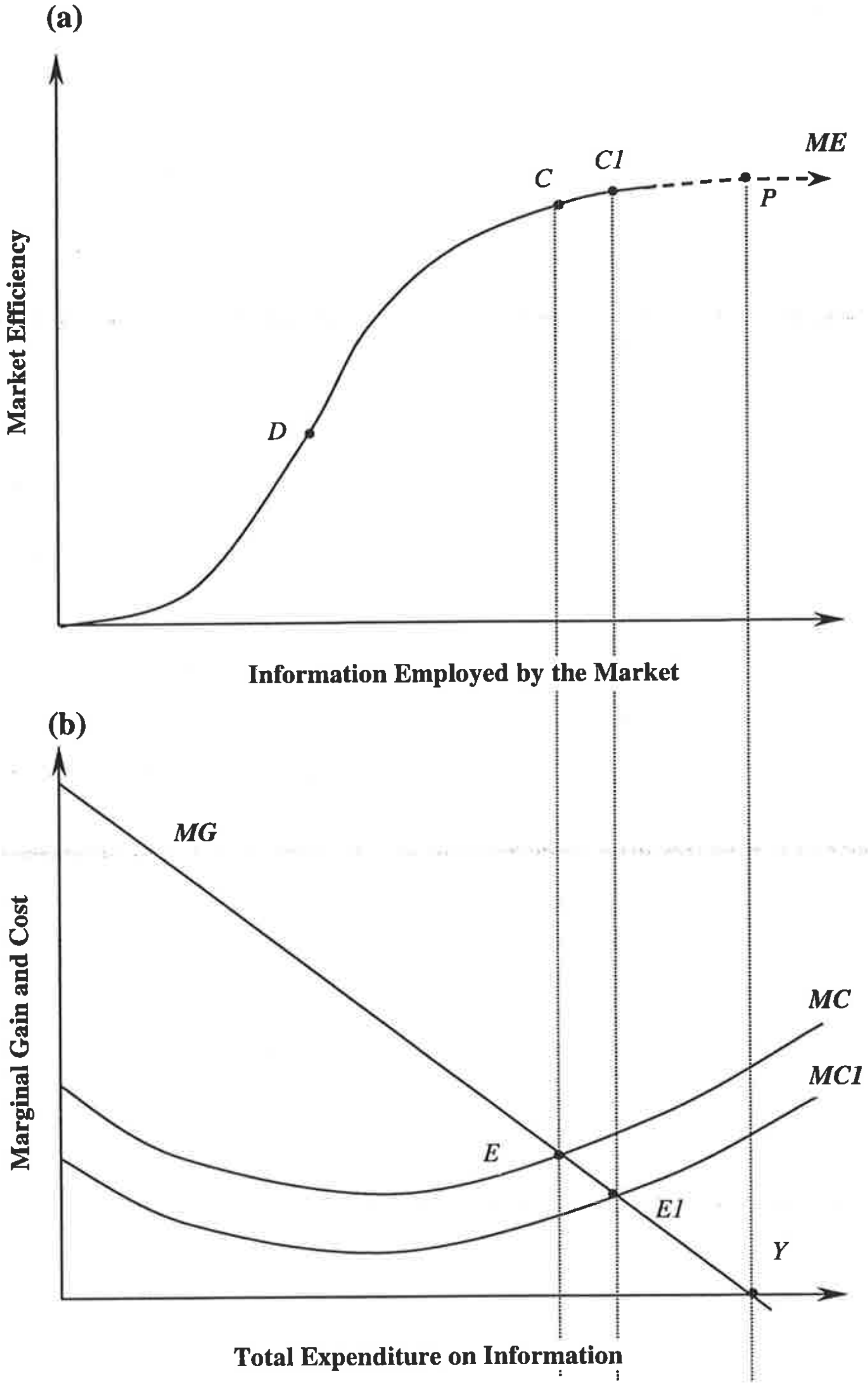
3.2.3 Determinants of an efficient stock market

It is obvious, that a perfectly efficient market is desirable and, also, that none exist. Thus, market efficiency is comparative efficiency instead of absolute efficiency. Even though in this literature, some markets are indicated as efficient and some others are specified as inefficient in terms of the test statistics, the difference between them is comparative.

Why is one market efficient and another market inefficient? In other words, why is one market more efficient than another one? The level of efficiency of the market is determined by the extent of correctly analysed information applying to share trading. The more information correctly used for share trading, the more efficient the stock market will be. On the other hand, where less effort is spent on searching for and processing information, the speed and accuracy with which stock prices can reflect information is necessarily reduced (Boudreaux 1975), and the market is less efficient.

Figure 3-1(a) depicts a structural relationship between the information employed by the market and market efficiency. The level of the market efficiency is measured along

Figure 3-1. The Determination of Market Efficiency



the vertical axis, whereas the horizontal axis indicates the extent of information instantly and correctly being employed by the market. The curve *ME* reveals that market efficiency rises as correct information employed in the market increases. The break phase in the curve represents that there is a long distance to the point *P*, at which the market is perfectly efficient. Because the perfectly efficient market status is a theoretical construct and is far from current market circumstances, point *P* can only be approached asymptotically rather than reached. Hence, the market is comparatively efficient around point *C*, and the market is comparatively inefficient around point *D*.

The efficient points on the curve *ME* of a market, for example *D* or *C*, are dynamic. If the market is competitive, the efficient points shift from the left to right with swing, i.e., the point *D* is on the way to become point *C*, and point *C* is on the way to approach the perfectly efficient point *P*. How is an efficient point finally positioned at a specific time? It is determined by the equilibrium of the marginal gain of possessing and the marginal cost of gathering and processing information.

It is assumed that share traders are seeking to maximise wealth in the market. Hence, each individual share trader is willing to gather and analyse information up to the point where his expenditure on the information is equal to his gain obtained from using the information. As Boudreaux (1975) stated if the market is competitive, then each share trader feels any increase in information expenditure on his part would not be matched by the gain from trading, and so the total gain is equal to total cost and market equilibrium occurs. The graphical analysis in Figure 3-1(b) is sufficient to illustrate the formation of the market equilibrium. The horizontal axis of Figure 3-1(b) indicates the total expenditure (of money or time) on information; the vertical axis measures the marginal gain and cost of expenditure on the information. The point *E* at which the marginal cost curve *MC* intersects the marginal gain curve *MG*, where *MC=MG*, is equilibrium of the market. While the marginal gain exceeds the marginal cost on the left of point *E*, the share traders would like to spend more on information. In contrast, when the marginal gain is less than the marginal cost on the right of point *E*, share traders prefer trading without further information gathering.

For the analysis on the relation of market equilibrium and market efficiency, a dot line is vertically drawn from point *C* of Figure 3-1(a) to point *E* of 3-1(b). Figure 3-1 shows that market equilibrium occurs at point *E*, corresponding to a level of market efficiency given by point *C*. The level of market efficiency is dependent upon the equilibrium of the marginal gain and the marginal cost of gathering and processing information. Another vertical line is from point *P* of Figure 3-1(a) to point *Y* of 3-1(b), which tells us that if the market is a perfectly efficient market, the marginal gain of gathering and processing information is under the marginal cost of gathering and possessing information.

Market efficiency increases subject to more information being employed correctly and instantly in share trading. However, the expenditure on information is restricted by the market equilibrium. Alternatively, market efficiency can be increased by reducing marginal cost of gathering information. For example, when marginal costs fall from *MC* to *MC1* for gathering the same amount of information, the marginal gain at point *E* is larger than marginal cost. The traders would like to spend more on gathering information. Expenditure on information increases from points *E* to *E1*. Accordingly, point *E1* incorporates much more information than point *E*., and point *C1* is more efficient than point *C*. However, from an economic perspective, the marginal cost curve is never less than or equal to zero. Therefore, the marginal cost of gathering and processing information will never equal the marginal gain at point *Y*. Consequently, the perfectly efficient market can be approached, but can never be reached.

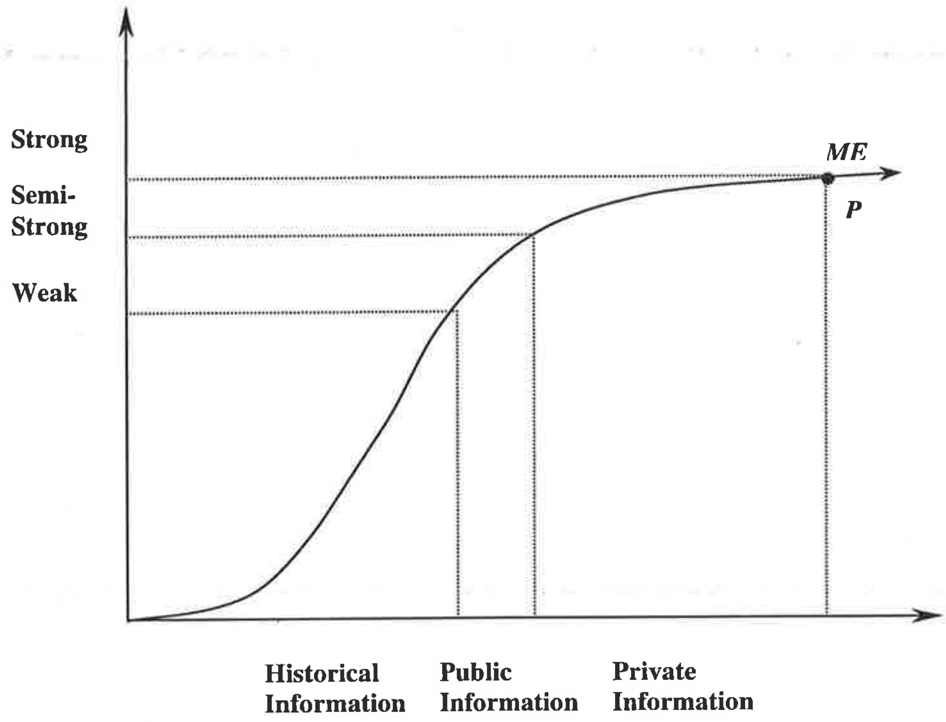
3.3 Efficient market hypothesis

3.3.1 Information sets and classification of market efficiency

The efficiency of the market depends on the information available on the market. Roberts (1967) initially distinguished three levels of market efficiency by considering three sets of information reflected in the prices. Later, Fama (1970) reconstructed the framework by creating the famous Efficient Market Hypothesis (EMH). Firstly: weak form efficiency, which implies that the information contained in the past prices of stocks is fully reflected in the current prices of stocks. Secondly: semi-strong form efficiency, which implies that all publicly available information is fully reflected in the current prices of stocks. Thirdly: strong form efficiency, which implies that all information, including historical, public and private information, is fully reflected in the current market prices of stocks.

The information of each successive set is nested cumulatively. Thus, the first set of information includes all the historical information of prices. The second set of information includes all the historical information and all the current public available information. The third set of information includes all the historical information, all the current public information and all privately held information. Thus, if the market is semi-strong form efficient, it must also be weak form efficient. Furthermore, if the market is strong form efficient, it must be weak form efficient and semi-strong form efficient.

Figure 3-2. The Classifications of Market Efficiency in EMH



The graphical association of the three sets of information and three classifications of market efficiency are illustrated in Figure 3-2. From the trace of market efficient curve *ME*, it can be seen that a market is a weak form efficient market only when all historical information is available in the market. When all historical and current public information is available in the market, the efficiency of the market crosses into the second level, semi-strong form efficiency. The third level, i.e., the strong form efficient market occurs when all the information such as historical, current public and private information, are available in the market. Conversely, if a market is not weak form efficient, it should be neither semi-strong form nor strong form efficient, due to the relevant set of information not being fully available in the market. Moreover, if a market is not a semi-strong form efficient, it should not be strong form efficient, as only the historical information is fully available in the market.

3.3.2 Weak form efficient market hypothesis

The weak form efficient market hypothesis asserts that the current prices fully reflect the information contained in the historical sequence of prices. Any knowledge from such information has already been included in current market prices, and is known by every participant. Thus, any participant of the market cannot predict future price changes by analysing past price patterns. Any effort to devise a trading strategy based on the information of past prices to yield abnormally high profit will be useless. Under the hypothesis of weak form efficiency, so called *technical analysis*, which is based on lines and charts drawn from data on past prices, would be unsuccessful in generating abnormal returns.

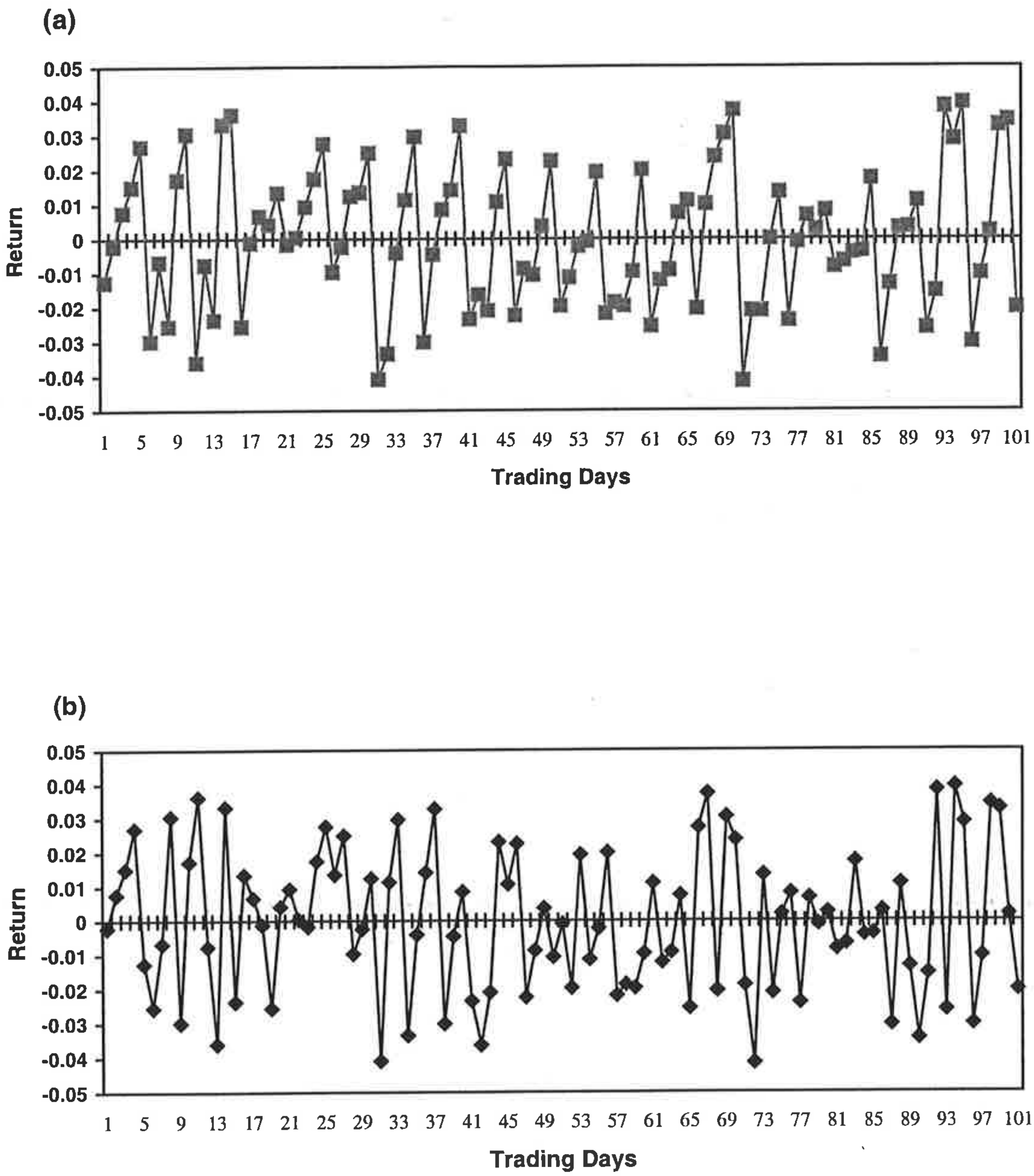
Samuelson (1965) argued rigorously that if information flows are unimpeded and there are no transaction costs in a speculative market, then today's price change reflects only today's news and is independent of yesterday's price change. Mandelbrot (1966) made the same argument, that if the market is efficient in the weak sense, then historical information has been incorporated into the prices. As a result, prices will change only as new information arrives. By definition, the forthcoming news is unpredictable and thus the resulting price change is unpredictable. The percentage price change is not correlated with historical percentage price change.

The forerunner of weak form efficiency hypothesised that the time series of stock prices follows a strict random walk.[1] The strict random walk model assumes that the successive increments of a time series are serially independent and that their probability distribution is identical through time. However, neither assumption is necessary to verify that a market is weak form efficient. The weak form efficient market requires only that the information of past price cannot be used to earn abnormal returns. Therefore, it will be seen in the next chapter that the most referred random walk model is not strict by releasing two restrictions.

To get an intuitive illustration of weak form efficiency, two hypothetical time series of returns are plotted in Figure 3-3. What is the difference between them? We can conclude firstly, by a roughly visual analysis rather than an empirical test, that the returns in 3-3(a) are not generated by a weak form efficient market. It is obvious that the returns and the five-days-lag returns in 3-3(a) are highly correlated. The returns exhibit a peak and a trough every five days. If the share traders exploit this sort of return pattern, they can gain abnormally high returns. In contrast, any regular return pattern cannot be detected in 3-3(b). Thus, the returns of 3-3(b) may have been generated by a weak form efficient market.

[1] The original meaning of random walk is often compared with a drunkard's walk. Leaving the bar, the drunkard moves a random distance at a certain time, and if he/she continues to walk indefinitely, he/she will eventually drift farther and farther away from the bar. This feature, as introduced into analysis of the stock price, means that today's stock price is equal to yesterday's price plus a random shock.

Figure 3-3. Regular and Irregular Return Patterns



Empirical studies of weak form efficiency are usually undertaken through two approaches. The most common approach is directly to test the random walk of stock prices. If the stock prices behave like a random walk, there is no rule that can be employed to gain abnormally high returns. Thus, the market is interpreted as a weak form efficient market. Alternatively, if the test statistics reject the random walk hypothesis, the market is not interpreted as a weak form efficient market. The serial correlation coefficient test, the runs test, the variance ratio test and so forth are popular methodologies of this approach.[2]

The next approach is to determine whether trading based on a strategy created in terms of past price performance can earn abnormal returns. If replicating a strategy can earn abnormal returns, the test rejects the weak form efficiency hypothesis. A traditional technique of this approach is called a Filter, which was introduced by Alexander (1961). The Filter technique implies that if the price of a share moves up at least x percent, buy and hold the share until the price moves down at least x percent from a subsequent high, at which point, sell the share and hold the short position. In a weak form efficient market, repeating the filter strategy cannot generate abnormally high returns.

3.3.3 Semi-strong form efficient market hypothesis

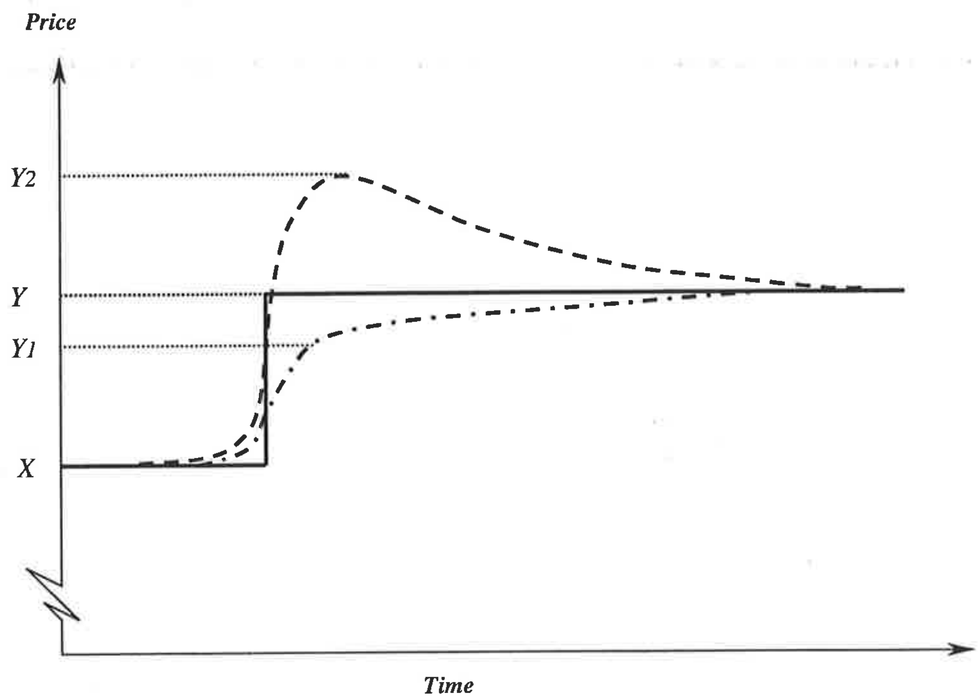
The semi-strong form efficient market hypothesis asserts that the current prices of stocks, not only fully reflect historical price information, but are also fully responsive to all current public information. The price response to the announcements of public information should be instantaneous and unbiased. Hence, analysis based on new publications of microeconomic information concerning the listed companies or macroeconomic information relevant to the country's economic policies will not yield

[2] See Section 4.3 in Chapter 4, Categories of Random Walk Tests.

abnormal returns. Under the hypothesis of semi-strong form efficiency, so called *fundamental analysis*, which is based on publicly available information, would be useless.

Studies on the semi-strong form of market efficiency usually test whether there are abnormal returns associated with the issuance of information to the public. If the prices cannot react to the new information properly, there should be some opportunity to make abnormal returns. For example as illustrated in Figure 3-4, suppose that the initial price of a share is *X*. After the announcement of a big company profit above expectation, in a perfectly efficient market, the price of the share should be adjusted by

Figure 3-4. Price Response to the Announcement of Public Information



the surprise good news immediately up to *Y* and be stable until a further announcement occurs. However, the price underreacts to the information initially going to Y_1, $(X< Y_1<Y)$. Thereafter the price moves gradually up to *Y* where it fully reflect the information. Under the circumstance of underreaction, the market speculators can earn abnormal returns by purchasing shares instantly following the announcement, and selling the shares when the price is fully adjusted to the correct level of *Y*. On the other hand, if the price overreacts to the information, the price rises to Y_2 immediately following the announcement, $(X<Y_2>Y)$. Then, it gradually falls back to *Y* where the information is fully incorporated into the price. There also exists a strategy for speculators to obtain abnormal return, i.e., by selling the shares shortly after the announcement and buying the shares back when the price approaches the correct level of *Y*.

The clearest and most reliable test for the abnormal returns associated with the announcement of public information is called an *event study*. In the first stage of the event study, what the new information is should be determined. Generally, the announcements of balance sheet, annual report, dividend issue, stock splits and so forth concerning listed companies are examples of the new information. The timing of the information release is defined in the second stage for the event study. If the announcement occurs after the market close of trading, the next day is defined as the announcement day. Finally, the abnormal return associated with the announcement needs to be estimated in the model.[3]

[3] Please see section 4.5 in Chapter 4, Design of Event Studies.

3.3.4 Strong form efficient market hypothesis

The strong form efficient market hypothesis asserts that the current prices fully reflect all categories of information, which includes historical information, public information and private (inside) information. Hence, all information is available to any market participant, and none can make superior profits by monopolising privileged information. Suppose a listed mineral company has found a new mineral deposit. A market participant may have access to this information before this news is published, and buys the shares of this company. When information concerning the finding of new mineral deposit is published, the market participant sells the shares as the share price has already increased in responses to the good news. This is a typical case of insider trading, which is contrary to strong form efficiency.

Generally speaking, corporate insiders, security analysts, and portfolio managers are suspected of having privileged information. An indirect test is an audit to identify whether there was a favourable bulk trade made by the suspects before the information is announced. Both purchasing a large number of shares in advance of a "good" news release and selling a large number of shares before a "bad" news release imply that the private information has been employed, i.e., that market is not strong form efficient.

Nevertheless, empirical testing of strong form efficiency is more complicated and difficult than the test of weak form efficiency or semi-strong form efficiency. First, it is usually impossible to identify the date on which the insiders access the private information. Next, the distinction between an abnormal return generated by reasonable analysis of public information (which is against semi-strong form efficiency) and an abnormal return generated by employing private information is blurred. Lastly, the insider always disguises the abnormal returns obtained by employing private information. Thus the reference material relevant to insider trading is difficult to gather. Nevertheless, there seems to be some successful cases in detecting insider trading by building econometric models.

3.3.5 Market anomalies

Studies before late-1970s usually provided evidence to support the EMH. But beginning in late-1970s, the findings of market anomalies seemed to incompatible with the EMH. One of the striking anomalies is seasonality that regular return patterns basing on calendar time exist in the stock prices that may exhibit a random walk. For example, we assume that the category of the horizontal axis of Figure 3-3(a) is weekdays, starting from Monday through Friday for each period of five days. Thus a regular return pattern, which is known as the day-of-the-week effect, shows that the returns on Mondays are significantly low and on Fridays are quite high. Trading in terms of this pattern will be able to obtain abnormal returns.

Because the market anomalies had challenged the EMH, Fama (1991) amended his EMH with a new structure of "tests of return predictability," "event studies" and "tests for private information." However, tests of return predictability are similar to the tests of weak form efficiency and anomalies, event studies are similar to the tests of semi-strong efficiency and tests of private information is the same as tests of strong form efficiency. Since the original version of EMH was such an impression that it is more popular than the new version in the textbooks and empirical studies. This is why we test the random walk hypothesis and seasonality respectively in this study.

The dominant seasonalities are the day-of-the-week effects, the month-of-the-year effects and the holiday effects. Dummy variable models are usually used in the tests of those seasonalities. If the mean return on the specific days is statistically significant and economically significant, the predictable return pattern can be used to earn abnormal returns. Thus, the market is not efficient.

3.4 Brief review of empirical studies on the weak form of market efficiency

As we previously indicated, in a weak form efficient market the stock prices should fully reflect historical information. Therefore, the market participants should not be able to make abnormally high returns based on historical information incorporated in the past prices. Empirical studies on the weak form of market efficiency are commonly performed by testing the random walk hypothesis and trading strategies.

3.4.1 Review of tests of the random walk hypothesis

The first empirical test of the random walk hypothesis was conducted by Bachelier (1900), a French mathematician. Bachelier performed a study of French government bonds. He concluded that the prices of the bonds follow a random walk, although he did not refer to that term in his paper. Besides his direct empirical works on asset prices, he also developed many of the mathematical properties of Brownian motion and martingales, which are the initially mathematical expressions of market efficiency. Kendall (1953) examined the correlation of weekly price changes in 19 British securities and the spot trading prices of cotton and wheat. Kendall found that the time series of prices are random and each price looks like a random number drawn from a symmetrical population of fixed dispersion. Roberts (1959) applied a simulation study to the pattern of weekly change in the Dow Jones Industrial Average (DJIA). He tested whether the familiar stock price pattern could be replicated using the assumption that the price follows a random walk. He stated that the weekly change of the index has the same appearance as a time series generated from a sequence of random numbers.

Granger and Morgenstern (1963) introduced spectral analysis (an approach originally developed in physical science) into the study of independence of successive security price changes. The spectrum of a time series is a frequency-domain representation of the autocorrelation function of that series, so that the spectrum analysis can give a relatively complete picture of the autocorrelation in any stationary stochastic process with finite variance. The evidence from their study showed that slight monthly and seasonal cycles might have been caused by mean changes over time. Thus their result supports the random walk hypothesis.

One of the outstanding studies on the random walk was conducted by Fama (1965). Fama was interested in the extent to which the return of the stock in a given time period is correlated with its return in a subsequent time period. This study assumed that if the autocorrelation is significantly large enough, the share traders thereby could formulate a profitable trade strategy using past returns. He tested the autocorrelation of daily returns for each of the 30 stocks in the DJIA in the period form 1957 to 1962. He found that the correlation coefficients between the returns on day t and day $t-1$, day $t-2$, through *t-10* are very small and nearly zero. It is unlikely that speculators can earn an abnormal return based on such a series of past returns.

Since Fama, a large number of tests of the random walk hypothesis have been performed on many stock markets. Two of the most comprehensive investigations were conducted by Solnik (1973) on major European markets and Jennergren and Korsvold (1975) on small European markets. Solnik examined the stationarity over time of serial correlation coefficients for 234 shares between March 1966 to April 1971. Shares in the sample were selected from 8 major European markets, France, U.K., Germany, Italy, Netherland, Belgium, Switzerland and Sweden. The average serial correlation coefficients of the returns for each market are slightly larger than that in the United States market, which indicates the lesser efficiency of most European markets. But the serial correlation coefficients are still statistically insignificant and support the random walk hypothesis. Jennergren and Korsvold (1975) investigated the daily stock price changes of relatively small European stock markets such as Austria, Denmark, Greece, Norway and Sweden. They detected greater serial correlation in price changes, implies that those markets deviate from a random walk.

The properties of individual share returns over short holding periods are generally consistent with market efficiency in most studies. In contrast, the properties of portfolio returns display significant evidence contrary to market efficiency. Conrad and Kaul (1988) explained that the predictable component of the portfolio returns could be caused by autocorrelation in the underlying expected returns. But Fisher (1966) earlier argued that the autocorrelation of portfolio returns is caused by the prices used to compute returns being out of date due to nontrading. Timothy (1993) presented evidence that transaction costs cause autocorrelation in portfolio returns by delaying price adjustment. The implication is that markets are inefficient, in that prices do not always fully reflect all available information. Another argument provided by Richard and Starks (1997) is that the correlated trading pattern of institutional investors is one cause of autocorrelation in both individual shares and portfolio daily returns.

In addition to the studies on developed markets, Errunza and Losq (1985) tested the behaviour of stock prices on 10 less-developed markets (Argentina, Brazil, Chile, Greece, India, Jordan, Mexico, Thailand, Mexico and Zimbabwe). They stated, based on the results of runs tests and serial correlation coefficient tests, that the stock returns of those less-developed markets are more correlated than those in developed markets. Laurence (1986) tested the random walk hypothesis on the Kuala Lumpur stock market and the Singapore stock market. He concluded that even though statistical measures indicate some small deviations from a perfect random walk, the weak form efficient characteristics of Kuala Lumpur and Singapore markets closely parallels those found in New York markets. Hsiao (1996) examined the weak form efficiency of the Shanghai stock market. He illustrated that the returns of stocks in the Shanghai market depart from a random walk.

3.4.2 Review of tests on trading strategies

Alexander (1961) developed the filter rule methodology and applied it in the analysis of the random walk. He examined both the DJIA from 1897 to 1929 and Standard and Poor's index of 500 stocks (S&P 500) from 1929 to 1959. The filter sizes he designed in his analysis ranged from 5 to 50 percent of price changes. He found that, generally, filters of different sizes have, for various time periods, generated higher returns than those obtained from a simple buy-and-hold strategy. This means that stock price changes are dependent which allows abnormal profits to be made. Thus, weak form efficiency was rejected in Alexander's study.

On the other hand, Fama and Blume (1966) found an opposite result in their study by using nearly the same filter rule methodology as Alexander. They tested the profitability of 24 potential filters ranged in sizes from 5 to 50 percent of price changes for 30 shares of the companies incorporated in the DJIA. Returns obtained from the filters of different sizes were compared individually with those generated by buy-and-hold strategy. It seems that the 5 percent filter generated much higher returns than those from buy-and-hold strategy. However, after the costs incurred from numerous transactions required by the small filter rule are deducted from the returns, the returns from the 5 percent filter strategy become negative, lower than those obtained form simple buy-and hold strategy. They concluded that the returns generated from filter rules, no matter what sizes were employed, after commissions were deducted, are usually negative or quite small. Even the slightly positive correlation that may exist in stock returns does not lead to a profitable trading rule.

In Australia, Ball (1978) performed a filter rule test on 128 shares listed on the Melbourne Stock Exchange. In his study, Ball successfully matched the filter rule portfolio and buy-and-hold portfolio for risk, which was not taken into account in either Alexander (1961) or Fama and Blume's (1966) research. Ball's results are consistent with weak-form efficiency. However, Ball pointed out that a very unsuccessful trading strategy can be converted into a successful strategy simply by undertaking the opposite function of the unsuccessful rule.

Bertoneche (1981) applied both spectral analysis and filter rules to price series for the New York Stock Exchange (NYSE) and six European markets during the period from 1969 to 1976. It is interesting that the results obtained from the two sorts of analysis are opposite. None of the series indicated a significant departure from independence using spectral analysis. On the other hand, the evidence obtained from the filter rule showed abnormal profits in all six European markets, even after transaction costs were considered. Bertoneche dealt with the conflict in his studies by arguing that spectral analysis was not powerful enough to adequately test the efficient market hypothesis. Consequently, he concluded that the markets he studied are not weak form efficient.

Besides the filter rule, moving average is another simple approach to test the existence of profitable strategies. The moving average rule is interpreted as follows: if the share price rises above its moving average by x percent, buy and hold until the price falls below its moving average by y percent and then sell short. Brock *et al* (1992) applied the moving average trading rule on the DJIA from 1897 to 1986. They found this technical trading rule has predictive ability in future returns due to its outperforming the buy-and-hold strategy. Hudson *et al* (1996) tested the Financial Times Industrial Ordinary Index (United Kingdom) in the period from 1935 to 1994. In contrast to the finding of Brock *et al* (1992), Hudson *et al* (1996) asserted that the moving average trading rule does not permit excess returns in the U.K. market. Therefore, their results seem to support the weak form efficiency of the U.K. financial market.

3.5 Review of tests for seasonal effects

The seasonal patterns (seasonality, calendar effects) indicate that returns behave regularly in accordance with calendar time. The returns are unusually high or low, on average, in some specific times of the week, the month, the year and so forth. The seasonally regular pattern in returns is perhaps the most common anomaly to challenge the EMH. The fact that the seasonally regular pattern is reliable implies a degree of predicability in returns, and market participants can take the advantage of it to earn abnormally high returns.

The first finding of seasonally regular return pattern was contributed by Fields (1931) who investigated the DJIA for the period from 1915 to 1930. Fields found that prices tend to rise over the weekends, Saturdays. This sort of day-of-the-week effects in the U.S. stock markets was developed in subsequent studies after four decades. Cross (1973), French (1980) and Gibbons and Hess (1981) studied the returns on the S&P 500 index over different periods. They found, similarly, that the negative mean returns usually appear on Mondays and positive mean returns usually appear on Fridays.

Jaffe and Westerfield (1985), Condoyanni *et al* (1988) and Agrawal and Tandon (1994) found that the day-of-the-week effects are universal features of stock markets in the world. However, the day-of-the-week effects display two major patterns in the international markets. In the U.S., U.K., Canada and some European stock markets, the mean returns on Mondays are negative and the lowest of the week, while the mean returns on Fridays are positive and the highest of the week, on average. On the other hand, in the stock markets of Japan, Australia and some Asian countries, the mean returns on Tuesdays are negative and the lowest of the week. Even though many investigators put forward several hypothesises, including the time-zone hypothesis and settlement hypothesis, to interpret the implications of the return pattern, none of the hypothesises is generally applicable for all markets.

Ball and Bowers (1988) examined the Sydney Stock Exchange indices for the period from 1974 to 1984. Their study showed that the mean return on Mondays is negative but not significantly different from zero. The negative Tuesday return is the lowest return of the week. Both the mean returns on Thursdays and Fridays are positive, and the Thursday mean return is slightly higher than Friday's mean return. Finn *et al* (1991) provided further evidence with the studies on Australian futures and bank bills, which showed that the mean returns of the Australian futures and bank bills are low on Tuesdays and high on Thursdays. However, they stated that this pattern is not apparent in the regression results of returns to interest rates.

Harris (1988) tested the NYSE for fourteen months between December 1981 and January 1983. He found that the negative Monday return occurs in nontrading time for large firms, and the negative Monday return occurs in trading time for small firms. He also indicated that an intra-day return pattern is common to all the weekdays. Returns are very large at the beginning and the end of the trading days. Wang *et al* (1997) illustrated that, in most of the cases analysed on the U.S. indices from 1962 to 1993, the Monday effect occurs primarily in the last two weeks of the month. The Monday return of the first three weeks is not significantly negative.

The other prominent seasonality is the month-of-the-year effects. Since Wachtel's (1942) first detection of disproportionately large January return, a number of studies have proven that the average return in Januarys is statistically higher than the average return in any other month of the year. Rozeff and Kinney (1976), Keim (1982), Ariel (1986), Lakonishok and Smidt (1988), Kohers and Kohli (1991), Sias and Starks (1997) provided evidence for the U.S stock market. Brown *et al* (1983) found evidence for the Australian stock market. Tinic *et al* (1987) and Berges *et al* (1984) found evidences for the Canadian market. Reinganum and Shapiro (1987) identified evidence for the U.K. stock market. Gultekin and Gultekin (1983), and Agrawal and Tandon (1994) supplied international evidences. The fact that average January returns are higher than that of other months seems a common status of the markets. The dispute is as to what causes the high January returns. Two main arguments are that firm size is related to January returns, and that the tax regime has this effect on the January returns.

Keim (1982) and Reinganum (1983) reported that small firms earn higher returns than large firms in the U.S. stock market. These higher returns are usually generated in the first few days of January. Cho and Taylor (1987) proven that in the U.S. stock market, the January return of small firm portfolios is higher than that of large firm portfolios. As the firm size increases, the return on the relevant portfolio becomes smaller. Brown *et al* (1983) suggested that, compared with large firms, the smallest firms generate high average returns not only in Januarys but also in any other months in the Australian market. On the other hand, Kohers and Kohli (1991) asserted that high January returns exist for both small firms and large firms. The January return is independent of firm size. Gultekin and Gultekin (1983) suggested that the regular monthly pattern in returns does not appear to be a size-related anomaly.

Wachtel (1942) found that there is a relation between the high January return and the tax regime. Branch (1977) and Reinganum (1983) partially attributed this January effect to tax-loss-selling pressure. Givoly and Ovadia (1983) illustrated that, due to tax-loss-selling pressure, the prices of many stocks over the last 35 years were depressed temporarily in December and then recovered in January. They concluded that the tax regime contributed a lot to a high return in January. Schultz (1985) and Sias and Starks (1997) argued again that the tax-loss-selling is the main cause of high January returns in the U.S. market. However, there are several studies showing the irrelevance of the tax regime to the month-of-the-year effects. Van den Bergh and Wessels (1985) and Van den Bergh *et al* (1988) continually rejected the tax-loss-selling hypothesis. Brown *et al* (1983) demonstrated that these high returns in January and July in the Australian market. Because Australia has a July-June tax year, the evidence does not support the tax-loss-selling hypothesis. Berges *et al* (1984) found that, in the Canadian market, returns in January exceeded returns for other months of the year in the two periods before and after the capital gain tax was introduced. Therefore, their finding is not consistent with the tax-loss-selling pressure hypothesis.

Another well-documented seasonality is the holiday effect. One of the earliest works on the holiday effects can be traced to Fields (1931), who found that the DJIA exhibited an increasing trend in advance of public holidays. Lakonishok and Smidt (1988) tested the DJIA for the period from 1897 to 1986. They found that the market produces significantly higher returns on trading days immediately preceding holidays. Ariel (1990) used CRSP (Centre for Research in Security Prices) data to examine returns on the 160 days preceding holidays. He found that, in the period from 1963 to 1982, the mean return on pre-holiday trading days is significantly higher than the mean return on non-holiday trading days. Pettengill (1989a) investigated the different holiday effects on returns for large firms and small firms by observing the returns of the S&P 500 index for the period of 1962 through 1986. He reported that, for both large and small firms, returns are influenced by a holiday effect and are unusually high on pre-holiday trading days. However, the return of large firms on post-holiday trading days, when it is not the end of the week, is negative and lower than that on ordinary trading days.

Ball and Bowers (1988) and Easton (1990) documented the existence of positive post-holiday mean return in Australia. They indicated that the mean return on post-holiday trading days is positive and larger than that of ordinary trading days, but smaller than that of pre-holiday trading days. Cadsby and Rater's (1992) provided international evidence for 11 countries. They showed that all markets exhibit high pro-holiday returns with reference to their local holidays, and only the Hong Kong market displays a significant higher return on the trading days preceding the U.S. holidays. Mookerjee and Yu (1999) stated that the January effect of the Shanghai market is significant in the period from May 1992 to December 1993.

Besides the seasonal regular return patterns of day-of-the-week effects, month-of-the-year effects and holiday effects, the seasonality of returns has been detected in turn-of-the-month, turn-of-the-year and intra-trading days. For example, Pettengill and Jordan (1988) reported, by testing four daily returns around the turns of the month in the period from 1962 to 1983, that the turn-of-the-month effects are equally strong for small and large firms. Ariel (1987) examined the returns for the first half-month (starting with the last day of the prior month) and latter half-month in the period from

1963 to 1987. He was surprised that all of the return for the period occurs in the first part of the month. Cadsby and Rater (1992) defined the turn of the month as the last day of prior month and first three days of current month. They found that the turn-of-the-month effects are significant for the markets of the U.S., Canada, U.K., Australia, Switzerland and West Germany, but not significant for the markets of Japan, Hong Kong, Italy and France. Wong *et al* (1993) indicated that the turn-of-the-year effects (January effect) can be measured in the Malaysian stock market according to the Gregorian calender, Muslim calender and Chinese calender.

3.6 Review of empirical studies on the semi-strong form of market efficiency

Under semi-strong form efficiency, the price should reflect new public information instantaneously and unbiasedly. After the announcement of new information, no market participant has time to make abnormal returns based on analysing the announced information. Since Fama, Fisher, Jensen and Roll's (FFJR) (1969) inaugural study on the effect of announcements, a variety of tests have been conducted to ascertain the reaction of market prices to new information.

FFJR examined 940 stock splits on the NYSE between 1927 and 1959. A stock split is simply an increase (or decrease for a reverse split which is called a stock combine) in the number of outstanding shares of a listed company. It has no effect on the firm's capital value and financial structure. In theory, the stock splits themselves provide no new information to the share traders about the firm. However, in practice, price movements of the split shares, caused by reasons other than the splits, should be related to more fundamental information. Splits are usually accompanied by or are followed by a dividend increase. As a result, share traders raise positive expectations about management's confidence on the future progress of the split-announced firms. In the studies performed by FFJR, returns are higher immediately following the announcement of the splits. There is no evidence that abnormal returns are available due to price overreaction or underreaction to the announcement. The market in the FFJR study is found to be semi-strong efficient.

In Australia, Brown (1970) tested the impact of the announcement of annual profits on share prices for a sample of 118 companies in the period from 1959 to 1968. In a subsequent study, Brown (1972) examined the impact of the release of half-yearly reports on share prices. Both his studies suggest that the market anticipates the new information, and that the share prices react rapidly to the unanticipated component of the information. This is consistent with an instantaneous and unbiased reaction of stock prices to new information and is therefore consistent with the semi-strong form of the efficient market hypothesis. Brown *et al* (1977) replicated Brown's (1972) study on both half-yearly and annual profit announcements with a sample of daily data. To distinguish the "good" news and "bad" news, two groups were formed. One comprised the companies that announced increased profit without dividend change. The other comprised the companies that announced decreased profit without dividend change. The cumulative excess returns of the two groups imply that the profit announcements provide new information to the market as shown by the relatively large positive return for the profit increase group and large negative return for the profit decrease group within the announcement period. The evidence also suggests that information about the direction of profit change is immediately included in the share prices, indicating that the market is semi-strong efficient.

Brown *et al* (1977) conducted a combined study on announcements of profits and announcements of dividends as they are usually released simultaneously. Six subgroups of the shares were constructed, in terms of announcements of the companies as follows: profit increase with dividend increase, profit increase with dividend constant, profit increase with dividend decrease, profit decrease with dividend increase, profit decrease with dividend constant, and profit decrease with dividend decrease. The results show that returns on the shares reflect the content of the two sources of information precisely. The highest positive abnormal returns are associated with the simultaneous announcements of profit and dividend increases. Similarly, the lowest negative abnormal returns are associated with the simultaneous announcements of profit and dividend decreases. Furthermore, the announcements with mixed signals of profit and dividend lead to abnormal returns falling between those two extremes. As a consequence, semi-strong form efficiency can be inferred from the Brown *et al* studies.

Scholes (1972) studied the price effects of large distributions of secondary shares in the NYSE over the period of July 1961 to December 1965. As a general rule, shares in the secondary distribution are sold at a subscription price that is below the current market price, and a large secondary distribution will depress the relative prices of the existing shares. Scholes (1972) tested whether the magnitude of price decline is a function of the volume of the shares sold in the secondary distribution, or is related to selling pressure from new shareholders attempting to earn abnormal return after they purchase the shares in the secondary distribution. He found that the price decline corresponds to block selling of insiders. Therefore, the market inefficiently reflects the announcement of the secondary distribution. Ibbotson (1975) tested initial public share offerings. He found that the initial purchasers of new issues appeared to receive abnormal returns during the first holding month after the new issue, but that abnormal returns were lost in the third month when the prices regressed to the equilibrium level. This is contrary to semi-strong form efficiency.

Rendleman *et al* (1987) tested the behaviour of stock prices during the weeks surrounding an earnings announcement. They distinguished between expected earnings and unexpected earnings, and maintained the proposition that only unexpected earnings announcements pass on new information to investors. The unexpected earnings were categorised into ten groups, from high value (positive) to low value (negative). The return movements immediately prior to the announcement are in directions exactly consistent with the properties of unexpected earnings. Nevertheless, after the announcements, positive returns are higher than the expected values, whereas, the negative returns are lower than the expected values. The post-announcement drifts of returns show that stock prices overreact to the announcements, which is inconsistent with the semi-strong form efficient market hypothesis. Foster *et al* (1984) and Bernard and Thomas (1990) presented similar results, which show that the stock prices fail to fully reflect the implication of current earnings. Previously announced earnings predict the future abnormal returns.

Kahenamn and Tversky (1982) and some other researchers reported that traders tend to overreact to unexpected information and dramatic events. In these conditions, a contrarian stock selection strategy, which consists of buying stocks that have been losers and selling short stocks that have been winners, will be profitable in the stock market. De Bondt and Thaler (1985) asserted that, on the basis of data recorded in the last half century, large abnormal returns could be generated by the contrarian trading strategy. Their argument supports the market overreaction hypothesis, i.e. that the market is not semi-strong efficient. Chan (1988) tested the NYSE using the data from 1929 to 1983. He found that estimations of returns using the contrarian trading strategy are sensitive to the methodologies employed. He pointed out that the risks of losers and winners were not equivalent in previous empirical studies. He showed that if the risk change can be controlled for in the applied methodology, for example, using the Capital Assert Pricing Model (CAPM), the contrarian strategy can only earn a very small abnormal return. Therefore, he did not find strong evidence to support the overreaction hypothesis.

3.7 Review of empirical studies on the strong form of market efficiency

As noted before, in a strong form efficient market, all information is reflected in the stock prices and no market participants can monopolise private information to earn abnormal return. If the market is not strong form efficient, generally, three groups of market participants seem to have the ability to access private information in their trading. Firstly, corporate insiders who include directors, officers and major shareholders. Next, Security analysts who are defined as market professionals with sophisticated analytic techniques, and devoting full-time effort to formulate strategies for their bosses or clients. Lastly, portfolio managers in charge of bulk trading for financial institutions. These three groups, acting on restricted private information, are also referred to as "insiders" and their trading as "insider trading." Thus the tests of strong form efficiency are usually tested on the abnormal returns obtained by these three groups with privileged information.

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Jensen (1969) evaluated the performance of 115 mutual funds in the U.S. market over the period from 1955 to 1964. He found that the average returns of the funds to investors, after management fees and other expenses were deducted, were below the Sharpe-Lintner market line, a proxy for market returns. But when fees were added back in, the average returns of the funds were scattered randomly about the market line. Jensen's result is consistent with the strong form of the efficient market hypothesis. Diefenbach (1972) examined the trading of institutional clients who were advised by security analysts. In his study, buy recommendations outnumber sell recommendations by a ratio of 26 to 1. The average price of shares bought under the recommendations fell by 3.0%, while only 47% of them experienced a price rise higher than the S&P industrial index. The superior performance recommended by security analysts is due to chance.

Jaffe (1974) studied insider trading with a sample covering 200 large U.S. firms during the period from 1962 to 1968. He found evidence that it was possible for insiders to profit on the basis of privileged information before the information was reflected in prices. Insiders purchase shares before their prices increased and sell shares before their prices decreased. Thus strong form efficiency was clearly refuted. Henriksson (1984) tested the strong form efficiency hypothesis on 116 mutual funds during the period of 1968 to 1980. Chang and Lewellen (1984) performed a similar study for the period from 1971 to 1979. Both of these studies showed that the average return of fund investors was significantly greater than the Sharpe-Linter market line, identified as the standard return on the market. This implies that fund managers possess an information privilege. Ippolito (1989) provided a more extensive analysis on 143 mutual funds in the U.S. for the period from 1965 to 1984. Fund returns, after all mutual fund expenses but before any load fee, were compared to the Sharpe-Lintner market line. He found that fund returns was 0.83% higher on average. Ippolito concluded that fund managers were highly informed traders and were compensated for the cost of obtaining information.

The previous U.S. evidence presents a mixed picture both for and against the strong form of the efficient market hypothesis. Similarly, tests on Australian markets have contradictory results. Brown and Walter (1982) evaluated the investment performance of 625 investment recommendations made by security analysts in the period from 1973 to 1979. They found that these recommendations outperformed the market on a risk-adjusted basis. Finn (1984) examined the performance of strategies that were suggested by professional analysts and manipulated by large institutional investors. Finn found that if analysts' suggestions had been acted on, the investors would have earned abnormally high returns. This illustrates that analysts may have incorporated private information into their suggestions. Unfortunately, institutional investors usually fail to act effectively to profit from this information. Conversely, a number of studies on the performance of Australian mutual funds and unit trusts conform to the strong form of market efficiency. For example, Robson (1986) tested the investment performance of unit trusts and mutual funds in Australia over a ten year period from 1969 to 1978. He concluded that the overall investment performance of the funds is inferior to both market indices, and do not exhibit any consistent pattern from one period to another. Robson's (1986) evidence rejects the hypothesis that the fund managers can benefit from private information.

3.8 Conclusion

The primary role of the stock market is to allocate capital resources into production sectors. Such allocations ultimately accommodate product demand and supply in equilibrium. An allocationally efficient stock market can allocate capital resources into the most productive sectors. Therefore, an allocationally efficient stock market will encourage the development of the economy. The prerequisites for allocational efficiency are operational efficiency and informational efficiency. Empirical studies on the efficiency of stock markets are usually involve the tests of informational efficiency on account of the fact that informational efficiency is incorporated into allocational efficiency and there is plenty of applicable transaction data for the tests of informational efficiency. This thesis will take advantage of this convenience to study the informational efficiency of China's Stock Market.

The distinctive feature of an efficient market is that prices fully reflect all available information. If the prices reflect the information instantaneously and unbiasedly, there is no chance to form a trading strategy to earn abnormally high returns, and the prices will be an appropriate signal for efficient capital allocation. The perfectly efficient market is a product of the theoretical conditions of no transaction costs and equal accessibility of information. Therefore, perfectly or absolutely efficient markets can not be tested in the real world. Instead, we are concerned with relative efficiency in empirical practice. The marginal costs and marginal gains of efforts on collecting and processing information determine levels of market efficiency.

Fama (1970) classified the efficiency of stock markets into three categories in his EMH. Weak form efficiency, in which the stock prices reflect historical information of past prices. Semi-strong form efficiency, in which the stock prices reflect historical and public information. Strong form efficient market, in which the stock prices reflect all available information, historical, public and private information. The categories of efficiency with respect to an information set are nested in accordance with the successive classifications of historical information, public information and private information.

Many studies have documented the fact that stock prices in developed markets display the behaviour of a random walk, but that such prices in less developed markets do not have this characteristic. That abnormally high returns can be generated by the application of a trading strategy has been found only in some of the studies. The regular seasonal return patterns are common phenomena of stock markets. However, the return patterns vary from market to market. For example the lowest and most negative mean returns usually occur on Mondays in the stock markets in America and Europe, and on Tuesdays in the stock markets of Australia and Japan. The proper reaction of stock prices to public information has been demonstrated in a considerable number of event studies. Nevertheless, there are still some exceptions. The results on using private information provide a mixed picture that some insider trading has success while some such trading fails to earn abnormally high returns.

Chapter 4 Design of Tests and Data Processing

4.1 Introduction

The last chapter has overviewed the efficient market theory and the relevant literature. The primary arguments of the theory can be statistically formulated in a manner whereby the statistical properties of stock prices and returns in an efficient market differ from that of an inefficient market. Martingale and fair game models have been frequently used to represent the conditions of an efficient market in the literature. However, in an efficient market, consideration of which stochastic process (prices, return or abnormal return) is martingale and what stochastic process is a fair game needs further discussion.

Stock price behaviour following a random walk is a traditionally popular characteristic of weak form market efficiency. The random walk hypothesis tests constituted the central content in empirical studies of weak form market efficiency for several decades. Nevertheless, there have been countless changes with respect to stock markets over the past hundred years, such as the upgrade of bid-ask rules and the introduction of electronic transaction systems. Therefore, the assertion that stock prices probabilistically follow an orthodox random walk model cannot remain unchanged. It is thought that the orthodox random walk model, that hypothesises independently and identically distributed increments, is too strict to be applied when recent market developments are taken into consideration. Thus, the new versions of the random walk model, loosening the "identical" and "independent" conditions, have broadened methodologies available to test weak form efficiency.

Over the past decades, a number of methods have been developed to test both weak form market efficiency and semi-strong form market efficiency. The methodological design of this study takes into account the available data and the comparability of the results between the markets in China and other countries. Due to short length of time series available for most individual shares and the lack of relevant economic indicators, some complicated models are currently restricted. Comparatively, the commonly used measures guarantee a believable analysis as they have been frequently tested in many markets. Meanwhile, they provide the possibility of comparative analysis between markets. As a consequence, we will use autocorrelation tests, dummy variable models and event study to test the weak form and semi-strong form of market efficiency.

The data should be adjusted for stock splits, dividends, rights and bonus issues before it is eligible for empirical testing. Unfortunately, there is no previously processed data available on individual shares in China for the time of this study. This is why the existing literatures on China's stock markets seldom concentrate on individual shares.[1] Since the share structure is complicated in China, the events are usually quite complex. Part of the contribution of this thesis is to design an appropriate approach and to suitably adjust data.

Following the introduction, Section 4.2 lays down the statistical foundation of this study in which the martingale, fair game and random walk models are redefined. Section 4.3 details the tests of the random walk hypothesis. Section 4.4 illustrates and

[1] Wu (1996) used unadjusted data in his study. Yu (1996), Liu *et al* (1996), Fang (1997), Chui and Kwok (1998) Su and Fleisher (1998) and Poon *et al* (1998), focus their tests on index data. Hsiao (1996) is the only one to adjust the data of Shanghai individual share in his study.

describes the tests of seasonal effects. Section 4.5 discusses the event studies. Section 4.6 details the process of adjusting the data for stock splits, dividend issues and so forth. The last section, 4.7, summarises this chapter.

4.2 Statistical foundations

4.2.1 Optimal estimates and forecasts conditioned on information sets

As previously mentioned, under the efficient market theory, the stock price P_t incorporates all relevant information that has happened until (the point of) time *t*, i.e., at time *t-1*. Therefore, in an efficient market, the joint distribution of stock prices at time *t* is identical to the joint distribution of the stock prices that would exist if all relevant information were available at time *t-1*, thus:

$$f(P_{1t}, P_{2t}, \cdots\cdots P_{nt}) = f(P_{1t}, P_{2t}, \cdots\cdots P_{nt} | \phi_{t-1}), \qquad \text{(4-2-1)}$$

where ϕ_{t-1} denotes the set of all relevant information at time *t*-1. If the price P_t takes the values $P_{1t}, P_{2t}, P_{3t} \cdots$, with respective probabilities $\pi_{1t}, \pi_{2t}, \pi_{3t} \cdots$, then the expected value of P_t is

$$\mathrm{E}P_t = \Sigma \pi_t P_t , \qquad \text{(4-2-2)}$$

where E is expectation operator and Σ is symbol of summation. Under the set of all relevant information at time *t*-1, ϕ_{t-1}, we have

$$\mathrm{E}(P_t | \phi_{t-1}) = \Sigma \pi_t (P_t | \phi_{t-1}) . \qquad \text{(4-2-3)}$$

Because we assume that the market is efficient with respect to the information set ϕ_{t-1}, then

$$\mathrm{E}P_t = \mathrm{E}(P_t|\phi_{t-1}) . \qquad (4\text{-}2\text{-}4)$$

A conditional expectation based on ϕ_{t-1} is viewed as an optimal estimate of the price P_t. In other words, the most accurate estimate of today's price is its expected value under the condition of availability of all relevant information, hence:

$$P_t = \mathrm{E}(P_t|\phi_{t-1}) + \varepsilon_t , \qquad (4\text{-}2\text{-}5)$$

and then

$$\varepsilon_t = P_t - \mathrm{E}(P_t|\phi_{t-1}) , \qquad (4\text{-}2\text{-}6)$$

where ε_t is the estimated error, representing a stochastic term resulting from the arrival of news of unanticipated event. The estimated error is expected to be zero, because prices change only on the arrival of unanticipated news that itself is a random variable, sometimes "good" news, sometimes "bad" news. The expected value of the estimated error is denoted:

$$\mathrm{E}\varepsilon_t = \mathrm{E}P_t - \mathrm{E}(P_t|\phi_{t-1}) = 0 . \qquad (4\text{-}2\text{-}7)$$

Similarly, the efficient market hypothesis is properly applied to stock returns, R_t. In an efficient stock market, the joint distribution of stock returns is identical to the joint distribution of returns that would exist if all relevant information were available at time *t-1*:

$$f(R_{1t}, R_{2t}, \cdots\cdots R_{nt}) = f\ (R_{1t}, R_{2t}, \cdots\cdots R_{nt}|\phi_{t-1}) . \qquad (4\text{-}2\text{-}8)$$

The conditional expected return is an optimal estimate of the return R_t based on the set ϕ_{t-1} of all relevant information, which means that the best estimate of today's return is its expectation:

$$R_t = \mathrm{E}(R_t|\phi_{t-1}) + \varepsilon_t . \qquad (4\text{-}2\text{-}9)$$

Therefore, the expectation of the estimated error equals zero,

$$E\varepsilon_t = ER_t - E(R_t|\phi_{t-1}) = 0. \qquad (4\text{-}2\text{-}10)$$

Hence (4-2-5) and (4-2-9) can be reinterpreted as meaning that the conditional expectation is an *unbiased* estimate of the actual value. In addition, (4-2-7) and (4-2-10) tell us that the estimate of the error is uncorrelated with all information available at time *t-1* or earlier, thus:

$$E(\varepsilon_t' \phi_{t-1}|\phi_{t-1}) = 0. \qquad (4\text{-}2\text{-}11)$$

This is known as the *orthogonality* condition, which intuitively means that if (4-2-11) does not hold, the information set ϕ_{t-1} could be used to reduce the estimated error ε_t and to improve the estimate. Hence all relevant information has not been reflected in the price P_t and return R_t, that is, the market is not efficient.

So far we have referred to the relationship between the actual return (or price) and their conditional expectation at the same time, for example, at time *t*. The statement obtained is that the optimal estimated value of return (or price) is its expectation based on all relevant information sets at time *t-1*. Now, let us consider the forecast of future return at the current point in time. Suppose we have a dynamic forecast at time *t* as to what the forecast we will make at time *t+1* will be, about the return at time *t+2*. Algebraically this explanation may be expressed as:

$$E_t\left[E_{t+1}\left(R_{t+2}|\phi_{t+1}\right)\right]. \qquad (4\text{-}2\text{-}12)$$

If the information set ϕ_t is all the relevant information at time *t* and is applied efficiently, then the best forecast for the return of time *t+2* made at time *t* is only the forecast for the return of *t+1* made at time *t*. Thus:

$$E_t\left[E_{t+1}\left(R_{t+2}\right)\right] = E_t(R_{t+1}|\phi_t). \qquad (4\text{-}2\text{-}13)$$

Extending the forecast to later future periods, we follow the rule of *iterated expectations* which may be succinctly represented as follow:

$$\mathrm{E}_t \mathrm{E}_{t+1} \mathrm{E}_{t+2} \cdots = \mathrm{E}_t . \qquad (4\text{-}2\text{-}14)$$

The expected return predicated at time t is the optimal forecast for any time in the future.

The above three properties, *unbiasedness*, *orthogonality* and *iterated expectation* are conditions for the mathematical expectation. Under the market efficiency hypothesis, the rationally subjective expectations of market participants are assumed to equal the conditional mathematical expectation, based on the true probability distribution of outcomes.

4.2.2 Martingales and fair games

Referring to games of chance

Suppose we have a stochastic variable X_{t+1} which has the property such that:

$$\mathrm{E}(X_{t+1} | \phi_t) = X_t \ . \qquad (4\text{-}2\text{-}15)$$

The stochastic process of X_t defined as a martingale, (4-2-15) implies that the best forecast of the future value X_{t+1} is the current value X_t. No information existing outside the information set ϕ_t can improve the forecast. (4-2-15) is rearranged as:

$$\mathrm{E}(Y_{t+1} | \phi_t) = \mathrm{E}(X_{t+1} | \phi_t) - X_t \ = 0 , \qquad (4\text{-}2\text{-}16)$$

Y_{t+1} is another stochastic variable, and then

$$\mathrm{E}(Y_{t+1} | \phi_t) = 0 . \qquad (4\text{-}2\text{-}17)$$

The stochastic process of Y_{t+1} related to (4-2-17) is called a fair game. Therefore, we know that if X_t is a martingale, $Y_{t+1} = X_{t+1} - X_t$ is a fair game. A fair game is sometimes referred to as a martingale difference.

Perhaps the earliest models of financial asset prices were the martingale and fair game models, originating in the history of games of chance (Hald 1990). If X_t represents a participant's cumulative wealth that he invests in a game at time *t*, then a martingale, as shown in (4-2-15), is one for which the expected wealth of the next period conditioned on the history of the game is simply equal to this period's wealth. This game, as shown in (4-2-17), is a fair game as the expected incremental gain at the next stage is zero, when conditioned by the history of the game. The game is neither in the participant's favour nor his opponent's favour.

Referring to *ex post* price

Let X_t be replaced by P_t that is the stock price at time *t*; and Y_t be replaced by R_t that is the stock return; ϕ_t be all relevant information at time *t* as before. In brief, the return is temporarily to be defined as the deviation of the prices between two different periods, *t* and *t+1*. Hence, (4-2-15), (4-2-16) and (4-2-17) can be written as:

$$\mathrm{E}(P_{t+1}|\phi_t) = P_t \ , \tag{4-2-18}$$

$$\mathrm{E}(R_{t+1}|\phi_t) = \mathrm{E}(P_{t+1}|\phi_t) - P_t \ = 0, \text{ and} \tag{4-2-19}$$

$$\mathrm{E}(R_{t+1}|\phi_t) = 0. \tag{4-2-20}$$

The prices in the above equations are *ex post* prices[2] under the assumption that profits as dividend have been deducted whenever the profits are generated. Hence there is no

[2] See Section 4.6 in this chapter, Data Processing.

trend in the prices; the adjusted prices follow a stationary stochastic process. Alternatively, the prices should be discounted back to present value, if the prices are *ex ante* prices (LeRoy 1989), since *ex ante* prices include the time value of capital (cumulative dividends), resulting in $P_{t+1} > P_t$ and $R_t > 0$.

Therefore, considering *ex post* prices, in an efficient market, the stock price P_t follows a stochastic process known as a martingale and stock returns follow a stochastic process known as a fair game. The best forecast for the future price is the current price, and the expected return is equal to zero.

Referring to *ex ante* price

Suppose that the profit of the listed company is stable in each period and fully allocated into dividends. Except for the profit, all factors that influence the stock price are stochastic. Therefore, the *ex ante* price should be

$$P_{t+1} = \mu + P_t + \varepsilon_{t+1} . \qquad (4\text{-}2\text{-}21)$$

As we know that the return is the difference between the prices at time t and t-1, we get

$$R_{t+1} = P_{t+1} - P_t = \mu + \varepsilon_{t+1} , \qquad (4\text{-}2\text{-}22)$$

or equivalent:

$$R_{t+1} = \mu + \varepsilon_{t+1} , \qquad (4\text{-}2\text{-}23)$$

μ is a constant with the interpretation of the expected change in price, or the forecast drift returns. Then

$$\mathrm{E}(R_{t+1} | \phi_t) = \mathrm{E}\mu + \mathrm{E}(\varepsilon_{t+1} | \phi_t) , \qquad (4\text{-}2\text{-}24)$$

$$\mathrm{E}(R_{t+1} | \phi_t) = \mu , \qquad (4\text{-}2\text{-}25)$$

because of

$$\mathrm{E}(\varepsilon_{t+1}|\phi_t) = 0 . \qquad (4\text{-}2\text{-}26)$$

Therefore, μ is the expected return as well. Assuming that investors are risk averse, if the investment in the market always acquires, on average, a positive return, then μ is usually greater than zero. ε_{t+1} is the abnormal return which is the difference between the actual return and the expected return with an expected value of zero. The average market return, or in other words, the expected return can be defined in several ways, e.g. by a buy-and-hold strategy (Fama 1970) or by an economic model of the supply and demand for the risky asset, such as Capital Asset Pricing Model (CAPM) (Cuthbertson 1996).

From the preceding discussion, it is apparent that gambling in casinos is unlike trading in stock markets. The average winnings of all participants in fair gambling equals zero. Considering *ex ante* prices, the expected return of all participants in an efficient market equals a positive value, but the average abnormal return of the efficient market is zero. Hence, in an efficient market in fact, the expected return is a martingale; meanwhile, the expected abnormal return is a fair game.[3]

4.2.3 Random walk models

Consider equation (4-2-21) with each symbol in the equation is defined as before,

$$P_{t+1} = \mu + P_t + \varepsilon_{t+1} . \qquad (4\text{-}2\text{-}27)$$

[3] Under the *ex ante* case, the stochastic process of prices is also called a submartingal, $\mathrm{E}(P_{t+1}|\phi_t) \geq P_t$ (Fama 1970).

The stochastic variable of stock price P_t is said to be a random walk, with a drift parameter μ, if the abnormal return term ε_{t+1} follows an independent and identical distribution (*iid* (0, σ^2)), where

$$E(\varepsilon_{t+1}) = 0;$$

$$Cov(\varepsilon_s \varepsilon_m) = \sigma^2, \text{ when } s = m; \qquad (4\text{-}2\text{-}28)$$

$$Cov(\varepsilon_s \varepsilon_m) = 0, \text{ when } s \neq m. \qquad (4\text{-}2\text{-}29)$$

The independence of increments ε_{t+1} implies that the random walk is in a sense more restrictive than the martingale, since a martingale does not restrict the higher conditional moment, such as σ^2, to be statistically independent. In other words, independence implies not only that increments are uncorrelated, but that any nonlinear function of increments is also uncorrelated. We shall call this definition random walk 1 or RW1. The later definitions, random walk 2 (RW2) and random walk 3 (RW3), are less restrictive, as defined by Campbell *et al* (1997), to facilitate the testing of efficient markets.

Although RW1 is elegant and simple, the assumptions of *iid* increments are not plausible for financial asset prices over long time spans. For example, technical equipment, institutional structures, regulatory legislation and social environments have been changed innumerably many times over a hundred years in developed stock markets. The assertions of the law of probability have not been maintained during this period. Thus, the restriction in RW1, which requires increments to be identically distributed, is relaxed in RW2 to suit evidence. RW2 requires that the increments be independent but not identically distributed. The weakest specification is RW3, relaxing the independence assumption from RW2. RW3 refers to a process with dependent but uncorrelated increments. Later, we will see that relaxing these restrictions has broadened the tests of market efficiency. In the context of this literature, the random walk hypothesis may be any one of these three if there is no specific definition.

4.2.4 The statistical properties of prices and returns

According to statistical theory, spurious tests are usually generated in a nonstationary time series.[4] A stationary time series is one for which: the mean and variance are constant over time; they depend only on the distance or lag between the two time periods, and not on the actual time at which they are computed. However, the prices of stocks are nonstationary. To develop some intuition for the nonstationarity of price series we write the following equations:

$$P_{t+1} = \mu + P_t + \varepsilon_{t+1},$$

$$P_{t+2} = \mu + P_{t+1} + \varepsilon_{t+2},$$

$$\cdots \cdots$$

$$P_{t+n} = \mu + P_{t+n-1} + \varepsilon_{t+n}.$$

Then, we substitute $P_{t+1}, P_{t+2} \cdots P_{t+n-1}$, successively, in the right hand side of each equation and get the general relationship:

$$P_{t+2} = P_t + 2\mu + \sum_{i=1}^{2} \varepsilon_i ,$$

$$\cdots \cdots$$

$$P_{t+n} = P_t + \mu \cdot n + \sum \varepsilon . \qquad (4\text{-}2\text{-}30)$$

Consider the conditional mean and variance of (4-2-30) at time $t+n$, conditional on some initial value P_t at time t, then

[4] Here the stationary refers to the weakly stationary (covariance stationary) instead of strict stationary.

$$E(P_{t+n}) = P_t + \mu \cdot n \text{, and} \tag{4-2-31}$$

$$Var(P_{t+n}) = \sigma^2 \cdot n . \tag{4-2-32}$$

It is obvious that the random walk variable P_t is nonstationary, because both the conditional mean and variance are not constant, and in fact are determined by the actual time, *t* or *t+n*, at which they are computed.

The first difference of a random walk time series is a stationary time series. For example as shown by (4-2-22), the returns referred to so far in this chapter are the first difference of the prices and are a stationary time series. The mean and variance are constant over time.

$$E(R_{t+n}) = \mu \text{, and} \tag{4-2-33}$$

$$Var(R_{t+n}) = \sigma^2 . \tag{4-2-34}$$

Unfortunately, these returns are not scale-free and unit-less, and may not permit comparison of investment performance across many assets. Therefore, the returns employed in the empirical literature are *simple returns* (or called rate of return and percent change return) and *log returns*. The simple return at time *t+1* is

$$(P_{t+1} - P_t)/P_t , \tag{4-2-35}$$

and the corresponding log return is

$$r_{t+1} = \ln(P_{t+1}/P_t) = \ln P_{t+1} - \ln P_t . \tag{4-2-36}$$

The logarithmic return is approximately equal to the simple return,

$$r_{t+1} = \ln(P_{t+1}/P_t) = \ln[1 + (P_{t+1} - P_t)/P_t] \approx \Delta P_{t+1}/P_t . \tag{4-2-37}$$

Empirical studies found that *simple return* of financial assets exhibit *limited liability*, which is contrary to the normal distribution. Limited liability means that the largest loss an investor can make is his total investment, so that the smallest net return achievable is -1 or -100%. Since the normal distribution's domain is the entire real line, this lower board of -1 clearly violates normality. The log return has the advantage of not violating limited liability. In addition, the multi-period log return is simply the sum of relevant single-period log returns, which has economic meaning. Unfortunately, the log return has one disadvantage. The simple return on a portfolio of assets is a weighted average of the simple returns on the assets themselves, where the weight on each asset is the ratio of the portfolio's investment in that asset. The log return does not share this convenient property. But in empirical applications this problem is usually minor. When returns are measured over short intervals of time, and are therefore close to zero, the log return on a portfolio is close to the weighted average of log return on the individual assets (Campbell *et al* 1997).

The simple return is frequently found in the literature before 1980, and the log return has been popularly employed in the literature after 1980. The log return will be applied in the empirical tests in this thesis. Unless otherwise specified, the returns used from now on are log returns.

4.3 Categories of random walk tests

The random walk was presented, in the previous section. If the price of the stock behaves as a random walk, the market is an efficient market. It is beneficial to compare this study with previous similar studies on many different markets; therefore the serial correlation coefficient test, the runs test and the variance ratio test will be employed. Since all of these tests deal with historical data with respect to past price information, the tests in this subsection refer to the tests of the weak form efficiency of the stock market.

4.3.1 Description of the serial correlation coefficient test

As Fama (1965) recommended one of the most direct and intuitive tests of the random walk for an individual time series is to check for serial correlation. A serial correlation coefficient is estimated from two observations of the same time series at different dates. Under the weakest version of the random walk, RW3, the increments of the random walk time series are uncorrelated at all leads and lags. The model of the serial correlation coefficient is

$$\rho(k) = \frac{Cov[r_t, r_{t-k}]}{\sqrt{Var[r_t]}\sqrt{Var[r_{t-k}]}} = \frac{Cov[r_t, r_{t-k}]}{Var[r_t]}, \qquad (4\text{-}3\text{-}1)$$

where $\rho(k)$ is the serial correlation coefficient of the time series r_t; here r_t is the return of a stock or a portfolio at time *t*; *k* is the lag of the period. In this research the lags are selected as 1 through 10 to conform to some prior studies (Fama 1965, Hsiao 1997). The standard deviation of $\rho(k)$, given a large sample, can be estimated as:

$$\sigma(\hat{\rho}(k)) = \sqrt{\frac{1}{n-k}}, \qquad (4\text{-}3\text{-}2)$$

where n is the number of observations. Fuller (1976) showed that the sample serial correlation coefficients $\hat{\rho}(k)$ are asymptotically independent and normally distributed with zero mean and standard deviation of $\sqrt{1/(n-k)}$. Therefore, when *k* is relatively small compared to the sample size *n*, the standard normal statistics *x* can be written as:

$$x = \frac{n}{\sqrt{n-k}}\hat{\rho}(k) \overset{a}{\sim} N(0, 1) \qquad (4\text{-}3\text{-}3)$$

H_0 : $\rho(k) = 0$, the null hypothesis states that the serial correlation coefficient, $\rho(k)$, is not significantly different from zero. H_a : $\rho(k) \neq 0$, the alternative hypothesis implies that the subsequent changes of observations in the time series are serial correlated. The test will be carried out at significance levels of α=0.05 and α=0.01. When the absolute value of x is less than the critical value 1.96 or 2.576, we accept the null hypothesis at the 5% significance level or at the 1% significance level, and the market (or the tested share or portfolio) can be concluded to be weak form efficient. Otherwise, we reject the null hypothesis, in which case we are quite sure that the market is not weak form efficient.

To test the joint hypothesis that all the serial correlation coefficients, $\rho(k)$ are simultaneously equal to zero, the Box and Pierce (1970) Q statistic is applied.

$$Q = n\sum_{k=1}^{m}\hat{\rho}^2(k), \tag{4-3-4}$$

where Q is asymptotically distributed as a *chi-square* distribution with m degrees of freedom; m is the maximum lag length. For small samples, Ljung and Box (1978) provide a finite-sample correction that yields a better fit to the *chi-square* distribution,

$$LB = n(n+2)\sum_{k=1}^{m}\frac{\hat{\rho}^2(k)}{n-k}. \tag{4-3-5}$$

By summing the squared serial correlations, the Q-statistic and the LB-statistic are designed to detect departures from zero serial correlations in either direction and at any leads and lags.

4.3.2 Description of the runs test

The runs test is a non-parametric statistic designed to determine whether the changes between observations are correlated or random. A run is defined as a sequence of consecutive observations with the same signs, e.g. + + +, 0 0, – – – –, +, 0, indicates five runs. "+" stands for a price increase or a positive return; "–" stands for a price decrease or a negative return; "0" means price unchanged or zero return. The runs test assumes that if the price changes are random, and hence the actual number of runs should be close to the expected number of the runs. The expected number of runs is generated in the condition of RW1 (Campbell *et al* 1997), thus, the runs test is a test for RW1.

In the following formulas, n denotes the number of observations; $i = 1, 2, 3$ denotes the signs of plus, minus, and no change; η_i denotes the total numbers of changes of each type of signs. Wallis and Roberts (1956) inferred the expected number of runs M, and the standard error of runs S_M as follow:

$$M = [\frac{n(n-1) - \sum_{i=1}^{3} \eta_i^2}{n}] \text{, and} \qquad (4\text{-}3\text{-}6)$$

$$S_M = \{ \frac{[\sum_{i=1}^{3} \eta_i^2 \langle \sum_{i=1}^{3} \eta_i^2 + n(n+1) \rangle - 2n \sum_{i=1}^{3} \eta_i^3 - n^3]}{n^2(n-1)} \}^{\frac{1}{2}} . \qquad (4\text{-}3\text{-}7)$$

Fama (1965) suggested that when n is larger, the expected number of runs M is approximately normally distributed. Furthermore, the standard normal statistic in the test of the actual number of runs being equal to the expected number of runs is

$$K = \frac{A_c - M \pm (1/2)}{S_M} \overset{a}{\sim} N(0, 1), \qquad (4\text{-}3\text{-}8)$$

where A_c denotes actual runs. 1/2 is the correction factor for continuity adjustment (Wallis and Roberts 1956), in which the sign of the continuity adjustment is positive if $A_c \leq M$, and negative if $A_c \geq M$. K follows a standard normal distribution. We set up the null hypothesis H_0: A_c=M, and the alternative hypothesis H_a: $A_c \neq M$. The test will be performed at significance levels of α=0.05 and α=0.01. When the absolute value of K is less than the critical value, 1.96 or 2.576, we accept the null hypothesis at the 5% significance level or at the 1% significance level. The actual number of runs is equal to the expected number of runs and the market is considered to be an efficient market. Otherwise, we reject the hypothesis and deduce that the market is inefficient.

The non-parametric runs test does not require that the observations follow a normal distribution, nor that they have a constant variance, thus, its validity does not depend on the shape of the underlying distribution. When the serial correlation coefficient is seriously affected by extreme outliers, the runs test may not be affected.

Some other versions (Mood 1940, Geary 1970) of the runs test only consider positive price changes and negative price changes; not unchanged prices. The results of these tests show almost no difference when trading in the market is frequent. If the market is suspected of being thin, then the version of the runs test which does not include the "no-change" category is less effective than version of the test which considers the "no-change" category as well.

4.3.3 Description of the variance ratio test

The variance ratio test was developed by Lo and MacKinlay (1988). The test implies that the increments in a random walk series are linear in the sample interval. Specifically, the variance estimated from the q-period returns should be q times as large as the variance estimated from one-period returns. To understand this proposition, (4-2-30) is rewritten in log prices and let q be the number of one-period intervals:

$$\ln P_{t+n} - \ln P_t = \mu \cdot q + \sum \varepsilon, \tag{4-3-9}$$

here μ is the mean one-period return in logarithm, ε is stochastic errors in logarithm, then

$$r_{t+q}^q = \mu q + \sum \varepsilon, \tag{4-3-10}$$

where r_{t+q}^q is the return over q-period, which is equal to the corresponding sum of one-period returns. The general expressions of expected return and variance of q-period returns are

$$\mathrm{E} r_t^q = \mu q \text{, and} \tag{4-3-11}$$

$$Var(r_t^q) = \sigma q . \tag{4-3-12}$$

Thus, the variance of q-period returns is q times of the variance of one-period returns,

$$Var(r_t^q)/Var(r_t) = q . \tag{4-3-13}$$

The variance ratio can be reduced as follow:

$$VR(q) \equiv \frac{Var(r_t^q)}{q \cdot Var(r_t)} = 1 + 2\sum_{k=1}^{q-1}(1 - \frac{k}{q})\rho(k) . \tag{4-3-14}$$

It is apparent in (4-3-14), that when the returns of the security are uncorrelated, the serial correlation coefficients in lags one to q should be simultaneously near zero and the *VR(q)* should be 1. Therefore, the variance ratio is designed for the test of RW3 as well.

Therefore, we set up the null hypothesis as H_0: $VR(q)$ = 1, and the alternative hypothesis H_a: $VR(q) \neq 1$. The test will be carried out at significance levels of α=0.05 and α=0.01. If the absolute value of test-statistics is less than the critical value, 1.96 or 2.576, we accept the null hypothesis at the 5% significance level or at the 1% significance level, which states that the returns are uncorrelated. Otherwise, we reject the null hypothesis, which means that the returns are serially correlated.

The standard normal test-statistics for the variance ratio test under the assumptions of homoscedasticity $Z(q)$ and heteroscedasticity $Z'(q)$ are those constructed by Lo and MacKinlay (1988),

$$Z(q) = \frac{VR(q) - 1}{\Phi(q)^{1/2}} \overset{a}{\sim} N(0, 1), \text{ and} \tag{4-3-15}$$

$$Z'(q) = \frac{VR(q) - 1}{\Phi'(q)^{1/2}} \overset{a}{\sim} N(0, 1), \tag{4-3-16}$$

where $\Phi(q)$ is the asymptotic variance of the variance ratio under the assumption of homoscedasticity; $\Phi'(q)$ is the asymptotic variance of the variance ratio under the assumption of heteroscedasticity; other variables are as defined before.

$$\Phi(q) = \frac{2(2q-1)(q-1)}{3q(nq)}, \tag{4-3-17}$$

$$\Phi'(q) = \sum_{j=1}^{q-1} [\frac{2(q-j)}{q}]^2 \cdot \hat{\delta}(j), \text{ where} \tag{4-3-18}$$

$$\hat{\delta}(j) = \frac{\sum_{t=j+1}^{nq} (p_t - p_{t-1} - \hat{\mu})^2 (p_{t-j} - p_{t-j-1} - \hat{\mu})^2}{[\sum_{t=1}^{nq} (p_t - p_{t-1} - \hat{\mu})^2]^2}, \qquad (4\text{-}3\text{-}19)$$

where nq states the number of observations; $\hat{\delta}(j)$ is the heteroscedasticity-consistent estimator, in which p_t is the price of the security at time t; $\hat{\mu}$ is the average return. In order to facilitate comparison of this study with previous research (Lo and MacKinlay 1988, Campbell *et al* 1997) on other markets, the q is selected as 2, 4, 8, and 16.

There are inherent relations between the serial correlation coefficient, the runs and the variance ratio tests. A significantly positive serial correlation coefficient implies that a trend exists in a time series of security prices, whereas, a negative serial correlation coefficient indicates the existence of reversals in price movements. Therefore, the significantly positive serial correlation of returns leads to actual runs of the returns being less than the expected runs, and the relevant variance ratio being larger than one. On the contrary, a significant negative serial correlation of returns results in more actual runs than expected runs and a small variance ratio of less one.

4.4 Design of tests for seasonal effects

The "seasonal effects" refer to the anomaly that returns on some specific dates exhibit significantly higher or significantly lower returns on average than on the other dates. Several seasonal effect patterns such as the day-of-the-week effects, the month-of-the-year effects, the holiday effects, the turn of the year effects, the turn of the month effects and so forth, have been found in many stock markets. The seasonal return patterns imply an environment of market inefficiency in which the participants of the market can generate abnormal returns by exploiting the seasonal return patterns. Tests of seasonal effects are usually conducted by detecting the difference of returns existing between the specific dates and the general dates. This part of the study will be implemented with dummy variable models and concentrates on the tests of the day-of-the-week effects, the month-of-the-year effects and the holiday effects.

4.4.1 Design of the day-of-the-week effect test

The day-of-the-week effects are identified by a significant difference in daily returns in a typical week. To test the day-of-the-week effects by detecting the characteristics of the mean returns arsing from trading on different weekdays, the dummy variable regression model is designed as follows:

$$r_{i,t} = a_{1,i}w_{1,t} + a_{2,i}w_{2,t} + a_{3,i}w_{3,t} + a_{4,i}w_{4,t} + a_{5,i}w_{5,t} + v_{i,t}, \quad (4\text{-}4\text{-}1)$$

where $r_{i,t}$ is the return of a share, or a portfolio *i*, in a weekday *t*. $w_{1,t}$ is a dummy variable for Monday (i.e. $w_{1,t}$ = 1 if the day of observation *t* is a Monday and 0 otherwise), $w_{2,t}$ is a dummy variable for Tuesday, and so forth. The coefficients of dummy variables $\alpha_{1,i}$ $\alpha_{2,i}$ $\alpha_{3,i}$ $\alpha_{4,i}$ $\alpha_{5,i}$ are the mean returns on Mondays through Fridays. $v_{i,t}$ is the random disturbance. The null hypothesis of the *t*-test is that the mean return of weekday *j* is equal to zero, $a_{j.i}$=0. The null hypothesis of the *F*-test is that the mean returns of every weekday are equal, $a_{1,i} = a_{2,i} = a_{3,i} = a_{4,i} = a_{5,i}$. If the null hypotheses are accepted at the 5% or 1% significance level, it is implies that, from the statistical theory, significant day-of-the-week effects do not exist. Otherwise, the hypothesis is rejected. Since a significant abnormal return is available, the market is inefficient.

4.4.2 Design of the month-of-the-year effect test

If the returns in different months are significantly different, the market exhibits the month-of-the-year effects. In testing the month-of-the-year effects, the dummy variable regression model is

$$r_{i,t} = a_{1,i}w_{1,t} + a_{2,i}w_{2,t} \cdots\cdots + a_{12,i}w_{12,t} + v_{i,t}, \quad (4\text{-}4\text{-}2)$$

where $r_{i,t}$ is the return of a share or a portfolio i, in month t. $w_{1,t}$ is a dummy variable for January (i.e. $w_{1,t}$ = 1 if the month of observation t is a January and 0 otherwise), $w_{2,t}$ is a dummy variable for February, and so forth. The coefficients of dummy variables $a_{1,i}$, $a_{2,i}$, ······, $a_{12,i}$ are the mean returns on January through December. $v_{i,t}$ is the random disturbance. The t-test will be applied for each coefficient of the dummy variable to indicate whether the average return of a month is significantly different from zero. The F-test detects if the average returns on every month are equal, $a_{1,i} = a_{2,i} = \cdots\cdots = a_{12,i}$. The tests will be conducted at the 5% or 1% significance level. Therefore the null hypothesis is similar to that in the day-of-the-week effect test.

As holidays consistently appear in some months, there are less trading days in those months. The unequal trading periods in each month of a year may lead to biased estimate. To control for this potential bias, the monthly return $r_{i,t}$ is replaced by the average daily returns of the month $\bar{r}_{i,t}$ in a successive test, thus

$$\bar{r}_{i,t} = \bar{a}_{1,i}w_{1,t} + \bar{a}_{2,i}w_{2,t} \cdots\cdots + \bar{a}_{12,i}w_{12,t} + v_{i,t} \quad (4\text{-}4\text{-}3)$$

$\bar{a}_{1,i}$, $\bar{a}_{2,i}$, ······, $\bar{a}_{12,i}$ are the average daily returns by months, January through December. The other symbols and the tests are the same as in (4-4-2).

4.4.3 Design of the holiday effect test

A holiday effect can be detected by significantly difference of returns occurring on the trading days before holidays and after holidays compared with normal trading days. The dummy variable regression model in testing the holiday effects is sightly changed from those in the tests of the day-of-the-week effects and the month-of-the-year effects:

$$r_{i,t} = a_{0,i} + a_{pr,i} w_{pr,t} + a_{po,i} w_{po,t} + \varepsilon_{i,t} \ , \tag{4-4-4}$$

where $r_{i,t}$ is the return of a share or a portfolio i in a trading day, $w_{pr,t}$ is the dummy variable for pre-holiday trading days, $w_{po,t}$ is the dummy variable for post-holiday trading days. The constant $\alpha_{0,i}$ measures the average daily return for the year except for the returns on the pre-holiday trading days and the post-holiday trading days, that is, the average of normal daily returns (average return on non-holiday trading days). The coefficient of the pre-holiday trading day dummy variable $\alpha_{pr,i}$ represents the increment between the average of normal daily returns and the mean return on the pre-holiday trading day. The coefficient of the post-holiday trading day dummy variable $a_{pa,t}$ represents the increment between the average of normal daily returns and the mean return on the post-holiday trading days, $\varepsilon_{i,t}$ is the disturbance. The null hypothesis of the t-test is that the differences between either the pre-holiday daily return or the post-holiday daily return and the normal daily return is equal to zero, $\alpha_{pr,i}$=0 or $a_{pa,t}$=0. The null hypothesis of the F-test is that the differences between pre-holiday daily return and normal daily return, and post-holiday daily return and normal daily return are simultaneously equal to zero, $\alpha_{pr,i} = a_{pa,t}$=0. All of the tests will be conducted at the 5% and 1% levels of significance.

To test the influence of the day-of-the-week effects on the holiday effects, we construct an additional dummy variable model that combines the day-of-the-week effect dummy variable model (4-4-1) and the holiday effect dummy variable model (4-4-4),

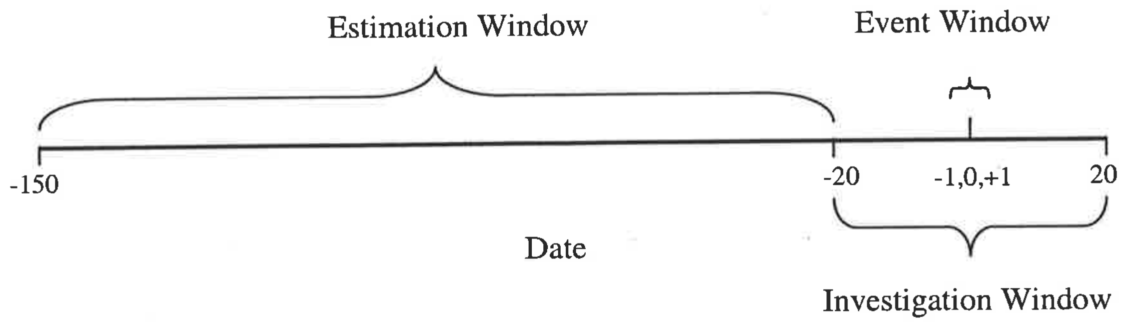
$$r_{i,t} = a_{1,i}w_{1,t} + a_{2,i}w_{2,t} + \cdots\cdots + a_{5,i}w_{5,t} + a_{pr.i}w_{pr,t} + a_{pa,i}w_{pa,t} + v_{i,t}\,. \quad (4\text{-}4\text{-}5)$$

The symbols in model (4-4-5) have the same meaning represented by the corresponding symbols in the models (4-4-1) and (4-4-4).

4.5 Design of the event study

It is well known that in a semi-strong form efficient market, new public information should be reflected immediately in asset prices. The prices react to the new information instantly and properly without the biases of overreaction or underreaction. Measurement of the sensitivity of asset prices to the new information can be conducted by testing the performance of asset return around the announcement of the new information. The general applicable methodology is termed an *event study*, which was perhaps published initially by Dolley in 1933. Over the past half century, the event studies have been employed in much research and their sophistication has been improved in some outstanding papers such as Fama, Fisher, Jensen and Roll's (FFJR) (1969) and Brown and Warner (1980, 1985). To construct an event study, the "event," "event window," "estimation window," "investigation widow" and "estimation model" should be determined. Figure 4-1 previews the relations of the event window and the estimation window and the investigation window that will be defined in the following subsections.

Figure 4-1. The Structure of Window Design for the Event Study



4.5.1 Brief structure of the event studies in this thesis

Event definition

The event is what the investigators would like to study, and it conveys information that potentially influences the stock prices. FFJR (1969) determined stock splits as an event in their study. Ball *et al* (1977) selected bonus and rights issues as the events of their study. Charest (1978a, 1978b) investigated a set of events that included the stock split proposals, stock split votes, stock split realisations, dividend increases and dividend decreases. Bernard and Thomas (1990) studied earning announcements. Due to the restriction of applicable data, the events defined for this study are zero-dividend proposal, zero-dividend approval, cash-dividend proposal; cash-dividend approval, rights proposal, rights approval, bonus proposal and bonus approval. Each type of events may be further grouped according to the informational content. More detailed specification of the selected events will be defined in the Chapter 7, which concerns the empirical tests and the results of event studies.

Event window

An event window is the period in which an event occurs. Strictly speaking, an event window should be a period when the occurrence of the event is publicly announced. The event window might be a day, a week or a month subject to what type of data is employed in the study. Since daily data is utilised in this study, the event window is primarily defined as the day when the event is announced. In the case that the event is announced after trading hours and then impacts on the next day's prices, or that there is a time difference in the announcements in different news media, the event window is expanded to three days. Thus, the event window in this study is combined with the day of the announcement and the days preceding and succeeding the announcement day. The announcement day is defined as 0, the three event days are represented as -1, 0, +1.

Estimation window

The parameters of selected models have to be estimated using a set of data; the normal expected returns can then be generated. The period of an employed data set in the estimation is known as an estimation window. For example, the lengths of the estimation windows in FFJR's (1969) study consisted of between 100 and 300 months from stock to stock. Also, the estimation windows of FFJR's (1969) study include two periods before and after the event window. However, the most common estimation window is settled prior to the event window in most subsequent studies. For example, in Corrado's (1989) study, the event window was the period between the day of -244 to the day of -6 preceding the announcement date, including 251 observations and excluding the investigation window. As a consequence, the estimation window in this study is defined from the day -150 to the day -21.

Investigation window

In an event study, not only do the abnormal returns occurring during the time of the event window need to be tested, but also the abnormal returns occurring in the period around the event window have to be investigated. The abnormal returns occurring before the event window can show us whether the market has anticipated the information contained in the event, while the abnormal returns after the event window can tell us whether the market overreacts or underreacts to the announcement of the event. The investigation period in this study is an extension of the event window, from day -20 through day +20. The relation of estimation window, event window and investigation window is previously represented in Figure 4-1.

The Selected models

To appraise the event's impact on the stock prices, we require a measurement of the abnormal return. The abnormal return is the actual return minus the normal return, and the normal return is defined as the return that would be expected if the event did not take place. Thus, it is necessary to specify a model for generating the normal return before the abnormal return can be measured. To generate the normal expected returns, FFJR (1969) applied a market model. Brown and Warner (1980, 1985) used a market adjusted model, a market model and a constant mean adjusted model. Chan (1988), and Gombola and Liu (1993) used the CAPM. In this study, the constant mean adjusted model, the market adjusted model and the market model will be employed. The CAPM model was tried before the formal models were finalised in this study. Nevertheless, this attempt at applying CAPM failed due to the lack of a market-determined risk-free asset available in China. The interest rate, and so forth, is distorted in the period of this study in China because of the centralised control of financial asset prices.[5]

4.5.2 Selected models and abnormal returns generation

Constant mean adjusted model

Three models will be applied in the study: the constant mean adjusted model, the market adjusted model and the market model. Although the constant mean adjusted model is perhaps the simplest model, Brown and Warner (1980, 1985) found it often yields results similar to those of the more sophisticated models. The constant mean adjusted model is

$$r_{i,t} = \bar{r}_i + \varepsilon_{i,t}, \qquad (4\text{-}5\text{-}1)$$

where $r_{i,t}$ is the return of i stock at day t, $\bar{r}_i$ is the mean return of stock i in the estimation window (i.e. from day -150 through -21), $\varepsilon_{i,t}$ is the abnormal return of stock i at day t. The constant mean adjusted model assumes that the normal return for a given security i is equal to a constant represented by its mean return in the estimation window. Then, the abnormal return is equal to the difference between the observed return and the normal return, i.e. the constant,

$$\varepsilon_{i,t} = r_{i,t} - \bar{r}_i. \qquad (4\text{-}5\text{-}2)$$

It is apparent that, the abnormal returns of a stock which is measured by the constant mean adjusted model depends merely on its previous mean return in the estimation window. The abnormal returns are not evaluated by a market criterion. Thus, the constant mean adjusted model focuses on the returns of each stock in the event

[5] The real interest rate was negative before 1996. The interest rates on state bonds were higher than that of corporate bonds, even though the risk of state bonds was lower than that of the corporate bonds.

window (or investigation window) to examine whether or not the returns on the stock in the event window (or investigation window) are statistically different from the mean return on the same stock in the estimation window.

Brown and Warner (1980) showed that the constant mean adjusted model was consistent with the CAPM. Under the assumption that a security has a constant systematic risk and that the efficient frontier is stationary, the CAPM predicts that a stock's expected return is constant.

Market adjusted model

In contrast to the constant mean adjusted model, the market adjusted model takes into account the market return to determine the normal return of a stock at the same point in time *t*. Market adjusted model is

$$r_{i,t} = r_{m,t} + \varepsilon_{i,t}, \qquad (4\text{-}5\text{-}3)$$

where $r_{m,t}$ is the market return at time *t*, as calculated from a market portfolio or a market index.[6] Thus, the market adjusted model assumes that the normal returns are equal across all stocks in time *t*, but not necessarily constant for a given security at different time. The abnormal return on any stock *i* is determined by the difference between its return and that on the market portfolio simultaneously,

$$\varepsilon_{i,t} = r_{i,t} - r_{m,t}. \qquad (4\text{-}5\text{-}4)$$

Therefore, the focus of market adjusted model is on examining whether or not the returns on the given stock during the event window (or the investigation window) are

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[6] Since there is not an index across both the Shanghai and Shenzhen markets and the segmentation of the A-shares and B-shares markets, the SSE-A, SZS-A, SSE-B and SZS-B will be employed as market indices when we test Shanghai A-shares, Shenzhen A-shares, Shanghai B-shares and Shenzhen B-shares respectively. See Section 4.6.1: Description of the Data, Section 2.4.1: A-shares and B-shares and Section 2.7.2: Behaviour of A-shares and B-shares.

statistically different from the returns on the market at the same time. However, since the parameters in the test of significance are introduced from the returns in the investigation window, we should notice that this estimate is still partially affected by the returns on the sample security and the market during the estimation window. The market adjusted model is also consistent with the CAPM if all securities have systematic risk of unity (Brown and Warner 1980).

Market model

The market model presumes that the return on a sample stock over a given period is linearly related to the return that is earned on a market portfolio (expressed as market index) over the same period. The market model is

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t} \ , \qquad (4\text{-}5\text{-}5)$$

where α_i is the intercept term, β_i is the slope of the return of market portfolio. β_i measures the marginal effect of the market return on the return of stock i. Here, the parameters of the market model are estimated from a regression with the returns on a stock and market portfolio in the estimation window, day -150 through day -21. The abnormal return (residual) on any stock i in the event window (or investigation window) is measured by the difference between its actual return and that regressed from this model at the same time. Hence:

$$\varepsilon_{i,t} = r_{i,t} - \hat{\alpha}_i + \hat{\beta}_i r_{m,t} \, , \qquad (4\text{-}5\text{-}6)$$

where $\hat{\alpha}_i$, $\hat{\beta}_i$ are the estimators of α_i, β_i. Therefore, the abnormal returns, $\varepsilon_{i,t}$, of a given stock specified in the market model are determined by a linear relation to the market returns. The market model focus is on examining whether or not the returns on stock i in the event window (or investigation window) are statistically different from the returns regressed on the market portfolio. The market model is still consistent with the CAPM under the assumption that the of fixed return of an asset is zero (Tinic and West 1979).

4.5.3 Design of test-statistics

The announcement of an event is basically categorised as "good" news, "bad" news or "no" news. If the event contains unanticipated good news, the stock prices in an efficient market would respond with a significantly positive return. Similarly, the stock prices respond to unanticipated bad news with a significantly negative return. To test the reaction of stock prices to such events, firstly, the parametric t-test is applied in examining the significance of abnormal returns in an event day and in an interval before the event day, after the event day and around the event day. The utilisation of the parametric t-test is under the assumption that stock returns are normally distributed. If such an assumption is violated, a false inference could result. Thus, taking into account the probability of non-normally distributed returns, the non-parametric rank test is applied assuming that there exist outlying abnormal values.

The test-statistic for abnormal returns on an event day, in this case, t = -1, 0, +1, is

$$t_* = \bar{\varepsilon}_t / \hat{s}(\bar{\varepsilon}_t), \qquad (4\text{-}5\text{-}7)$$

where $\bar{\varepsilon}_t$ is average abnormal return of stocks involved in the test at day t, $\hat{s}(\bar{\varepsilon}_t)$ is the corresponding standard deviation.

$$\bar{\varepsilon}_t = \frac{1}{N_t}\sum_{i=1}^{N_t} \varepsilon_{i,t}\text{, and} \qquad (4\text{-}5\text{-}8)$$

$$\hat{s}(\bar{\varepsilon}_t) = \sqrt{\left[\ \sum_{t=-150}^{-21} (\bar{\varepsilon}_t - \bar{\bar{\varepsilon}})^2\ \right] \Big/ 129}\,, \qquad (4\text{-}5\text{-}9)$$

where N_t is the number of stocks involved in the test at day t, $\overline{\overline{\varepsilon}}$ is the average abnormal return of N_t stocks from day -150 to day -21, such that

$$\overline{\overline{\varepsilon}} = \frac{1}{130} \sum_{t=-150}^{-21} \overline{\varepsilon}_t \, . \qquad (4\text{-}5\text{-}10)$$

Masulis (1980), Brown and Warner (1985), Corrado and Zivney (1992) have used these statistics.

We have to emphasise that the variable t in this case does not represent calendar time when we construct the tests of significance. The t is a time count in the period of the estimation window and the investigation window, which is shown as -150 to +20 on Figure 4-1. Thus, although similar events for different stocks occur at different calendar time, they have the same time account.

Compared with tests simply on the event day, tests of abnormal returns within an interval have greater economic meaning. For example, the significant non-zero positive abnormal return in a period before the event widow implies that the market has anticipated the good news, or that there is insider trading using the information before that information is announced. Then following the event, a significant negative return after the event window implies that the market had overreacted to this good news previously, and then adjusted itself after the event. Brown and Warner (1985) recommended the following t-statistic:

$$t_{a,b} = \sum_{t=a}^{b} \overline{\varepsilon}_t \Big/ \Big[\sum_{t=a}^{b} \hat{s}^2(\overline{\varepsilon}_t) \Big]^{1/2} . \qquad (4\text{-}5\text{-}11)$$

The first and last days of the interval are a and b, which are selected as –10 to 0, -10 to +10, 0 to +10, and so forth in this study. $\overline{\varepsilon}_t$ and $\hat{s}(\overline{\varepsilon}_t)$ are the same as before. This test-statistic is also formulated in matrices by Campbell *et al* (1997).

Corrado (1989) indicated that, when the distribution of abnormal return is skewed, the non-parametric sign test is weaker than the non-parametric rank test as the expected proportion of positive abnormal returns may differ from half even under the null hypothesis. Campbell and Wasley (1993) found that the rank test in their study, using the Corrado (1989) model, provides more reliable inference than do the standard parametric tests.

In the rank test-statistic, we let $k_{i,t}$ denote the rank of an abnormal return $\varepsilon_{i,t}$ in an abnormal return time series. l is the number of abnormal returns in the time series. The time series is constructed by 170 abnormal returns in the estimation window plus the event window and the investigation period. Therefore the expected rank of an abnormal return should be $(l+1)/2$ = 85.5 in this rank test. Thus, the rank test-statistic t_k is

$$t_k = \frac{1}{N_t}\sum_{i=1}^{N_t}\left(k_{i,t} - \frac{l+1}{2}\right) \Big/ s(k_t), \qquad \text{(4-5-12)}$$

where $s(k_t)$ is the standard deviation of the ranks and calculated by

$$s(k_t) = \sqrt{\frac{1}{171}\sum_{t=-150}^{+20}\left[\frac{1}{N_t}\sum_{i=1}^{N_t}(k_{i,t} - 85.5)\right]^2} \qquad \text{(4-5-13)}$$

The event days of -1, 0, +1 will be examined by the rank test, respectively. All of the tests in the event studies are conducted at the 5% or 1% significance level.

4.6 Data processing

4.6.1 Description of the data

The primary data used in this study are drawn from the database of the Newland Securities Investment Consulting Company.[7] Supplementary data was collected from the Tianjin Northern International Investment and Trust Corporation,[8] the *Shanghai Stock Exchange Annual* series, the *Shanghai Securities Yearbook* series, the *Shenzhen Stock Exchange Fact Book* series[9] and so forth. The relevant references concerning dividends, and new rights and so forth are from previously cited resources, and additionally, from the "Shangshi Gongsi Ziliaoku (Database of Listed Companies),"[10] "Haiyong '97 Nianbao Xiangjie (Haiyong '97 Annual Reports Analyses)" and "'98 Yieji Zhanwang ('98 Achievement Prediction)."[11]

The original data of this study consisted of daily market-close prices and market-open prices, weekly market-close prices and market-open prices, monthly market-close prices and market-open prices. The dates of the last observations in those data series are 10 April 1998, but the dates of the initial observations varies from time to time according to the outstanding dates of each individual share or data availability. However, the longest period of the data records in empirical test of this study is from

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[7] Newland Securities Investment Consulting Company, located in Shanghai, P. R. China, is a large company for securities information supply and investment consulting in China.
[8] Tianjin Northern International Investment and Trust Corporation, located in Tianjin, P. R. China, is a middle size non-bank financial institute mainly dealing with security business.
[9] *Shanghai Stock Exchange Annual* is edited by the Shanghai Stock Exchange, *Shanghai Securities Yearbook* is edited by its editorial commission and *Shenzhen Stock Exchange Fact Book* is edited by the Shenzhen Stock Exchange. All the books are published in regular interval of one year.
[10] A database in CD format that is produced and issued by Shenzhen Genius Information Corporation Limited, Shenzhen, P. R. China.
[11] A database in CD format that is produced by Beijing Haiyong Zixun Xitong Youxian Gongsi (Peking Haiyong System of Investment Pty Ltd), and issued by People's Posts and Telecommunications Publishing House, P. R. China.

December 1990 to April 1998 for the Shanghai stock market, and from April 1991 to April 1998 for the Shenzhen stock market.

The tests performed in this thesis will be conducted on the indices and individual shares' prices respectively. The indices of the Shanghai Stock Exchange (SSE) are: SSE Index (SSE);[12] SSE A-shares Index (SSE-A); SSE B-shares Index (SSE-B); SSE Manufacturing Index; SSE Commercial Index; SSE Real Estate Index; SSE Utility Index; and SSE Miscellaneous Index. The base date of SSE and SSE-A is 19th of December 1990 with the base value of 100. The base date of SSE-B is 21st of February 1992 with the base value of 100. The base date of the remaining sectoral indices is 30th of April 1993 with base value of 1358.78. All indices of the Shanghai market are composite indices and volume weighted with all relevant individual shares.

Similarly, the indices of the Shenzhen Stock Exchange (SZS) are: SZS Index (SZS);[13] SZS A-share Index (SZS-A); SZS B-share Index (SZS-B); SZS Manufacturing Index; SZS Commercial Index; SZS Property Index; SZE Utility Index; SZS Financial Index; and the SZS Miscellaneous Index. However, the base date of the indices of the Shenzhen market is the 20th of July 1994 with the base value of 1000. All indices of the Shenzhen market are component indices and value weighted with the relevant individual shares in the selected samples. For example, the SZS-A covers forty major A-shares and SZS-B covers seven major B-shares stocks listed on the Shenzhen market.

[12] SSE is used being the abbreviations of either the Shanghai Stock Exchange or the Shanghai Stock Exchange Composite Index (Shanghai market index). The SES usually represents the Shanghai Stock Exchange Composite Index in this thesis except in this paragraph here.

[13] SZS is used being the abbreviations of either the Shenzhen Stock Exchange or the Shenzhen Stock Exchange Component Index (Shenzhen market index). The SSZ usually represents the Shenzhen Stock Exchange Component Index in this thesis except in this paragraph here.

Table 4-1 gives a brief outline of data used in this study. Of them, the SSE represents the behaviour of the whole Shanghai market, and the SZS represents the behaviour of the whole Shenzhen market. The SSE-A and SSE-B represent the behaviour of the A-shares and the B-shares in the Shanghai market, while SZS-A and SZS-B represent

Table 4-1. Brief Outline of the Data Employed in This Study

Index	Abbreviation	Available Period	Base Date	Base Value	Available Shares
		Shanghai Stock Exchange			
SSE Index	SSE	12/1990 - 5/1998	12/19/1990	100	424
SSE A-shares Index	SSE-A	2/1992 - 5/1998	12/19/1990	100	375
SSE B-shares Index	SSE-B	2/1992 - 5/1998	21/2/1992	100	49
SSE Manufacturing Index	SSE-I	8/1993 - 5/1998	30/4/1993	1358.79	254
SSE Commercial Index	SSE-Com	8/1993 - 5/1998	30/4/1993	1358.79	46
SSE Real Estate Index	SSE-R	8/1993 - 5/1998	30/4/1993	1358.79	7
SSE Utility Index	SSE-U	8/1993 - 5/1998	30/4/1993	1358.79	37
SSE Miscellaneous Index	SSE-M	8/1993 - 5/1998	30/4/1993	1358.79	80
		Shenzhen Stock Exchange			
SZS Index	SZS	4/1991 - 5/1998	20/7/1994	1000	399
SZS A-shares Index	SZS-A	10/1992 - 5/1998	20/7/1994	1000	348
SZS B-shares Index	SZS-B	10/1992 - 5/1998	20/7/1994	1000	51
SZS Manufacturing Index	SZS-I	7/1994 - 5/1998	20/7/1994	1000	276
SZS Commercial Index	SZS-Com	7/1994 - 5/1998	20/7/1994	1000	35
SZS Property Index	SZS-P	7/1994 - 5/1998	20/7/1994	1000	15
SZS Utility Index	SZS-U	7/1994 - 5/1998	20/7/1994	1000	23
SZS Conglomerate Index	SZS-Con	7/1994 - 5/1998	20/7/1994	1000	48
SZS Financial Index	SZS-F	7/1994 - 5/1998	20/7/1994	1000	2

the behaviour of the A-shares and the B-shares in the Shenzhen market. The sectoral indices aggregate the performances of the shares of the relative sectors.[14] Besides the index data, the individual share data employed in the study include 375 Shanghai A-shares, 49 Shanghai B-shares, 348 Shenzhen A-shares and 51 Shenzhen B-shares.

The primary criteria for selection of individual share data are that the shares have been listed for more than half a year, and that the shares have not been suspended during the listed period except for common holidays and normal *ex* dates. In addition, some special requirements are applied in construction of data samples for specific tests, which will be detailed in the relevant Chapters.

Three possible alternatives are available for dealing with the days (or weeks and months) with no trading (Keinkel and Kraus 1988). One approach is to assign zero return for the days with no trading. The second approach is to ignore the days with no trading and use only return data for trading days. The third possibility is to construct a linear model to estimate the returns of the days with no trading. The first approach is followed in this study for the reasons proposed by Yong (1992). First, since nontrading is a characteristic of thin markets, it is not appropriate to ignore the days with no trading. Next, by eliminating the nontrading days, the analysis in the runs tests may conclude that the market is efficient even through in reality it might not be. Third, the linear model generating observations are not actual ones. Furthermore, the zero returns reflect the true returns on the nontrading days. Finally, the prices on nontrading days

[14] From now on, the English titles of each sector and sector index, except for the Manufacturing, are cited from the official documents of relevant stock exchange, such as yearbooks. Even though these titles may not be formally employed in foreign markets, such quotations are convenient for checking references. However, we replace Industry - an inexplicit translation, with Manufacturing. The categories of Real Estate and Miscellaneous for the Shanghai market are similar to those of Property and Conglomerate for the Shenzhen market.

are represented as the same prices of prior trading days in the database obtained from China, they automatically produce zero returns for the nontrading days. However, except for some cases on B-shares before 1993, nontrading is not a common feature for the shares on China's stock markets.

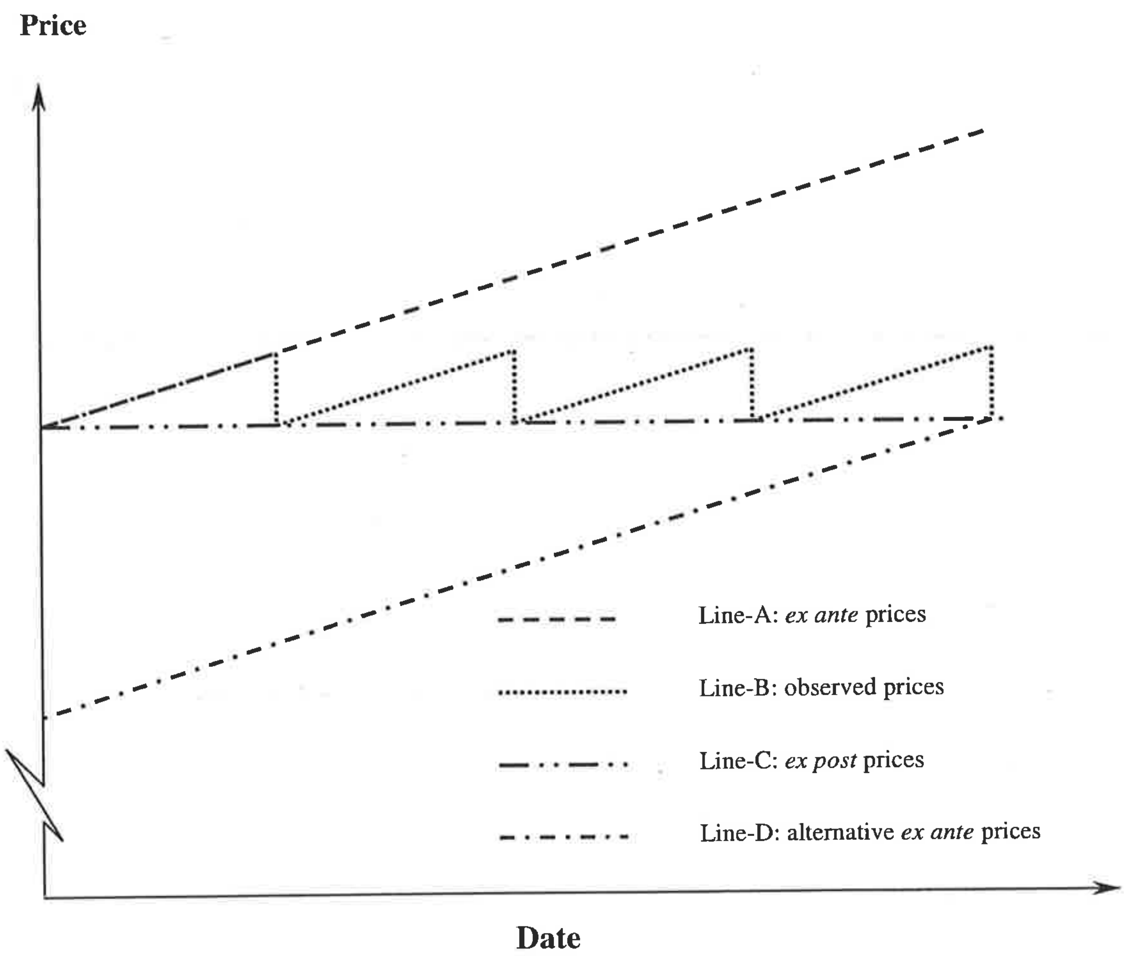
Stock indices of both the Shanghai and Shenzhen markets have been adjusted for stock splits, dividend issues, rights issues, bonus issues and so forth. The adjustments are undertaken by simply dropping from the index the shares that have issues at the *ex* dates. Unfortunately there is not an adjusted version of individual share prices already available for this study, so one of the contribution of this dissertation is to perform these adjustments systematically on all the available data.

4.6.2 Data processing

In Section 4.2.2 of this chapter, we have referred to *ex ante* prices and *ex post* prices in the discussion of martingales and fair games. In reality, the observed prices in the transactions consist of *ex ante* and *ex post* prices from a dynamic viewpoint. To demonstrate the stock price adjustment procedure, we assume that the profits of a firm are stable and are fully allocated into dividends immediately after the profits turn up. Therefore the dividends accumulate gradually in the interval between the dates when the dividends are issued. Except for the dividend *ex date*, the stocks price includes dividends at all time.

Figure 4-2 simulates the relations of *ex ante* prices, *ex post* prices, observed prices and the alternative *ex ante* prices for our processing *ex ante* returns. Line-A illustrates the *ex ante* prices that imply that all dividends are included in the prices. Line-B illustrates the observed prices that imply that the dividends are exercised four times in the whole period. Except for the four *ex* dates, the dividends are still involved in the remaining days. Line-C illustrates the *ex post* prices that imply that the dividends are fully exercised at each date as the profits are produced. The line-D is parallel to Line-A, which represents alternative *ex ante* prices for processing the *ex ante* returns. All lines are represented by broken lines to indicate that prices undulate due to stochastic factors.

Figure 4-2. Simulation of the Relation between *ex ante* Prices and *ex post* Prices



In the study of stock markets, the stock prices, particularly the returns, should have the same basis in order to allow effective analysis. In other words, returns of a time series should all be *ex post* returns or should all be *ex ante* returns (cum-dividend returns). Since cum-dividend returns possess the statistical properties shown in equation (4-2-23), empirical tests of market efficiency usually apply to *ex ante* returns. Therefore, the observed stock prices have to be adjusted in order to generate *ex ante* returns. Issuance of dividends is an example that is entitled the *ex event*. Likewise, the bonus issues, rights issues, stock splits and so forth have *ex event* effects on stock prices and returns. Thus, the adjustments of stock prices and returns should take into account the ex-dividends, ex-bonus, ex-rights, ex-stock splits and so forth.

Current-price-adjustment procedure

There are two common procedures for data processing of *ex* events. One is the current-price-adjustment procedure; the other is the past-price-adjustment procedure. In the current-price-adjustment procedure, the current price at the *ex* date is adjusted by adding the ex-dividend back. Thus the prices at the *ex* date and at the *pre-ex* date can be matched on the same basis, and the cum-dividend return at the *ex* date is obtained. For example, Hsiao (1996) processed price data by applying the current-price-adjustment procedure. The ex-dividend adjusted case is

$$r_{i,t+1} = \ln(P_{i,t+1} + D_{i,t+1}) - \ln(P_{i,t}), \qquad (4\text{-}6\text{-}1)$$

where, $r_{i,t+1}$ is the log return of stock i at time $t+1$; $P_{i,t+1}$ is the price of stock i at time $t+1$; $D_{i,t+1}$ is the cash dividend; $P_{i,t}$ is the price at time t; $t+1$ is the dividend *ex* date.

The combined case of ex-dividend and ex-bonus is,

$$r_{i,t+1} = \ln(P_{i,t+1} \times (1 + R'_{i,t+1}) + D_{i,t+1}) - \ln(P_{i,t}), \qquad (4\text{-}6\text{-}2)$$

where $R'_{i,t+1}$ is the rate of the bonus. For the combined case of ex-dividend, ex-bonus (stock splits are the same as bonus issues) and ex-rights, we aggregate Hsiao's (1996) formulae as:

$$r_{i,t+1} = \ln\left(P_{i,t+1} \times \frac{(1 + R'_{i,t+1} + R''_{i,t+1}) \times P_{i,t}}{P_{i,t} + R''_{i,t+1} \times s_{i,t+1}} + D_{i,t+1} \right) - \ln\left(P_{i,t}\right), \qquad (4\text{-}6\text{-}3)$$

where $R''_{i,t+1}$ is the rate of rights, $s_{i,t+1}$ is the subscription price per share in the new issue. We can reduce formulas by simply dropping off the irrelevant factors in formula (4-6-3) for the combined cases of adjusting rights and bonus, dividend and rights, rights only, bonus only and so forth respectively.

Obviously, formulas of (4-6-1) to (4-6-3) base on the past price $P_{i,t}$ to adjust the current price $P_{i,t+1}$. If we suppose: the adjustments are according to the current-price-adjustment procedure; the adjustments are successive and cumulated from recent *ex* date to distant *ex* date; the adjustments are undertaken not only on the prices of *ex* dates but are also on each succeeding price, therefore, the time series of adjusted prices is simulated in Line-A in Figure 4-2.

Past-price-adjustment procedure

In this study, we apply the past-price-adjustment procedure to process the data. The price at the *pre-ex* date is adjusted by eliminating the ex-dividend. Thus the prices at the *ex* date and at the *pre-ex* date can be matched on the same basis, and the cum-dividend return at the *ex* date is obtained. For example, the ex-dividend-adjustment case is

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(p_{i,t} - D_{i,t+1}\right), \qquad (4\text{-}6\text{-}4)$$

For the case of ex-bonus (or stock splits):

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t}}{1 + R'_{i,t+1}}\right). \qquad (4\text{-}6\text{-}5)$$

For the case of ex-rights:

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t} + R''_{i,t+1} \times s_{i,t+1}}{1 + R''_{i,t+1}}\right). \qquad (4\text{-}6\text{-}6)$$

For the combined case of ex-dividend and ex-bonus:

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t} - D_{i,t+1}}{1 + R'_{i,t+1}}\right). \qquad (4\text{-}6\text{-}7)$$

For the combined case of ex-dividend and ex-rights:

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t} - D_{i,t+1} + R''_{i,t+1} \times s_{i,t+1}}{1 + R''_{i,t+1}}\right). \qquad (4\text{-}6\text{-}8)$$

For the combined case of ex-bonus and ex-rights:

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t} + R''_{i,t+1} \times s_{i,t+1}}{1 + R'_{i,t+1} + R''_{i,t+1}}\right). \qquad (4\text{-}6\text{-}9)$$

For the combined case of ex-dividend, ex-bonus (stock splits are the same as bonus issues) and ex-rights, we generalise the formula:

$$r_{i,t+1} = \ln\left(P_{i,t+1}\right) - \ln\left(\frac{P_{i,t} - D_{i,t+1} + R''_{i,t+1} \times s_{i,t+1}}{1 + R'_{i,t+1} + R''_{i,t+1}}\right). \qquad (4\text{-}6\text{-}10)$$

Formulas of (4-6-4) to (4-6-10) base on the current price $P_{i,t+1}$ to adjust past price $P_{i,t}$.

If we suppose: the adjustments are according to past-price-adjustment procedure; the adjustments are successive and cumulated from distant *ex* date to recent *ex* date; the adjustments are undertaken not only on the price of *pre-ex* date but are also on each preceding price, therefore, the time series of adjusted prices is simulated in Line-D in Figure 4-2.

The past-price-adjustment procedure outperforms the current-price-adjustment procedure in the following respects. First, the price changes of stocks are regularly reported on both the Shanghai and Shenzhen markets. The methods to calculate the price change are similar to the past-price-adjustment procedure. Next, the stock indices of both the Shanghai and Shenzhen markets are computed in accord with the *Paasche* price index system,[15] which adjusts the weights of the base (past) according to the weights of reported (current) values. Therefore, since the past-price-adjustment procedure is consistent with either the calculation of price change or the computation of indices, it will facilitate the analysis. Finally, the market participants pay attention to real current prices. They require past price only for comparison. The past-price-adjustment procedure, rather than current-price-adjustment procedure, satisfies the requirements of the market participants.

Other specifications for the data processing

Some management factors that concern the microstructure of stock exchanges and dividend issue strategies of listed firms require a specific price adjustment. For example, a firm may issue bonus (free rights) and dividend simultaneously at an *ex* date. The bonus may or may not entitle the shareholders to the dividend distribution. Therefore, these factors have to be taken into account when processing the data.

First, if the bonus (free rights) is not entitled to the dividends in a dual distribution of dividends and bonus, the adjusted formula is formula (4-6-7). If the bonus entitles the

[15] *Paasche* price index: $\Sigma p_1 q_1 / \Sigma p_0 q_1$. *Laspeyres* price index: $\Sigma p_1 q_0 / \Sigma p_0 q_0$. p_1 is the price in reported value terms, p_0 is the price in base value terms, q_1 is the volume in reported value terms, q_0 is the volume in base value terms.

dividends, the adjusted formula should be

$$r_{i,t+1} = \ln(P_{i,t+1}) - \ln\left(\frac{P_{i,t}}{1+R'_{i,t+1}} - D_{i,t+1}\right). \tag{4-6-11}$$

Second, if the rights do not entitle the dividend in a dual distribution of the dividends and rights, the adjusted formula is formula (4-6-8). If the rights entitle the dividends, the adjusted formula should be

$$r_{i,t+1} = \ln(P_{i,t+1}) - \ln\left(\frac{P_{i,t} + R''_{i,t+1} \times s_{i,t+1}}{1+R''_{i,t+1}} - D_{i,t+1}\right). \tag{4-6-12}$$

Third, if the bonus and rights do not entitle the dividends in a multi-distribution of dividends, bonus and rights *ex* date; formula (4-6-10) is applicable for the price adjustment. Otherwise, if the dividends are distributed according to the shares after the bonus and the rights issues, the adjusted formula should be

$$r_{i,t+1} = \ln(P_{i,t+1}) - \ln\left(\frac{P_{i,t} + R''_{i,t+1} \times s_{i,t+1}}{1+R'_{i,t+1} + R''_{i,t+1}} - D_{i,t+1}\right). \tag{4-6-13}$$

Fourth, some firms allocate only dividends (bonus and rights) to a category of shareholders in a certain financial year. This is indicated by the following wording: "the legal person shareholders do not enjoy this distribution"; or "the new shareholders from the last new issue will not enjoy this year's dividend." Under these circumstances, an additional adjustment element will multiply the negative item prior to applying the log operator. The additional adjustment multiplier is the number of shares that are eligible in this issue divided by the number of total existing shares.

Fifth, several authors have documented the dividend drop-off ratio that is the ratio of the decline in shares price on the *ex* dividend date to the dividend per shares. Empirical evidence from the U.S. (Elton and Gruber 1970) and Australia (Brown and Walter 1986) show that the dividend drop-off ratio is generally less than one. Eades *et* *al* (1984) and Barclay (1987) found that when the dividend income is taxed more heavily than capital gains, the share price should decline by an amount that is less than the dividend. In the stock markets of China, the capital gains are exempt from tax, but dividend were taxed after July 1995. To prevent the distortion of the price adjustment from the dividend drop-off ratio, post July 1995 taxes are subtracted from the dividends, in processing the data.

Sixth, the par values of initially issued shares in the Shanghai market were 50 RMB or 100 RMB. These shares were split into one RMB of par value before December 1992. The adjustment for the splits is the same as the adjustment for ex-bonus. In addition, the B-shares of the Shenzhen market were denominated in RMB before the 22nd of March 1993, in U. S dollars between the 23rd of march 1993 to 28th of June 1993, in Hong Kong yuan after 29th of June 1993. Therefore, the prices in those periods are adjusted into Hong Kong yuan according to the exchange rates of the corresponding time period.

4.7 Conclusion

Statistical equations capture well the efficient market hypothesis, that is if all of today's available information is incorporated in today's stock price, the today's price is the optimal estimator of tomorrow's price. Martingale and fair game models have been the dominant specifications of the conditions of an efficient market. Are the stochastic process of prices a martingale and the stochastic process of returns a fair game, or are the stochastic process of return a martingale and stochastic process of abnormal return a fair game (LeRoy 1989)? The answer depends on what sorts of prices are defined in the assertions. In the recent studies, empirical tests are performed on *ex ante* prices, therefore the stochastic processes of returns follow a martingale and the stochastic processes of abnormal returns follow a fair game.

The stock price movement in an efficient market has been characterised as a random walk. The orthodox random walk model is found to have the property of independent and identical distribution of increments. However, the restriction of the orthodox random walk model cannot be satisfied in a market that has existed over many years. For example, the application of computer transaction systems, market globalisation, and modern telecommunications lead to a market to be heterogenous in different years. In reality, if highly abnormal returns cannot be obtained by monopolising information, the market is efficient. Campbell *et al* (1997) proposed three versions of the random walk model by loosening the restrictions of an identical and independent distribution of increments. In this thesis, the tests of the weak form efficiency of China's stock market are designed on the basis of the new versions of the random walk model.

We have chosen to employ the serial correlation coefficient model, the variance ratio model and runs test model for the tests of the random walk hypothesis. The dummy variable model with no constant term is used for the tests of the day-of-the-week effects and the month-of-the-year effects. The dummy variable model with a constant term is employed for the tests of the holiday effects. In addition, the event study for the tests of the semi-strong form of market efficiency is used on daily returns with the constant mean adjusted model, the market adjusted model and the market model. We take three important factors into considerations for designing the testing methodology. First, China's stock market is a new emerging market, half of the individual shares have been listed for less than three years. Thus, short data series prevent some elegant models from being effective. Second, the models used have been extensively applied to developed markets, less developed markets and new emerging markets. The results of these studies provide benchmarks for this study. Third, central control, prevalent in China, results in distortion of economic indicators. For example, the negative real interest rate in China can not be defined as a risk-free return to be used in the CAPM model.

The lack of properly adjusted individual share data has prevented previous studies on market efficiency of China from testing individual shares. Development of adjusted data of individual shares is a contribution of this dissertation. There are two approaches to data processing. One is to adjust current (*ex* date) prices depending on past prices. The other is to adjust past prices depending on current prices. We apply the latter approach to take account of the consistent properties with market indicators that are regularly reported in China. Meanwhile, we try a sufficient adjustment for price movements determined from different dividend (bonus and rights) issue strategies.

Chapter 5 Random Walk Hypothesis: Results and Analysis

5.1 Introduction

Weak form efficiency has been studied broadly on the stock markets in the world. Tests of the random walk hypothesis have predominated in the literature on weak form efficiency for several decades. Three of the most commonly used implements in tests of the random walk hypothesis are the serial correlation coefficient test, the runs test and the variance ratio test. For example, Fama (1965) studied the daily price change for the stocks on the DJIA by using runs and serial correlation coefficient tests. Pettengill (1989b) applied the runs test to the daily returns. Lo and MacKinlay (1988) created variance ratio test to examine weekly returns.

Many previous studies display several common features concerning the assessment of whether the market is efficient or not. Firstly, the conclusions are drawn from the results generated by one of the previously mentioned implements. Secondly, the conclusions are drawn from the results calculated using daily, or weekly, or monthly data only. Thirdly, the conclusions are drawn from the results calculated using index or individual share price data only. Further analyses are obtained by comparing the results calculated using daily data with the results calculated using weekly or monthly data, or by comparing the results calculated using index data with the results calculated using individual share price data.

A comprehensive review of the literature illustrates that even when one sort of test (the serial correlation coefficient test, the runs test, the variance ratio test, etc.) fails to reject the random walk hypothesis, the others may actually reject it. When the monthly prices follow a random walk, the weekly prices or daily prices may not. When the returns on stock prices are independent, the returns on indices may be dependent. Therefore, applying a variety of tests to different types of data and comparing the results on the bases of similar sort of data and test implements will improve the accuracy of the study.

As a new emerging stock market, the efficiency of the China's Stock Market has not been extensively tested. For instance, Yu (1994) and Mookerjee and Yu (1999) applied the serial correlation test and the runs test only to two composite indices of the Shanghai and Shenzhen stock exchanges for the period from 1991 to 1993. Wu (1996) applied the serial correlation coefficient test only to two indices and 20 individual stocks for the period from 1992 to 1993. Even Hsiao (1996) provide a relatively comprehensive study of the Shanghai market using the serial correlation coefficient test, the run test and the variance ratio test for the period from 1991 to 1995, his study did not refer to the Shenzhen market. Besides the similar inadequateness that we reviewed above for the tests of other world's stock markets, the small sample of short period still gives rise to plausible results of the studies of China's stock markets.[1]

[1] The results of these studies of China's stock markets will not be further discussed for following reasons. First, the data series are too short to provide relative confident evidence. In particular, in the first three years (1991 to 1993) China's stock markets were not regular operated. Too much influence of institutional and administrative changes involved in the stock prices. Second, the data used in the studies had not been adjusted for stock splits and dividend issues (Wu 1996), or for the denominate currency of B-shares (Hsiao 1996).

This chapter tries to overcome the weaknesses found in previous studies to provide a more comprehensive test of the random walk hypothesis on both the Shanghai and Shenzhen markets. In doing so, we will apply the serial correlation coefficient test, the runs test and the variance ratio test. Each model in the test will be run using main market index data, sector index data and individual shares' data. These types of data will be tested in the subgroups of daily data, weekly data and monthly data respectively. Also, the investigating period is relatively longer than the previous studies of China's stock market.

Therefore, this chapter will be structured into five sections. Following the introduction, Section 5.2 uses the serial correlation coefficient test of returns. Section 5.3 applies the runs test. Section 5.4 applies the variance ratio test. Each section contains three subsections: tests the returns in main market indices, in sector indices and in individual share prices. Each subsection will detail the tests on daily returns, weekly returns and monthly returns. Section 5.5 will summarise the results to provide a broad picture of these tests.

5.2 Tests of serial correlation coefficients

The serial correlation coefficient can be used to measure whether or not the returns and the lagged returns in the same time series are correlated. A serial correlation coefficient which is not significantly different from zero implies that the returns and the lagged returns are uncorrelated. Thus, the stochastic process of stock prices exhibits a random walk. Alternatively, a significant non-zero serial correlation coefficient indicates that the returns and the lagged returns are correlated. The stochastic process of stock prices does not follow a random walk. A significant positive serial correlation coefficient means that a trend exists in the stock prices, whereas a significant negative serial correlation coefficient shows the existence of a reversal in the stock prices. Both the significant trend and reversal of returns can be used to predict price movement to obtain abnormal return. Therefore, the significant serial correlation coefficient between the returns in lead and lag is inconsistent with Market efficiency.

As stated in Chapter 4, the null hypothesis is that the serial correlation coefficient is equal to zero. The alternative hypothesis is that the serial correlation coefficient does not equal to zero. If the test-statistic is larger than 1.96 or 2.58, the null hypothesis is rejected at the 5% or 1% significance level. The joint null hypothesis is that all serial correlation between the returns from lag of one to ten are simultaneously equal to zero, and the alternative joint null hypothesis is that not all serial correlation coefficients between the returns from lag one to ten are equal to zero. If the Q-statistic is larger than 18.31 or 23.21, the joint null hypothesis is rejected at the 5% or 1% significance level respectively. Similarly for the LB-statistic.

5.2.1 Tests of serial correlation coefficients for returns in the three main indices of the Shanghai and Shenzhen markets

The three main indices of the Shanghai market are the Shanghai Stock Exchange Index (SSE), the Shanghai A-shares Index (SSE-A) and the Shanghai B-shares Index (SSE-B). The three main indices of the Shenzhen market are the Shenzhen Stock Exchange Index (SZS), the Shenzhen A-shares Index (SZS-A) and the Shenzhen B-shares Index

(SZS-B). Table 5-1 summarises the serial correlation coefficients, Q-statistics and LB-statistics of returns from the tests for the Shanghai market in Panel-A and for the Shenzhen market in Panel-B. There are three sections in each panel which represent the test-statistics calculated using daily returns, weekly returns and monthly returns.

5.2.1.1 Empirical analysis of serial correlation coefficients for daily returns in the three main indices

The daily returns in market indices of both the Shanghai and Shenzhen stock exchanges exhibit correlated return patterns. The serial correlation coefficients of returns in lags one and two in the SSE are significantly different from zero at the 1% significance level. In the SZS, the serial correlation coefficients in lags one and four are non-zero at 1% significance level as well, and in lags two and five are non-zero at the 5% significance level. Moreover, the null hypothesis that overall serial correlation coefficients from lag one through ten in the SSE and in the SZS are simultaneously equal to zero are also rejected by Q-statistics and LB-statistics at the 1% level of significance.

Also, the daily returns in the A-shares index and the B-shares index of each stock exchange exhibit correlated return patterns, which shows that both the A-shares and B-shares contribute correlated return patterns to the market. Nevertheless, the correlated return patterns in the A-shares indices differ from these in the B-shares indices. Firstly, the significant correlation coefficients of returns appear more frequently in the A-shares indices than in the B-shares indices. For example, two significant serial correlation coefficients of returns can be found in lags one and two in

Table 5-1. Serial Correlation Coefficients of Returns in the Three Main Indices for Lags 1 through 10 and Q-Statistics

	No.	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Q-stat.	LB-stat.
PANEL A: Test-statistics on Shanghai Stock Market													
Daily Returns													
SSE	1849	**0.0598	**0.0666	0.0397	0.0268	0.0393	-0.0096	-0.0018	-0.0275	0.0227	0.0013	**24.4346	**24.5003
SSE-A	1592	*0.0531	**0.0595	0.0393	0.0256	0.0398	-0.0117	-0.0053	-0.0333	0.0244	0.0011	*19.1109	*19.1755
SSE-B	1552	**0.2602	0.0216	0.0061	-0.0193	0.0122	0.0191	-0.0320	-0.0337	0.0220	0.0306	**112.6489	**112.8977
Weekly Returns													
SSE	378	0.0862	-0.0654	0.0542	0.0086	-0.0210	0.0376	0.0109	-0.0544	0.0198	-0.0142	7.6059	7.7135
SSE-A	326	0.0821	-0.0767	0.0404	-0.0040	-0.0240	0.0353	0.0062	-0.0617	0.0149	-0.0162	6.6184	6.7033
SSE-B	317	*0.1181	0.0518	0.0166	0.0605	-0.0297	0.0533	0.0273	0.0285	-0.0723	-0.0809	11.8505	12.1119
Monthly Returns													
SSE	89	-0.0890	0.0338	-0.0254	-0.1773	-0.0828	0.0441	0.1641	-0.0430	*0.2476	-0.1332	14.0413	15.6137
SSE-A	77	-0.1248	0.0211	-0.0447	-0.1912	-0.1456	-0.0208	0.1767	-0.0540	*0.2729	-0.1479	15.9176	17.9421
SSE-B	75	0.0462	-0.0306	-0.0631	-0.1172	-0.1984	-0.1144	-0.1712	0.1831	0.1520	*0.3070	*19.0086	*21.7961
PANEL B: Test-statistics on Shenzhen Stock Market													
Daily Returns													
SZS	1806	**0.0528	*0.0542	0.0310	**0.0804	*0.0484	-0.0288	0.0422	0.0086	0.0422	-0.0175	**36.5425	**36.6695
SZS-A	1383	0.0230	*0.0572	0.0092	*0.0607	0.0512	*-0.053	0.0080	-0.0255	0.0048	-0.0345	*20.6202	*20.7202
SZS-B	1384	**0.165	*0.062	0.0267	0.0212	0.0215	-0.0112	-0.0451	0.0155	0.0031	-0.0281	**49.5827	**49.7207
Weekly Returns													
SZS	361	**0.1300	0.0676	0.0643	0.0514	0.1010	0.0114	0.0272	-0.0616	-0.0424	-0.0209	16.2847	16.5356
SZS-A	283	0.0373	0.0009	-0.0097	0.0000	0.0597	0.0143	0.0720	-0.0501	-0.0527	-0.0585	5.3789	5.5584
SZS-B	283	**0.1501	-0.0230	-0.0593	0.0297	0.0428	0.0207	0.0684	0.0815	0.0207	0.0317	11.9269	12.1654
Monthly Returns													
SZS	85	*0.2396	0.0143	0.0444	-0.1018	-0.0606	*0.2247	0.0489	-0.1386	0.1576	-0.1302	15.9379	17.4221
SZS-A	67	0.0898	-0.0074	0.2005	-0.0351	-0.1198	0.2448	0.0161	-0.0887	0.2435	-0.0831	13.2756	15.0965
SZS-B	67	0.0196	0.2186	-0.1464	-0.0307	-0.0838	-0.0785	-0.0302	-0.0073	0.2328	0.1104	10.1227	11.4167

Notes: 1. SSE: Shanghai market index; SSE-A: Shanghai A-shares Index, SSE-B: Shanghai B-shares Index.
2. SZS: Shenzhen market index; SZS-A: Shenzhen A-Shares Index; SZS-B: Shenzhen B-Shares Index.
3. '*', '**' Indicate the 5% and 1% levels of significance.
4. LB-statistic is adjusted Q-statistic for small sample.

the SSE-A and only one can be found in lag one in the SSE-B. Similarly, three significant non-zero coefficients exist in lags two, four and six in the SZS-A, but two exist in lags two and three in the SZS-B.

Secondly, the magnitude of correlation of returns in the B-shares indices exceed that of the A-shares indices. For example, the returns in the SSE-B have the largest serial correlation coefficient in lag one 0.2602, about five times that in the SSE-A 0.0531. This coefficient is squared into a determinant coefficient as R^2 of 0.0677, which implies that 6.77 percent of the variation of the daily SSE-B return can be explained by the return of the preceding day. Likewise, the lag one correlation coefficient of returns in the SZS-B is 0.165, which is almost seven times as large as that in SZS-A 0.0230. In particular, the joint test of lag one through lag ten correlation coefficients in SSE-B rejects the null hypothesis at the 1% significance level with a *Q*-statistic of 112.6489 and a *LB*-statistic of 112.8977. By contrast, the *Q*-statistic for returns in the SSE-A is 19.1109 and the *LB*-statistic is 19.1755, which reject the null hypothesis of zero correlation coefficient at the 5% significance level. Similarly, the *Q*-statistics and *LB*-statistics are 49.5827 and 49.7207 respectively in the SZS-B, significantly at the 1% level, and are 20.6202 and 20.7202 in SZS-A, significantly at the 5% level.

However, the serial correlation of daily returns in the three main indices on each of the two markets decays gradually as the lag length increases. In the cases that the lags are over four days on the Shanghai market and over seven days on the Shenzhen market, no significant correlation coefficients are observed. This means that the historical information embedded in longer period of lags is less influential in determining the future price than that of information embedded in shorter lag lengths. The decay of serial correlation as the lag in days increase is evident in many markets in the world (Fama 1965, Laurence 1986, Butler and Malaikah 1992, Panas 1990 Yong 1992). In addition, the serial correlation coefficients in the lags one to five on both of the two markets, with the exception of SSE-B in lag four, are entirely positive. All but one of the statistically significant serial correlation coefficients have positive signs. Apparently, the trend of daily prices exists in the first five trading days on both the Shanghai and Shenzhen markets. A negative serial correlation, which represents the reversals of prices, usually occurs in the sixth to eighth trading days in the three main indices of the Shanghai market, and in the sixth and tenth trading days in the three main indices of the Shenzhen market.

5.2.1.2 Empirical analysis of serial correlation coefficients for weekly and monthly returns in the three main indices

The serial correlation of weekly returns in the three main indices of the Shanghai market are obviously smaller than those of daily returns.[2] Only the serial correlation coefficient of weekly returns in lag one in the SSE-B is significantly different from zero at the 5% level. The remaining serial correlation coefficients and all *Q*-statistics and *LB*-statistics for the Shanghai market are insignificant. Similarly, with the exceptions of the serial correlation coefficients in the lag one in the SZS and the SZS-B, all of the remaining serial correlation coefficients and all *Q*-statistics and *LB*-statistics are not statistically significant. Thus, the correlated return pattern in

[2] The serial correlation of daily returns, weekly returns and monthly returns cannot be compared to each other directly according to the magnitude of their serial correlation coefficients. Since the interval of observations, as well as the numbers of observations of daily, weekly and monthly returns are quite different within the same period. Their standard deviations differ greatly. Therefore, the comparison of serial correlations between daily, weekly returns and monthly returns in this context are conducted in terms of the serial correlation coefficients and the standard deviation, i.e. the z-statistics or *t*-statistics values.

weekly returns is not as significant as that in daily returns for the three main indices of the two markets.

The decay of serial correlation of weekly returns in the three main indices is also exhibited as the lag length increases on the Shanghai market, but the decay is more slow on the Shenzhen market. For the three main indices of the Shanghai and Shenzhen markets, the number of positive serial correlation coefficients of weekly returns is greater than the number of negative coefficients. The trends of weekly prices of the three main Shanghai indices appear simultaneously in one, three, six and seven week lags, while the reversals appear in five and ten week lags. On the other hand, the trends of weekly prices of the three main Shenzhen indices occur simultaneously in one, four, five and seven week lags. The reversals occur in two, three, eight, nine and ten weeks lags respectively for different indices.

The serial correlation of monthly returns in the three main indices of the Shanghai market are dramatically different from those of the daily and weekly returns. Firstly, the statistically significant serial correlation coefficients of monthly returns occur in long period lags - in nine months in the SSE and SSE-A, in ten months in the SSE-B. Next, the serial correlation of monthly returns in the three main indices of the Shanghai market keep increase as the lag length increases, compared with decreases exhibited in daily and weekly returns. Moreover, most of the serial correlation coefficients of monthly returns have negative signs, implying that the indices usually reverse performance in consecutive months. The differences of serial correlations between daily returns and monthly returns in the three main indices of the Shenzhen market are, apparently, not as large as the differences in the Shanghai market. But it seems to be emerging. The serial correlation coefficients of monthly returns in the three main indices of the Shenzhen market do not decrease as the lag length increases as they for daily returns. More negative correlation coefficients are found in monthly returns than in daily and weekly returns.

5.2.1.3 A comparative analysis with a test on the United States Market

The New York Stock Exchange in the United States is the largest market in the world, and is generally considered to be a perfectly efficient market in many senses. Thus, tests on the stocks of the New York Stock Exchange are used as a benchmark to assess the tests on other markets. The tests of serial correlation coefficients on the CRSP value-weight index by Campbell *et al* (1997) are presented in Table 5-2.

Table 5-2. Serial Correlation Coefficients of Returns in the CRSP Value Weighted Index for lags 1 through 4 and Q-statistics

Sample Period	No. of Obs.	One	Two	Three	Four	Q5	Q10
Daily Returns							
03/07/62-30/12/94	8179	**0.176	**-0.070	0.010	-0.080	**263.3	**269.5
03/07/62-27/10/78	4090	**0.278	0.012	**0.046	*0.033	**329.4	**343.5
30/10/78-30/12/94	4089	**0.108	-0.022	-0.029	-0.035	**69.5	**72.1
Weekly Returns							
10/07/62-27/12/94	1695	0.015	-0.025	0.035	**-0.070	8.80	**36.7
10/07/62-03/10/78	848	0.056	-0.037	0.058	0.016	9.00	*21.5
10/10/78-27/12/94	847	-0.020	-0.015	0.016	-0.033	5.30	**25.2
Monthly Returns							
31/07/62-30/12/94	390	0.043	-0.053	-0.013	-0.004	6.80	12.50
31/07/62-29/09/78	195	0.064	-0.038	0.073	0.062	3.90	9.70
31/10/78-30/12/94	195	0.013	-0.063	-0.083	-0.077	7.50	14.00

Notes: 1. Q5 is Q-statistic for the null hypothesis of overall zero serial correlation coefficients for lag one through five. Q10 is Q-statistic for the null hypothesis of overall serial zero correlation coefficients for lag one through ten.

2. '*', '**' Indicate the 5% and 1% levels of significance.

Source: Campbell J. Y., W. L. Andrew and A. C. Mackinlay, 1997, The Econometrics of Financial Market, Princeton.

It is very interesting that some prominent features of serial correlation of returns in the three main indices in the Shanghai and Shenzhen markets are mirrored in the New York Stock Market. Firstly, the daily returns in the CRSP exhibit highly dependent patterns, particularly in the first lag. Next, the rate of rejections of the null hypothesis of zero correlation coefficients for daily returns in the CRSP is larger than that for weekly and monthly returns in the CRSP. Thirdly, the magnitude of the serial correlation coefficient of daily returns in the CRSP decays gradually as the lag length extends, but this decay is not apparent in weekly returns. Even, this decay is reversed in monthly indices. Finally, the daily returns exhibit more positive correlations, while conversely, the monthly returns exhibit more negative correlations. Nevertheless, these features of serial correlation of returns described above are not cases special to the U.S. and the China's markets. If we view the full picture by putting together all separate studies on daily, weekly, or monthly returns in indices and individual shares, these features can be detected in other countries' markets too.

Fisher (1966) initially attributed the significantly correlated daily returns to non-trading (or nonsynchronous trading). The explicit models of non-trading have been developed by Cohen *et al* (1978, 1979), and Lo and MacKinlay (1988, 1990c). The non-trading effect arises when a share is not continually traded in a trading day, particularly, when non-trading in a share occurred in a period. Because the prices of the shares employed in empirical tests are nominally chosen to be closing prices, but in reality they do not exactly satisfy this definition. In the case of non-trading, the closing price of a share in a day may be the price at a different time of the day, or a previous day. Therefore, the new information each day cannot be incorporated into the closing prices, which results in unchanged prices and a correlated return pattern. The non-trading hypothesis is evident in the China's B-shares. The non-trading phenomenon of B-shares will be detailed later.

Unfortunately, the non-trading hypothesis is not applicable to the analysis of China's A-shares, because of the coexistence of active trading of the A-shares and the significant correlation of daily returns in the A-shares indices.[3] Moreover, Conrad and Kaul (1988) demonstrated that the positive serial correlation in the daily returns of common stock portfolios is too large to be explained by non-trading alone. In addition, in the case of active trading, the suggestion (Cohen *et al* 1979) that transaction costs induce price adjustment delays cannot be justified as the main reason for high correlation of daily returns in the A-shares indices.

An acceptable explanation for significant serial correlation of daily returns in the A-shares indices is the cross-effect. The cross-effect, raised by Lo and MacKinlay (1990c), implies that the price of an individual security A or B could move up and down frequently leading to negative serial correlation of returns on both securities. However, the price of security A increasing (decreasing) today implies that the price of security B will probably increase (decrease) tomorrow. Therefore the cross-correlation of returns between securities A and B is positive. Despite the fact that individual security returns are weakly negatively serial correlated, the returns in an index or a portfolio would be positively correlated due to the cross-effect between the many shares involved in the index or portfolio. Lo and MacKinlay (1990c) showed that over half of the positive serial correlation of returns in an index is attributable to the positive cross-effect.

[3] The discontinuous trading of B-shares and active trading of A-shares have been partially illustrated by the turnover rates in Chapter 2.

Chan and Lakonishok (1995), and Sias and Starks (1997) found that institutional investors have a correlated trading strategy, to sell the "winner" (the share with high price today but a low price expected in the future) and to buy the "loser" (the share with low price today but a high price expected in the future) in their portfolio arrangement. The correlated trading pattern of the institutional investors is one of the factors that cause daily returns on the index to be serially correlated. That the trading of China' institutional investors contributes to serial correlation in the return pattern of the daily index has not be investigated yet, since the major institutional investors were authorised only in recent year.[4]

The larger rate of rejections of the null hypothesis of zero coefficients on daily returns versus weekly and monthly returns is common phenomena of the world's stock markets. Peirson (1995) addressed this difficulty in rejecting the random walk hypothesis using weekly data and monthly data, concluding that a statistically significant departure from a random walk was generally present in daily data. Similarly, in most cases, correlation becomes smaller as the lag length increases in daily and weekly returns (Yong 1992). Both the phenomena reveal that the larger the interval of the observations of prices, the less important is the lag price in determining the future price. But it should be stressed that the explanation about price interval is not applicable to monthly indices as we know that in China's case the serial correlation coefficients of monthly returns displays more negative signs and increase as the lag length increase. Fama and Franch (1988a) and Poterba and Summers (1988) found larger negative serial correlation in longer horizon returns, i.e. in multi-year returns.

[4] In 1998 and 1999, the first ten mutual fund companies were established. Each of the companies operates more than two billion RMB.

They concluded that weekly fluctuations in stock returns differ in many ways from movements in three- to five-year returns, and that substantial mean-reversion in stock markets usually exists only at long horizons. Campbell *et al* (1997) indicated that perhaps the most obvious concern of the long-horizon effect is the extremely small sample size. In a sample period of half a century, there are only 30 nonover-lapping two-year returns. We probably can attribute the increasing negative correlation of monthly returns as the lag length increases in China's market to the "long-horizon" effect because of the small size of the sample available in the tests, even though monthly returns are not "long-horizon" by definition.

5.2.2 Tests of serial correlation coefficients for returns in the sector indices of the Shanghai and Shenzhen markets

The tests of serial correlation coefficients for returns in the sector indices are summarised in Table 5-3, in which Panel-A reports the results for the Shanghai market and Panel-B reports the results for the Shenzhen market.[5] The first section of each panel represents the test-statistics calculated using daily sector indices. The next sections of each panel give the number of rejections of zero correlation coefficients tested on the returns of daily, weekly and monthly indices. (More detail descriptions are available in the appendix Table A-1).

[5] The English titles of each sector and sector index, except for the Manufacturing, are cited from the official documents of relevant stock exchange. See footnote 14 in Chapter 4.

Table 5-3. Serial Correlation Coefficients of Returns in Sector Indices for Lags 1 through 10 and Q-Statistics

	No.	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Q-stat.	LB-stat.
PANEL A: Test-statistics on the Shanghai Stock Market													
Daily Returns													
Manufacturing	1244	*-0.0611	**0.0691	0.0067	0.0266	0.0513	**-0.0705	-0.0025	-0.0339	0.0311	-0.0495	**26.6175	**26.7627
Commercial	1242	-0.0241	0.0378	0.0219	0.0178	0.0453	**-0.0897	0.0023	-0.0019	0.0112	-0.0463	*18.8289	*18.9472
Real Estate	1243	**-0.2715	-0.0020	0.0159	0.0129	*0.0578	-0.0544	0.0309	-0.0015	0.0009	0.0136	**101.2601	**101.5419
Utility	1241	-0.0039	0.0514	0.0023	0.0105	0.0450	**-0.0778	-0.0157	-0.0099	0.0150	-0.0270	15.0548	15.1436
Miscellaneous	1244	-0.0330	0.0342	0.0233	0.0161	0.0398	**-0.1083	0.0141	-0.0018	0.0242	-0.0274	**22.2416	**22.3766
Numbers of rejections of the null for 5 sector indices at the 5% and 1% significance levels													
Daily Returns	5	2	1	0	0	1	4	0	0	0	0	4	4
Weekly Returns	5	0	0	0	0	0	0	0	0	0	0	0	0
Monthly Returns	5	1	0	0	0	0	0	0	1	4	0	2	3
PANEL B: Test-statistics on the Shenzhen Stock Market													
Daily Returns													
Manufacturing	930	-0.0084	0.0099	0.0632	0.0041	0.0362	*-0.0666	0.0032	-0.0417	-0.0112	-0.0085	11.0249	11.1105
Commercial	930	-0.0180	0.0368	*0.0656	0.0080	0.0520	-0.0388	-0.0050	0.0182	-0.0427	-0.0065	11.5735	11.6574
Property	930	-0.0188	0.0371	0.0638	0.0282	0.0535	**-0.0776	0.0051	-0.0472	-0.0183	0.0139	16.9408	17.0699
Utility	930	-0.0335	0.0155	0.0580	0.0445	0.0565	-0.0443	0.0018	-0.0163	-0.0162	-0.0179	11.8004	11.8813
Conglomerate	625	0.0259	0.0612	0.0768	0.0248	**0.1102	-0.0609	0.0194	-0.0586	-0.0435	0.0665	**22.9847	**23.2638
Financial	930	*0.0667	0.0060	*0.0665	0.0410	0.0527	-0.0127	0.0423	-0.0469	0.0135	0.0113	16.5520	16.6607
Numbers of rejections of the null for 6 sector indices at the 5% and 1% significance levels													
Daily Returns	6	1	0	2	0	1	2	0	0	0	0	1	1
Weekly Returns	6	0	1	0	0	1	0	2	0	0	0	2	2
Monthly Returns	6	1	0	0	0	0	0	0	0	0	2	0	1

Notes: 1. The data period for the Shanghai market is 8/1993 - 4/1998; for the Shenzhen market is 7/1994 - 4/1998.
2. '*', '**' Indicate the 5% and 1% levels of significance.
3. LB-statistic is adjusted Q-statistic for small sample.

The daily returns in the sector indices of the Shanghai market are significantly correlated as in the three main indices. However, the statistically significant serial correlation coefficients of daily returns in sector indices do not concentrate the same way in lags one and two as in the three main indices. Besides the serial correlation coefficients of daily returns in lag one in the real estate index and lag two in the Manufacturing index, and the serial correlation coefficients of daily returns in lag six in each sector index except for real estate are all significantly different from zero at the 1% significance level. The correlation coefficient of daily returns in lag five in real estate index is also significantly non-zero at the 5% level of significance. Moreover, the *Q*-statistics and *LB*-statistics reject the hypothesis that serial correlation coefficients of daily returns from lags one through ten are simultaneously equal to zero in 4 of 5 sector indices at the conventional levels of significance.

The statistically significant correlation of returns disappears in weekly returns of sector indices of the Shanghai market. No statistically significant correlation coefficients of weekly returns can be found in any lag at conventional levels (5% or 1%) of significance. However, the serial correlation of returns is significant again in monthly returns of sector indices of the Shanghai market. One of five serial correlation coefficients in lags one and eight, and four of five serial correlation coefficients in lag nine are non-zero at either the 5% or 1% significance levels. Two of five *Q*-statistics and three of five *LB*-statistics reveal that the hypothesis of zero serial correlation of monthly returns in lags one through ten are rejected at conventional levels in nearly half of the sector indices of the Shanghai market.

The results of the tests on the returns of sector indices in the Shanghai market look like those on the returns of the three main indices with almost the similar meaning on corresponding tests. For example, the serial correlation of returns decays as the lag length increases in daily returns and weekly returns, but grows in the monthly returns. The daily returns are more correlated than weekly and monthly returns.

The tests of the serial correlation coefficients of returns in sector indices of the Shenzhen market show a weakly correlated return pattern which is not as serious as in the Shanghai market. Six significantly non-zero serial correlation coefficients of daily returns are present respectively in lag one in Finance, in lag three in Commerce and Manufacturing, in lag five in Conglomerate and in lag six in Manufacturing and Property. Only the *Q*-statistic and *LB*-statistic in Conglomerate are statistically significant. The numbers of significant serial correlation coefficients and the *Q*-statistics and *LB*-statistics in daily and monthly returns, with the exception of weekly returns, are smaller in the Shenzhen market than in the Shanghai market.

One outstanding feature that can be observed in Table 5-3 is that nearly all serial correlation coefficients of daily returns in sector indices of the two markets are negative in lag one, lag six and lag eight, while almost all are positive in lag two, three, four and five. This somewhat paradoxical departure from those of the three main indices in Table 5-1 suggests that the correlation between leading and lag returns may change from time to time, considering the short period data of sector indices available in the investigation, compared to the long period data available for the three main indices. Additionally, the statistically significant serial correlation coefficients of daily returns appear often in lag six in the sector indices of the two markets, particularly, in the Shanghai market. The remaining statistically insignificant serial correlation coefficients in lag six are comparatively large as well.

5.2.3 Tests of serial correlation coefficients for returns in individual shares of the Shanghai and Shenzhen markets

Since so many statistics were generated in the tests of serial correlation of returns in individual shares, the results are briefly summarised in Table 5-4 for the Shanghai market and in Table 5-5 for the Shenzhen market. Panel-A in each table outlines the number and percentage of rejections of the null hypothesis from tests performed on daily returns. Panel-B and Panel-C provide the equivalent results from the tests of weekly and monthly returns. In each panel of the tables, the tests in A-shares, B-shares and the overall shares are reported respectively. (Appendix Tables A-2, A-3 and A-4 present the number and percentage of positive and negative correlation of the returns from lags one through ten).

5.2.3.1 Empirical analysis on serial correlation coefficients of daily returns of individual shares

From Panel-A of Tables 5-4 and 5-5, it can be seen that the daily returns of individual A-shares are less correlated than that of individual B-shares. In the Shanghai market represented in Table 5-4, the biggest percentage of rejections of the null hypothesis of zero serial correlation coefficients in A-shares daily returns is 30.07% in lag six, but 44.90% in B-shares in lag one. Moreover, about 27% of the *Q*-statistics and *LB*-statistics of individual A-shares reject the joint null hypothesis that all serial

Table 5-4. Summary of Serial Correlation Coefficient Tests and Q-statistics for Individual Shares of the Shanghai Market

	lag	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Q-stat.	LB-stat.
PANEL A: Number and Percentage of Rejections of the Null Hypothesis Tested on Daily Returns													
A-shares	No. of rejections	32	48	36	15	33	112	21	33	50	29	101	102
373	*Rejections (%)*	*8.58*	*12.87*	*9.65*	*4.02*	*8.85*	*30.07*	*5.63*	*8.85*	*13.42*	*7.77*	*27.08*	*27.35*
B-shares	No. of rejections	22	5	6	9	2	7	9	9	4	2	20	20
49	*Rejections (%)*	*44.90*	*10.20*	*12.24*	*18.37*	*4.08*	*14.29*	*18.37*	*18.37*	*8.16*	*4.08*	*40.82*	*40.82*
Overall	No. of rejections	54	53	42	24	35	119	30	42	54	31	121	122
422	*Rejections (%)*	*12.80*	*12.56*	*9.95*	*5.69*	*8.29*	*28.23*	*7.11*	*9.95*	*12.81*	*7.35*	*28.67*	*28.91*
PANEL B: Number and Percentage of Rejections of the Null Hypothesis Tested on Weekly Returns													
A-shares	No. of rejections	14	39	17	11	24	34	12	53	22	18	43	69
373	*Rejections (%)*	*3.75*	*10.46*	*4.56*	*2.95*	*6.45*	*9.12*	*3.22*	*14.21*	*5.90*	*4.83*	*11.53*	*18.50*
B-shares	No. of rejections	7	1	1	1	0	1	1	4	1	3	3	5
49	*Rejections (%)*	*14.29*	*2.08*	*2.08*	*2.04*	*0.00*	*2.04*	*2.04*	*8.16*	*2.04*	*6.12*	*6.12*	*10.20*
Overall	No. of rejections	21	40	18	12	24	35	13	57	23	21	46	74
422	*Rejections (%)*	*4.98*	*9.50*	*4.28*	*2.85*	*5.70*	*8.29*	*3.08*	*13.51*	*5.45*	*4.98*	*10.90*	*17.54*
PANEL C: Number and Percentage of Rejections of the Null Hypothesis Tested on Monthly Returns													
A-shares	No. of rejections	25	11	9	6	11	9	12	26	52	20	54	73
302	*Rejections (%)*	*8.28*	*3.64*	*2.98*	*1.99*	*3.64*	*2.99*	*3.97*	*8.61*	*17.22*	*6.62*	*17.88*	*24.17*
B-shares	No. of rejections	3	2	0	5	0	0	2	1	0	1	2	3
41	*Rejections (%)*	*7.32*	*4.88*	*0.00*	*12.20*	*0.00*	*0.00*	*4.88*	*2.44*	*0.00*	*2.44*	*4.87*	*9.76*
Overall	No. of rejections	28	13	9	11	11	9	14	27	52	21	56	76
343	*Rejections (%)*	*8.16*	*3.79*	*2.62*	*3.21*	*3.21*	*2.63*	*4.08*	*7.87*	*15.18*	*6.12*	*16.33*	*22.16*

Notes: 1. The tests on daily returns were conducted on 422 shares listed on the Shanghai market, including 373 A-shares and 49 B-shares.

2. The tests on weekly returns were conducted on 422 shares listed on the Shanghai market, including 373 A-shares and 49 B-shares.

3. The tests on monthly returns were conducted on 343 shares listed on the Shanghai market, including 302 A-shares and 41 B-shares.

4. Rejection means: rejection of the null hypothesis of a zero serial correlation coefficient at the 5% significance level, rejection of the null hypothesis of joint zero serial correlation coefficients from lags one through ten for the Q-statistics and LB-statistics at the 5% significance level.

Table 5-5. Summary of Serial Correlation Coefficient Tests and Q-statistics for Individual Shares of the Shenzhen Market

	lag	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Q-stat.	LB-stat.
PANEL A: Number and Percentage of Rejections of the Null Hypothesis Tested on Daily Returns													
A-shares	No. of rejections	49	53	15	38	20	46	26	24	26	18	66	69
347	*Rejections (%)*	*14.12*	*15.27*	*4.32*	*10.95*	*5.76*	*13.26*	*7.49*	*6.93*	*7.49*	*5.19*	*19.02*	*19.88*
B-shares	No. of rejections	24	4	3	9	0	5	6	1	4	3	23	23
52	*Rejections (%)*	*46.15*	*7.69*	*5.77*	*17.31*	*0.00*	*9.62*	*11.54*	*1.92*	*7.69*	*5.77*	*44.23*	*44.23*
Overall	No. of rejections	73	57	18	47	20	51	32	25	30	21	89	92
399	*Rejections (%)*	*18.30*	*14.29*	*4.51*	*11.78*	*5.01*	*12.78*	*8.02*	*6.27*	*7.52*	*5.27*	*22.31*	*23.06*
PANEL B: Number and Percentage of Rejections of the Null Hypothesis Tested on Weekly Returns													
A-shares	No. of rejections	21	16	14	16	18	7	19	29	19	32	27	61
346	*Rejections (%)*	*6.07*	*4.63*	*4.05*	*4.62*	*5.21*	*2.03*	*5.49*	*8.38*	*5.49*	*9.26*	*7.80*	*17.63*
B-shares	No. of rejections	4	6	7	1	0	1	1	2	1	1	6	6
51	*Rejections (%)*	*7.84*	*11.76*	*13.73*	*1.96*	*0.00*	*1.96*	*1.96*	*3.92*	*1.96*	*1.96*	*11.76*	*11.76*
Overall	No. of rejections	25	22	21	17	18	8	20	31	20	33	33	67
397	*Rejections (%)*	*6.30*	*5.55*	*5.29*	*4.28*	*4.54*	*2.02*	*5.04*	*7.81*	*5.04*	*8.32*	*8.31*	*16.88*
PANEL C: Number and Percentage of Rejections of the Null Hypothesis Tested on Monthly Returns													
A-shares	No. of rejections	8	27	18	4	9	11	6	9	10	14	42	53
271	*Rejections (%)*	*2.95*	*9.96*	*6.64*	*1.48*	*3.32*	*4.06*	*2.21*	*3.32*	*3.69*	*5.17*	*15.50*	*19.56*
B-shares	No. of rejections	3	2	1	0	1	0	0	2	4	1	3	6
46	*Rejections (%)*	*6.52*	*4.35*	*2.17*	*0.00*	*2.17*	*0.00*	*0.00*	*4.35*	*8.70*	*2.17*	*6.52*	*13.04*
Overall	No. of rejections	11	29	19	4	10	11	6	11	14	15	45	59
317	*Rejections (%)*	*3.47*	*9.15*	*5.99*	*1.26*	*3.15*	*3.47*	*1.89*	*3.47*	*4.42*	*4.73*	*14.20*	*18.61*

Notes: 1. The tests on daily returns were conducted on 399 shares listed on the Shenzhen market, including 347 A-shares and 52 B-shares.

2. The tests on weekly returns were conducted on 397 shares listed on the Shenzhen market, including 346 A-shares and 51 B-shares.

3. The tests on monthly returns were conducted on 317 shares listed on the Shenzhen market, including 271 A-shares and 46 B-shares.

4. Rejection means: rejection of the null hypothesis of a zero serial correlation coefficient at the 5% significance level, rejection of the null hypothesis of joint zero serial correlation coefficients from lags one through ten for the Q-statistics and LB-statistics at the 5% significance level.

correlation coefficients from lags one through ten are equal to zero. For the B-shares, the percentages of rejections by the *Q*-statistics and *LB*-statistics are approximately 40.82%. The overall shares, combining A-shares and B-shares, show a correlated daily return pattern similar to that of A-shares, due to the A-shares accounting for over 85% of the shares of the Shanghai market. Aggregating the A-shares and B-shares of the Shanghai market, the biggest percentage of rejections of the null hypothesis is 28.23% for lag six, and about 28.67% of the *Q*-statistics and *LB*-statistics reject the joint null hypothesis that all serial correlation coefficients from lags one to ten are equal to zero.

Likewise, in the Shenzhen market represented in Table 5-5, the biggest percentage of rejections of the null hypothesis of zero serial correlation coefficients in A-shares daily returns is 15.27% for lag two, but 46.15% in B-shares for lag one. Furthermore, about 19.88% of the *Q*-statistics and *LB*-statistics of individual A-shares reject the joint null hypothesis that all serial correlation coefficients from lags one through ten are equal to zero. By contrast, for the B-shares, the percentages of rejections by the *Q*-statistics and *LB*-statistics are approximately to 44.23%. Combining the A-shares and B-shares on the Shenzhen market, the biggest percentage of rejections of the null hypothesis of zero correlation coefficient is 18.30% for lag one. The *Q*-statistics and *LB*-statistics reject the joint hypothesis that all serial correlation coefficients from lags one to ten are equal to zero for about 22.31% of the individual shares.

How should we assess the market after considering the test of serial correlation of daily returns in individual shares? The assessments in some studies (Solnik 1973 and Laurence 1986) have been made by consulting Fama's (1965) statement: "All the sample serial correlation coefficients are quite small in absolute value. The largest is only 0.123. Although 11 of (30) coefficients for lag one are more than twice their computed standard errors, this is not regarded as important case." Specifically, the percentage of rejections of the null hypothesis 36.36% (the rate of 11 to 30) in Fama's statement is more or less accepted as a benchmark to measure the randomness of stock prices of a market.

The results on seven European markets (by Solnik 1973) and four Asian markets (by Laurence 1986, and Butler and Malaikah 1992) are arranged in Table 5-6. In considering Fama's (1965) statement, Solnik stated that deviations from the random walk seem slightly more apparent in European stock prices than in the U.S. stock prices. Laurence (1986) claimed that the Singapore and Malaysia stock prices have only a small deviation from perfect independence. Butler and Malaikah (1992) found the Saudi stock prices have a significant departure form the random walk.

The percentages of rejections of null hypothesis for individual A-shares and overall shares of both the Shanghai and Shenzhen markets are less than 36.36% in any lag of length. Thus, if the rejection percentage of 36.36% in Fama 's (1965) statement is accepted as a standard of uncorrelated returns for individual shares, the performances of A-shares markets and the whole markets of Shanghai and Shenzhen should be defined as weak form efficient. However, it is paradoxical according to this percentage alone to argue that China's stock markets are more efficient than the U.S. stock market and most of the markets represented in Table 5-6. Even though a comparison is based on different years of the markets, from many perspectives, such as the legislation governing the market, information disclosure and so forth, China's stock markets cannot compete with those markets. China's stock markets are still emerging.

Table 5-6. Percentages of Rejections of the Null Hypothesis of Zero Serial Correlation Coefficients of Daily Returns in Individual Shares

Country		Italy[a]	U.K[a]	Germany[a]	Nederlands[a]	Belgium[a]	Sweden[a]
Lag	One	30.00	52.50	65.71	37.50	29.41	16.67
Country		**France[a]**	**U.S.A[b]**	**Singapore[c]**	**Malaysia[c]**	**Kuwait[d]**	**Saudis[d]**
Lag	One	63.06%	36.67	79.17	31.25	36.11	100.00
	Two		30.00	12.50	31.25	13.89	11.43
	Three		13.33	45.83	25.00	16.67	5.71
	Four		13.33			13.89	5.71
	Five		10.00	12.50	18.75	16.67	8.57
	Six		13.33				
	Seven		0.00				
	Eight		6.67				
	Nine		13.33				
	Ten		3.33	33.33	12.50		

Source: [a]Calculated from Solnik (1973), rejections of the null hypothesis at the 5% significance level.
[b]Calculated from Fama (1965), rejections of the null hypothesis at the 5% significance level.
[c]Calculated from Laurence (1986), rejections of the null hypothesis at the 5% significance level.
[d]Calculated from Butler and Malaikah (1992), rejections of the null hypothesis at the 5% significance level.

Certainly, it cannot be concluded that the daily returns of individual B-shares are independent given the 44.90% and 46.15% rates of rejections of zero serial correlation coefficients in lag one for the Shanghai and Shenzhen markets respectively, which are greater than Fama 's (1965) 36.36%. The correlated return pattern of individual B-shares results from thin markets and non-trading. As detailed in Chapter 2, since the Chinese residents are prohibited from trading B-shares, the B-shares market is less than ten percent of the size of the A-shares market. The turnover rate of B-shares is only 16% of that of A-shares for the Shanghai market and 10% of that of the A-shares for the Shenzhen market.

5.2.3.2 Empirical analysis on serial correlation coefficients of weekly and monthly returns in individual shares

Panel-B of Tables 5-4 and 5-5 reports the percentages of rejections of the null hypothesis of zero serial correlation of weekly returns in individual shares of the Shanghai and Shenzhen markets. The percentages of rejections of zero serial correlation coefficients of weekly returns are lower than those presented in Panel-A for the tests on daily returns. The largest percentage of the rejections in weekly returns is 14.21% for lag eight for individual A-shares in the Shanghai market, 14.29% for lag one for individual B-shares in the Shanghai market, 9.26% for lag ten for individual A-share in the Shenzhen market, and 13.76% for lag three for individual B-shares in the Shenzhen market. Thus all of them are smaller compared with the relevant largest percentages in the tests of daily returns. The rejection percentages by the Q-statistics and LB-statistics across the A-shares, B-shares and the overall shares in tests of weekly returns in Panel-B are also smaller than those in the tests of daily returns in Panel-A.

The characteristic that weekly returns are less correlated than daily returns, as shown in the studies of the three main indices and sector indices, have been found in the analysis of individual shares. In addition, even though only a few previous studies conducted simultaneously on daily and weekly returns, that the daily returns are more correlated than weekly returns across a broad range of the markets in the world. The percentages of rejections of zero serial correlation of weekly returns for individual shares of the world markets in Table 5-7 are smaller than those tested on daily returns in Table 5-6.

Table 5-7. Percentages of Rejections of the Null Hypothesis of Zero Serial Correlation Coefficients of Weekly Returns in Individual Shares

Country		Italy[a]	U.K[a]	Germany[a]	Nederlands[a]	Belgium[a]
lag	one	16.67	17.50	22.86	12.50	29.41
Country		France[a]	U.S.A[a]	Switzerland[a]	Sweden[a]	Malaysia[b]
lag	one	26.15	16.67	5.90	16.67	27.65
	Two					11.76
	Three					7.65
	Four					8.82
	Five					6.47
	Six					5.88
	Seven					4.12
	Eight					5.88

Source: [a]Calculated from Solnik (1973), rejections of the null hypothesis at the 5% significance level.
[b]Calculated from Yong (1992), rejections of the null hypothesis at the 5% significance level.

Panel-C of Tables 5-4 and 5-5 show that the serial correlation of monthly returns in individual shares of the Shanghai and Shenzhen markets are weaker than those of daily returns, but similar to those of weekly returns. This feature of monthly returns of individual shares in China's market is not consistent with that of some markets in the world. Table 5-8 reports the percentages of rejections of zero serial correlation coefficients of monthly returns in individual shares of some markets in the world. The rejection percentages in monthly returns in Table 5-8 are smaller than in daily returns in Table 5-6 and in weekly returns in Table 5-7 in comparison with relevant markets.

With the exception of the *Q*-statistics and *LB*-statistics, the percentages rejection of zero serial correlation coefficients of monthly returns in China's markets are lower than those of some less developed countries, but close to those of developed countries. This conclusion is based on the comparison of the percentages of rejection in Panel-C of Tables 5-4 and 5-5 with those in Table 5-8.

Table 5-8. Percentages of Rejections of the Null Hypothesis of Zero Serial Correlation Coefficients of Monthly Returns in Individual Shares

Country		Argentina[a]	Brazil[a]	Chile[a]	Greece[a]	India[a]	Jordan[a]
Lag	One	13.64	14.29	18.18	0.00	8.00	12.50
Country		Korea[a]	Mexico[a]	Thailand[a]	Zimbabwe[a]	France[b]	Italy[b]
Lag	One	12.00	12.50	20.00	20.00	1.54	3.33
Country		U.K.[b]	Germany[b]	Netherlands[b]	Belgium[b]	Switzerland[b]	Sweden[b]
Lag	One	2.50	8.00	8.33	5.88	5.88	16.67
Country		U.S.A.[b]	U.K.[b]	U.S.A.-OCT[c]	Athens[d]		
Lag	One	3.00	2.50	12.25	70.00		
	Two				30.00		
	Three				1.00		
	Four				0.00		
	Five				0.00		

Source: [a]Calculated from Errunza and Losq (1985), rejections of the null hypothesis at the 5% significance level.
[b]Calculated from Solnik (1973), rejections of the null hypothesis at the 5% significance level.
[c]Calculated from Hagerman and Richmond (1973), rejections of the null hypothesis at the 5% significance level.
[d]Calculated from Panas (1990), rejections of the null hypothesis at the 5% significance level.

5.3 Run tests

As a parametric test, the serial correlation coefficient could be adversely affected by outlying observations. The nonparametric runs test provides a useful analysis of asymmetrically distributed data. As indicated previously, a run is defined as a sequence of consecutive increments of either positive sign, negative sign or zero. A random time series should exhibit actual (number of) runs approximating expected (number of) runs. Too many or too few actual runs are inconsistent with randomness. Thus, when trends in stock prices dominate the series, the serial correlation of returns is positive and the actual runs is less than the expected runs. Conversely, where here is a preponderance of stock price reversals, the actual runs is greater than the expected runs.

As we specified in Chapter 4, the null hypothesis in the runs test is that the actual runs of returns is equal to expected runs. The alternative hypothesis is that the actual runs of returns is not equal to the expected runs. If the absolute value of the K-statistic is larger than 1.96 or 2.58, the null hypothesis will be rejected at the 5% or 1% significance level respectively.

5.3.1 Runs tests on the returns in the three main indices of the Shanghai and Shenzhen markets

The empirical runs tests on the returns in indices are arranged in Table 5-9. Panel-A describes the results of the runs tests on daily, weekly and monthly returns of the indices for the Shanghai market, and Panel-B details the equivalent results for the Shenzhen market. Tests on the returns in the three main indices (SSE, SSE-A and SSE-B of the Shanghai market, SZS, SZS-A and SZS-B of the Shenzhen market) and in sector indices are listed in parallel in each section of the table.

In the daily return section of Panel-A, the actual runs of the daily returns in the three main indices of the Shanghai market are less than their relevant expected runs. The K-statistics significantly reject the null hypothesis that the actual runs is equal to the expected runs at the 1% or 5% significance level. Similarly in Panel-B, the K-statistics report that the actual runs of the daily returns in the three main indices of the Shenzhen market are significantly less than the expected runs at the 1% or 5% significance level. The runs tests on the daily returns in the three main indices of the two markets in Table 5-9 corroborate the tests of serial correlation coefficients of daily returns presented in Table 5-1. The positive serial correlation of daily returns in the first order results

Table 5-9. Runs Tests on Indices of the Shanghai and Shenzhen Markets

	Obs.	Act.-Run	Exp.-Run	Std.	*K*-stat.
PANEL A: Shanghai Stock Market					
Daily Returns					
SSE	1849	821	923	21.4037	**-4.7422
SSE-A	1592	771	811	19.9311	*-1.9818
SSE-B	1552	668	802	19.1568	**-6.9688
Manufacturing	1244	654	623	17.6252	1.7305
Commercial	1242	665	623	17.5888	*2.3595
Real Estate	1243	648	622	17.5736	1.4510
Utility	1241	652	622	17.5837	1.6777
Miscellaneous	1244	670	625	17.5962	*2.5290
Weekly Returns					
SSE	378	139	189	9.6622	**-5.1231
SSE-A	326	133	164	8.9972	**-3.3899
SSE-B	317	130	154	8.3858	**-2.8024
Manufacturing	254	108	128	7.9287	*-2.4594
Commercial	254	122	128	7.9287	-0.6937
Real Estate	254	96	126	7.8415	**-3.762
Utility	253	112	127	7.9311	-1.8282
Miscellaneous	255	108	128	7.9478	*-2.4535
Monthly Returns					
SSE	89	39	45	4.5889	-1.1985
SSE-A	77	39	39	4.3518	0.1149
SSE-B	75	41	38	4.2070	0.5942
Manufacturing	61	31	31	3.8714	0.1292
Commercial	60	28	31	3.8400	-0.6510
Real Estate	60	33	30	3.7706	0.6630
Utility	60	31	31	3.8400	0.1302
Miscellaneous	61	37	31	3.8714	1.4207

	Obser.	Act.-Run	Exp.-Run	Std.	*K*-stat.
PANEL B: Shenzhen Stock Market					
Daily Returns					
SZS	1806	812	903	21.1566	**-4.2776
SZS-A	1383	672	713	18.5400	*-2.1845
SZS-B	1384	700	759	17.6327	**-3.3177
Manufacturing	930	457	464	15.1675	-0.4285
Commercial	930	495	468	15.2026	1.7431
Financial	930	489	470	15.1740	1.2192
Property	930	473	467	15.2225	0.3613
Utility	930	485	468	15.1933	1.0860
Conglomerate	625	319	312	12.3899	0.5246
Weekly Returns					
SZS	361	151	180	9.4166	**-3.0266
SZS-A	283	121	142	8.3660	*-2.4504
SZS-B	283	120	139	8.1037	*-2.2829
Manufacturing	192	89	97	6.9093	-1.0855
Commercial	192	81	97	6.9093	*-2.2434
Financial	192	95	98	6.8724	-0.3638
Property	192	89	97	6.8980	-1.0873
Utility	191	95	96	6.8689	-0.0728
Conglomerate	129	54	64	5.5056	-1.7255
Monthly Returns					
SZS	53	33	28	3.5165	1.2797
SZS-A	67	31	34	4.0533	-0.6168
SZS-B	67	29	33	3.9063	-0.8960
Manufacturing	47	23	24	3.3135	-0.1509
Commercial	46	21	23	3.2495	-0.4616
Financial	46	22	24	3.3468	-0.4482
Property	46	22	24	3.3468	-0.4482
Utility	46	26	24	3.3273	0.4508
Conglomerate	32	12	16	2.6814	-1.3053

Notes: 1. SSE: Shanghai market index; SSE-A: Shanghai A-shares Index; SSE-B: Shanghai B-shares Index; Others are sector indices.
2. SZS: Shenzhen market index; SZS-A: Shenzhen A-Shares Index; SZS-B: Shenzhen B-Shares Index; Others are sector indices.
3. '*', '**' Indicate significance at the 5% or 1% level.

in too few actual runs compared with the expected runs. Therefore, both the serial correlation coefficient tests and runs tests on the daily returns in the three main indices of the two markets indicate a departure from randomness.

The runs tests on weekly returns in the three main indices of both the Shenzhen and Shanghai markets almost replicate the results on daily returns. All of the actual runs of weekly returns in the three main indices of the two markets are significantly smaller than their corresponding expected runs, so that the statistically significant negative K-statistics reject the null hypothesis at the 1% or 5% significance level. However, the absolute values of the K-statistics of A-shares indices of the two markets are larger than those of the B-shares indices in weekly returns, but smaller in the daily returns. The B-shares indices show more dependence in daily behaviour and the A-shares indices display more dependence in weekly behaviour. Nevertheless, this conclusion of the runs tests are not matched completely in the serial correlation coefficient tests in Table 5-1. Even though the serial correlation coefficients of the first order weekly returns became larger for A-shares indices and smaller for B-shares indices, in the comparison with their equivalents on daily returns, the serial correlation of the first order weekly returns in B-shares indices are still greater than those of A-shares indices.

The difference between actual runs and expected runs of monthly returns in the three main indices of the Shanghai and Shenzhen markets narrows visibly. It can be seen from the monthly return section of Table 5-9, that each K-statistic of the monthly returns in the three main indices of the two markets cannot reject the null hypothesis. Thus, the runs tests show that the daily and weekly performance of the three main indices of the two markets refute the random walk hypothesis, whereas the monthly performance conform to randomness.

5.3.2 Runs tests on the returns in sector indices of the Shanghai and Shenzhen markets

The runs tests on the daily returns in sector indices show that the K-statistics for Commercial and Miscellaneous sectors of the Shanghai market are positive and statistically significant, and the remaining K-statistics of each sector of the Shanghai and Shenzhen markets are statistically insignificant. However, all sectors' K-statistics, except for Manufacturing in the Shenzhen market, show that the actual runs are larger than the expected runs, which is different from that of the three main indices. The significant K-statistics for weekly returns can still be found for the Manufacturing, Real Estate and Miscellaneous sectors of the Shanghai market, and for Commercial sectors for the Shenzhen market. The signs of all K-statistics are negative, demonstrating that actual weekly runs are less than the expected weekly runs in each sector indices of the two markets, which is consistent with that of the three main indices. Nevertheless, the discrepancies between the actual runs and expected runs of monthly returns in sector indices are small, such that none of the K-statistics in the monthly return section of Table 5-9 are statistically significant.

The behaviour of the three main indices of the Shanghai and Shenzhen markets is similar considering the undistinguishing results of the runs tests. The behaviour the sector indices of the Shanghai market probably deviates from randomness more seriously than the sector indices of the Shenzhen market. Two of five K-statistics of daily returns and three of five K-statistics of weekly returns in sector indices of the Shanghai market reject the null hypothesis at 5% or 1% significance level. By contrast, only one of six K-statistics of weekly returns in sector indices of the Shenzhen market refutes the null at the 5% significance level.

5.3.3 Runs tests on the returns in individual shares of the Shanghai and Shenzhen markets

The runs tests on the returns of individual shares of the Shanghai and Shenzhen markets are summarised in Table 5-10. Three sections for tests on daily returns, weekly returns and monthly returns construct Panel-A for the Shanghai market and Panel-B for the Shenzhen market respectively. In the columns of the table, the "Positive K" implies that the K-statistic is positive, whereas, the "Negative K" implies that the K-statistic is negative. The "Rejection" of the null hypothesis occurs at the 5% level of significance when the difference between the actual runs and expected runs is over 1.96 times standard deviation of the runs. The number and percentage of the individual shares with positive K-statistics, negative K-statistics and rejections of the null are listed in the rows of each section in Table 5-10.

5.3.3.1 Runs tests on the daily returns in individual shares of the Shanghai and Shenzhen markets

Inspecting the results of the tests on daily returns in Table 5-10, several notable features can be found. Firstly, positive K-statistics dominate in the tests on individual A-shares. The positive K-statistic is found in 87.70% (328 of 374) of Shanghai

Table 5-10. Summary of Runs Tests on Individual Shares of the Shanghai and Shenzhen Markets

		Total	Positive *K*	Negative *K*	Rejection
PANEL A: Shanghai Stock Market					
Daily Returns					
A-shares	Numbers	374	328	46	126
	(%)		*87.70*	*12.30*	*33.69*
B-shares	Numbers	50	3	47	37
	(%)		*6.00*	*94.00*	*74.00*
Overall	Numbers	424	331	93	163
	(%)		*78.07*	*21.93*	*38.44*
Weekly Returns					
A-shares	Numbers	374	154	220	26
	(%)		*41.18*	*58.82*	*6.95*
B-shares	Numbers	50	25	25	4
	(%)		*50.00*	*50.00*	*8.00*
Overall	Numbers	424	179	245	30
	(%)		*42.22*	*57.78*	*7.08*
Monthly Returns					
A-shares	Numbers	374	245	129	7
	(%)		*65.51*	*34.49*	*1.87*
B-shares	Numbers	50	30	20	1
	(%)		*60.00*	*40.00*	*2.00*
Overall	Numbers	424	275	149	8
	(%)		*64.86*	*35.14*	*1.89*

		Total	Positive *K*	Negative *K*	Rejection
PANEL B: Shenzhen Stock Market					
Daily Returns					
A-shares	Numbers	341	266	75	31
	(%)		*78.01*	*21.99*	*9.09*
B-shares	Numbers	51	5	46	35
	(%)		*9.80*	*90.20*	*68.63*
Overall	Numbers	392	271	121	66
	(%)		*69.13*	*30.87*	*16.84*
Weekly Returns					
A-shares	Numbers	341	124	217	20
	(%)		*36.36*	*63.64*	*5.87*
B-shares	Numbers	51	13	38	6
	(%)		*25.49*	*74.51*	*11.76*
Overall	Numbers	392	137	255	39
	(%)		*34.95*	*65.05*	*6.63*
Monthly Returns					
A-shares	Numbers	341	253	88	8
	(%)		*74.19*	*25.81*	*2.35*
B-shares	Numbers	50	26	24	2
	(%)		*52.00*	*48.00*	*4.00*
Overall	Numbers	391	279	112	10
	(%)		*71.36*	*28.64*	*2.56*

Notes: 1. The tests on daily, weekly and monthly returns of individual shares listed on the Shanghai market were conducted on 424 shares, including 374 A-shares and 50 B-shares.

2. The tests on daily and weekly returns of individual shares listed on the Shenzhen market were conducted on 392 shares, including 341 A-shares and 51 B-shares. The tests on monthly returns of individual shares listed on the Shenzhen market were conducted on 391 shares, including 341 A-shares and 50 B-shares.

3. Positive *K* implies that the number of actual runs is larger than the number of expected runs; negative *K* implies that the number of actual runs is less than the number of expected runs

4. Rejection means: rejections of the null hypothesis that the number of actual runs is equal to the number of expected runs at the 5% or 1% significance level.

A-shares and in 78.01% (266 of 341) of Shenzhen A-shares. The feature that the actual runs exceed the expected runs reveals that the reversals preponderate over trends in most of the A-shares prices, which is consistent with the over-speculation in the A-shares market. Secondly, in contrast, negative *K*-statistics are obtained in most of the tests on individual B-shares. The negative differences that actual runs are less expected runs exist in 94.00% (47 of 50) of Shanghai B-shares and 90.20% (46 of 51) of Shenzhen B-shares. The trends dominate reversals in the prices of most B-shares, which is consistent with thin trading in the B-shares markets. Thirdly, 33.69% (126 of 374) of *K*-statistics obtained in the tests of Shanghai A-shares are larger than 1.96, rejecting the null hypothesis that the actual runs is equal to expected runs at the 95% significance level. However, this rejection of the null hypothesis can only be made in 9.09% (31 of 341) of Shenzhen A-shares. Next, the preponderance of rejections of the null hypothesis is found in the tests of B-shares. Seventy-four percent (37 of 50) of Shanghai B-shares and 68.63% (35 of 51) of Shenzhen B-shares reject the null with an absolute value of *K*-statistic over 1.96. Finally, for the shares overall, the percentage of rejections of the null hypothesis in the runs tests of individual shares is 38.44% for the Shanghai market and 16.84% for the Shenzhen market. That the percentage of rejections of the null hypothesis on daily returns of individual shares is bigger for the Shanghai market than for the Shenzhen market is consistent with the results from the serial correlation coefficient tests.

Similar runs tests on daily returns in individual shares have previously been undertaken in many markets of the world. Some results from previously studies are arranged in the Table 5-11, in which the last one is cited from Fama's (1965) famous paper. Twenty-seven percent (8 of 30) of individual shares violating randomness in

Fama's (1965) study is not, in Fama's (1965) opinion, considered to be sufficient evidence against the efficient market hypothesis. This is generally accepted as a benchmark for the hypothesis of randomness in most of the succeeding research. The penultimate item in the table is cited from Pettengill's (1989b) study. Pettengill (1989b) wanted to replicate Fama's (1965) study with the same shares, but a much longer sample period. Pettengill (1989b) found evidence violating randomness in 100% (30/30) of shares, challenging the findings of Fama's (1965) study.

Table 5-11. Runs Tests on Daily Returns in Individual Shares in Different Markets of the World

Country/Market		No. of Shares	Positive *K*	Negative *K*	Rejection
Kuala Lumpur[a]	Numbers	16	1	15	6
	(%)		*6.00*	*94.00*	*38.00*
Singapore[a]	Numbers	24	1	23	17
	(%)		*4.00*	*96.00*	*71.00*
Kuwait[b]	Numbers	36			14
	(%)				*39.00*
Saudi[b]	Numbers	35			35
	(%)				*100.00*
Johannesburg[c]	Numbers	24	0	24	23
	(%)		*0.00*	*100.00*	*96.00*
Norway[d]	Numbers	15	0	15	14
	(%)		*0.00*	*100.00*	*93.00*
Sweden[d]	Numbers	30	0	30	3
	(%)		*0.00*	*100.00*	*10.00*
New York[e]	Numbers	30	0	30	30
	(%)			*100.00*	*100.00*
New York[f]	Numbers	30	4	26	8
	(%)		*13.00*	*87.00*	*27.00*

Source: 1. [a]Calculated from Laurance (1986).
2. [b]Calculated from Butler and Malaikah (1992).
3. [c]Caculated from Roux and Gilbertson (1978).
4. [d]Caculated from Jennergren and Korsvold (1975).
5. [e]Caculated from Pettengill (1989b).
6. [f]Caculated from Fama (1965).

Notes: Rejections of the null hypothesis at the 5% significance level.

Nevertheless, attention should be paid to the comparison of the tests reported in Tables 5-10 and 5-11. The first distinction between the markets of China and the rest of the world is that the actual daily runs are less than the expected daily runs for individual shares in foreign markets. Between 87% and 100% of individual shares in foreign markets have negative *K*-statistics, as reported in Table 5-11. This preponderance of negative *K*-statistics can be matched in the tests on individual B-shares of the Shanghai and Shenzhen markets, but not in the tests on individual A-shares of the two markets. The next distinction is that the percentage of rejections of the null hypothesis in individual A-shares of the Shanghai market is slightly higher than two of nine cases in world markets as presented in Table 5-11. However, the percentage of rejections of the null hypothesis in individual A-shares of the Shenzhen market is dramatically lower than any of these nine cases, including Fama's (1965). According to the benchmark created in Fama's (1965) study, the behaviour of China's individual A-shares should be interpreted as a random walk. The paradoxical result that China's A-shares market appears to be more efficient than the New York market is raised again.

5.3.3.2 Runs tests on the weekly and monthly returns of individual shares of the Shanghai and Shenzhen markets

The results in the weekly return sections of Table 5-10 illustrate that the weekly returns of the individual shares of the Shanghai and Shenzhen markets are less correlated than the daily returns. The percentage of the shares with positive *K*-statistics is approximately equal to the percentage of the shares with negative *K*-statistics in the tests on weekly returns. Specifically, the null hypothesis that actual runs is equal to expected runs is accepted in the tests on weekly returns for most individual shares. The percentage of rejections of the null hypothesis is only under 12%.

The results in the monthly return sections of Table 5-11 show that the monthly returns of the individual shares of both the Shanghai and Shenzhen markets are substantially independent. Only 1.87% (7 of 374) of the Shanghai A-shares, 2% (1 of 50) of the Shanghai B-shares, 2.35% (8 of 341) of the Shenzhen A-shares and 4% (2 of 50) of the Shenzhen B-shares reject randomness using the runs tests on monthly returns. In aggregating A-shares and B-shares, the percentage of rejections is 1.89% for all individual shares of the Shanghai market, 2.56% for all individual shares of the Shenzhen market.

Several findings in the runs tests on individual shares of the Shanghai and Shenzhen markets should be considered in order to obtain a comprehensive picture. Firstly, the daily prices of most individual B-shares significantly depart from randomness, but this is as serious for individual A-shares. Secondly, the weekly prices, and particularly the monthly prices, of most individual shares are consistent with the random walk hypothesis. Thirdly, the daily returns of most A-shares exhibit too many runs, but most B-shares exhibit too few runs. Next, the actual runs of weekly returns are less than the expected runs for more than half of the individual shares. Conversely, the actual runs of monthly returns exceed the expected runs in more than half individual shares.

5.4 Variance ratio tests

The assumption of the variance ratio test is that the increments in a random walk series are linear in the observation interval. Thus, under the hypothesis that the share prices follow a random walk, the returns of the shares are linear in the length of the interval in which the returns are generated. Accordingly, the variance of the q-day returns is q

times as large as the variance of the one-day returns. Therefore, the ratio of the two variances divided by q should equal to one. A variance ratio of less than one implies that the returns of short intervals tend toward mean reversion over a longer interval. On other hand, a variance ratio of exceeding one implies that the returns of short intervals are inclined to trend over a longer interval. Variance ratio tests derived in the study of Hausman (1978), and further developed by Lo and Mackinlay (1988) who claimed that the variance ratio test is a powerful and reliable test of the random walk hypothesis.

As we stated in Chapter 4, the null hypothesis is that the variance ratio is equal to one. The alternative hypothesis is that the variance ratio is not equal to one. If the test-statistic is larger than 1.96 or 2.58, the null hypothesis will be rejected at the 5% or 1% significance level, respectively. Otherwise, the null hypothesis will not be rejected.

5.4.1 Variance ratio tests on returns in the three main indices of the Shanghai and Shenzhen markets

The results of variance ratio tests on returns in the three main indices of the Shanghai and Shenzhen markets are arranged in Table 5-12. Tests on daily, weekly and monthly returns are reported respectively in Panel-A for the Shanghai market and in Panel-B for the Shenzhen market. As detailed in Chapter 4, $VR(q)$ represents the variance ratio of the returns, and $Z(q)$ and $Z^*(q)$ represent the statistics of the variance ratio tests under the assumption of homoscedasticity and heteroscedasticity, respectively.

Table 5-12. Variance Ratio Tests for Intervals 2, 4, 8, 12 and 16 on the Three Main Indices of the Shanghai and Shenzhen Markets

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL A: Shanghai Stock Market							
Daily Returns							
SSE	1849	VR(q)	1.0606	1.1772	1.3045	1.3353	1.3569
		Z(q)	**2.6029	**4.0673	**4.4173	**3.8330	**3.4711
		Z*(q)	1.5937	*2.2412	**2.3621	*2.1263	*2.016
SSE-A	1592	VR(q)	1.0544	1.1633	1.2914	1.3183	1.3320
		Z(q)	*2.1707	**3.479	**3.9207	**3.3749	**2.9944
		Z*(q)	1.4171	*2.0259	*2.2172	*1.9808	1.8396
SSE-B	1552	VR(q)	1.2621	1.4159	1.4917	1.5181	1.5852
		Z(q)	**10.3177	**8.7471	**6.532	**5.4230	**5.2108
		Z*(q)	**5.0159	**4.5019	**3.443	**2.9796	**2.9995
Weekly Returns							
SSE	378	VR(q)	1.0883	1.1010	1.1715	1.1995	1.1925
		Z(q)	1.7124	1.0444	1.1150	1.0180	0.8319
		Z*(q)	1.1715	0.7687	0.9109	0.8877	0.7638
SSE-A	326	VR(q)	1.0887	1.0865	1.1249	1.1282	1.0944
		Z(q)	1.5974	0.8296	0.7531	0.6059	0.3775
		Z*(q)	1.0979	0.6169	0.6236	0.5383	0.3550
SSE-B	317	VR(q)	1.1229	1.2600	1.4362	1.5150	1.5737
		Z(q)	*2.1820	**2.4583	**2.592	**2.3990	*2.2611
		Z*(q)	**2.5327	**2.7563	**2.8277	**2.5942	**2.4896
Monthly Returns							
SSE	89	VR(q)	0.9322	0.9524	0.8182	1.0534	1.2226
		Z(q)	-0.6320	-0.2344	-0.5531	0.1250	0.4320
		Z*(q)	-0.5531	-0.2103	-0.5172	0.1203	0.4330
SSE-A	77	VR(q)	0.8988	0.8776	0.3911	0.4859	0.5053
		Z(q)	-0.8768	-0.5590	-1.7100	-1.1055	-0.8778
		Z*(q)	-0.7860	-0.5245	-1.6985	-1.1440	-0.9573
SSE-B	75	VR(q)	1.0745	1.0930	0.7729	0.7807	0.7874
		Z(q)	0.6367	0.4191	-0.6284	-0.4642	-0.3711
		Z*(q)	0.6596	0.4344	-0.6735	-0.5267	-0.4503

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL B: Shenzhen Stock Market							
Daily Returns							
SZS	1806	VR(q)	1.0539	1.1527	1.3358	1.4380	1.5182
		Z(q)	*2.2906	**3.4656	**4.8132	**4.9487	**4.9810
		Z*(q)	1.1719	1.8458	**2.7863	**3.0555	**3.2586
SZS-A	1383	VR(q)	1.0244	1.1013	1.2252	1.2383	1.2590
		Z(q)	0.9084	*2.0103	**2.8233	**2.3538	*2.1752
		Z*(q)	0.6185	1.2330	*2.2101	*1.9649	1.4620
SZS-B	1384	VR(q)	1.1667	1.3285	1.4564	1.4807	1.4996
		Z(q)	**6.1962	**6.5232	**5.723	**4.7496	**4.1981
		Z*(q)	**2.8630	**3.2360	**3.0227	**2.6527	**2.4549
Weekly Returns							
SZS	361	VR(q)	1.1363	1.3154	1.6052	1.6824	1.7430
		Z(q)	**2.5823	**3.1853	**3.8439	**3.4003	**3.1354
		Z*(q)	**2.4363	**3.0601	**3.4594	**3.0410	**2.8599
SZS-A	*283*	VR(q)	1.0446	1.0677	1.1308	1.1720	1.2402
		Z(q)	0.7477	0.6048	0.7331	0.7552	0.8918
		Z*(q)	0.6637	0.5641	0.6712	0.6996	0.8515
SZS-B	283	VR(q)	1.1592	1.2035	1.3152	1.5001	1.6464
		Z(q)	**2.6692	1.8168	1.7668	*2.1961	**2.3998
		Z*(q)	*2.0104	1.0955	1.1765	*1.9912	*2.1101
Monthly Returns							
SZS	85	VR(q)	1.2650	1.4609	1.6353	2.0239	2.2608
		Z(q)	**2.4144	*2.2171	1.8845	**2.3333	**2.3793
		Z*(q)	*2.2967	*2.0645	1.8664	**2.3869	**2.5766
SZS-A	67	VR(q)	1.1225	1.3468	1.7699	2.5268	3.6522
		Z(q)	0.9874	1.4714	*1.9993	**3.0202	**4.3031
		Z*(q)	0.9557	1.3445	1.9251	**3.1060	**4.8016
SZS-B	67	VR(q)	1.0483	1.2933	1.4452	1.7214	1.9896
		Z(q)	0.3890	1.2445	1.1560	1.4270	1.6055
		Z*(q)	0.4245	1.3330	1.2403	1.6153	*1.9689

Notes: 1. SSE: Shanghai market index; SSE-A: Shanghai A-shares Index, SSE-B: Shanghia B-shares Index.

2. SZS: Shenzhen market index; SZS-A: Shenzhen A-Shares Index; SZS-B: Shenzhen B-Shares Index.

3. VR(q) is the variance ratio; q is the interval of the observations.

4. Z(q) is distributed as a standard normal under the assumption of homoscedasticity.

5. Z *(q) is distributed as a standard normal under the assumption of heteroscedasticity.

6. '*' indicates significance at the 5% level, '**' at the 1% level.

5.4.1.1 Variance ratio tests on daily returns in the three main indices of the Shanghai and Shenzhen markets

In the daily return section of Table 5-12, the results of the variance ratio tests under the assumption of homoscedasticity indicate that the daily behaviour of the three main indices of both the Shanghai and Shenzhen markets depart markedly from randomness. All the test-statistics of *Z(q)*, with the exception of SZS-A in interval two, reject the null at either the 1% or 5% level of significance. Furthermore, the rejections of the null hypothesis are robust in most intervals to the presence of heteroscedasticity.

However, the rejections of the null hypothesis under the presence of heteroscedasticity are weaker than under the assumption of homoscedasticity. Every *Z*(q)* is smaller than the corresponding *Z(q)*, and some of the test-statistics of *Z*(q)* are statistically insignificant. Nevertheless, even though the rejections of the null hypothesis are attributed partially to the variance changes, there is little doubt that the objections are mainly due to the violation of randomness.

The variance ratios exceed one for all the cases in the daily return section, and most of them are relatively large. For example, the entries in the first column of Panel-A and Panel-B correspond to the variance ratios in interval q of 2. Referring to the equation of (4-3-14), variance ratio in interval q of 2 is approximately equal to one plus the first order serial correlation coefficient estimator.[6] Hence, the SSE-B's variance ratio of 1.2621 for interval q of 2, implies that the first order serial correlation coefficient for daily returns of SSE-B is approximately 26.21%, which is consistent with the value

[6] $VR \equiv Var(r_t^q)/q \cdot Var(r_t) = 1 + 2\sum_{k=1}^{q-1}(1-k/q)\rho(k)$, when $q=2$, then $VR(q) = 1+\rho(1)$.

reported in Table 5-1. With the corresponding *Z(q)* of 10.3177 and *Z*(q)* of 5.0195, the random walk hypothesis is resoundingly rejected.

The variance ratios of daily returns in the three main indices increase successively as the length of the interval q increases. For example, the variance ratio of daily returns of SES-A climbs from 1.0606 for interval q of 2 to 1.3569 for interval q of 16, and similar patterns can be found in the tests on the other main indices. Using the interpretation of Campbell *et al* (1997), the increase of the variance ratio following the enlarging of the interval length q implies positive serial correlation in multiple period returns.[7] For instance, by using the variance ratios of SSE we get VR(8)/VR(4) = 1.3045/1.1772 = 1.1081, which implies that four-day returns of SSE have a first order serial correlation coefficient of approximately 10.81%.

The serious violation of randomness found in the tests of serial correlation and runs tests for B-shares indices is evidenced again in the variance ratio tests. All values of the variance ratios of daily returns of B-share indices result in strong rejections of the null hypothesis, with *Z(q)* and *Z*(q)* comparatively larger than those of the A-shares indices.

5.4.1.2 Variance ratio tests on weekly and monthly returns in the three main indices of the Shanghai and Shenzhen markets

In the weekly return section of Table 5-12, the results of the variance ratio tests on weekly returns are similar in some aspects to the results in the tests on daily returns.

[7] According to equation (4-3-14), $VR(2q)/VR(q) = Var(r_t^{2q})/2Var(r_t^{q}) = 1+\rho_q(1)$

All the estimates of the variance ratios are larger than one, and most increase as the interval length of q enlarges. Thus, first order positive serial correlation and positive serial correlation in multiple periods are common phenomena in weekly returns, as in daily returns, for the three main indices of the Shanghai and Shenzhen markets. The feature that variance ratios, which are derived from weekly returns of the three main indices, are over one and increasing with interval length of q enlarging conforms to the studies by Lo and MacKinlay (1988) and Campbell *et al* (1997) on the equal-weighted and value-weighted CRSP indices.

On the other hand, the results of variance ratio tests on weekly returns differ somewhat from those on daily returns. The weekly returns of shares show less dependency than daily returns, in line with the results of the serial correlation coefficient tests. Except for several statistics in the tests on SZS, almost all variance ratios and $Z(q)$ and $Z^*(q)$ derived from weekly returns are smaller in comparison with the corresponding statistics from daily returns. However, the weekly behaviour of A-shares indices is consistent with a random walk, but for B-shares indices.

In the monthly return section of Table 5-12, the variance ratios of monthly returns in the three main indices of the Shenzhen market are great than one and increasing in interval length, similar to the features of the tests on daily and weekly returns. Moreover, the monthly behaviour of the three main indices of the Shenzhen market is in violation of randomness.

Apart from the tests on the Shenzhen market, the variance ratio tests on the monthly returns in the three main indices of the Shanghai market have a unique pattern that is different from those in the tests on daily and weekly returns. Firstly, all estimated variance ratios are insignificant indicating that the monthly behaviour of the three main indices of the Shanghai market follows a random walk. Secondly, the variance ratios of less than one initially appear in the tests on monthly returns of the Shanghai market, which result in negative statistics of $Z(q)$ and $Z^*(q)$. As demonstrated above, the variance ratio of interval q of 2 is approximately equal to one plus the first order serial correlation coefficient estimator. Hence, the variance ratio of less than one in the interval of 2 implies that the first order serial correlation coefficient is negative. These cases of SSE-A and SSE-B are anticipated with reference to the results of serial correlation coefficient tests presented in Table 5-1.

5.4.2 Variance ratio tests on returns in sector indices of the Shanghai and Shenzhen markets

Table 5-13 reports the variance ratio tests on returns in sector indices for the Shanghai market in Panel-A and for the Shenzhen market in Panel-B. The top sections of each panel present the variance ratio test-statistics on daily returns. In the bottom section, the results of the variance ratio tests on daily, weekly and monthly returns are briefly summarised. (For more detail, see appendix Tables A-5 and A-6).

The results of the variance ratio tests on daily returns in sector indices display some special characteristics again in step with those from the serial correlation coefficient tests and runs tests. In contrast to the findings in the tests on the three main indices, with the exception of the tests on the Conglomerate and Financial indices of the Shenzhen markets, the values of variance ratios of daily returns in the sector indices do

Table 5-13. Variance Ratio Tests for Intervals 2, 4, 8, 12 and 16 on Sector Indices of the Shanghai and Shenzhen Stock Markets

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL A: Shanghai Stock Market			***Daily Returns***				
Manufacturing		VR(q)	0.9377	0.9785	1.0355	1.0141	0.9893
	1244	Z(q)	*-2.1951	-0.4046	0.4217	0.1317	-0.0852
		Z*(q)	*-2.0707	-0.1835	0.1950	0.0645	-0.0444
Commercial		VR(q)	0.9750	1.0117	1.0490	1.0307	1.0146
	1242	Z(q)	-0.8820	0.2193	0.5821	0.2875	0.1163
		Z*(q)	-0.4219	0.0986	0.2661	0.1387	0.0594
Real Estate		VR(q)	0.7289	0.5991	0.5763	0.5830	0.5991
	1243	Z(q)	**-5.5489	**-4.5435	**-4.034	**-2.9021	*-2.1901
		Z*(q)	*-2.0282	**-3.0104	**-2.9091	*-1.9889	-1.7941
Utility		VR(q)	0.9951	1.0443	1.0698	1.0449	1.0196
	1241	Z(q)	-0.1720	0.8326	0.8291	0.4198	0.1557
		Z*(q)	-0.1051	0.4310	0.4183	0.2187	0.0850
Miscellaneous		VR(q)	0.9656	1.0443	1.0071	0.9910	0.9864
	1244	Z(q)	-1.2116	0.8326	0.0849	-0.0847	-0.1079
		Z*(q)	-0.7082	0.4310	0.0426	-0.0440	-0.0588
Tests on 5 Indices			***Daily Returns (Brief Summary)***				
No. of Over 1		VR(q)	0	2	4	3	2
No. of Signif.		Z(q)	2	1	1	1	1
No. of Signif.		Z*(q)	0	0	0	0	0
Tests on 5 Indices			***Weekly Returns (Brief Summary)***				
No. of Over 1		VR(q)	2	1	1	1	0
No. of Signif.		Z(q)	0	0	0	0	0
No. of Signif.		Z*(q)	0	0	0	0	0
Tests on 5 Indices			***Monthly Returns (Brief Summary)***				
No. of Over 1		VR(q)	0	0	0	0	2
No. of Signif.		Z(q)	1	0	0	0	0
No. of Signif.		Z*(q)	0	0	0	0	0

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL B: Shenzhen Stock Market			***Daily Returns***				
Manufacturing		VR(q)	0.9936	1.0354	1.0935	1.0327	0.9921
	930	Z(q)	-0.1937	0.5750	0.9598	0.2641	-0.0545
		Z*(q)	-0.1383	0.3242	0.5505	0.1602	-0.0351
Commercial		VR(q)	0.9841	1.0496	1.1497	1.1491	1.0994
	930	Z(q)	-0.4835	0.8060	1.5364	1.2049	0.6825
		Z*(q)	-0.3245	0.4593	0.8969	0.7452	0.4476
Property		VR(q)	0.9834	1.0473	1.1498	1.1088	1.0896
	930	Z(q)	-0.5053	0.7693	1.5378	0.8789	0.6156
		Z*(q)	-0.3177	0.4316	0.9070	0.5525	0.4113
Utility		VR(q)	0.9686	1.0009	1.1191	1.1054	1.0666
	930	Z(q)	-0.9566	0.0145	1.2225	0.8515	0.4576
		Z*(q)	-0.7077	0.0086	0.7318	0.5360	0.3046
Conglomerate		VR(q)	1.0294	1.1537	1.3489	1.4039	1.4833
	625	Z(q)	0.7333	*2.0468	**2.9297	**2.6674	**2.7095
		Z*(q)	0.4653	1.3205	*1.9879	1.8580	*1.9744
Financial		VR(q)	1.0689	1.1466	1.3126	1.3707	1.4504
	930	Z(q)	*2.1001	*2.3847	**3.2091	**2.9961	**3.0932
		Z*(q)	1.3077	1.3628	*1.9661	*1.9606	*2.1427
Tests on 6 Indices			***Daily Returns (Brief Summary)***				
No. of Over 1		VR(q)	2	6	6	6	5
No. of Signif.		Z(q)	1	2	2	2	2
No. of Signif.		Z*(q)	0	0	1	1	2
Tests on 6 Indices			***Weekly Returns (Brief Summary)***				
No. of Over 1		VR(q)	4	2	2	2	3
No. of Signif.		Z(q)	1	0	2	2	2
No. of Signif.		Z*(q)	1	2	2	2	2
Tests on 6 Indices			***Monthly Returns (Brief Summary)***				
No. of Over 1		VR(q)	3	5	5	6	6
No. of Signif.		Z(q)	0	1	3	3	5
No. of Signif.		Z*(q)	0	1	3	5	5

Notes: 1. VR(q) is the variance ratio; q is the interval of the observations, '*' indicates significance at the 5% level, '**' at the 1% 'level'.
2. Z(q) is distributed as a standard normal under the assumption of homoscedasticity, Z*(q) is distributed as a standard normal under the assumption of heteroscedasticity.
3. 'No. & (%) of Over 1' indicates the number and percentage of the indices with the estimator of variance ratio that is larger than one in that interval.
4. 'No. & (%) of Signif.' indicates the number and percentage of the indices with the statistic of variance ratio test that rejects the null hypothesis at the 1% or 5% significance level.

not usually ascend or descend consistently as interval length of q increases. Next, a statistically significant violation of the hypothesis of randomness has only been detected in the Manufacturing and Real Estate indices of the Shanghai market, the Conglomerate and Financial indices of the Shenzhen market. The daily returns in seven of eleven sector indices of the two markets exhibit insignificant correlation. In addition, except for the cases of the Conglomerate and Financial indices of the Shenzhen market, all the variance ratios in q of 2 is less than one. The values of variance ratios in the interval q of 2 on sector indices were suggested by the relatively positive or negative first order serial correlation coefficients in Table 5-3.

The evidence generated using daily returns in the three main indices in the serial correlation coefficient test, runs test and variance ratio test are similarly against hypothesis of a random walk. However, the results derived from daily returns in the sector indices across the three sorts of tests cannot be reconciled completely. Among the sector indices which show a correlated daily return pattern in the serial correlation coefficient test, only the Manufacturing and Real Estate indices of the Shanghai market, and the Conglomerate and Financial indices of the Shenzhen market are corroborated by the variance ratio test. On other hand, there are no sector indices that have been found to have significantly correlated daily returns simultaneously in both the variance ratio test and runs test. The differing results from the three tests suggest that the existence of outliers and non-normally distributed property in the daily returns of sector indices, reinforcing the necessity for analysis of multiple tests. For example, the evidence provided by the serial correlation coefficient test, runs test and variance ratio test could be able to compensate for the shortcomings of each other in the assessment of market efficiency.

The results of the variance ratio tests in the weekly and monthly returns in sector indices of the Shanghai market conform to the random walk hypothesis. None of the variance ratio test-statistics on weekly returns and only one of five on monthly returns in interval q of 2 rejects the null hypothesis that the variance ratio is equal to one. On the other hand, the results of variance ratio tests in the weekly and monthly returns in sector indices of the Shenzhen market cannot be interpreted as effective support for the random walk hypothesis. Two of six variance ratio test-statistics on weekly returns in intervals q of 8, 12 and 16, three and five of six on monthly returns in intervals q of 8, 12 and 16 are statistically significant reject the null hypothesis at conventional levels.

In review of the serial correlation coefficient tests, the weekly and monthly returns in sector indices exhibit more correlation in the Shanghai market than in the Shenzhen market. In contrast, the variance ratio tests illustrate that the weekly and monthly returns in sector indices exhibit more correlation in the Shenzhen market than in the Shanghai market. The contradictory evidence from the two tests possibly results from the high weekly and monthly fluctuations of the sector indices of the Shenzhen market when compared to the Shanghai market. Table 5-13 (and appendix Tables A-5 and A-6) shows that the majority of variance ratios of weekly and monthly returns of Shenzhen market are larger than one, and the statistics that reject the null hypothesis are derived from these variance ratios. As shown in equation (4-3-14), the variance ratios with value greater than one imply high fluctuation in the q-period returns, causing the variances of q-period returns to be large compared with the variances of one-period returns multiplied by the interval length of q. In contrast, the majority of variance ratios of weekly and monthly returns are less than one in the Shanghai market. Prior analyses suggest that the serial correlation coefficient test is appropriate in examining the data series with light fluctuation, and the variance ratio test may be more effective in examining the data series with heavy fluctuation.

5.4.3 Variance ratio tests on returns in individual shares of the Shanghai and Shenzhen markets

A brief summary of variance ratio tests on the returns in individual shares are reported in Table 5-14 for the Shanghai market and Table 5-15 for the Shenzhen market. Panel-A of each table presents the results of the tests on daily returns including individual A-shares, B-shares and the combination of overall A-shares and B-shares. Panel-B and Panel-C present the relevant results of tests on weekly and monthly returns respectively. In every subsection of each Panel, the numbers and percentages of the variance ratios with values greater than one are listed in the first rows. The numbers and percentages of rejections of the null hypothesis under the assumptions of homoscedasticity and heteroscedasticity are listed in the second and third rows, respectively.

5.4.3.1 Variance ratio tests on daily returns in individual shares of the Shanghai and Shenzhen markets

The results of variance ratio tests on daily returns reported in Panel-A of Tables 5-14 and 5-15 show several features. Firstly, the percentage of individual B-shares rejecting the null hypothesis are dramatically higher than the percentage of individual A-shares.

Table 5-14. Summary of Variance Ratio Tests for Intervals 2, 4, 8, 12 and 16 on the Individual Shares of the Shanghai Stock Market

Intervals		q=2		q=4		q=8		q=12		q=16	
PANEL A: Daily Returns											
						370 of A-Shares					
No. & (%) of Over 1	VR(q)	156	*42.16*	207	*55.95*	227	*61.35*	188	*50.81*	176	*47.57*
No. & (%) of Signif.	Z(q)	35	*9.46*	44	*11.89*	38	*10.27*	25	*6.76*	22	*5.95*
No. & (%) of Signif.	Z*(q)	6	*1.62*	9	*2.43*	9	*2.43*	6	*1.62*	12	*3.24*
						50 of B-Shares					
No. & (%) of Over 1	VR(q)	24	*48.00*	22	*44.00*	18	*36.00*	14	*28.00*	15	*30.00*
No. & (%) of Signif.	Z(q)	23	*46.00*	20	*40.00*	17	*34.00*	14	*28.00*	15	*30.00*
No. & (%) of Signif.	Z*(q)	8	*16.00*	6	*12.00*	3	*6.00*	3	*6.00*	3	*6.00*
						420 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	180	*42.86*	229	*54.52*	245	*58.33*	202	*48.10*	191	*45.48*
No. & (%) of Signif.	Z(q)	58	*13.81*	64	*15.24*	55	*13.10*	39	*9.29*	37	*8.81*
No. & (%) of Signif.	Z*(q)	14	*3.33*	15	*3.57*	12	*2.86*	9	*2.14*	15	*3.57*
Panel B: Weekly Returns											
						370 of A-Shares					
No. & (%) of Over 1	VR(q)	219	*59.19*	160	*43.24*	158	*42.70*	138	*37.30*	143	*38.65*
No. & (%) of Signif.	Z(q)	19	*5.14*	17	*4.59*	27	*7.30*	38	*10.27*	45	*12.16*
No. & (%) of Signif.	Z*(q)	9	*2.43*	18	*4.86*	29	*7.84*	39	*10.54*	60	*16.22*
						50 of B-Shares					
No. & (%) of Over 1	VR(q)	28	*56.00*	28	*56.00*	29	*58.00*	33	*66.00*	35	*70.00*
No. & (%) of Signif.	Z(q)	5	*10.00*	5	*10.00*	6	*12.00*	5	*10.00*	7	*14.00*
No. & (%) of Signif.	Z*(q)	3	*6.00*	3	*6.00*	6	*12.00*	7	*14.00*	7	*14.00*
						420 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	247	*58.81*	188	*44.76*	187	*44.52*	171	*40.71*	178	*42.38*
No. & (%) of Signif.	Z(q)	24	*5.71*	22	*5.24*	33	*7.86*	43	*10.24*	52	*12.38*
No. & (%) of Signif.	Z*(q)	12	*2.86*	21	*5.00*	35	*8.33*	46	*10.95*	67	*15.95*
Panel C: Monthly Returns											
						272 of A-Shares					
No. & (%) of Over 1	VR(q)	81	*29.78*	75	*27.57*	91	*33.46*	76	*27.94*	54	*19.85*
No. & (%) of Signif.	Z(q)	26	*9.56*	31	*11.40*	30	*11.03*	39	*14.34*	40	*14.71*
No. & (%) of Signif.	Z*(q)	12	*4.41*	20	*7.35*	34	*12.50*	42	*15.44*	44	*16.18*
						42 of B-Shares					
No. & (%) of Over 1	VR(q)	25	*59.52*	26	*61.90*	29	*69.05*	29	*69.05*	28	*66.67*
No. & (%) of Signif.	Z(q)	3	*7.14*	1	*2.38*	6	*14.29*	6	*14.29*	7	*16.67*
No. & (%) of Signif.	Z*(q)	4	*9.52*	6	*14.29*	7	*16.67*	9	*21.43*	8	*19.05*
						314 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	106	*33.76*	101	*32.17*	120	*38.22*	105	*33.44*	82	*26.11*
No. & (%) of Signif.	Z(q)	29	*9.24*	32	*10.19*	36	*11.46*	45	*14.33*	47	*14.97*
No. & (%) of Signif.	Z*(q)	16	*5.10*	26	*8.28*	41	*13.06*	51	*16.24*	52	*16.56*

Notes: 1. VR (q) is the variance ratio; q is the interval of the observations.

2. Z (q) is distributed as a standard normal under the assumption of homoscedasticity.

3. Z*(q) is distributed as a standard normal under the assumption of heteroscedasticity.

4. 'No. & (%) of Over 1' indicates the number and percentage of the shares that the estimate of the variance ratio is larger than one in that interval.

5. 'No. & (%) of Signif.' indicates the number and percentage of the shares that the statistic of the variance ratio test rejects the null hypothesis at the 1% or 5% significance level.

Table 5-15. Summary of Variance Ratio Tests for Intervals 2, 4, 8, 12 and 16 on the Individual Shares of the Shenzhen Stock Market

Intervals		q=2		q=4		q=8		q=12		q=16	
PANEL A:	***Daily Returns***										
						345 of A-Shares					
No. & (%) of Over 1	VR(q)	207	*60.00*	217	*62.90*	237	*68.70*	215	*62.32*	202	*58.55*
No. & (%) of Signif.	Z(q)	56	*16.23*	59	*17.10*	60	*17.39*	37	*10.72*	35	*10.14*
No. & (%) of Signif.	Z*(q)	15	*4.35*	23	*6.67*	22	*6.38*	16	*4.64*	24	*6.96*
						48 of B-Shares					
No. & (%) of Over 1	VR(q)	29	*60.42*	27	*56.25*	23	*47.92*	20	*41.67*	19	*39.58*
No. & (%) of Signif.	Z(q)	26	*54.17*	23	*47.92*	26	*54.17*	20	*41.67*	19	*39.58*
No. & (%) of Signif.	Z*(q)	7	*14.58*	7	*14.58*	5	*10.42*	4	*8.33*	3	*6.25*
						393 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	236	*60.05*	244	*62.09*	260	*66.16*	235	*59.80*	221	*56.23*
No. & (%) of Signif.	Z(q)	82	*20.87*	82	*20.87*	86	*21.88*	57	*14.50*	54	*13.74*
No. & (%) of Signif.	Z*(q)	22	*5.60*	30	*7.63*	27	*6.87*	20	*5.09*	27	*6.87*
Panel B:	***Weekly Returns***										
						345 of A-Shares					
No. & (%) of Over 1	VR(q)	263	*76.23*	227	*65.8*	207	*60*	172	*49.86*	194	*56.23*
No. & (%) of Signif.	Z(q)	34	*9.86*	39	*11.3*	43	*12.46*	38	*11.01*	52	*15.07*
No. & (%) of Signif.	Z*(q)	24	*6.96*	41	*11.88*	41	*11.88*	43	*12.46*	62	*17.97*
						48 of B-Shares					
No. & (%) of Over 1	VR(q)	30	*62.5*	19	*39.58*	19	*39.58*	30	*62.5*	29	*60.42*
No. & (%) of Signif.	Z(q)	8	*16.67*	3	*6.25*	3	*6.25*	3	*6.25*	6	*12.5*
No. & (%) of Signif.	Z*(q)	1	*2.08*	1	*2.08*	0	*0.00*	1	*2.08*	7	*14.58*
						393 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	293	*74.55*	246	*62.60*	226	*57.51*	202	*51.40*	223	*56.74*
No. & (%) of Signif.	Z(q)	42	*10.69*	42	*10.69*	46	*11.70*	41	*10.43*	58	*14.76*
No. & (%) of Signif.	Z*(q)	25	*6.36*	42	*10.69*	41	*10.43*	44	*11.20*	69	*17.56*
Panel C:	***Monthly Returns***										
						203 of A-Shares					
No. & (%) of Over 1	VR(q)	98	*48.28*	86	*42.36*	132	*65.02*	113	*55.67*	110	*54.19*
No. & (%) of Signif.	Z(q)	7	*3.45*	9	*4.43*	21	*10.345*	25	*12.315*	26	*12.808*
No. & (%) of Signif.	Z*(q)	7	*3.45*	12	*5.91*	24	*11.823*	28	*13.793*	33	*16.256*
						40 of B-Shares					
No. & (%) of Over 1	VR(q)	24	*60.00*	28	*70.00*	34	*85.00*	36	*90.00*	28	*70.00*
No. & (%) of Signif.	Z(q)	1	*2.50*	5	*12.50*	6	*15.00*	7	*17.50*	8	*20.00*
No. & (%) of Signif.	Z*(q)	5	*12.50*	6	*15.00*	7	*17.50*	8	*20.00*	10	*25.00*
						243 A-Shares and B-Shares					
No. & (%) of Over 1	VR(q)	122	*50.21*	114	*46.91*	166	*68.31*	149	*61.32*	138	*56.79*
No. & (%) of Signif.	Z(q)	8	*3.29*	16	*6.58*	27	*11.111*	32	*13.169*	34	*13.992*
No. & (%) of Signif.	Z*(q)	12	*4.94*	20	*8.23*	31	*12.757*	36	*14.815*	43	*17.695*

Notes: 1. VR (q) is the variance ratio; q is the interval of the observations.

2. Z (q) is distributed as a standard normal under the assumption of homoscedasticity.

3. Z*(q) is distributed as a standard normal under the assumption of heteroscedasticity.

4. 'No. & (%) of Over 1' indicates the number and percentage of the shares that the estimate of the variance ratio is larger than one in that interval.

5. 'No. & (%) of Signif.' indicates the number and percentage of the shares that the statistic of the variance ratio test rejects the null hypothesis at the 1% or 5% significance level.

The percentage of statistically significant $Z(q)$ statistics on the B-shares are triple those of the A-shares, while the percentage of statistically significant $Z^*(q)$ statistics on the B-shares are double those of A-shares. Hence, that the daily returns in individual B-shares are more highly correlated. This is evident in all three of the serial correlation test, runs test and variance ratio test, illustrating the inefficient B-shares market. Next, a considerable difference exists between the percentage of statistically significant $Z(q)$ and the equivalent percentage of statistically significant $Z^*(q)$. This difference has already been found in the variance ratio tests on returns in indices, but they are relatively smaller. Nevertheless, the rejection of the null by some individual shares is partially due to heteroscedasticity of daily returns.

Recall that in the serial correlation coefficient and runs tests, the percentage of the shares that reject the null hypothesis is larger in the Shanghai market than in the Shenzhen market. Unexpectedly, in the variance ratio test, the percentage of the shares that reject null hypothesis is apparently larger in the Shenzhen market than in the Shanghai market. In addition, the percentage of the individual shares that have variance ratios greater than one in each interval of q in the Shenzhen market is greater than the corresponding percentage in the Shanghai market. As a consequence, the daily returns in individual shares fluctuate slightly more strongly in the Shenzhen market than in the Shanghai market. This phenomenon has also appeared in the variance ratio tests on weekly and monthly returns in sector indices.

5.4.3.2 Variance ratio tests on weekly and monthly returns in individual shares of the Shanghai and Shenzhen markets

Panel-B of Tables 5-14 and 5-15 report that less than 15% of individual shares, which have the statistically significant test-statistics of variance ratios on weekly returns for different intervals, reject the null hypothesis. Thus, the weekly behaviour of individual shares should be regarded as consistent with the random walk hypothesis. The uncorrelated weekly return pattern in individual shares has been confirmed by the serial correlation coefficient tests and runs tests. Moreover the small differences between the values of $Z(q)$ and $Z^*(q)$ imply that the heteroscedasticity of weekly returns on individual shares have little effect in the determination of variance ratios.

In Panel-C of Tables 4-14 and 4-15, the percentages of individual shares that have statistically significant test-statistics of variance ratios for monthly returns are slightly larger than that in Panel-B for weekly returns. However, the percentages of rejections are still under 20%. Following the serial correlation coefficient tests and runs tests, the variance ratio tests provide the evidence again that the monthly price behaviour of China's individual shares obey the random walk.

5.5 Conclusion

This chapter has comprehensively tested the random walk hypothesis to determine the validity of weak form efficiency for both the Shanghai and Shenzhen markets. The serial correlation coefficient test, runs test and variance ratio test have been applied to data on the daily returns, weekly returns and monthly returns. Also, each test has been conducted on the returns in the three main indices, sector indices and individual share prices. The abundant results detailed in each section of this chapter are briefly summarised in Table 5-16. The symbol "N" in a cell in the table denotes evidence against the random walk hypothesis, which is given under the following conditions: When the test is on an index, the test-statistic rejects the null hypothesis at the 5% level of significance. When the test is on sector indices or individual share prices, the test-statistics of more than 30.00% (a little lower than 36.36%, Fama 1965) sector indices or individual shares reject the null hypothesis at the 5% level of significance. The symbol "P" in a cell denotes positive evidence in favour of the random walk hypothesis, which also indicates the absence of evidence against the hypothesis.

Several features of the tests of this chapter can be deduced from Table 5-16. Firstly, the daily returns in the three main indices of the Shanghai and Shenzhen markets (SSE, SSE-A, SSE-B, SZS, SZS-A and SZS-B) are highly correlated. The weekly returns and monthly returns in the three main indices are correlated as well, but not as significantly as the daily returns. Secondly, the returns in the sector indices of Shanghai and Shenzhen markets are correlated, but the correlation of returns in sector indices are weaker than that present in the three main indices. Thirdly, the daily behaviour of individual A-shares and B-shares prices of the Shanghai market and the daily behaviour of individual B-shares prices of the Shenzhen market did not follow a random walk. Finally, the behaviour of B-shares exhibits more violation of random walk than that of A-shares. The returns of individual A-shares of the Shanghai market seem more correlated than that of the Shenzhen market.

Table 5-16. Brief Conclusions of the Serial Correlation Coefficient Tests, Runs Tests and Variance Ratio Tests on the Shanghai and Shenzhen Markets

Market	Category	Shares	Serial Correlation Coefficient Tests			Runs Tests			Variance Ratio Tests		
			Daily-Returns	Weekly-Returns	Monthly-Returns	Daily-Returns	Weekly-Returns	Monthly-Returns	Daily-Returns	Weekly-Returns	Monthly-Returns
Shanghai Market	*Three Main Indices*	A-shares	N	P	N	N	N	P	N	P	P
		B-shares	N	N	N	N	N	P	N	N	P
		Overall	N	P	N	N	N	P	N	P	P
	Sector Indices		N	P	N	N	N	P	N	P	P
	Individual Shares	A-shares	N	P	P	N	P	P	P	P	P
		B-shares	N	P	P	N	P	P	N	P	P
		Overall	N	P	P	N	P	P	P	P	P
Shenzhen Market	*Three Main Indices*	A-shares	N	P	P	N	N	P	N	P	N
		B-shares	N	N	P	N	N	P	N	N	N
		Overall	N	N	N	N	N	P	N	N	N
	Sector Indices		N	P	P	P	P	P	P	P	N
	Individual Shares	A-shares	P	P	P	P	P	P	P	P	P
		B-shares	N	P	P	N	P	P	N	P	P
		Overall	P	P	P	P	P	P	P	P	P

Notes: 1. 'N' represents the statistic or evidence against the random walk hypothesis.
2. 'P' represents the statistic or evidence that supports the random walk hypothesis.
3. The standard in definitions of 'N' in the tests of sector indices and individual shares is that 30% of individual shares or sector indices with the statistics reject the null hypothesis at the 5% level of significance, which is referenced from Fama (1965) 11/30 (36.36%).

Empirical results reported in Table 5-16 substantiate that the three tests (serial correlation coefficient test, runs test and variance ratio test) are not completely consistent in rejection or acceptance of the null hypothesis. The daily, weekly and monthly behaviour of stock prices vary remarkably. The properties of the returns in indices and in individual stock price data are different. Therefore, this comprehensive analysis avoids a distorted view that may occur when only one model is used on a particular type of data. However, the comprehensive analysis still gives rise to a discussion in classifying the market as being efficient or not due the many assort statistics.

Fama (1965) pointed out that using market index data in a random walk test might lead to a false perception of price change dependence even when price changes of individual shares represented by the index are independent. This spurious dependence comes from the persistence effect on stocks of not trading coincidentally, i.e. a thin market. Nevertheless, we conclude that China's stock markets are not weak form efficient. The following arguments support that interpretation. Firstly, market efficiency relies on information being available to be used to predict future prices and earn abnormal returns. The correlated return patterns in indices can be employed in prediction of stock price change, particularly for institutional traders who control ample capital to organise portfolio trading. Secondly, the correlated return pattern of individual B-shares means that future prices are predictable. Even the correlated return pattern of individual B-shares results from a "thin" market, the "thin" market is also a characteristic of an inefficient market (Butler and Malaikah 1992). Thirdly, the criterion of 36.36% set by Fama (1965) 35 years ago may not be reasonable today. In the modern market where information is communicated rapidly, the market predictability has been improved with the update methodologies. This criterion should be lowed to 15%, at least, 30% applied in this study is still high.

Chapter 6 Tests of Seasonality: Results and Analysis

6.1 Introduction

The EMH suggests that the stock prices in an efficient market should not display any regular pattern. Where the pattern is regular and reliable, this degree of predicability can be taken advantage of by investors to form a strategy to obtain abnormal returns. However, the findings of stock return anomalies in the studies beginning in the 1980s have challenged the EMH. Perhaps the most enduring anomalies are seasonalities (calendar effects) that are specified as the "day-of-the-week effects," "month-of-the-year effects (January effect)" and "holiday effects."

Cross (1973), French (1980) and Gibbons and Hess (1981) indicated that the mean return on Mondays is significantly negative and low on the U.S. stock market. Ball and Bowers (1988) showed that the Australian stock market has its lowest mean return on Tuesdays. Jaffe and Westerfield (1985) and Condoyanni *et al* (1988) demonstrated that mean returns on Mondays are the lowest on the U.S. and some other American and European markets, but on Tuesdays are the lowest on the Australian and Japanese and some other Asian markets. Rozeff and Kinney (1976) and some other researchers illustrated high January returns on the U.S. stock market. Reinganum and Shapiro (1987) showed that the high returns coexist in January and April on the London stock market. Gultekin and Gultekin (1983) produced evidence of high January returns on 16 stock markets. Lakonishok and Smidt (1988) and Ariel (1990) provided evidence of high returns occurring on the trading days before holidays.[1,2]

According to the EMH, if there were a regular return pattern, the investors would quickly move to exploit this pattern, whereafter the pattern would not be present. However, the regular seasonal return patterns have persisted widely in stock markets. To explain the existence of anomalies, several hypotheses have been put forward in previous studies. For example, the time zone hypothesis, the closed-market hypothesis, the settlement procedure hypothesis, the tax-loss-selling pressure hypothesis, the institutional trading hypothesis and so forth. Nonetheless, there is hardly any hypothesis that is generally appropriate for all stock markets.

China's stock markets have been opened for only about ten years. Do the seasonal regular return patterns exist on China's stock markets? Do China's stock markets exhibit the same return patterns as are present in other stock markets? Are the return patterns similar on the Shanghai and Shenzhen markets, for the A-shares and B-shares? What hypotheses are applicable to China' stock markets? Each of these questions will be addressed in this Chapter. Thus, besides the introduction section, Section 6.2 presents the day-of-the-week effect tests on the Shanghai and Shenzhen stock markets. Section 6.3 presents the month-of-the-year effect tests on the two markets. Section 6.4 discusses the holiday effect tests. Section 6.5 summarises the whole chapter.

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[1] Mookerjee and Yu (1999) tested the seasonality of China' stock markets using only the Shanghai and Shenzhen market indices (SSE and SZS) for a period from December 1990 to December 1993. Their results rested on short periods of data. For example, they stated that the January effect of the Shanghai market was not significant before the abolishment of price-limitation in 21 May 1992, but significant after that day. However, there were only two Januaries in the first sub-period from December 1990 to 21 May 1992, and one January in the second sub-period from 21 May 1992 to December 1993.

[2] Xu (1996), using a shorter data set, tested seasonal volatility of China's stock markets for the periods from January 1993 to December 1995 for four indices or from June 1992 to June 1994 for seven individual shares. He showed the volatility of returns is different on the days of the week.

However, we have to stress, in advance, that some test-statistics on the seasonal effects of China's stock markets are not as statistically significant as those of some markets of other countries, but there remains some statistically significant evidence of abnormal returns. Throughout the chapter it is noted that although an investor cannot be certain of repeatedly obtaining abnormal profits when the *t*-statistics are insignificant, it is the case that the investor could have made an abnormal profit for this particular sample of data. It is in this sense that we mean "economically significant." The primary role of this chapter is to provide an initial picture of the seasonal return patterns of China's stock markets, which, at least, is a benchmark for further study.[3]

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[3] One of the reasons that the seasonal effects of China's stock markets are not as statistically significant as those of some other markets comes from the short data time series employed in this study. The longest data time series in this study covers about seven years. Most of the available data time series are less than 5 years. The determination of length of data time series in the degree of significance of the tests statistic can be shown in the following *t*-statistic and *F*-statistic formulas:

$$t = \frac{\hat{\beta}-\beta}{se(\hat{\beta})} = \frac{\hat{\beta}-\beta}{\sqrt{(\sum \hat{u}^2/(n-2))/\sum X_i^2}} \quad ; \quad \beta = \frac{\sum (X_i-\overline{X})(Y_i-\overline{Y})}{\sum (X_i - X)^2},$$

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)} \quad ; \quad R^2 = \frac{(\sum (X_i-\overline{X})(Y_i-\overline{Y}))^2}{\sum (X_i-\overline{X})^2 \sum (Y_i-\overline{Y})^2}.$$

We assume that the periods of time series X_i and Y_i are doubled with another five years, and all of the observations in the first five years are replicated in the second five years. Thus there are no changes in the numerators of *t*-statistic and *F*-statistic. The changes in the denominators of *t*-statistic and *F*-statistic are only determined by observation number *n*. Therefore, the magnitudes of *t*-statistic and *F*-statistic almost double. In a dummy variable model with zero intercept for the seasonal effect test, $\hat{\beta}$ is the actual mean return of a specific day, β is the expectation of $\hat{\beta}$. β and $\hat{\beta}$ will not change if we double the sample size by using the same sample twice. Even if the difference between β and $\hat{\beta}$ is small and close to zero, if the sample size, *n*, is quit large, the *t*-statistic and *F*-statistic may exceed the critical values at conventional levels of significance. In contrast, if the observation period is short, even if the difference between β and $\hat{\beta}$ is relatively large, the *t*-statistic and *F*-statistic may still be less than the critical values.

The prior discussion may explain why some of the seasonal effects of China's stock markets are statistically insignificant, but "economically significant." For example, in Table 6-2 and as described on page 214, if we buy SSE-A on Tuesday and sell it on Wednesday, after considering the transaction fee and average daily return for the week we get an abnormal return 0.00312-(-0.00328)-0.003-0.00051=0.00289, but the *t*-statistics are statistically insignificant. (This means that the investor would have earned abnormal profits for this sample of data, but we would not be confident that this trading strategy would always work). The prior discussion also probably illustrates why some of the seasonal effects of other markets are statistically significant and "economically insignificant." For example, in Table 6-3, if we buy Nikkei Dow on Tuesday and sell it on Wednesday, after considering the transaction fee (assumed the same as in China) and average daily return for the week we get an abnormal return: 0.00139-(-0.00095)-0.003-0.0004=-0.00106, but the *t*-statistics are statistically significant.

6.2 Day-of-the-week effect tests for the Shanghai and Shenzhen markets

In an efficient market, there should not exist a regular return pattern that can be used to obtain abnormal returns. However, many studies have previously indicated that the mean return varies according to the day of the week suggesting that the day-of-the-week effects exist in most markets of the world. The regular day-of-the-week return patterns of the Shanghai and Shenzhen stock markets have also been found in this study. Even though some of the test-statistics are not statistically significant, they are "economically significant;" abnormal returns can be obtained by trading according to the regular return pattern for this particular sample of data.

6.2.1 Characteristics of day-of-the-week effects in the Shanghai and Shenzhen markets

The tests of day-of-the-week effects are initially conducted on the three main indices of the Shanghai and Shenzhen markets. As previously described, the SSE-A, SSE-B and SSE aggregate the price behaviour of the A-shares, B-shares and all shares respectively for the Shanghai market. The SZS-A, SZS-B and SZS aggregate the price behaviour of the A-share, B-shares and all shares respectively, for the Shenzhen market. To facilitate the analysis of comparison between the A-shares and B-shares, the test period of the Shanghai market is selected from February 1992 to April 1998 in

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The other reason that the seasonal effects of China's stock markets are not as statistically significant as those of some other markets is that in the first several years after China's stock markets opened, the institutional regulation and market microstructure changed frequently. The effects of market management activities have doubtless diluted the testability of the seasonal effects.

line with the available data series of the SSE-B. Meanwhile, the test period of the Shenzhen market is from October 1992 to April 1998 in line with the available data series of the SZS-B. The additional benefit in testing the day-of-the-week effects starting from February 1992 is to avoid dealing with the confusion of six trading days a week before January 1992 and five trading days after February 1992 in the Shanghai market.

Table 6-1 (and appendix Figure A-1) reports the results of the tests on the three main indices of the Shanghai and Shenzhen markets. Panel-A presents the mean returns across every weekday and the associated *t*-statistics, standard deviations, observation numbers and the *F*-statistics for the Shanghai market. Panel-B presents the equivalent components for the Shenzhen market.

Two notable patterns of day-of-the-week effects can be found on the Shanghai and Shenzhen markets. First of all, the day-of-the-week effects of A-shares differ from the that of B-shares for both the Shanghai and Shenzhen markets. The negative returns of the A-shares of the two markets usually occur on Mondays, Tuesdays or Thursdays. The negative returns of the B-shares of the two markets usually occur on Tuesdays, Wednesdays and Thursdays successively. However, the only significant (at 5% level or better) mean returns are on Fridays for the SSE-A and SSE and on Thursdays for the SSE-B. Furthermore, the day-of-the-week effects in the Shanghai market are more apparent than that of the Shenzhen market. For example, the *F*-statistics of 2.30595 for the SSE-A, 1.57364 for the SSE-B and 2.28225 for the SSE are comparatively larger than 0.9725 for the SZS-A, 0.88539 for the SZS-B and 0.74012 for the SZS. In particular, the *F*-statistics for the SSE-A and SSE imply that the mean returns of the

A-shares and overall shares of the Shanghai market differ over the five weekdays at the 5% significance level.

Table 6-1. Average Daily Returns of the Weeks on the Shanghai and Shenzhen Markets (I)

	Mon.	Tue.	Wed.	Thu.	Fri.	All Days	F-stat.
PANEL-A: Shanghai Market							
	SSE-A (February 1992 - April 1998)						
Mean Return	-0.00131	-0.00440	0.00220	0.00226	0.00584	0.00092	*2.30595
t-statistics	-0.57003	-1.91860	0.95831	0.98807	*2.53362		
Standard Deviation	0.04176	0.03225	0.03698	0.05496	0.03179	0.04057	
Observations	308	311	312	312	308	1551	
	SSE-B (February 1992 - April 1998)						
Mean Return	0.00016	-0.00150	-0.00132	-0.00234	0.00191	-0.00062	1.57364
t-statistics	0.13757	-1.25583	-1.10826	*-1.96797	1.59455		
Standard Deviation	0.02203	0.02081	0.01940	0.02135	0.02155	0.02107	
Observations	308	312	313	312	308	1553	
	SSE (February 1992 - April 1998)						
Mean Return	-0.00110	-0.00428	0.00204	0.00216	0.00551	0.00086	*2.28225
t-statistics	-0.50078	-1.95702	0.93358	0.98735	*2.50014		
Standard Deviation	0.03992	0.03071	0.03467	0.05281	0.03051	0.03873	
Observations	308	312	313	312	308	1553	
PANEL-B: Shenzhen Market							
	SSZ-A (October 1992 - April 1998)						
Mean Return	-0.00005	-0.00208	0.00157	-0.00067	0.00318	0.00039	0.97525
t-statistics	-0.02451	-1.13914	0.85771	-0.36707	1.72002		
Standard Deviation	0.03802	0.02870	0.02793	0.02946	0.02689	0.03048	
Observations	274	279	278	279	272	1382	
	SSZ-B (October 1992 - April 1998)						
Mean Return	0.00079	-0.00199	-0.00184	-0.00185	0.00116	-0.00074	0.33145
t-statistics	0.52769	-1.32970	-1.23353	-1.23851	0.77124		
Standard Deviation	0.03281	0.02057	0.02194	0.02199	0.02553	0.02493	
Observations	274	278	278	279	274	1383	
	SSZ (October 1992 - April 1998)						
Mean Return	0.00032	-0.00204	0.00108	-0.00008	0.00242	0.00034	0.74012
t-statistics	0.18804	-1.20640	0.63889	-0.04861	1.42594		
Standard Deviation	0.03491	0.02683	0.02492	0.02763	0.02515	0.02812	
Observations	274	279	278	278	274	1383	

Notes: 1. *t*-statistics test the null hypothesis that the mean return is equal to zero.

2. *F*-statistics test the null hypothesis that the mean returns are equal across all five days of the week.

3. '*', '**' indicate rejections of the null hypothesis at the 5% or 1% significance level, respectively.

The studies of French (1980) and Gibbons and Hess (1981) showed that the day-of-the-week effects were not constant across years due to the influence of extreme events. The instability of day-of-the-week effects has been detected for the A-shares of both the Shanghai and Shenzhen markets, but not for the B-shares. Table 6-2 illustrates simply the mean returns on each weekday in the relatively short period from January 1994 to April 1998. The day-of-the-week effects for the B-shares for the two markets in the period from 1994 to 1998 are almost consistent with that in the period from 1992 to 1998, in that the mean returns on Mondays and Fridays are positive and the mean returns on Tuesdays, Wednesdays and Thursdays are negative. On the other hand, the day-of-the-week effects for the A-shares of the two markets in the period from 1994 to 1998 vary in pattern from that in the period from 1992 to 1998. The A-shares have positive average Monday return in the relatively short period compared with a negative average Monday return in the longer period. Since the A-shares account for about 95% of the shares in the market, the day-of-the-week effects of the SSE and SSZ basically exhibit the same pattern as for the SSE-A and SSZ-A in the two periods. In addition, in the shorter period, the mean returns are not significant for the SSE-A, SSE-B and SSE, but are for the SZS-A on Fridays.

Table 6-2 also reports the day-of-the-week effects exhibited in the sector indices of the Shanghai market for the period from August 1993 to April 1998 and of the Shenzhen market for the period from July 1994 to April 1998. Table 6-2 shows the day-of-the-week effects are nearly consistent in pattern across the shares in the different industrial categories. All the sector indices of the Shanghai and Shenzhen markets have positive returns on Mondays, Wednesdays and Fridays, and negative returns on Tuesdays and Thursdays. In particular, the returns on Fridays for the sectors of Manufacturing and

Financial of the Shenzhen markets are significant positive. The F-statistics reject the null hypothesis that the mean returns are equal on weekdays for the sectors of Conglomerate of the Shenzhen market.

Table 6-2. Average Daily Returns of the Weeks on the Shanghai and Shenzhen Markets (II)

	Mon.	Tue.	Wed.	Thu.	Fri.	All Days	F-stat.
PANEL-A: Shanghai Market							
	(January 1994 - April 1998)						
SSE-A	0.00158	-0.00328	0.00312	-0.00263	0.00375	0.00051	1.77026
SSE-B	0.00006	-0.00146	-0.00030	-0.00205	0.00016	-0.00072	0.42153
SSE	0.00153	-0.00343	0.00311	-0.00248	0.00362	0.00047	1.87394
	(August 1993 - April 1998)						
Manufacturing	0.00211	-0.00328	0.00239	-0.00270	0.00217	0.00014	1.55148
Commercial	0.00172	-0.00392	0.00303	-0.00289	0.00340	0.00027	2.09942
Real Estate	0.00002	-0.00456	0.00554	-0.00095	0.00415	0.00084	1.38991
Utility	0.00107	-0.00307	0.00318	-0.00137	0.00398	0.00076	1.52030
Miscellaneous	0.00046	-0.00229	0.00339	-0.00301	0.00408	0.00052	1.71014
PANEL-B: Shenzhen Market							
	(January 1994 - April 1998)						
SZS-A	0.00136	-0.00206	0.00224	-0.00221	*0.00413	0.00069	1.39895
SZS-B	0.00119	-0.00288	-0.00202	-0.00153	0.00162	-0.00072	1.64112
SZS	0.00169	-0.00214	0.00160	-0.00128	0.00317	0.00061	1.06260
	(July 1994 - April 1998)						
Manufacturing	0.00449	-0.00350	0.00379	-0.00273	*0.00487	0.00158	2.17721
Commercial	0.00347	-0.00345	0.00445	-0.00268	0.00450	0.00166	1.14790
Financial	0.00230	0.00065	0.00411	-0.00137	*0.00594	0.00233	1.19020
Property	0.00371	-0.00298	0.00260	-0.00288	0.00308	0.00071	1.33608
Utility	0.00403	-0.00287	0.00332	-0.00269	0.00415	0.00119	1.84272
Conglomerate	0.00438	-0.00157	0.00317	-0.00273	0.00457	0.00156	*2.84222

Notes: 1. t-statistics test the null hypothesis that the mean return is equal to zero.
2. F-statistics test the null hypothesis that the mean returns are equal across all five days of the week.
3. '*', '**' indicate rejections of the null hypothesis at the 5% or 1% significance level, respectively.

Nevertheless, despite the slight difference in the day-of-the-week effects between the two periods, the common feature of day-of-the-week effects on the Shanghai and Shenzhen markets remains approximately unchanged. The mean returns on Tuesdays are negative and the negative mean Tuesday returns are usually the lowest mean returns of the week. Whereas the mean returns on Fridays are positive, the highest returns of the week.

It must be emphasised again that a large portion of t-statistics and F-statistics is not statistically significant. Even so, some of them are "economically significant;" abnormal returns could be generated through a strategy related to the day-of-the-week return patterns of the Shanghai and Shenzhen markets for this particular sample of data. For example, by citing the data in the first line in Table 6-2, if a trader buys a portfolio in line with the share structure of the SSE-A on Tuesday and sells this portfolio on Wednesday, after subtracting commission fee and average daily return for the week, the trader, possibly, could get an abnormal return: 0.00312-(-0.00328)-0.003-0.00051=0.00289. The figures 0.00312 and -0.00328 are the mean returns on Wednesdays and Tuesdays. 0.00051 is the average daily return over the week; 0.003 is the commission fee for dual trading.

6.2.2 Day-of-the-week effects in the Shanghai and Shenzhen markets: a comparison with foreign markets

A majority of studies have found the day-of-the-week effects in stock markets. Further research shows that the day-of-the-week effects in some markets have a specific pattern. Cross (1973) studied the returns on the S&P 500 index over the period from 1953 to 1970. He stated that the negative mean return of -0.0018 on Mondays is the lowest mean return among the weekdays, and the positive mean return of 0.0012 on Fridays is the highest mean return. French (1980) demonstrated again, by testing S&P 500 index over a slightly longer period from 1953 to 1977, that the average return on

Mondays is significantly negative and lower than the average returns on the other weekdays. Gibbons and Hess (1981) confirmed French's findings and these findings are further supported by a series of studies.

Jaffe and Westerfield (1985) found that the day-of-week effects in the stock markets of the U.K., Canada, Japan and Australia display different patterns. Like in the U.S. market, the average returns of Canadian and the U.K. markets are both negative on Mondays and the negative average Monday return is the lowest return of the week. Unlike the U.S. market, the Australian and Japanese markets have their lowest negative average returns on Tuesdays. This return pattern for the Australian market was confirmed by Ball and Bowers (1988). However, they stressed that the highest positive return in the Australian market occurs on Thursday instead of Friday.

The international evidence for the day-of-the-week effects by Condoyanni *et al* (1988) supported the findings of Jaffe and Westerfield (1985). They detailed again that the U.S., Canadian and U.K. markets have their lowest and negative returns on Mondays, meanwhile the Australian, French and Japanese markets have their lowest and negative returns on Tuesdays. In an investigation on the emerging markets of Asia, Wong *et al* (1992) indicated that like the U.S. and Canadian markets, the Singaporean, Malaysian, and Hong Kong markets have their lowest negative returns on Mondays, while Thailand has its lowest negative return on Tuesdays, which is more like the pattern for the Australian and Japanese Markets.

A large battery of international evidence on the day-of-the-week effects was given by Agrawal and Tandon (1994). In their study of 18 different countries' markets, they found that the mean Friday returns are large and significantly positive in almost all markets, which is consistent with the evidence in the previous studies. For Mondays, thirteen markets exhibit negative mean returns, of which seven are statistically significant at the 10% level or less. Tuesday returns are negative in twelve markets and eight of them are significant at the 10% level or better.

According to the previous studies, the day-of-the-week effects for the markets referred to above are sorted into three categories as outlined in Table 6-3: The United States and United Kingdom (U-U) pattern, the Australian and Japanese (A-J) pattern and the "other" pattern. The U-U pattern is classified as the negative Monday return being the lowest return of the week. The A-J pattern is classified as the negative Tuesday return being the lowest of the week. When the returns on Mondays and Tuesdays are both positive, then that market falls in the "other" pattern. Table 6-3 shows that mean returns and statistics derived for the different periods on the same market may be different across periods, but can be usually described as having the same pattern. Further, regardless of a market's category, positive Friday returns are across all of the markets (or tests), and the majority of the Friday returns of these markets are also the highest return of the week. With the exception of the small negative Wednesday return in SET of Luxembourg and negative Thursday returns in SESI of Singapore, Wednesday and Thursday returns are positive throughout the every market.

The day-of-the-week effects of the Shanghai and Shenzhen markets follow a pattern similar to that found in the A-J category: the negative Tuesday returns dominate both markets and are usually the lowest return of the week in a majority of the indices.

Table 6-3. Average Daily Return of the Week on World Stock Markets

Country	Index	Period	Mon.	Tue.	Wed.	Thu.	Fri.	Average
PANEL-A: United States and United Kindom Pattern (U-U)								
U. S[a].	S&P 500	1962-1983	**-0.00126	0.00017	0.00107	0.00028	**0.00082	0.00023
U.S[c].	DJIA	1969-1984	**-0.00134	0.00013	0.00057	0.00210	0.00058	0.00041
U.K.[d]	FT All Shares	1963-1987	**-0.00165	**0.00138	*0.00073	0.00018	**0.00110	0.00037
U. K[c].	FT All Shares	1969-1984	*-0.00950	**0.00106	*0.00090	0.00011	0.00044	-0.00140
U. K[a].	LSE	1950-1983	**-0,00142	0.00087	0.00079	0.00046	0.00060	0.00028
Switzerland[d]	SBCI	1963-1988	**-0.00082	**-0.00066	**0.00061	*0.00057	**0.00107	0.00016
Singapore[d]	Straits Times	1973-1987	-0.00047	-0.00023	*0.00085	0.00063	**0.00133	0.00043
Singapore[b]	OCBC	1975-1988	-0.00050	-0.00030	*0.00100	0.00040	*0.00200	0.00052
Singapore[b]	SES	1975-1988	-0.00030	0.00120	*0,00080	-0.00010	*0,00100	0.00027
Mexico[d]	Bolsa	1977-1988	-0.00028	0.00008	**0.00319	**0.00410	**0.00578	0.00255
Malaysia[b]	KL I&C	1975-1988	-0.00100	-0.00090	0.00100	*0,00160	*0,00150	-0.00030
Italy[d]	Banca Comm	1970-1987	-0.00044	*0.00102	0.00113	**0.00135	**0.00178	0.00056
HongKong[b]	Hang Seng	1975-1988	-0.00090	0.00050	0,00170	0.00060	*0.00510	0.00133
Hong Kong[d]	Hang Seng	1973-1987	-0.00088	*-0.00157	*0.00173	0.00092	*0.00176	0.00041
Germany[d]	FAZ Atkien	1971-1987[f]	-0.00078	-0.00017	*0.00086	*0.00091	*0.00101	0.00037
Denmark[d]	Copenhagen	1973-1987	*-0.00062	-0.00023	**0.00081	0.00055	*0.00062	0.00023
Canada[d]	Tornoto	1976-1987	**-0.00134	0.00026	**0.00109	**0.00106	**0.00131	0.00051
Canada[c]	Toronto	1969-1984	**-0.00157	-0.00003	*0.00073	*0.00075	**0.00094	0.00016
Canada[a]	Toronto	1976-1983	**-0,00139	0.00022	0.00115	0.00106	**0,00139	0.00052
Brazil[d]	Rio de Janeiro	1972-1988	*-0.00189	0.00083	**0.00625	**0.00427	**0.00615	0.00312
PANEL-B: Australian and Japanese Pattern (A-J)								
Australia[d]	All Ordinary	1972-1988	-0.00056	**-0.00098	0.00060	**0.00153	**0.00137	0.00041
Australia[a]	All Ordinary	1973-1983	-0.00052	**-0.00133	0.00037	**0.00166	**0.00130	0.00032
Australia[e]	All Ordinary	1974-1984	-0.00007	**-0,00152	0.00053	**0.00191	**0,00161	0.00021
Australia[c]	All Ordinary	1969-1984	-0.00049	**-0.00200	0.00040	0.00017	*0.00163	-0.00006
Belgium[d]	Belgium SE	1972-1988	*0.00052	**-0.00072	0.00032	**0.00069	**0.00090	0.00033
France[c]	CAC Genaral	1969-1984	-0.00050	**-0.00157	*0.00100	**0.00152	*0.00087	0.00026
France[d].	CAC Genaral	1971-1987[f]	0.00044	**-0.00116	**0.00128	*0.00094	*0.00087	0.00048
Japan[a]	Nikkei Dow	1970-1983	-0.00020	**-0,00090	0.00015	0.00026	*0.00063	0.00038
Japan[c]	NSE	1969-1984	**0.00090	**-0.00095	**0.00139	0.00025	0.00039	0.00040
Japan[d]	Nikkei Dow	1970-1987	-0.00005	**-0.00084	**0.00164	0.00046	**0.00078	0.00053
Netherlands[d]	ANP-CPS	1971-1987[g]	0.00006	*-0.00072	0.00006	0.00024	**0.00146	0.00019
New Zeland	BBI	1966-1988	**0.00089	-0.00005	0.00022	0.00022	**0.00085	0.00042
Sweden[d]	J&P	1971-1979	-0.00037	*-0.00096	0.00009	0.00073	**0.00174	0.00020
Thailand[b]	SET	1975-1988	0.00030	-0.00070	0.00040	0.00060	*0,00180	0.00015
PANEL-C: Other Pattern								
Luxembourg[d]	LSI	1977-1984	0.00001	**0.00218	-0.00054	0.00042	0.00014	0.00046
Taiwan[b]	WSI	1975-1988	0.00050	0.00100	*0,00170	0.00080	0.00090	0.00080

Notes: 1. [a]Cited from Jaffe and Westerfield (1985).
2. [b]Cited from Wong et al (1992), equal weighted average.
3. [c]Cited from Condoyanni *et al* (1988).
4. [d]Cited from Agrawal and Tandon (1994), equal weighted average.
5. [e]Cited form Ball and Bowers (1988), equal weighted average.
6. [f]Two subperiods: 1971-1974 and 1980-1987.
7. [g]Two subperiods: 1971-1979 and 1983-1987.
8. '*', '**' indicate 5% and 1% significance levels, respectively.

However, the day-of-the-week effects of the Shanghai and Shenzhen markets exhibit unique features in that the SSE-B, SZS-A, SZS-B and SZS reveal negative returns on Thursdays in the period from February 1992 to April 1998. In particular, either the three main indices or the sector indices of the two markets exhibit negative returns on Thursdays in the period from 1994 to 1998. Furthermore, the absolute values of negative returns on Mondays are smaller for SSE-A and SZS-A in the period from 1992 to 1998. Meanwhile, the negative returns become positive on Mondays in overall indices for the period from 1994 to 1998.

6.2.3 Implications and possible hypotheses of day-of-the-week effects of the Shanghai and Shenzhen markets

Why do Australia, Japan and some Pan-Pacific markets have the lowest negative returns on Tuesdays, and not on Mondays like the markets in the United States, Britain and Canada? Jaffe and Westerfield (1985) raised the time zone hypothesis that was supported by Condoyanni *et al* (1988). The time zone hypothesis maintains that New York is the financial centre of the world, and that the behaviour of the other financial markets usually reacts to the behaviour of the New York market. London is only 5 hours ahead of New York, and Canada is 1 hour behind. Therefore the trading in those markets nearly occurs during the same day. However, Sydney, Tokyo and Melbourne are 14 or 15 hours ahead, so that the Tuesday market performance in Australia and Japan are in step with the Monday market performance in America.

Shanghai and Shenzhen are 13 hours ahead of New York, nearly the same time zone as Sydney, Tokyo and Melbourne. According to the time zone hypothesis, the Tuesday market performance in China should follow the Monday market behaviour of New York. In other words, the lowest negative Tuesday returns of the Shanghai and Shenzhen markets would be a reaction to the lowest negative Monday returns in the New York market. However, as we know, the A-shares, which account for 95% of the market turnover value, are inaccessible to foreign investors and the Chinese currency is not convertible. Therefore, China's stock markets are almost closed to the world; Chinese share traders seldom consult the world markets' performance before they trade shares.

Aside from China's stock markets, the time zone hypothesis has also been a dissatisfactory explanation for some other markets. From Table 6-3 it is apparent that Hong Kong and Singapore exhibit the U-U pattern, but they are in the Pan-Pacific time zone. Meanwhile France, Belgium and Netherlands exhibit the A-J pattern, but they are in the European time zone. Thus, Wong *et al* (1992) asserted that the U.S. market makes little contribution to the day-of-the-week week effects in the markets of Singapore, Malaysia, Hong Kong and etc.

To interpret the negative Monday return and positive Friday return pattern, French (1980) set up three hypotheses: the trading time hypothesis, the calendar time hypothesis and the closed-market hypothesis. The trading time hypothesis implies that if the return generating process only occurs in trading time, the return for each day of the week would be the same. However, the existence of day-of-the-week effects in the Shanghai and Shenzhen markets illustrate uneven mean weekday returns, refuting the trading time hypothesis. For further evidence, an empirical test is designed for the SSE and SZS in the two periods from 1992 to 1998 and from 1994 to 1998. In this test, a return of a weekday is decomposed into a trading time (from market open to market close in a trading day) return and a non-trading time (from market close of previous trading day to market open of current trading day) return. If the trading time hypothesis is correct, the trading time returns should be equal when tested at the conventional levels of significance. In Table 6-4, the hypothesis of equal trading time returns is rejected by *F*-statistics in both specified periods except for the SZS in the period from 1992 to 1998. Nevertheless, the *F*-statistic of 2.14982 for the SZS in the period from 1992 to 1998 is close to the critical value of 2.26.

Table 6-4. Average Returns on Trading Time and Non-trading Time

	Mon.	Tue.	Wed.	Thu.	Fri.	Average	F-stat.
PANEL-A: Shanghai Market							
			(SSE, February 1992 - April 1998)				
Close - Close	-0.00110	-0.00428	0.00204	0.00216	*0.00551	0.00086	*2.28225
Open -Close	-0.00223	*-0.00390	0.00163	-0.00222	**0.00437	-0.00033	**3.66480
Close - Open	0.00112	-0.00038	0.00041	**0.00438	0.00113	0.00174	1.15786
			(SES, January 1994 - April 1998)				
Close - Close	0.00153	-0.00343	0.00311	-0.00248	0.00362	0.00047	1.87394
Open -Close	-0.00044	*-0.00326	0.00167	**-0.00448	**0.00502	-0.00037	**3.91437
Close - Open	0.00197	-0.00017	0.00145	0.00200	-0.00141	0.00083	1.37903
PANEL-B: Shenzhen Market							
			(SZS, October 1992 - April 1998)				
Close - Close	0.00032	-0.00204	0.00108	-0.00008	0.00242	0.00034	0.74012
Open -Close	-0.00177	-0.00133	0.00052	-0.00110	**0.00421	0.00011	2.14985
Close - Open	**0.00209	-0.00071	0.00056	0.00102	*-0.00178	0.00023	**3.07233
			(SZS, January 1994 - April 1998)				
Close - Close	0.00169	-0.00214	0.00160	-0.00128	0.00317	0.00061	1.06260
Open -Close	-0.00080	-0.00129	0.00101	-0.00236	**0.00561	0.00043	*2.91830
Close - Open	*0.00249	-0.00085	0.00060	0.00108	*-0.00244	0.00018	*2.97895

Notes: 1. *t*-statistics test the null hypothesis that the mean return is equal to zero.
2. *F*-statistics test the null hypothesis that the mean returns are equal across all five days of the week.
3. '*', '**' indicate rejections of the null hypothesis at the 5% and 1% significance levels.
4. 'Close – Close' is from market close of the previous trading day to market close of the current trading day.
5. 'Open – Close' means trading time from market open to market close of a trading day.
6. 'Close – Open' means non-trading time from market close of the previous trading day to market open of the current trading day.

The calendar time hypothesis states that if the expected return is a linear function of the calendar time, the mean return for Mondays will be three times the mean return of any other day of the week. Obviously, the calendar time hypothesis is rejected when the mean return on Mondays is negative and the average daily return for the week is positive. However, considering the positive Monday return in the Shanghai and Shenzhen markets in the period from 1994 to 1998, and the influence of uneven trading time returns illustrated above, a robust analysis is applied to non-trading time returns. If the calender time hypothesis is true, the non-trading time return of Monday (from the market close of Friday to market open of next Monday) should be at least triple the non-trading time return of the other days. Table 6-4 provides some evidence that the calendar time hypothesis exists in non-trading time. Regardless of whether average Monday returns are positive or negative, the non-trading time returns on Mondays are positive and usually several times the average non-trading time returns during the week, except for that of the SSE in the period from 1992 to 1994.

The closed-market hypothesis assumes that the prices of stocks are usually high before the market closure for more than one trading day, and are usually low after the market reopens. A possible psychological reason is that share traders have a good feeling in advance of the holiday after a period of hard work, which motivates them to purchase the shares. Thus, the increasing demand results in high prices as well as high returns before market closure on Fridays. When the market reopens, the release of unhappy emotion from new working pressure leads to the selling of shares, so that the prices decline and the returns become negative on Mondays. From the analysis of Table 6-2, the closed-market hypothesis is not favourably supported by the positive Monday returns and the negative Tuesday returns on the Shanghai and Shenzhen markets in the period from 1994 to 1998. If the closed-market hypothesis is effective and the returns are negative on Tuesdays instead of Mondays, this may be due to the presence of many long weekends which include holidays on Saturday, Sunday and Monday. But this is not the case in China.[4]

Nevertheless, the closed-market hypothesis is supported by the evidence on Table 6-4, in which the daily returns are decomposed into trading time and non-trading time returns. The phenomena of low and negative non-trading time (from Thursday market close to Friday market open) returns and significant positive trading time returns on Friday (from market open to market close on Friday) illustrates that the good feeling of share traders rise gradually in the working hours of Friday before the market closure. On the other hand, the positive non-trading time (from Friday close to Monday open) returns and negative trading time returns on Monday (from market open to market close on Monday) show that the good feeling of share traders is replaced after the market reopens. Moreover, if the closed-market hypothesis were true, it should be present in the holiday effect tests that will be detailed later in this chapter.

The most documented hypothesis to explain the day-of-the-week effects is the settlement procedure which is specific to a particular market. The settlement hypothesis refers to the fact that the transactions are settled several business days after the quote and trading. The time lag between the trading and the payment or receiving would favour trading on certain days of the week for the interest benefits. For example, under the one-day settlement procedure, an individual buying on Thursday and selling

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[4] In Australia, there are some long weekends of three days holiday including Saturday, Sunday, and a public holiday on Monday. In China, there is only one chance for this case when the 1st of May is on Monday. For more detail, see Section 6.4, Holiday effect tests for the Shanghai and Shenzhen markets. Also appendix Table A-8 provides the records of market closure for public holidays.

on Friday pays cash on Friday and receives cash on Monday. The loss of two days interest over Saturday and Sunday makes the traders less willing to sell shares on Friday, resulting in higher returns on Friday. Under the three-day settlement procedure, similar arguments imply that the traders are unwilling to sell shares on Wednesday, and the high returns occur on Wednesday. Gibbons and Hess (1981) unsuccessfully linked the settlement procedure to the day-of-the-week effects in the S&P 500 index for the U.S. market. Jaffe and Westerfield (1985), Wong *et al* (1992) and Agrawal and Tandon (1994) found that the settlement procedure could explain the day-of-the-week effects only in a fraction of the markets in their studies.

In the Shanghai and Shenzhen markets, A-shares employed a one-day settlement procedure. Following the logic of the trading strategy presented above, share traders would prefer holding shares on Friday and selling shares on Thursday. The negative returns on Thursday and positive returns on Friday in all indices represented in Table 6-2, excluding the SSE-B and SZS-B, seem to support the settlement hypothesis on A-shares market and in the sector indices. On the other hand, a three-day settlement procedure is followed in B-shares transactions. Beyond the explanation of the settlement hypothesis, the returns in the SSE-B and SZS-B on Wednesday are negative, although they are negative on Tuesday as well. Thus, the settlement hypothesis cannot contribute any explanatory power to the day-of-the-week effects on the B-shares market according to the evidence in Tables 6-1 and 6-2.

Another possible interpretation of day-of-the-week effects for China's stock markets is the regularity of information disclosure. The issues of dividends, rights and bonus in the Shanghai and Shenzhen markets are usually announced on Fridays, and exercised on Mondays.[5] The shareholders of China are immature in their assessment of the news. Their overvaluation of the event news leads to high returns on Fridays. When the announced events are exercised on Mondays, their assessment of the news is corrected and the share prices are adjusted (down) in the trading time on Mondays.

The last puzzle for the day-of-the-week effects in the Shanghai and Shenzhen markets is the outstanding cycle of the returns in the period from 1994 to 1998. It can be found on Table 6-2, that the signs of the returns in A-shares and sector indices from Monday through Friday are: "+, –, +, –, +," which has contributed to the negative first order correlation of daily returns reported in Table 5-3. We attribute this cycle to the one-day settlement procedure: if you buy with all your capital today, you cannot buy tomorrow instead of selling tomorrow or on the following days. The B-shares returns look more stable with the signs of "+, –, –, –, +," but, Theobald and Price (1984) postulated, that thin trading reduces this observed weekly seasonality.

Notwithstanding, all of the hypotheses lack firm evidence. There is no perfect hypothesis so far which can fully explain the day-of-the-week effect. In fact, a market is influenced by many determinants. One hypothesis may be suitable as an explanation for one aspect of the seasonal effect, but no single hypothesis can explain all of the seasonal effects.

[5] This does not mean an issue is announced on Friday and exercised on the next Monday. The interval between the announcement and the realisation of this issue may be from one week to several months.

6.3 Month-of-the-year effect tests for the Shanghai and Shenzhen markets

Many empirical studies have proclaimed that there are regular return patterns according to the month of the year, so that these month-of-the-year effects are significant in most of the markets of the world. Likewise, the month-of-the-year effects of the Shanghai and Shenzhen stock markets have been clearly found in this study. Even though the month-of-the-year effects in the Shanghai and Shenzhen markets are not as statistically significant as those in other stock markets, they are still "economically significant" for generating abnormal returns over the sample taken for this study. Also, an important finding is that the month-of-the-year effects display a new pattern that cannot be matched to those of other markets.

6.3.1 Characteristics of month-of-the-year effects in the Shanghai and Shenzhen markets

The initial tests of month-of-the-year effects for the Shanghai and Shenzhen markets in this study were conducted on the monthly returns in the period from 1992 to 1998. The results (reported in the appendix Table A-7) show that the mean January returns in the SSE and the SSE-A are positive and nearly double the mean February returns, but much lower than the positive mean returns in April, May, August and November. The mean January returns in the remaining indices of the SSE-B, SZS, SZS-A and SZS-B are all negative. Thus, there seems to be two contrary patterns of monthly returns in China's stock markets, specified as positive and negative mean January returns respectively. Only the mean returns in August for SZS and SZS-A are statistically significant at the 5% level.

However, the "two pattern results" are difficult to interpret because of the following facts. Firstly, the mean monthly returns calculated using monthly data stress the consideration of calendar time rather than trading time. Although no specific evidence in the literature details whether the returns on the stock market are closely linearly correlated with calendar time or with trading time, some of the previous studies (Rogalski 1984, Johnston *et al* 1991) show that the returns are more relevant to trading time than to non-trading time. As a consequence, if a month is occupied by a long-term holiday without trading, the number of trading days for this month is much less than the number of trading days in the month without holiday, so that the mean monthly return dose not represent the return in the month exactly. For example, the Spring Festival is the most important Chinese holiday when the stock market is closed for more than one week.[6] Suppose the market closes for 16 days in February for the Spring Festival, the monthly return calculated using monthly data can only cover about 5 trading days, which is a quarter of the number of the trading days of other months. Due to this, the average daily return for the month in the year will be used as a good proxy for the monthly return.

Secondly, the Chinese Spring Festival usually occurs in February, but occurred in January in 1993. Also, the market closing periods for the holidays were decided by either the Shanghai or the Shenzhen stock exchange individually before 1995. Thus, the market closing period for the Shanghai market for the Chinese Spring Festival in

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[6] Both the Shanghai Stock Exchange and the Shenzhen Stock Exchange closed for 16 consecutive days for the Spring Festival in 1996, 1997 and 1998. See appendix Table A-8.

1993 was 23rd to 26th January for 4 days, but 20th January to 31st January for 12 days for the Shenzhen market. As a matter of fact, many speculators and individual investors attacked the Shanghai A-shares market while the Shanghai market was open and the Shenzhen market was closed. The over speculation resulted in the SSE-A jumping from 780.39 to 1198.48 with a 53.57% return in January 1993.[7] Easton (1990) has previously documented this phenomenon for the Melbourne and Sydney stock markets. In order to avoid the confusion of the variation of the market closing periods for the Spring Festival in the two markets, the tests are conducted for the period from 1994 to 1998 despite the consequentially small sample size.

The final results calculated using daily returns for the month of the year are presented in Table 6-5 (and in appendix Figures A-2 and A-3). The results calculated using monthly returns for the same period are reported in Table 6-6 for comparison. Obviously, the *t*-statistics and *F*-statistics in Table 6-5 are more sensitive than those in Table 6-6. The problem of small sample bias is lessened to a certain extent in the calculation of daily returns in Table 6-5 compared with monthly returns in Table 6-6.

Table 6-5 shows a striking characteristic of month-of-the-year effects in the three mean indices of the Shanghai and Shenzhen markets. The average daily returns for the months in the three main indices of the Shanghai and Shenzhen markets are identically negative in December and January, but positive in February and August. Further, the

[7] The market closing periods for 1995's Spring Festival were still different, with 16 days for the Shenzhen market and 9 days for the Shanghai market. However, the returns on the Shanghai market did not exceed 5.3%, much less than that during 1993's Spring Festival. This is because, firstly, the market scale increased by 140% from 1993 to 1995, which made attacking the market more difficult. Secondly, the loss was so enormous for ordinary investors in the campaign of attacking the market in 1993's Spring Festival, that the speculators could not induce the ordinary investors into the same pitfall. Finally, 1995 was a bearish year on China's stock markets, with turnover value significantly lower than the previous year.

average daily returns on the SSE, SSE-A, SZS and SZS-A in August are statistically significant at the conventional levels. The average daily returns on SSE-B in January and February are statistically significant at the 5% level as well.

Nonetheless, the average daily returns do not vary much across the months of the year. The largest *F*-statistic is 1.78083 for the SSE-B and the smallest one is only 0.44944 for the SSZ-B. Thus, none of the *F*-statistics can reject the null hypothesis that the average daily returns for each month of the year are not significantly different from each other. Despite the fact that the *F*-statistics and some *t*-statistics are still insignificant, the "economical significance" is apparent. Trading shares according to this month-of-the-year return pattern, as displayed in Table 6-5, could produce abnormal returns for this particular sample of data.

Table 6-7 reports the results tested on the sector indices of the Shanghai and Shenzhen markets. In comparison with Table 6-5, it is evident that the average daily returns by month for the Shanghai sector indices, and half of the Shenzhen sector indices, display a similar month-of-the-year effects as in the three main indices. The average daily returns of January and December in all five sector indices of the Shanghai market are negative. The positive average daily returns in August are high, and four of five are statistically significant. For the Shenzhen market, the average daily returns of January in three indices are negative and in the remaining three are positive but lower in contrast to the positive returns of other months. Positive average daily returns in August are statistically significant in three of six indices. All indices have negative average returns in December.

Table 6-5. Average Daily Returns by Month on the Shanghai and Shenzhen Markets

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	F-stat.
Panel-A: Shanghai Market					SSE (January 1994 - April 1998)								
Daily Mean Return	-0.00182	0.00098	0.00258	0.00111	0.00006	-0.00095	-0.00310	0.01018	-0.00029	-0.00016	-0.00057	-0.00307	1.03231
t-statistic	-0.58005	0.26080	0.86346	0.36939	0.01790	-0.28020	-0.92768	**3.08305	-0.08489	-0.04619	-0.16948	-0.92360	
Standard Deviation	0.018171	0.025155	0.021431	0.023188	0.044027	0.023596	0.026539	0.052961	0.033373	0.037245	0.021759	0.02876	
Observation	99	69	109	107	94	84	87	89	85	80	85	88	
					SSE-A (January 1994 - April 1998)								
Daily Mean Return	-0.00169	0.00084	0.00272	0.00115	0.00000	-0.00098	-0.00337	0.01062	-0.00023	-0.00011	-0.00045	-0.00321	1.04350
t-statistic	-0.51801	0.21718	0.88110	0.36790	0.00130	-0.27502	-0.97495	**3.10387	-0.06527	-0.03076	-0.12926	-0.93213	
Standard Deviation	0.01880	0.02578	0.02208	0.02371	0.04534	0.02482	0.02769	0.05566	0.03437	0.03878	0.02243	0.02922	
Observation	98	69	109	107	94	82	87	89	85	80	85	88	
					SSE-B (January 1994 - April 1998)								
Daily Mean Return	-0.00528	0.00469	-0.00227	0.00045	0.00057	-0.00163	0.00018	0.00350	-0.00224	-0.00363	-0.00341	-0.00162	1.78083
t-statistic	-*2.64773	*1.97638	-1.20206	0.23747	0.27767	-0.75739	0.08526	1.67227	-1.04584	-1.64621	-1.59416	-0.77179	
Standard Deviation	0.02503	0.02422	0.01289	0.01521	0.01934	0.01451	0.01294	0.02099	0.01382	0.01399	0.01847	0.03465	
Observation	99	69	109	107	94	84	87	89	85	80	85	88	
Panel-B: Shenzhen Market					SZS (January 1994 - April 1998)								
Daily Mean Return	-0.00163	0.00114	0.00041	0.00283	0.00099	-0.00007	-0.00023	0.00609	0.00027	0.00226	-0.00008	-0.00482	0.69341
t-statistic	-0.56965	0.32242	0.15030	1.03336	0.33904	-0.02173	-0.07645	*2.02604	0.08828	0.71196	-0.02571	-1.59427	
Standard Deviation	0.01697	0.02787	0.01682	0.02657	0.04427	0.02145	0.02465	0.03777	0.03462	0.03049	0.01761	0.02839	
Observation	99	64	109	107	94	83	87	89	85	80	85	88	
					SSZ-A (January 1994 - April 1998)								
Daily Mean Return	-0.00172	0.00144	0.00059	0.00308	0.00083	-0.00041	-0.00040	0.00683	0.00041	0.00225	-0.00002	-0.00474	0.66905
t-statistic	-0.55340	0.37388	0.19906	1.03761	0.26181	-0.12250	-0.12169	*2.08560	0.12343	0.65460	-0.00573	-1.44668	
Standard Deviation	0.01830	0.03053	0.01839	0.02945	0.04713	0.02314	0.02599	0.04292	0.03792	0.03328	0.01808	0.02913	
Observation	99	64	109	107	94	84	87	88	84	80	85	88	
					SZS-B (January 1994 - April 1998)								
Daily Mean Return	-0.00222	0.00003	-0.00156	-0.00023	-0.00134	0.00204	0.00010	0.00116	-0.00036	-0.00244	0.00106	-0.00454	0.44944
t-statistic	-0.90090	0.01092	-0.66801	-0.09610	-0.53266	0.76721	0.03922	0.44983	-0.13661	-0.89455	0.39970	-1.74473	
Standard Deviation	0.02016	0.02717	0.00922	0.01544	0.02377	0.03735	0.02429	0.02371	0.01715	0.01557	0.02944	0.03789	
Observation	99	64	109	107	94	84	87	89	85	80	85	88	

Notes: 1. *t*-statistics test the null hypothesis that the mean return is equal to zero.

2. *F*-statistics test the null hypothesis that the mean returns are equal across all months of the year.

3. '*', '**' indicate rejections of the null hypothesis at the 5% and 1% significance levels.

Table 6-6. Average Monthly Returns on the Shanghai and Shenzhen Markets

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	F-stat.
Panel-A: Shanghai Market				SSE (January 1994 - April 1998)									
Mean Return	-0.03574	0.01349	0.05614	0.02379	0.01875	-0.04207	-0.06736	0.22643	-0.00588	-0.00342	-0.01200	-0.06762	0.86754
t-statistic	-0.31050	0.18846	0.78424	0.33237	0.26187	-0.52564	-0.84166	**2.82902	-0.07352	-0.04274	-0.14988	-0.84485	
Standard Deviation	0.07753	0.03984	0.11116	0.15868	0.10701	0.13130	0.19170	0.41984	0.07613	0.13286	0.07761	0.08527	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	
				SSE-A (January 1994 - April 1998)									
Mean Return	-0.03338	0.01206	0.05983	0.02408	0.00008	-0.02011	-0.07340	0.23635	-0.00485	-0.00222	-0.00961	-0.07058	0.81566
t-statistic	-0.28389	0.15842	0.78567	0.31616	0.00112	-0.23616	-0.86207	**2.77591	-0.05702	-0.02613	-0.11287	-0.82895	
Standard Deviation	0.07693	0.04262	0.11122	0.16178	0.11474	0.17610	0.20486	0.44225	0.07767	0.13847	0.08002	0.08815	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	
				SSE-B (January 1994 - April 1998)									
Mean Return	-0.10436	0.06478	-0.04952	0.00969	0.01062	-0.03424	0.00392	0.07782	-0.04756	-0.07263	-0.07249	-0.03571	1.03334
t-statistic	-1.35316	1.39542	-1.06672	0.20879	0.22882	-0.65966	0.07557	1.49922	-0.91630	-1.39925	-1.39671	-0.68803	
Standard Deviation	0.13450	0.09295	0.12096	0.12872	0.10820	0.06169	0.08920	0.05856	0.03594	0.07084	0.13833	0.13402	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	
Panel-B: Shenzhen Market				SZS (January 1994 - April 1998)									
Mean Return	-0.03567	0.01463	0.00890	0.06064	0.01865	-0.00140	-0.00506	0.13553	0.00577	0.04515	-0.00168	-0.10605	0.54880
t-statistic	0.03376	0.22786	0.13862	0.94429	0.29038	-0.01955	-0.07043	1.88780	0.08039	0.62895	-0.02341	-1.47713	
Standard Deviation	0.12042	0.02691	0.13238	0.22567	0.07838	0.14082	0.17594	0.21243	0.09929	0.20627	0.08833	0.09319	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	
				SSZ-A (January 1994 - April 1998)									
Mean Return	-0.03953	0.01963	0.01309	0.06596	0.01543	-0.00811	-0.00901	0.15030	0.00869	0.04498	-0.00041	-0.10426	0.54695
t-statistic	0.04221	0.28780	0.19200	0.96736	0.22624	-0.10644	-0.11824	*1.97146	0.11399	0.59000	-0.00533	-1.36749	
Standard Deviation	0.13110	0.03215	0.14093	0.23561	0.07674	0.14989	0.18293	0.23824	0.10474	0.22312	0.07815	0.09994	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	
				SZS-B (January 1994 - April 1998)									
Mean Return	-0.04238	0.00043	-0.03406	-0.00485	-0.03101	0.04178	0.00264	0.02550	-0.00769	-0.04884	0.02250	-0.09991	0.36879
t-statistic	-0.76170	0.00767	-0.61214	-0.08725	-0.55732	0.67158	0.04237	0.40996	-0.12359	-0.78516	0.36162	-1.60612	
Standard Deviation	0.09685	0.11297	0.05483	0.08413	0.10883	0.08654	0.14224	0.11655	0.06076	0.06078	0.30514	0.10484	
Observation	5	5	5	5	5	4	4	4	4	4	4	4	

Notes: 1. *t*-statistics test the null hypothesis that the mean return is equal to zero.

2. *F*-statistics test the null hypothesis that the mean returns are equal across all months of the year.

3. '*', '**' indicate rejections of the null hypothesis at the 5% and 1% significance levels.

Table 6-7. Average Daily Returns by Month in Sector Indices

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	F-stat.
PANEL A: Shanghai Stock Market					***(August 1993 - April 1998)***								
Manufacture	-0.00193	0.00048	0.00203	0.00080	-0.00025	-0.00143	-0.00234	**0.00852	-0.00016	-0.00058	0.00018	-0.00446	0.94772
Commercial	-0.00190	0.00140	0.00282	0.00177	0.00166	-0.00140	-0.00277	**0.00876	-0.00083	-0.00204	0.00211	-0.00399	1.06219
Real Estate	-0.00253	0.00086	0.00376	0.00252	0.00060	0.00118	-0.00512	0.00873	0.00031	-0.00132	0.00327	-0.00335	0.55722
Utility	-0.00195	0.00046	0.00214	0.00231	-0.00044	0.00246	-0.00311	**0.00984	-0.00039	-0.00156	0.00221	-0.00366	1.10616
Miscellaneous	-0.00176	0.00389	0.00319	0.00257	-0.00077	-0.00229	-0.00510	**0.00841	-0.00066	-0.00128	0.00272	-0.00329	1.11191
PANEL B: Shenzhen Stock Market					***(July 1994 - April 1998)***								
Manufacture	0.00016	0.00069	0.00279	0.00404	0.00017	0.00101	0.00331	*0.00763	-0.00032	0.00335	-0.00028	-0.00442	0.68495
Commercial	-0.00046	0.00022	0.00270	0.00651	-0.00054	0.00040	0.00378	0.00289	0.00313	0.00363	0.00110	-0.00455	0.39249
Property	-0.00045	-0.00015	0.00346	0.00280	0.00055	-0.00042	0.00214	0.00556	-0.00178	0.00315	-0.00016	-0.00692	0.64042
Utility	-0.00075	0.00192	0.00253	0.00273	-0.00125	0.00091	0.00498	**0.00884	0.00080	0.00377	-0.00175	-0.00620	0.92330
Conglomerate	0.00060	0.00174	0.00299	0.00895	-0.00064	0.00446	0.00394	0.00167	-0.00032	**0.01028	0.00120	-0.00605	1.36449
Financial	0.00156	0.00297	0.00439	**0.00927	0.00445	0.00378	-0.00086	*0.00635	0.00104	-0.00086	-0.00036	-0.00374	0.96998

Notes: 1. t-statistics test the null hypothesis that the mean return is equal to zero.

2. F-statistics test the null hypothesis that the mean returns are equal across all months of the year.

3. '*', '**' indicate rejections of the null hypothesis at the 5% and 1% significance levels.

6.3.2 Comparison of month-of-the-year effects between China's stock markets and other world's markets

Wachtel (1942) was one of the pioneers in detection of month-of-the-year effects in stock markets. He found that the disproportionately large January returns are associated with the tax regime. After Wachtel's initial work, many studies indicate the existence of unequal monthly returns over the year in most of the world's markets. Rozeff and Kinney (1976) observed that, in the United States, stock returns in January are significantly larger than the remaining eleven months. Keim (1982) documented, by testing the common stocks of the United States from 1963 to 1979, that the relationship between excess returns and firm size is always negative and is more pronounced in January than in any other month. His evidence shows that the mean January returns of small firms are significantly positive and are the highest for the year. As the firm size increases, the positive January return becomes negative. However, over all size firms, the positive January return is the highest of the year. Cho and Taylor (1987) found evidence that there is a negative relationship between firm size and the January return in the period from 1973 to 1983 for the stocks on the New York and American Stock Exchanges.

Kohers and Kohli (1991) asserted that the phenomenon of high January returns is independent of firm size, because the variation per unit of returns in January is the lowest of any month of the year. Ariel (1987) proposed, that during the nineteen years between 1963 and 1981, the high January returns in the United States market are usually generated in the first half month, with the last half contributing nothing. Jordan and Jordan (1991) detected that the high January return also exists in the bond market.

They posited that most of the positive January return comes from the turn of the year which includes the last trading day of December and the first four trading days of January.

Tests of month-of-the-year effects on specific country's market, other than the United States have been carried out by a number of authors. Brown *et al* (1983) showed that the high January return exists in the Australian market. Tinic *et al* (1987) provided evidence of large, positive January returns on Canadan stocks. Meanwhile, they indicated that the average returns of Canadan stocks in March, April, July and December are not significantly lower than in January. Van den Bergh and Wessels (1985) and Van den Bergh *et al* (1988) found month-of-the-year effects with a high positive January return on Dutch stocks. Reinganum and Shapiro (1987) examined the returns on the stocks listed on the London Stock Exchange in the periods from 1956 to 1965 and from 1965 to 1980. They posited that the month-of-the-year effects of high January and April returns appear in the second period, but not in the first period.

Gultekin and Gultekin (1983) contributed an international investigation for 18 markets including both developed and developing countries, in America, Europe and Asia-Pacific, but not Africa. They discovered that the month-of-the-year effect pattern associated with the U.S. market is also present in many markets in the investigation period from 1959 to 1979. Positive mean returns occur in January on all 18 stock markets. Among them, 14 markets display the highest mean returns for the year in January, although, the mean return in April in the U.K market is almost as high as the mean January return. A more recent international study carried out by Agrawal and Tandon (1994) produced results similar to those of Gultekin and Gultekin's (1983) evidence in the later period from 1971 to 1987. A total of 19 markets in his study exhibit positive January returns. Sixteen of those positive January returns are statistically significant at the 10% level of significance, and eleven of them are the highest returns of the year. The high mean April return in the U.K market in Gultekin and Gultekin's (1983) evidence is replicated in Agrawal and Tandon's (1994) study.

Despite the arguments that excess returns are present in the days surrounding the beginning of years, or are related to the firm size, the general month-of-the-year effects of the world's markets can be concluded from the above studies. The January return is positive and high, frequently the highest returns of the year and significant at the conventional levels. For a detailed description, the results of some frequently referenced literature are assembled in Table 6-8. It can be seen, from the table, that all the mean January returns are positive. Among the positive mean January returns, fifteen of twenty-six are the highest of the years. Fifteen of twenty, excluding the six unavailable *t*-statistic cases, are statistically significant at the 5% or 1% level. Furthermore, except for one case, all mean April returns and mean December returns are positive. For the joint tests that all mean monthly returns are equal, eight of twenty-four reject the null hypothesis at significance levels of less than 5% and fourteen of twenty-four at significance levels of less than 10%.

In contrast, the month-of-the-year effects in the Shanghai and Shenzhen markets, presented in Tables 6-5 and 6-7, differ completely from those of the rest of the world's markets. None of the world's market has similar features to the Shanghai and Shenzhen markets. First, the January returns on the world's markets are positive high

Table 6-8. Mean Monthly Returns for the World's Markets

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	K-W, P-value
Australia	*0.0340	-0.0031	0.0121	0.0191	0.0171	-0.0120	-0.0096	0.0149	-0.0760	0.0226	0.0040	*0.0292	0.3800
Australia[a]	0.0265	-0.0058	0.0051	0.0084	0.0097	0.0043	0.0066	-0.0037	-0.0239	0.0213	-0.0085	0.0399	*0.0430
Australia[b]	**0.0314	-0.0008	0.0017	0.0124	0.0098	0.0095	0.0124	0.0034	-0.0107	*0.0223	0.0028	**0.0345	no report
New Zealand	0.0094	0.0026	*0.0261	0.0220	0.0089	0.0076	0.0142	0.0008	0.0047	-0.0158	0.0155	0.0193	0.5000
U.K[a].	0.0341	0.0069	0.0125	0.0313	-0.0121	-0.0169	-0.0111	0.0188	-0.0024	0.0080	-0.0068	0.0206	#0.0920
U.K.	**0.0462	0.0145	0.0135	**0.0369	-0.0239	-0.0139	-0.0166	*0.0269	-0.0100	0.0017	0.0005	0.0164	**0.0010
U.K[c1].	0.0115	0.0094	0.0124	0.0305	0.0039	-0.0079	-0.0004	0.0284	0.0033	0.0200	0.0046	0.0193	F-stat. 0.5500
U.K[c2]	0.0538	0.0110	0.0051	0.0391	-0.0021	-0.0101	0.0033	0.0053	0.0074	0.0051	-0.0101	0.0132	F-stat.*2.1500
U.S.-Dow	0.0088	-0.0018	0.0098	*0.0163	-0.0096	-0.0001	0.0078	0.0005	-0.0086	0.0042	0.0159	**0.0143	no report
U.S.-Ew[a]	0.0508	0.0054	0.0154	0.0044	-0.0142	-0.0100	0.0073	0.0072	-0.0042	-0.0079	0.0179	0.0137	#0.1000
U.S[d].	0.0666	-0.0209	0.0491	0.0716	-0.03812	0.0079	-0.0262	0.0497	-0.0261	0.0634	0.0586	0.0423	F-stat. 1.4000
Belgium	**0.0336	*0.0197	0.0062	*0.0241	-0.0179	-0.0046	0.0093	-0.0005	-0.0080	-0.0024	0.0087	0.0188	**0.0100
Brazil	*0.0919	0.0349	*0.0908	*0.0952	*0.0970	*0.1048	0.0366	0.0666	*0.0722	0.0506	0.0505	0.0625	0.9900
Canada	0.0186	0.0104	0.0094	0.0084	0.0133	0.0022	0.0029	*0.0351	-0.0130	-0.0162	**0.0405	0.0242	0.1600
Denmark	*0.0236	-0.0047	0.0053	0.0220	-0.0005	0.0036	0.0113	0.0055	-0.0061	0.0002	-0.0223	*0.0236	0.2000
France	**0.0436	0.0110	0.0254	**0.0389	-0.0085	-0.0245	0.0084	0.0168	-0.0065	-0.0036	0.0115	0.0093	*0.0500
Germany	0.0220	0.0039	0.0250	0.0121	-0.0175	0.0069	-0.0105	0.0126	-0.0007	0.0180	0.0015	0.0191	0.6500
Hong Kong	**0.0896	0.0089	-0.0392	0.0112	0.0362	0.0093	0.0047	-0.0199	-0.0477	0.0469	-0.0199	0.0286	#0.0600
Italy	**0.0685	**0.0418	0.0187	0.0025	-0.0047	-0.0129	-0.0042	**0.0411	-0.0143	0.0047	0.0051	-0.0067	**0.0100
Japan	**0.0285	0.0140	**0.0348	0.0047	0.0002	*0.0211	0.0002	0.0029	-0.0045	0.0062	0.0177	0.0184	#0.1000
Luxemburg	0.0273	0.0024	0.0342	-0.0021	0.0135	0.0286	-0.0140	0.0202	0.0175	-0.0048	-0.0268	0.0205	0.4400
Mexico	**0.1304	**0.1255	-0.0079	0.0191	0.0562	0.0449	0.0589	*0,0819	0.0794	-0.0042	0.0352	0.0484	0.3500
Netherlands	**0.0402	-0.0056	0.0171	0.0126	-0.0080	0.0013	0.0046	-0.0117	*-0.0349	-0.0036	0.0204	0.0230	*0.0300
Singapore	**0.0751	0.0218	-0.0102	0.0226	0.0322	0.0102	-0.0153	-0.0146	-0.0048	0.0291	-0.0268	0.0015	#0.0900
Sweden	**0.0521	0.0157	0.0252	0.0168	-0.0076	-0.0052	0.0136	-0.0296	-0.0145	-0.0103	-0.0110	0.0095	*0.0400
Switzerland	**0.0252	-0.0044	0.0017	0.0050	-0.0160	0.0020	0.0066	0.0118	-0.0108	0.0039	-0.0007	0.0196	#0.0700

Source: [a]Cited from Gultekin and Cultekin (1983); 11/1959 - 11/1979, but types of data was not mentioned; *t*-statistics are not available.
[b]Cited from Brown *et al* (1983); All Australia industrial, mining and oil stocks, 3/1958 - 6/1981; re-estimated *t*-statistics.
[c1&c2]Cited from Reinganum and Shapiro (1987), LSPD 1/1956 - 12/1965 and LSPD 1/1966 - 12/1980; t-statistics are not available.
[d]Cited from Jordan and Jordan (1991); S&P 500 1/1963 - 12/1986. *t*-statistics are not available.
The remaining cases cited from Agrawal and Tandon (1994), data and periods are the same as the description in table 6-3.

Notes: 1. *t*-statistics test the null hypothesis that the mean return is equal to zero.
2. Kruskal-Wallis (*K-W* test) tests the null hypothesis that the mean monthly returns are equal for the year.
3. ‘#’, ‘*’ and ‘**’ indicate rejections of the null hypothesis at the 10%, 5% and 1% significance levels.

and usually statistically significant. The January returns on the Shanghai and Shenzhen markets are negative or small positive values. Next, with only one exception, the December returns are positive on world's markets, whereas the December returns on the Shanghai and Shenzhen markets are negative. Furthermore, the August returns on the Shanghai and Shenzhen markets are positive and dramatically high, with most being statistically significant.

6.3.3 Implications and possible hypotheses of month-of-the-year effects of the Shanghai and Shenzhen markets

As have known above, the outstanding feature of month-of-the-year effects in the world's stock markets is the high positive return in January. Wachtel (1942) initially formulated the tax regime hypothesis to explain the high January return, and successive studies have advanced the explanation of the association between the anomalous monthly return and the tax rules. For example, Branch (1977) and Reinganum (1983) partially attributed this January effect to tax-loss-selling pressure. The tax-loss-selling hypothesis means that the tax regime encourages the selling of securities that have experienced recent price declines, so that the (short term) capital loss can be used to offset taxable income. Therefore, for the January to December tax year, the return should be low in December under the selling pressure and high in January, after the pressure is released.

The tax-loss-selling hypothesis has raised extensive debate. The empirical tests on the markets that have a January to December (calendar year) tax year usually generate consistent evidence. For example, Schultz (1985) indicated that the high January returns on the U.S. market occur only after the Tax Act in 1917. Sias and Starks (1997) also concluded that the tax-loss-selling is the main reason for the month-of-the-year effects in the U.S. market. However, there are several exceptions such as Van den Bergh and Wessels (1985) who stated that the month-of-the-year effects existing in the Dutch stock market is unrelated to the tax year. Berges *et al* (1984) reported that regardless the introduction of capital gain tax, returns in January exceed returns for other months of the year on Canadian stocks.

Where the tax year is not the same as the calendar year, the London stock market exhibits high returns in both April and January, because the end of English tax year for individuals is the 5th of April (Reiganum and Shapiro 1987). Dissimilarly, the high return in the Australian market appears in January but not also in July (Brown *et al* 1983), even though the Australian tax year is from July to June. Nevertheless, Reiganum and Shapiro (1987) supported the tax-loss-selling hypothesis by showing that the high January and April returns appeared in the period from 1965 to 1980 when the capital gain tax was introduced, but not in the period from 1956 to 1965 when no capital gain tax was levied. On the contrary, Brown *et al* (1983) questioned why, if the January effect is caused by the tax-loss-selling pressure, the January return is high in Australia despite the tax year in Australia?

The tax year in China is from the 1st of January to the 31st of December, identical to the U.S. and most other countries. However, until now, Chinese individual shareholders have never been taxed on their capital gain income. The institutional investors of stocks have to pay business income tax other than capital gain duty. Because the capital gain is a component of business income, at this point, they pay capital gain income tax indirectly. The key issue is that there are two accounting systems in China: the old one was copied from the previous "Socialist Russia (Soviet Union)," the new one is derived from developed countries. In the old system, net income can be accounted for only after trading, i.e. the market value premium of a share is not considered as revenue. Conversely, in the new system, the market value premium is included in revenue. Currently, the authority emphasises employing the new accounting system rather than the old one. But the soft restriction implies that the institutions can select one of them from time to time when it is beneficial for them to do so. In other words, the institutions can hold or trade the share without important consideration of the tax regime. For this reason, there is but no significant tax-loss-selling pressure in China.

According to the accounting rules in China, before the end of December (the financial year), the accounts payable and accounts receivable between enterprises should be settled. Loans should be payed back to the bank if the due day was in the current year. However, financial year settlement usually could not be completed in December due to the arrears among enterprises. Therefore, a portion of the settlement has to be postponed to January before the Chinese Spring Festival. The Chinese Spring Festival is the first day of the Chinese lunar year, which usually starts in February, but sometimes it starts in the second half of January. Since the Chinese lunar year is the traditional financial year of China, the unsettled accounts in the public Calendar year are accustomed to be settled before the new Spring Festival. Hence, if the final year settlement create selling pressure, the selling pressure would impact December and January, with low or negative returns in both December and January in China's stock markets.

In addition, as mentioned before, the Chinese people treat the Chinese Spring Festival as important, rather than Christmas Day or New Year's Day. Chinese people have the tradition of realising available income, and the bulk of annual purchasing at the end of the lunar year. In particular, the majority of companies, enterprises and other institutions usually awards their staff final yearly bonus, which account for around 10% or more of annual income, a few days in advance of the beginning of the Spring Festival. As a matter of fact, the final year tradition of the Chinese people causes the withdrawal of funds from the share market, so that the selling pressure makes the prices of the shares low during January. Eventually, after the Chinese Spring Festival, the funds are released from individuals and institutional investors to the share markets to push the prices of shares higher in February as opposed to in January.

Keim (1982) raised the information hypothesis by citing Rozeff and Kinney (1976), that "January marks the beginning and end of several potentially important financial and informational events... January is the start of the tax year for investors, and the beginning of the tax and accounting year for most firms, and the preliminary announcements of the previous calendar year's accounting earnings are made." Keim (1982) argued that anticipation of the impending release and the gradual dissemination of important information have a greater impact on the prices in January. The information hypothesis is probably not appropriate as an explanation for the low January returns on China's stock markets, because information used not to disseminate in January in China.

However, the information hypothesis is consistent with the high positive August returns on China's stock markets. In terms of the legislation of China Securities Regulatory Commission (CSRC), listed companies should publish the interim report before the end of August. As a general regulation for saving advertising expense, the news related to the interim dividends, rights and bonus are usually announced in the same publication. Statistical data report that over 80% of companies announce their interim reports in August for the most recent four years. On the other hand, the Chinese share traders are keen to attack the market with information. The "inside news," "specialist anticipation," "consulting suggestion," and the dissemination of true information push stock prices from a high to another high, from this category of shares to that category of shares. Therefore, the returns of China's stock markets are comparatively eminent in August.

Besides the influence from the above micro-information in relation to individual companies, the macro-information contributes to high positive August returns as well. Firstly, the scale of newly listed companies and new rights issues are controlled by CSRC. CSRC is in charge of making the scheme each year and the initial scheme is publicly published in the early months of the year. According to the market reaction to the scheme, CSRC adjusts the scheme and the revised scheme is publicly broadcasted in the middle of the year. Secondly, China's Ministry of Finance is in charge of developing the plan for the distribution of treasury bonds. The plan is also typically aired in the early and middle months of the years. As is common knowledge, the new issues of shares and bonds are "bad" news, cooling the market in June and July. Then after the bad news passes away, the market rebounds under the good expectation relating to the interim report.

It is reasonable to query why the annual reports of the listed companies are usually published in March and April, but the markets react positively to the information in the annual reports much more weakly than in the interim reports? Shi (1998) indicated that it is a common phenomenon for many companies in China that the company's achievements are much better in the interim reports than in annual reports. Some company achievements in the interim reports are artificial due to accounting practices. Since the auditing requirement on interim reports is not as strict as on annual reports, the interim reported earnings including the incorrect forecasting components. Therefore, the relatively true annual reports convey the news that is not as "good" as the relatively false interim reports.

The comparatively low December returns and high January returns in world's markets are sometimes attributed to the window-dressing of institutional money managers adjusting the shares in their portfolio (Lakonishok and Smidt 1988). According to the window-dressing hypothesis, just prior to the end of the calendar year, institutional investors buy winners and sell losers in order to present respectable year-end portfolio holdings, because they are evaluated in relation to their performance. Empirical tests result in mixed evidence for the window-dressing hypothesis. For example, even though Athanassakos (1991) found that Canadian institutional investors undertake seasonal re-balance of their portfolio, Griffiths and White (1993) offered little support for the hypothesis in their evaluation of Canadian block trading around the turn-of-the-year. The window-dressing hypothesis does not have supportive evidence in China's stock markets as the capital of institutional investors account for a small percentage of the market in this study period. Ten large fund companies, each of which controls 2 billion Yuan, were created after June 1998. Besides, block trading is seldom detected near the end of the year in the absence of bullish or bearish marketing.

Ogden (1990) claimed that a standardisation in the payments system in the United States generally induces a surge in stock returns around the turn of each month and especially at the turn of the year. The surge occurs because investors have substantial cash receipts at the turn of the month or year, which increases their demand for stocks to gain liquid profits. Chen and Fish (1994) suggested that money growth has a negative effect on the market returns. They found that more money is emitted in December when Federal Reserve to accommodate the holiday-specific money demand, the potential loss of shares grows due to increased inflation. While the Federal Reserve has consistently acted to remove the holiday-specific money in January, the share prices rebound as the threat of inflation is removed. In their viewpoint, money supply has more effect on stock return than tax-loss-selling. Both the liquid profit hypothesis and money supply hypothesis has no manifestation in China's stock market for two reasons. Firstly, although Chinese investors receive more cash in December and January, including in February before the Spring Festival, they are not interested in buying shares for liquid profits. Secondly, the increased money supply in January has not been followed by market rebounding.

6.4 Holiday effect tests for the Shanghai and Shenzhen stock markets

Besides the day-of-the-week effects and the month-of-the-year effects, the holiday effects are another sort of seasonality associated with regular return patterns that question the hypothesis of market efficiency. Unlike the weeks and months, the holidays may vary from market to market in frequency, date and duration. For example, the United States has eight holidays: New Years' Day, Presidents' Days (formerly Washington's Birthday), Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas Day. China has four holidays: New Year's Day, Labor Day, National Day and the Spring Festival. Of these holidays, only the New Year's days of the two countries can be matched to each other in date, but not in duration. Nonetheless, holiday effects have been detected in China's stock markets as proclaimed in many other markets of the world.

6.4.1 General pattern of holiday effects in world's markets

Holiday effects are characterised with unusually high or low returns on trading days before or after the holidays. The most frequently testified holiday effect suggests that mean returns on pre-holiday trading days is positive and high compared with non-holiday trading days. Lakonishok and Smidt (1988) examined the DJIA over the period from 1897 to 1986 and found that the significantly higher average daily return on trading days that immediately precedes holidays is 0.219%, in comparison with the normally average daily return of 0.0094%. This is further evidenced by the fact that approximately 51% of the capital gains on the DJIA have been obtained on the pre-holiday trading days for the past ninety years. By testing the value-weighted and equally weighted indices of stocks listed on the NYSE and AMEX for the period from 1963 to 1982, Ariel (1990) found that returns are unusually high on trading days that precede holidays. For example for the equally-weighted index, the average pre-holiday trading day return is 0.528% and average normal trading day return is 0.059%. He stated that the returns on pre-holiday trading days account for nearly one-third of total annual returns. Cadsby and Ratner's (1992) contributed an international study in which ten of eleven country's markets display positive mean returns on pre-holiday trading days.

A number of studies provide evidence of positive mean returns on post-holiday trading days besides positive mean returns on pre-holiday trading days. However, of these studies, some show that the mean positive return on post-holiday trading days is larger than that on normal trading days, while the others show inverse results that the mean positive return on post-trading days is smaller than that on normal trading days. Ball and Bowers (1988) documented the existence of positive post-holiday mean return in Australia. They indicated, using the Statex-Autuaries Price Index and the Accumulation Index form 1974 to 1984, the positive mean returns on post-holiday trading day are 0.244% and 0.187%,[8] larger than any weekdays. Easton (1990) examined the Sydney and Melbourne All Ordinaries for the period from 1958 to 1980, and found that positive mean returns on the post-holiday trading days are smaller than those of pre-holiday trading days in the two markets. Pettengill (1989a) observed the returns of the S&P 500 index for the period from 1962 to 1986, and illustrated that mean returns for pre-holiday trading days are much higher than mean returns for non-holiday trading days for both small and large firms. However, the post-holiday returns are lower on average than non-holiday returns for large firms, versus, the post-holiday returns are almost three times the size of non-holiday returns for the small firms.

[8] The mean returns are calculated from the Ball and Bowers (1988) result by adding constants (non-holiday mean returns) to the coefficients (incremental returns against the non-holiday mean returns) of holiday dummy variable.

There are also cases of negative returns, on average, on pre-holiday trading days or post-holiday trading days. In Cadsby and Ratner's (1992) international study, for the U.K market in the period from 1983 to 1988, the mean return before the local holiday is -0.09%. Meanwhile, the mean return on non-holiday trading days is 0.06%. Liano *et al* (1992) investigated the OTC stocks in the U.S. for the sample period from 1973 to 1989 to determine if a holiday effect exists in the OTC market. The OTC stocks generate unusually high returns on pre-holiday trading days and unusually low returns on post-holiday trading days. In particularly, the low post-holiday return is negative.

In addition to the argument of holiday effects over the whole pre-holiday and post-holiday trading period, some studies documented that the holiday effect appears at several specific weekdays immediately preceding or following holidays. French (1980), using the S&P composite portfolio from 1953 to 1977, found that mean returns are negative on Monday and Tuesday following holidays, while the mean returns are positive on Wednesdays, Thursdays and Fridays. The mean returns on Mondays, Wednesdays, Thursdays and Fridays are higher than the non-holiday mean return, however, are only statistically significant on Fridays. Using the S&P 500 index for the period from 1962 to 1986, Pettengill (1989a) reported that pre-holiday returns for each weekday are higher than corresponding non-holiday returns for both large and small firms. Unusually, the mean post-holiday returns are negative for the first three days of the week and are less than non-holiday returns for the large firms, while the mean post-holiday returns are higher than corresponding non-holiday returns for small firms.

The holiday effects in some previous studies are assembled in Table 6-9. The fourth column presents the mean returns on non-holiday trading days, while the fifth and sixth columns present the mean returns on pre-holiday trading days and post-holiday trading days respectively. Obviously, by a visual inspection of Table 6-9, the general holiday effect pattern should be described as the mean return on pre-holiday trading days being positive and larger than on non-holiday trading days. Fourteen of sixteen cases in Table 6-9 fall in this category. In considering the mean post-holiday returns, the general holiday effect pattern can be further classified as small post-holiday return pattern, middle post-holiday return pattern and large post-holiday return pattern. The

Table 6-9. Holiday Effects in International Markets

Country	Index	Period	Non-Holiday	Pre-holiday	Post-Holiday
[a]Canada	Toronto	1975 - 1987	**0.0014	**0.0037	na
[a]Japan	Nikkei	1979 - 1988	**0.0005	**0.0023	na
[a]Hong Kong	Hang Seng	1980 - 1989	0.0004	**0.0049	na
[a]Australia	All Ordinaries	1980 - 1989	*0.0005	**0.0030	na
[a]Italy	Banca	1980 - 1989	**0.0009	*0.0031	na
[a]Switzerland	SBCII	1980 - 1989	*0.0004	0.0014	na
[e1]U.S.	CRSP(VWID)	1963 - 1982	[n]0.0003	[n]0.0036	na
[e2]U.S.	CRSP(EWID)	1963 - 1982	[n]0.0006	[n]0.0053	na
[b2]U.S.	S&P 500 (small)	1962 - 1986	[n]0.0007	**0.0066	**0.0019
[d1]Australia	All Ordinaries(S)	1958 - 1980	0.0002	**0.0021	**0.0014
[d2]Australia	All Ordinaries(M)	1958 - 1980	0.0003	**0.0024	0.0008
[b1]U.S.	S&P 500 (large)	1962 - 1986	[n]0.0002	**0.0027	0.00003
[c1]U.S.	OTC (EWID)	1973 - 1989	**0.0005	[n]0.004	[n]0.00009
[c2]U.S.	OTC (VWID)	1973 - 1989	**0.0003	[n]0.0039	[n]-0.0009
[a]West Germany	CBI	1980 - 1989	*0.0005	0.0002	na
[a]France	CACGI	1980 - 1989	**0.0007	0.0005	na
[a]U.K.	Financial Times	1983 - 1988	*0.0006	-0.0009	na

Sources: [a]Cited from Cadsby and Ratner (1992), holidays are local holidays only.

[b1 & b2]Cited from Pettengill (1989a), 'b1' for large firms, 'b2' for small firms.

[c1 & c2]Cited form Liano and *et al* (1992), mean Pre- and Post-holiday returns are calculated from constant plus corresponding increments. 'VWID' means value weighted index, 'EWID' means equally weighted index.

[d1&d2]Cited from Easton (1990), 'S' means Sydney market, 'M' means Melbourne market, Wilcoxon test, value weighted and equally weighted indices.

[e1 & e2]Cited from Ariel (1990),

[n]*t*-statistics are not available for mean returns.

'na' means no data available.

'*','**' indicate rejections at the 5% and 1% significance levels.

small post-holiday return pattern implies that the mean post-holiday return are smaller than the mean pre-holiday and mean non-holiday returns. Three of six cases in Table 6-9 fall into this category. The middle post-holiday return pattern implies that the mean post-holiday return is less than the mean pre-holiday return, but larger than the mean non-holiday return. Three of six cases in Table 6-9 have this feature. Obviously, for the large post-holiday return pattern, the mean post-holiday return is larger than both the mean pre-holiday return and mean post-holiday return. However, the large post-holiday pattern has not been found in previous literature.

6.4.2 Comparison of the holiday effects between China's stock markets and other markets of the world

There are four public holidays in China. Labor Day is on the 1st of May with one day's leave. National Day is on the 1st of October with two days' leave. New Year's Day is on the 1st of January with one day's leave. The Chinese Spring Festival has three days' leave, which depends upon the Chinese calendar instead of the public calendar, appearing in February frequently, in January occasionally. Since the public holidays are always connected with weekends, the market closing periods are often longer than the holidays. In particular, the periods of market closures for the Chinese Spring Festivals are flexible according to the decisions of the authorities.[9]

The initial test of holiday effects on China's stock markets is generally employed on pre-holiday trading days and on post-holiday trading days. Thereafter, the test is extended to three days preceding holiday and four days succeeding holiday for a more

[9] If the public holiday does not connect with the weekend in calendar time, the weekend holidays (Saturday and Sunday) are frequently adjusted to be adjacent to the holidays, see appendix Table A-8.

robust study. Table 6-10 (and appendix Figures A-4 and A-5) reports the results of the two tests in the top portion and lower portion; Panel-A is for the Shanghai market and Panel-B is for the Shenzhen market. Besides *t*-statistics in each column, the entries in the column of "Non-holiday" are the mean returns on non-holiday trading days. The entries in the column of "Pre-holiday" are the incremental mean returns on pre-holiday trading days or incremental average daily returns of the three days preceding holidays. The entries in the column of "Post-holiday" are the incremental returns on post-holiday trading days or incremental average daily returns of the four days succeeding holidays. Thus the incremental mean return plus the mean Non-holiday return is the relevant mean return.

Although, the holiday effects tested on the pre-holiday and post-holiday trading days on the Shanghai and Shenzhen markets are not statistically significant except for the SSE-B, the results display patterns identical to the general pattern in the international markets. All mean returns on pre-holiday trading days in each index of the two markets are positive and larger than the corresponding mean returns on non-holiday trading days. Specifically, the holiday effects tested on the pre-holiday and post-holiday trading days on the Shanghai market are consistent with the small post-holiday return pattern which is reported in Table 6-9, derived from the S&P 500 for large firms by Pettengill (1989a) and OTC indices by Liano *et al* (1992). The mean returns on pre-holiday trading days are positive, while the mean returns on post-holiday trading days are negative and lower than both the mean returns on pre-holiday and non-holiday trading days. However, the holiday effects tested on the pre-holiday and post-holiday

Table 6-10. Holiday Effects in the Shanghai and Shenzhen Markets

Shanghai Stock Exchange	Non-holiday	Pre-holiday	Post-holiday	Shenzhen Stock Exchange	Non-holiday	Pre-holiday	Post-holiday
PANEL-A: Shanghai Market				**PANEL-B: Shenzhen Market**			
Tests on Pre-holiday Trading Day and Post-holiday Trading Day							
SSE-A (2/1992-5/1998)				*SZS-A (10/1992-5/1998)*			
Mean	0.0009	0.0024	-0.0004	Mean	0.0002	0.0060	0.0064
Increment		0.0015	-0.0013	Increment		0.0058	0.0062
t-test	0.8707	0.1736	-0.1605	t-test	0.2639	0.8781	0.9535
SSE-B (2/1992-5/1995)				*SZS-B (10/1992-5/1998)*			
Mean	-0.0007	0.0082	-0.0019	Mean	-0.0009	0.0041	0.0046
Increment		0.0089	-0.0012	Increment		0.0050	0.0055
t-test	-1.3728	*2.0553	-0.2678	t-test	-1.3545	0.9315	1.0340
SSE (2/1992-5/1998)				*SZS (10/1992-5/1998)*			
Mean	0.0009	0.0026	-0.0005	Mean	0.0002	0.0018	0.0085
Increment		0.0017	-0.0014	Increment		0.0016	0.0083
t-test	0.9442	0.2086	-0.1737	t-test	0.2456	0.2726	1.4108
Tests on Three Days Preceding and Four Days Succeeding Holiday							
SSE-A (2/1992-5/1998)				*SZS-A (10/1992-5/1998)*			
Mean	0.0010	0.0020	-0.0014	Mean	-0.0001	0.0088	0.0004
Increment		0.0010	-0.0024	Increment		0.0089	0.0005
t-test	0.9301	0.2015	-0.5566	t-test	-0.0584	*2.3239	0.1460
SSE-B (2/1992-5/1995)				*SZS-B (10/1992-5/1998)*			
Mean	-0.0009	0.0062	-0.0021	Mean	-0.0011	0.0048	-0.0009
Increment		0.0071	-0.0012	Increment		0.0059	0.0002
t-test	-1.5543	**2.7933	-0.5564	t-test	-1.4811	1.8801	0.0771
SSE (2/1992-5/1998)				*SZS (10/1992-5/1998)*			
Mean	0.0010	0.0022	-0.0013	Mean	-0.0001	0.0075	0.0009
Increment		0.0012	-0.0023	Increment		0.0076	0.0009
t-test	1.0011	0.2536	-0.5867	t-test	-0.0978	*2.1641	0.3121

Notes: 1. The data in the column ‘Non-holiday’ are the average daily return of non-holidays trading days (or entitled as mean return on normal trading days).

2. The data in the column ‘Pre-holiday’ (‘Post-holiday’) are the incremental mean return against the mean Non-holiday return. Thus the incremental mean return plus the mean Non-holiday return is the relevant mean return.

3. *t*-statistics test the null hypothesis of zero incremental return.

4. ‘*’ , ‘**’ indicate significance at the 5% and 1% levels.

trading days on the Shenzhen market displays a unique large post-holiday return pattern that has not been found in previous studies. The mean returns on post-holiday trading days are larger than the mean returns on pre-holiday trading days, and the mean returns on pre-holiday trading days are larger than the mean returns on non-holiday trading days.

Does this type of holiday effects exist only on one day immediately before and after holidays, or on more than one day before and after holidays? Using the same basic methodology, the test of holiday effects is extended to three trading days preceding holidays and four trading days succeeding holidays. It can be seen from Table 6-10, for the Shanghai market, that there are no apparent differences between the holiday effects tested on pre-holiday and post-holiday trading days and tested on three trading days preceding holidays and four trading days succeeding holidays. In contrast, on the Shenzhen market, the holiday effects tested on pre-holiday and post-holiday trading days differ from those tested on three trading days preceding and four trading days succeeding holidays. The mean non-holiday returns in the SZS and SZS-A become negative, meanwhile, the average incremental daily returns of three trading days preceding holidays for the SZS and SZS-A are statistically significant and positive. Thus, the average daily returns of the three trading days preceding holidays are larger than the average daily returns of the four trading days succeeding holidays, and are larger than the mean returns of non-holiday trading days. This sort of holiday effects on the Shenzhen market coincides with the middle post-holiday return pattern reported in Table 6-9 and evidenced from the test on the S&P 500 for small firms by Pettengill (1989a) and the test on the Australian markets by Easton (1990).

Aside from this, there are several other distinct features of holiday effects, for the particular sample of study period, on China's stock markets that can be seen in Table 6-10. First, the mean returns on post-holiday trading days and the average daily returns of the four days succeeding holidays on the Shanghai market are negative, which implies that the trading on several days immediately after holidays on the Shanghai market results in loss of profits. Next, the mean returns of B-shares in the Shanghai market on non-holiday trading days and post-holiday trading days and the average daily return of four days succeeding holidays are negative, which means that the Shanghai B-shares' capital gains are generally obtained only on several days before holidays. Additionally, the capital gains for the SZS and the SZS-A seem to be generated only on the three days preceding and four days succeeding holidays in terms of the negative mean return on non-holiday trading days.

6.4.3 Implications and possible hypotheses of the holiday effects of the Shanghai and Shenzhen markets

Since the market closures for holidays in China are scheduled with consideration of the weekend, the pre-holiday trading days often fall on Fridays and the post-holiday trading days may fall on Mondays. For example, fifteen of thirty pre-holiday trading days are Fridays and seventeen of thirty post-holiday trading days are Mondays for the Shanghai market in the period from December 1990 to May 1998. Thirteen of twenty-eight pre-holiday trading days are Fridays and thirteen of twenty-eight post-holiday trading days are Mondays for the Shenzhen market in the period from April 1991 to May 1998. Therefore, we will test whether the day-of-the-week effects have contributed to the holiday effects in the Shanghai and Shenzhen markets.

The model to test whether the holiday effects are independent from the day-of-the-week anomalies is combined with the models of the tests of day-of-the-week effects and holiday effects.[10] In brief, the influences of day-of-the-week effects on holiday effects are examined by regressing the daily returns against the pre-holiday dummy variable, post-holiday dummy variable and the dummy variables for each weekday. Thus, if the mean returns of each specific day calculated in the combined model vary significantly from those of corresponding days calculated in the separate models, it suggests that the day-of-the-week effects have contributed to the holiday effects.

Table 6-11 reports the mean returns and *t*-statistics for each day of the week and for pre-holiday and post-holiday trading days, which are generated in the combined model. It can be observed that the mean returns on pre-holiday trading days are positive and mean returns on post-holiday trading days are negative for the Shanghai market. Meanwhile, the mean returns on pre-holiday trading days and on post-holiday trading days are positive and the mean post-holiday returns are larger than the pre-holiday returns for the Shenzhen market. The signs and the magnitudes of mean returns and *t*-statistics of returns on pre-holiday and post-holiday trading days in Table 6-11 seem to replicate the results in Table 6-10. Furthermore, the signs and magnitudes of mean returns and *t*-statistics for each day of the week represented in Table 6-11 approximately correspond to those in Table 6-1. As a result, the day-of-the-week effects have not contributed to the holiday effects on neither the Shanghai nor Shenzhen markets. The fact that day-of-the-week effects do not explain holiday effects for China's stock markets coincides with evidence from Ariel (1990) for the U.S. market, Easton (1990) for the Australian market and Liano *et al* (1992) for the OTC stocks in the U.S..

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[10] The models mentioned here have been detailed in Chapter 4 as equations (4-4-1), (4-4-4) and (4-4-5).

Table 6-11. Day-of-the-Week and Holiday Effects

	Mon.	Tue.	Wed.	Thu.	Fri.	Pre-holiday	Post-holiday
PANEL-A			*SSE-A (February 1992 - April 1998)*				
Mean Return	-0.0018	-0.0041	0.0024	0.0024	0.0058	0.0024	-0.0004
t-statistics	-0.7676	-1.7765	1.0427	1.0217	*2.4428	0.2857	-0.0518
			SSE-B (February 1992 - April 1998)				
Mean Return	0.0001	-0.0015	-0.0013	-0.0025	0.0016	0.0082	-0.0019
t-statistics	0.1066	-1.2631	-1.1139	*-2.0442	1.2915	*1.9600	-0.4436
			SSE (February 1992 - April 1998)				
Mean Return	-0.0015	-0.0037	0.0023	0.0023	0.0055	0.0026	-0.0003
t-statistics	-0.6663	-1.7099	1.0548	1.0598	*2.4847	0.3346	-0.0358
PANEL-B			*SSZ-A (October 1992 - April 1998)*				
Mean Return	-0.0007	-0.0022	0.0021	-0.0007	0.0027	0.0060	0.0065
t-statistics	-0.3524	-1.1904	1.1248	-0.4045	1.4309	0.9195	0.9955
			SSZ-B (October 1992 - April 1998)				
Mean Return	0.0004	-0.0018	-0.0020	-0.0021	0.0011	0.0041	0.0046
t-statistics	0.2342	-1.1796	-1.3472	-1.3949	0.7032	0.7655	0.8688
			SSZ (October 1992 - April 1998)				
Mean Return	0.0004	-0.0023	0.0015	-0.0002	0.0023	0.0018	0.0085
t-statistics	0.2136	-1.3400	0.8926	-0.0923	1.3163	0.3063	1.4552

Notes: 1. t-statistics test the null hypothesis that the mean return is equal to zero.
2. '*', '**' indicate rejections of the null hypothesis at the 5% and 1% significance levels.

The closed-market hypothesis has been used to support for the day-of-the-week effects detected in this study. If the hypothesis is true, regardless of whether the market is closed for the weekend or for a holiday, the returns on the trading days before market closure should be high and the returns on the trading days after market reopens should be low. The results of the tests of the holiday effects in Table 6-10 indicate directly that the closed-market hypothesis is active in the Shanghai market. The mean returns on pre-holiday (before market closure) trading days are positive and comparatively high, meanwhile, the mean returns on post-holiday (after market reopen) trading days are negative and low. In contrast, the closed-market hypothesis cannot be observed for the Shenzhen market by simple visual inspection of Table 6-10, since the mean return on post-holiday trading days is larger than on pre-holiday trading days.

However, when the post-holiday returns are decomposed into trading time returns and non-trading time returns, the hypothesis gains credibility. This is similar to the results that obtained with the day-of-the-week effects. The mean trading time returns on post-holiday trading days for the SZS, SZS-A and SZS-B are 0.007%, -0.043% and 0.367%, while the mean trading time returns on pre-holiday trading days for the SZS, SZS-A and SZS-B are 0.080%, 0.381% and 0.580%. The phenomenon that the mean trading time returns are less on post-holiday trading days than on pre-holiday trading days, while mean returns are larger on post-holiday trading days than on pre-holiday trading days, illustrates that the high post-holiday returns on the Shenzhen market are usually generated in non-trading time. An alternative explanation is that the happy emotion of the traders raises returns beginning from the pre-holiday trading day and is maintained until the market opens on the post-holiday trading day. Thus, the non-trading time return of post-holiday day is high as well. After the market opens, the prices and returns decline during the trading time due to working burden on the traders. Therefore, the closed-market hypothesis is also active on the Shenzhen stock market.

Nevertheless, French (1980) refuted the closed-market hypothesis for interpreting holiday effects. He stated that, if the closed-market hypothesis was correct, the average post-holiday return should be lower than the average non-holiday return. Pettengill (1989a) found no evidence supporting the closed-market hypothesis. He argued that if holiday returns resulted from a closed-market effect, then market closure not associated with holidays should produce an effect on returns. However, in the study on the Shanghai and Shenzhen markets, the comparatively high returns before market closure for weekends and holidays and comparatively low returns after the market opens, even testified in trading time, are evidence in favour of the closed-market hypothesis.

As discussed in the section of day-of-the-week effects, under the influence of the settlement procedure, a holiday will postpone receiving cash from selling shares on the days before market closure. Since shareholders are unwilling to sell shares, the prices on trading days before market closure should grow by an interest factor according to the duration of the market closure. Because the A-shares market in China is operated in terms of a one-day settlement procedure, the sales on pre-holiday trading days have to receive cash on post-holiday trading days and the sales on two or three days preceding the holiday can claim cash on the next day before holiday. Therefore, the returns on pre-holiday trading days should be high and the return on two or three days preceding holidays shouldn't be affected by the holidays. Notwithstanding, the average daily returns on pre-holiday trading days and three days preceding the holidays are positive and high on both the Shanghai and Shenzhen markets. This suggests that the settlement hypothesis have no determination for the holiday effects on China's stock markets.

Why are post-holiday returns negative on the Shanghai market, but positive on the Shenzhen market? Probably, since Shenzhen is geographically linked to Hong Kong, where a Western style of living is more popular, the holiday effects on the Shenzhen market are determined by both Chinese and Western holidays. For instance, the Christmas Day, New Year's Day and the Chinese Spring Festival fall within less than one and a half month, which leads to some trading days preceding this holiday meanwhile following another holiday. Even though the Shenzhen market does not close for the Western holidays, the Western holidays scheduled in Hong Kong affect the Shenzhen market. For example, in the period of six days between Christmas Day and New Year's Day from 1992 to 1997, the average daily return was –0.14% on the Shanghai market, and conversely, 0.40% on the Shenzhen market. The high returns on the trading days between Christmas Day and New Year's Day on the Shenzhen market are consistent with the findings in many markets of Western countries (Pettengill 1989a). Apparently, the Western holidays have effects on the Shenzhen market.

6.5 Conclusion

The efficient market theory suggests that regular return patterns do not exist in an efficient stock market. The existence of regular return patterns implies that the market participants can predict the market behaviour according to historical information to obtain abnormal returns, so that the market is not efficient. The anomalies of regular seasonal return patterns have been universally discovered on stock markets. The frequently documented seasonalities are the day-of-the-week, the month-of-the-year and the holiday effects.

The day-of-the-week effects imply that mean returns are significantly different according to the day of the week. Previous findings of day-of-the-week effects have been classified into two patterns: the United Stated and the United Kingdom (U-U) pattern, and Australian and Japanese (A-J) pattern. The U-U pattern has the lowest mean return on Mondays, while the A-J pattern has the lowest mean return on Tuesdays. The day-of-the-week effects of China's A-shares differ from China's B-shares. The negative mean returns usually occur on Mondays, Tuesdays and Thursdays for A-shares, but on Tuesdays, Wednesdays and Thursdays for B-shares. In addition, when the tested period is changed to the most recent four years, the negative mean Monday return for A-shares is replaced by a positive mean Monday return. The patterns of the returns in sector indices are consistent with that in A-shares indices. Nevertheless, the day-of-the-week effect pattern of both the Shanghai and the Shenzhen markets are identical to the A-J pattern.

The time zone hypothesis has been suggested to interpret the relationship between U-U and A-J patterns. The prior condition for the effectiveness of time zone hypothesis is that of the market being open to respond to the New York stock market. Since the foreign inaccessible A-shares dominate the market and the Chinese currency is not convertible, the time zone hypothesis cannot explain the day-of-the-week effects for China's stock markets. The settlement procedure hypothesis is an effective explanation on A-shares to some extent, but not on B-shares. When the daily returns of the week are decomposed into trading time returns and non-trading time returns, the closed-market hypothesis can properly illustrate the day-of-the-week effects for China's stocks markets.

The month-of-the-year effects are highlighted by the significantly high January returns on many stock markets. However the returns on China's stock markets are negative in January and significantly positive in August for A-shares, which means that China's stock markets have a unique month-of-the-year effect pattern that cannot be matched by those of other markets. The tax-loss-selling hypothesis has been frequently referred to in discussions of the high January returns in the literature. Under the circumstances of no capital gain tax and flexible accounting rules dealt with market premium for the tax income in China, the tax-loss-selling pressure fails to explain the true causes of monthly return patterns on China's stock markets. We attribute the negative December and January returns and positive February return on China' stock markets mostly to the traditional accounting settlements and salary allocation in relation to the Chinese Spring Festivals. The high August return on China's stock markets is due to consequent information effects. In particular it results from the announcement of interim reports of individual companies. The window-dressing hypothesis is not consistent with the evidence on China's stock markets.

Even though, the dates and the duration of the holidays are often different in international markets, the holiday effects have been broadly detected. The general pattern of holiday effects display high mean positive returns on pre-holiday trading days, which are lager than those on non-holiday trading days and post-holiday trading days. Based on the fact that the biggest mean return occurs on pre-holiday trading days, the mean return on post-holiday trading days is larger than that on non-holiday trading days in some markets, and the mean return on post-holiday trading days is smaller than that on non-holiday trading days in the other markets. Empirical tests on the Shanghai market show that the mean returns on the trading days before holidays are larger than that of non-holiday trading days, and the mean return of non-holiday trading days are larger than that on the trading days after holidays. On the Shenzhen market, the mean returns on post-holiday trading days are larger than the mean returns on non-holiday and post-holiday trading days, which is unique in comparison with other markets. However, the average daily returns of the three days before holidays are larger than the average daily returns of the four days after holidays on the Shenzhen market. In step with the analysis on the day-of-the-week effects, the closed-market hypothesis has the effective meaning on explanations of holiday effects on China's stock markets. Moreover, we attribute the unique pattern of the Shenzhen market to the possible combination of Western (Hong Kong) and Eastern (China) life-styles.

It should be noted that China's stock markets have only been open for ten years and that the available data for this seasonality test is about seven years or less. The tests therefore are still built on relative short sample periods. Many of the seasonal effects are not as significant as that of other markets, but there is some statistically significant evidence of seasonalities in the Chinese markets. Also these seasonal effects are "economically significant," in that trading shares on these seasonal patterns would have engendered abnormal profits for this particular sample period. Although many of the world's markets have statistically significant seasonalities, trading on these pattern do not always result in abnormal profits (economically insignificant). Moreover, this study has presented a complete analysis of the seasonalties in China's stock markets. The results have enriched the relevant literature on the efficiency of emerging markets.

Chapter 7 Event Studies: Reaction of the Returns to Public Information

7.1 Introduction

In a semi-strong form efficient market, the stock prices should fully, instantly and correctly reflect the public information. Event studies provide a direct test of the hypothesis of semi-strong form market efficiency by examining the reaction of stock prices to the announcement of firm specific events. The firm specific events, such as stock splits and dividend issues, are taken to be irrelevant to shareholders' wealth, because such idiosyncratic phenomena are theoretically diversifiable. However, such events do convey the information on the future cash flows of the company. Current events signal the future profitability of the company, and the gains to the investors. Therefore, the announcements of events can, and frequently do, affect the stock prices and returns.

The magnitude of the abnormal stock price performance in the period surrounding the event announcement date is a measure of the impact of the events. This study tests the abnormal returns on the announcement date and the cumulative abnormal returns in intervals before and after the announcement date. The presence of significant abnormal returns occurring before the announcement date implies that the share traders have anticipated the informational content of the event, or that they have accessed to inside information. The presence of significant non-zero abnormal returns persisting after the announcement indicates systematic overreaction or underreaction in the stock prices in response to the information. Where there is no underreaction or overreaction, a significant and abnormal performance of stock prices on the event announcement date is consistent with the hypothesis that stock prices fully, instantly and correctly reflect the announced event.

This study focuses on the specific events of zero-dividend issues, cash dividend issues, bonus issues and rights issues. The following factors, in particular, need to be taken into consideration with respect to the tests. Firstly, the proposal and subsequent approval of each event are announced consecutively. Secondly, the A-shares and B-shares investors may rationally react to the announcement differently. Thirdly, the announcement of one event is often followed by the announcement of another event within a financial year. Finally, events of a particular type have unequal informational content due to the difference in the specific schemes. Bearing these factors in mind, thirty-seven samples have been constructed. This study will not conduct individual tests on the Shanghai and Shenzhen markets to avoid a lack of precision, which usually results from small samples.

Extensive tests will detect the preferences of China's share traders to the different types of events specifically, the preferences of A-shares traders compared with B-shares traders, the different responsiveness of China's shares traders to the event proposal and approval respectively, and the reaction of stock prices to the unique announcement and the announcement relating to the possibility of further events in the future. More importantly, this study shows that stock prices react to the announcement of events in different manner depending upon the specific issue schemes.

Following the introduction of the chapter, Section 7.2 defines the events and the relevant announcements. Section 7.3 discusses the application of daily return data, the principle of sample construction and the criteria used in the assessment of market efficiency. Section 7.4 tests the reaction of returns to the announcement of zero-dividend issues. Section 7.5 tests the reaction of returns to the announcement of cash dividend issues. Section 7.6 tests the reaction of returns to the announcement of bonus issues. Section 7.7 tests the reaction of returns to the announcement of rights issues. The final Section, 7.8, summarises the results of this Chapter.

7.2 Event determination and the announcement of information

7.2.1 Determination of the events for this study

The events triggering stock price movements are generally classified as either macroeconomic events or microeconomic events. For example, the movements of interest rates, the adjustment to the national budget and the implementation of new regulations are macroeconomic events that may affect all stock prices. Microeconomic events include stock splits, dividend issues, mergers, acquisitions and so forth. Microeconomic events primarily concern a specific company, and having an effect on that company's stock price. The event study literature usually emphasises the average reaction of stock prices to specific microeconomic events. However, the scope of the application of event studies is restricted for China's stock markets due to the available data. Particularly, the stock splits, mergers and acquisitions, which are popularly documented in the literature regarding developed markets, cannot be effectively investigated in China's Stock Market.

Often, when the price of a stock increases substantially, the company would like to split its stock in order to bring the stock price into a more desirable trading range. Although stock splits only enlarge the number of outstanding shares without affecting the total value of capital, the occurrence of a stock split usually conveys informational content about the potential growth of dividends. Thus, the shareholders usually have favourable expectations for the future of the split stock and the market frequently reacts to stock splits positively. However, this is not the case in China's stock markets, since the high stock prices that had been split were not due to trading based on the good performances of relevant companies, but rather they were set at the initial issues. In the early period of China's stock markets, the par values of the stocks of the initial issues were determined by the individual companies. Hence, during the period from 1990 to 1992, the par values of the stocks listed in the Shanghai market varied between 1 yuan, 10 yuan, 50 yuan and 100 yuan RMB respectively. To facilitate trading, all the stocks that had par values over 1 yuan had been split into 1 yuan shares before 1993. Nevertheless, this type of stock split does not convey the same economic information as stock splits generally in the markets of other countries.

Mergers and acquisitions in a mature market should be the result of enterprises acting in line with their own economic interests. In contrast, most mergers and acquisitions involving companies listed on China's stock markets occur because of governmental action. A large number of the listed companies are organised by their parent companies that are state owned. The local government is the owner of state assets, which enables the local governments to intervene the listed company through their parent companies. When a listed company performs badly, its parent company is accustomed to saving it from insolvency by investing in the company, exchanging assets or purchasing unsold inventory. Therefore the under-performing company will continually satisfy the listing qualifications. On the other hand, when the listed company operates well, the parent company would consider the profitable company merging its unprofitable affiliates, and consequently seeking further capital from the market by issuing new rights. Because the magnitude of a new issue depends on the existing capital size of a listed company, the company after merger would be able to raise more capital. The major objective of local government is to promote the listing of local enterprises, and thereby, to raise as much capital as possible.

Moreover, the veracity of the forecasts of earnings and profits in the financial reports of listed companies is suspect. In particularly, this distrust was prevalent during the initial years, prior to normalisation of the accounting system. Due to the complicated motivations for stock splits, mergers and acquisitions in China's stock markets, the studies on these events may generate ambiguous results.[1] Therefore the price reaction to the announcements of stock splits, mergers and acquisitions, financial reports have not been analysed in this study.

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[1] Xicheng Xu, a postgraduate student at the Graduate School of the People's Bank of China, presented a paper at the 2nd Shanghai International Finance Workshop in August 1999. The paper was entitled "Prices Mechanism and Efficiency of China's Stock Market, A Study on the Mergers and Acquisitions" and provides ambiguous results. He argued that the false mergers and acquisitions, as well as the artificial interest rate employed in the CAPM model, led to unsuccessful tests. Another reason of the ambiguous results, in my opinion, is that the author did not adjust the stock prices for dividend issues before he did this test.

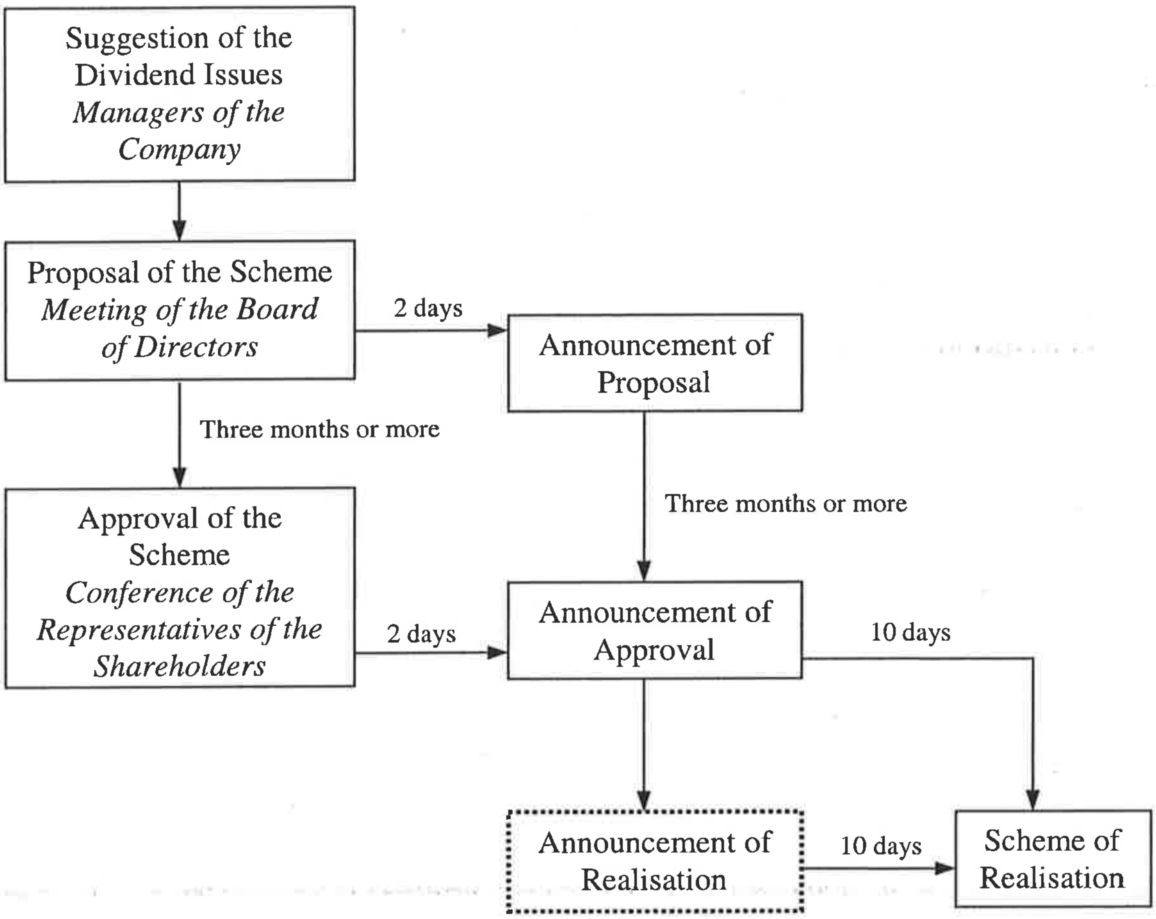
In light of the above, the dividend payment, bonus issues and new rights issues in China's stock markets hold comparative advantage for this type of study. Firstly, the dividends, bonus and new rights issues are economically meaningful as these suffer little artificial intervention from non-economic functions. Secondly, the numbers of observations associated with dividends, bonus, and new rights issues permit useful statistical tests. Finally, the further classification into zero-dividend issues, cash dividend issues, bonus issues and new rights issues provide a diverse scope for the event studies.

7.2.2 Announcement of information in China

The announcement of an event impacts the market by revealing the relevant information. According to the laws and regulations of China's stock markets,[2] important events such as profit distribution and dividend issues should be proposed in the Meeting of the Board of Directors, and approved by the Conference of the Representatives of the Shareholders. Information related to the event must be published within a short period after the relevant decision is made. The process from the proposal of a dividend (or bonus and new rights) issue, to the approval and then the realisation accompanying information disclosures are illustrated in Figure 7-1.

[2] See "Zhonghua Renmin Gongheguo Gongsifa (Company Law of the People's Republic of China)," approved in the 5th Meeting of the Executive Committee of the Eighth National People's Congress, 21 December 1993; "Gufenzhi Gongsi Songpei Gu Xinxi Pilu de Neirong Yu Geshi Linshi Guiding (The Provisions of Content and Style of Information Disclosure for Share Owner Company with Public Issues)," formulated by China's Securities Regulatory Commission, 12 June to 27 October 1994; "Zhonghua Renmin Gongheguo Zhengquan Fa (Securities Law of the People's Republic of China)," drafted by the Financial and Economic Committee of the Tenth National People's Congress in December 1998.

Figure 7-1. The Process of Dividend and New Rights Issues in Relation to the Announcement of Information



The manager puts forward the suggestion of a proposal to the Board of Directors. If it is accepted, following the negotiation between the directors in the Meeting of the Board of Directors, a scheme of the proposal is filed and will be announced in two days. The proposal is voted on by the coming Conference of the Representatives of Shareholders. In general, the scheme of the proposal can be approved by the representatives of the shareholders, and will be announced in two days immediately after the vote. If the date of realisation of the scheme is far from the date of approval of the scheme, the company will make an announcement again about ten days before the actual realisation. Otherwise, the scheme will be realised in ten days succeeding the approval. The announcements are usually published on the notice board of the stock exchange via the transaction system, and in authorised financial newspapers.

Some companies design favourable structures of dividends and new rights issues in their schemes in that they use the announcement strategies to promote the price performance of their shares. For example, one comprehensive scheme includes cash dividends, bonus and new rights issues together, which can be separated into three different schemes. Therefore, the number of announcements in the comprehensive scheme could be tripled if it were separated into three different schemes. The company attracts greater amount of attention from the share traders for a prolonged period. Apparently, this comprehensive announcement, compared with a signal announcement with anticipation of a future announcement, has dissimilar effects on stock prices.

Taking into account the above facts, this study will analyse the announcements of proposals, announcements of approvals, announcements not associated with future announcement in the same financial year, announcements associated with future announcement in the same financial year. Of course, the specific selection of the events in the study is subject to the availability of reference material covering the events.

7.3 Daily data, sample construction and the criteria of efficiency

7.3.1 Daily stock return data

Previous literature exhibits the use of both monthly and daily stock return data employed in event studies. For example, FFJR (1969), Charest (1978a, 1978b), Brown and Warner (1980) used monthly stock return data, whereas, Scholes (1972), Corrado (1989), Frankfurter and Schneider (1995) used daily stock return data. Theoretically, daily data and monthly data may differ in potentially important respects: daily returns depart more from normality than monthly returns (Fama 1976), the estimation of parameters from daily returns is complicated due to non-synchronous trading (Scholes and Williams 1977), and daily returns have smaller standard deviation than do the monthly returns (Brown and Warner 1985).

However, Brown and Warner (1985) showed in their simulation that the non-normality of daily returns has no obvious impact on event study methodologies. They provided evidence that the mean abnormal returns in a cross-section of securities converge to normality as the number of securities in the sample increases, although the daily abnormal returns are highly non-normal. Their study argued that standard parametric tests are well-specified using daily abnormal returns computed using either the market model or the market adjusted model, and, as expected, the power of each test is greater with daily returns than monthly returns. In addition, the use of daily returns is potentially effective in that it permits the researcher to take advantage of precise information about the specific day of the month on which an event takes place.

Besides the benefits of using daily data, as argued by Brown and Warner (1985), using daily data in this study is suitable due to the special characteristics of China's stock markets. Firstly, China's stock markets have been open for only nine years and the majority of companies were listed after 1995. Thus, the number of monthly observations is less than one hundred for most of the listed companies. The sample size for both monthly observations of a stock and the numbers of stocks with sufficient observations is too small to satisfy the requirements of the statistical tests. Secondly, an assumed estimation window of 36 monthly observations covers three years in which the same event, such as the announcement of a dividend issue, may happen at least three times. Despite the fact that 36 observations is sufficient for generating abnormal returns for a study on dividend issues, this estimation would be biased because of the influences of other economically significant events which can occur during this estimation window.

7.3.2 Sample construction

The samples for each type of event analysed in this study are limited to the period from 1994 to 1998 for the following reasons. Firstly, because neither the Shanghai nor the Shenzhen stock market was regularly operated in the initial period before 1993, the process of dividends and new rights issues of the two markets had not been determined by formal regulation. Secondly, the legislation negotiated by each market respectively had not been unified prior to 1993, so that the same event on the two markets may have had different characteristics. Thirdly, the professional financial newspapers, which are authorised by CSRC for publishing information about stock markets, were inaugurally issued around the end of 1993. The official annual yearbooks of the stock exchanges, which contain the records of relevant events, were regularly published only after 1993. Therefore, references to the events, which occurred prior to 1993, cannot be obtained.

Given the predetermined event window of 130 days and the investigation window of 41 days discussed in Chapter 4, the selected stocks in the samples should be traded no less than 150 days before and 20 days after the event date to be considered in this study. The trading of selected shares should be continuous day to day, except when the market closes for public holidays. All of the events analysed in this study are taken from the *Shanghai Stock Exchange Statistics Annual* and the *Shenzhen Stock Exchange Fact*, or from the databases of the Newland Information Consulting Company and the Shenzhen Genius Information Corporate Limited.[3] When the content or the event date is ambiguous, or cannot reconciled with different reference sources, the relevant stock will not be sampled.

Considering the preceding event determination, announcement process and data specification, thirty-seven different samples (in Table 7-1) will be examined in this study. Nevertheless, each sample will be more precisely defined in the relevant subsections of this chapter.

[3] For the data resources, please see Section 4.6 in Chapter 4.

Table 7-1. The Samples Tested in the Event Studies

Main Event	Announcement	Shares	Samples
Zero-dividend	Proposal	A-shares	Unique announcement
			Announcement associated with future announcement
			Overall
	Approval	A-shares	Unique announcement
			Announcement associated with future announcement
			Overall
		B-shares	Unique announcement
Cash Dividend	Proposal	A-shares	Under-ADPR cash dividend
			Over-ADPR cash dividend
			Unique announcement
			Announcement associated with future announcement
	Approval	A-shares	Under-ADPR cash dividend
			Over-ADPR cash dividend
			Unique announcement
			Announcement associated with future announcement
		B-shares	Under-ADPR cash dividend
			Over-ADPR cash dividend
			Unique announcement
			Announcement associated with future announcement
Bonus	Proposal	A-shares	Small bonus
			Middle bonus
			Large bonus
			Overall
	Approval	A-shares	Small bonus
			Middle bonus
			Large bonus
			Overall
		B-shares	Small bonus
			Middle-large bonus
			Overall
Rights	Proposal	A-shares	Low-ratio rights
			High-ratio rights
			Overall shares
	Approval	A-shares	Low-ratio rights
			High-ratio rights
			Overall
		B-shares	Overall

Note: The definitions of each sample will be given in the relevant sections of this chapter.

7.3.3 Criteria for assessment of market efficiency

Theoretically, in a semi-strong form efficient market, the stock prices should fully and instantaneously reflect the announcement of information, permitting no abnormal returns to be obtained through strategic trading. Typically quantitative analysis in line with this theory starts at event time $t = 0$, with the formation of a portfolio on the basis of the event that affects the stock prices of the portfolios, say a stock split. One then goes on to investigate whether later on ($t > 0$) the estimated abnormal returns measured by the model are equal to zero. Statistically significant departure from zero is interpreted as being inconsistent with market efficiency.

In fact, empirical studies employed this theory in a variety of ways. FFJR (1969) defined the U.S. market as an efficient market by indicating that the market could adjust to the announcement of stock splits and use the informational content to re-evaluate the stream of expected income from the shares. Their arguments are based on the description of the cumulative abnormal returns (CARs) with tables and figures rather than statistical tests. Scholes (1972) applied an Abnormal Performance Index to detect abnormal returns in the periods of secondary issues. He discovered that the Abnormal Performance Index alters little in the period after the announcement of secondary issue, which is direct evidence of an efficient market. Thus, once the secondary issue has been announced, it is not necessary for present shareholders to trade.

Charest (1978a, 1978b) concentrated on the t-tests for the abnormal returns at the announcement date of stock splits and dividend changes. He also analysed the CARs that occurred after the announcement. However, if the abnormal returns at the event date are statistically significant and different from zero, he claimed that the market is inefficient, as he thought that the events are irrelevant to the wealth of shareholders. Charest's (1978a, 1978b) viewpoint is reversed in the successive research, such as in Brown and Warner (1985) and Campbell *et al* 's (1997) studies. They pointed out that because the announcement conveys information, the stock prices should reflect the announcement instantly at the event date with the abnormal returns being significantly different from zero. Brown and Warner (1985) developed the *t*-test on CARs in intervals, and this was later formulated in matrix expression by Campbell *et al* (1997). They argued that systematically non-zero abnormal returns that persist after the announcement of specific events are inconsistent with the hypothesis of an efficient market.

This study follows the approach of Brown and Warner (1985) and Campbell *et al* (1997). More specifically, the *t*-test will be applied to abnormal returns at the event dates, on CARs in intervals before, around and after the announcement date, according to the methodologies detailed in Chapter 4. The assessment of market efficiency will be according to the following criteria. Firstly, statistically significant CARs in the intervals before the event date imply anticipation of the announcement, or insider trading. Despite the fact that using inside information is a characteristic of an inefficient stock market, since the use of inside information cannot be isolated from the effect of reasonable anticipation of the announcement, this criterion is not widely employed. Secondly, the statistically significant CARs in the intervals after the event date imply the existence of an opportunity to follow a strategy to gain abnormally high returns. This is the primary criterion to measure market efficiency. Thirdly, the statistically significant positive or negative abnormal returns at the event date in relation to the “good” news or “bad” news illustrates the reasonable response of the stock prices to the announcement. Finally, combined with the second and third criteria, the existence of inefficient of underreaction or overreaction can be specified.

7.4 Reaction of returns to the announcement of zero-dividend issues

7.4.1 Dividend, taxes and informational content

Dividends are a portion of the company’s profits paid to its shareholders. Profits, in this context, include retained profits as well as the current year’s profits. In China, the dividends are normally paid in cash, but occasionally they are paid in the form of shares (stock dividend) with no cash alternative. Regardless of whether the company issues cash dividends or stock dividends, theoretically, a company’s dividend policy has no effect on shareholder’s wealth, when certain conditions hold. This proposition was first advanced by Miller and Modigliani (1961).

There are three options that a company could choose from to finance a given investment plan. One is to allocate the existing profits directly into capital in lieu of the payment of any dividend to its shareholders. The next is to pay the cash dividend out of its profits and simultaneously make a new share issue of the same amount at the current market price. The third is to pay the stock dividend (bonus) out of its profits according to market price. Obversely, since the effect of dividend payment on shareholders’ wealth is offset exactly by other means of capital financing, the shareholder wealth is indifferent to any of these dividend policies.

Pettit (1977) argued that the proposition of dividend policy irrelevance could only hold under the assumptions of perfectly competitive capital markets with all investors being tax-exempt, or where there is no differential taxation of capital gains and interest income. He found that investors whose tax rate on dividends was greater than (or less than) the tax rate on capital gains tended to invest in the companies with a low (or high) dividend yield. Lewellen *et al* (1978) provided evidence to indicate that investors are influenced by tax policy, in that there is a weak inverse relationship between dividend yields and investors' marginal tax rates. In their regression model, with regard to the dividend yields of investors' portfolios and various investor characteristics, they found that the tax rate variable is statistically significant but economically unimportant.

Regardless of the argument of irrelevance of dividend policy under the assumption of tax-exemption,[4] the fact that stock prices should be influenced by the informational content of dividend announcement has been put forward in many studies. Lintner (1956), and Ball and Brown (1968) suggested that investors take a company's dividend announcement as a source of information when forecasting the future returns of an investment in the company's shares. For example, an increase in the size of a company's dividend may anticipate greater future cash flows with a resultant rise in the price of the company's share. Meanwhile, a decrease in the size of dividend causes investors to be more pessimistic about the future cash flows of the company, which

[4] The effect of dividend policy has been hotly debated. In addition to the Miller and Modigliani's (1961) dividend irrelevance theory, there are Gordon's (1963) "bird-in-hand" theory, Pettit's (1977) "tax preference" theory and "clientele effect" theory (Peirson *et al* 1995). Further discussion is beyond this study.

leads to a decline in the prices of the company's share. In particularly, zero dividend is always indicative of potentially poor performance of the company in the future.

Zero-dividend means that neither a cash dividend nor a stock dividend will be distributed to the shareholders in the current financial year. There were few cases of zero-dividend for either the Shanghai or Shenzhen markets before 1994, but many cases emerged after 1996. Zero-dividend policy may arise in several circumstances in China. Firstly, where the listed company is operating poorly without any profits available to be allocated as dividends; the company may even be insolvent. This type of cases accounts for 20% of all zero-dividend issued companies in China. Next, the listed company may not be operating soundly, with little profit the payment of dividend makes no sense. This type of cases accounts for 40%. Thirdly, the reported "profit" may be made only in the accounting statements. In fact, the accounting profit may never be attainable due to the presence of bad debts. This type of cases accounts for 25%. Finally, the company may prefer holding profits as a source of new funding rather than allocating dividends, since raising capital from issuing new shares would be assessed by the authority through a complicated procedure. This type of cases accounts for 15%. Obviously, the first three types of cases of zero-dividend announcements have bad news content. The last one is ambiguous. In general, the information of zero-dividend could be categorised as bad news.

7.4.2 Tests on the announcement of zero-dividend proposals for A-shares: results

In terms of the legislation from CSRC, the listed company can be authorised to issue rights and bonus if it has had two years of continuous profit.[5] Thus, some zero-dividend announced companies will be able to issue rights, or issue bonus out of their retained profits and accumulated capital reserves. Among the 164 observations of zero-dividend proposals of A-shares on the Shanghai and Shenzhen markets, twenty of them were announced contemporaneously with rights or bonus issues, and thirty-seven of the zero-dividend announcements were followed with announcements of rights and bonus issues after several months. To avoid confusion, we exclude the observations that were combined with the contemporaneous announcements of zero-dividend and rights or bonus issues. The tests are conducted respectively on the 107 announcements of zero-dividend proposals without future announcement of rights or bonus issues and 37 announcements of zero-dividend proposals associated with future announcement of right or bonus issues.

7.4.2.1 A-shares return behaviour around the announcement of zero-dividend proposals

The A-shares return behaviour around the announcement of zero-dividend proposals is summarised in Table 7-2. The cumulative abnormal returns (CARs) generated using the market adjusted model, the market model and the mean adjusted model are represented in Table 7-2(a). The category "Unique" consists of announcements of zero-dividend proposals without future announcement of rights or bonus issues, and the category of the "Associated" consists of the announcements of zero-dividend proposals associated with future announcement of rights or bonus issues. In the following discussion, these categories may be referred to as the unique-announcement

[5] "Shangshi Gongsi Songpei Gu Linshi Guiding (Temporary Provisions for the Bonus and Right Issues of the Listed Companies)," China's Securities Regulatory Commission, 1993.

sample and the future-associated-announcement sample. The date on which the announcement (event) occurs is labelled 0. Dates labelled -1 and +1 are alternative event days in the case of event date record error, or where the information was released after market close. Dates labelled with negative numbers are days before the event date, while positive numbers indicate days following the event date. The relevant test statistics on specific event days and in intervals are reported in Table 7-2(b) and Table 7-2(c). Figure 7-2 provides a visual description for CARs measured by the market adjusted model, the market model and the mean adjusted model.

As was previously discussed in Chapter 4, the market adjusted model stresses the difference between specific stock returns and contemporaneous market returns. The market model emphasises the difference between the specific stock returns and the predicted regression values for the stock returns based upon market returns. Thus, the CARs in the market adjusted model and the market model sections demonstrate that zero-dividend stocks perform badly around the proposal announcement date in comparison with the market level. The CARs for the overall sample are negative and consecutively tend to become larger in absolute value. The CARs at the event date for the first 20 days are -8.16% and -8.20%, for the two models respectively, and usually decrease in the next 21 days to a level of -16.56% and -15.42%.

Alternatively, the mean adjusted model highlights the deviation of the specific stock return from its average return during the estimation window. Thus the CARs in the mean adjusted model section do not show that the zero-dividend stocks exhibit poor returns around the announcement date in comparison with their general performance in

Table 7-2. Results of the Tests on the Announcement of Zero-Dividend Proposals for A-shares in China's Stock Market

7-2(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*			*Mean Adjusted Model*		
Date	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*
-20	-0.0020	0.0079	-0.0003	-0.0017	0.0079	-0.0001	-0.0015	0.0123	0.0008
-18	-0.0029	0.0045	-0.0017	-0.0028	0.0041	-0.0017	0.0063	0.0167	0.0080
-16	-0.0162	0.0030	-0.0131	-0.0158	0.0029	-0.0128	-0.0018	0.0233	0.0023
-14	-0.0255	0.0021	-0.0210	-0.0251	0.0017	-0.0207	-0.0065	0.0273	-0.0010
-12	-0.0264	0.0046	-0.0213	-0.0251	0.0043	-0.0203	-0.0100	0.0273	-0.0039
-10	-0.0281	0.0052	-0.0227	-0.0270	0.0054	-0.0217	-0.0055	0.0337	0.0009
-8	-0.0320	0.0219	-0.0232	-0.0304	0.0216	-0.0219	-0.0008	0.0598	0.0091
-6	-0.0407	-0.0030	-0.0346	-0.0399	-0.0024	-0.0338	0.0075	0.0447	0.0136
-4	-0.0454	-0.0109	-0.0397	-0.0453	-0.0108	-0.0397	0.0211	0.0663	0.0285
-3	-0.0495	-0.0185	-0.0444	-0.0496	-0.0183	-0.0445	0.0250	0.0624	0.0311
-2	-0.0771	-0.0371	-0.0705	-0.0776	-0.0357	-0.0707	0.0058	0.0728	0.0168
-1	-0.0871	-0.0535	-0.0816	-0.0880	-0.0518	-0.0820	0.0099	0.0740	0.0204
0	-0.1043	-0.0869	-0.1015	-0.1057	-0.0853	-0.1023	0.0010	0.0387	0.0072
+1	-0.1187	-0.0907	-0.1141	-0.1212	-0.0901	-0.1161	-0.0044	0.0346	0.0020
+2	-0.1342	-0.0922	-0.1274	-0.1379	-0.0911	-0.1303	-0.0019	0.0369	0.0045
+3	-0.1490	-0.1013	-0.1412	-0.1532	-0.1000	-0.1445	0.0006	0.0486	0.0085
+4	-0.1566	-0.1057	-0.1483	-0.1601	-0.1051	-0.1511	-0.0077	0.0470	0.0012
+6	-0.1415	-0.0968	-0.1342	-0.1468	-0.0957	-0.1384	0.0264	0.0541	0.0309
+8	-0.1417	-0.0885	-0.1330	-0.1446	-0.0883	-0.1354	0.0106	0.0737	0.0209
+10	-0.1409	-0.1025	-0.1346	-0.1408	-0.1003	-0.1342	-0.0115	0.0463	-0.0021
+12	-0.1554	-0.1015	-0.1466	-0.1547	-0.0976	-0.1454	-0.0261	0.0292	-0.0171
+14	-0.1713	-0.0821	-0.1567	-0.1661	-0.0790	-0.1518	-0.0801	0.0344	-0.0614
+16	-0.1996	-0.1182	-0.1863	-0.1924	-0.1121	-0.1793	-0.1280	-0.0396	-0.1136
+18	-0.1952	-0.1267	-0.1840	-0.1859	-0.1186	-0.1749	-0.1440	-0.0580	-0.1300
+20	-0.1737	-0.1240	-0.1656	-0.1616	-0.1161	-0.1542	-0.1420	-0.0646	-0.1293

Notes: 1. Unique: the sample of 107 zero-dividend proposals without the future announcement of rights or bonus issues.

2. Associated: the sample of 37 zero-dividend proposals associated with the future announcement of rights or bonus issues.

3. Overall: total of 144 zero-dividend proposals including the 'Unique' and 'Associated' samples.

4. Date 0: the date of the announcement.

5. Date -1 to -20: the dates before the announcement.

6. Date +1 to +20: the dates after the announcement.

7-2(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

	Parametric t-test Statistics								
	Market Adjusted Model			*Market Model*			*Mean Adjusted Model*		
Date	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*
-1	-1.6339	-2.3981	-1.9769	-1.8112	-2.3884	-2.1725	0.2791	0.0849	0.2635
0	-2.8127	-4.8871	-3.5550	-3.0887	-4.9771	-3.8960	-0.6075	-2.6561	-0.9675
+1	-2.3462	-0.5581	-2.2618	-2.7130	-0.7050	-2.6469	-0.3728	-0.3081	-0.3830
	Nonparametric (rank) t-test Statistics								
	Market Adjusted Model			*Market Model*			*Mean Adjusted Model*		
Date	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*
-1	-1.3562	-1.2868	-1.5194	-1.2920	-1.5320	-1.5429	0.2949	-0.2222	0.2164
0	-2.3292	-3.0812	-2.8351	-2.6609	-2.9746	-3.1289	-0.8796	-2.0942	-1.2305
+1	-1.9023	-0.2209	-1.7211	-2.2210	-0.3461	-2.0345	-0.0381	-0.8814	-0.2211

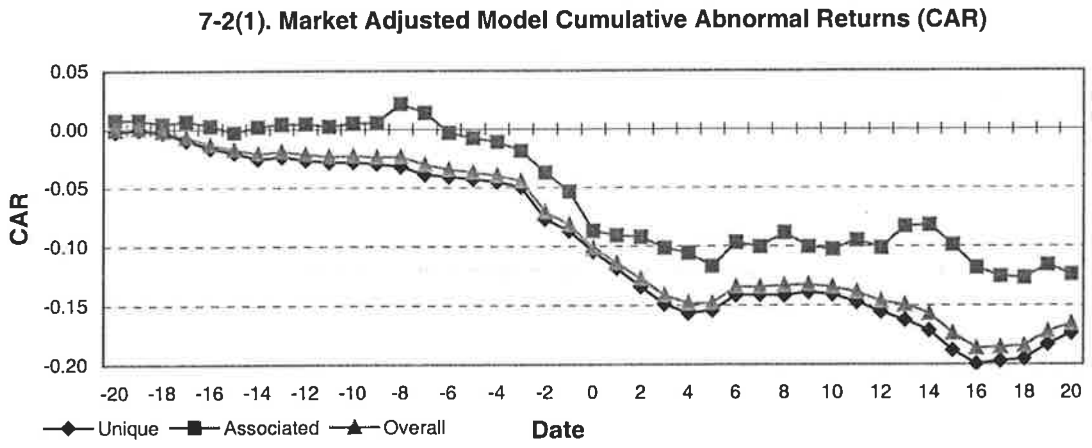
Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

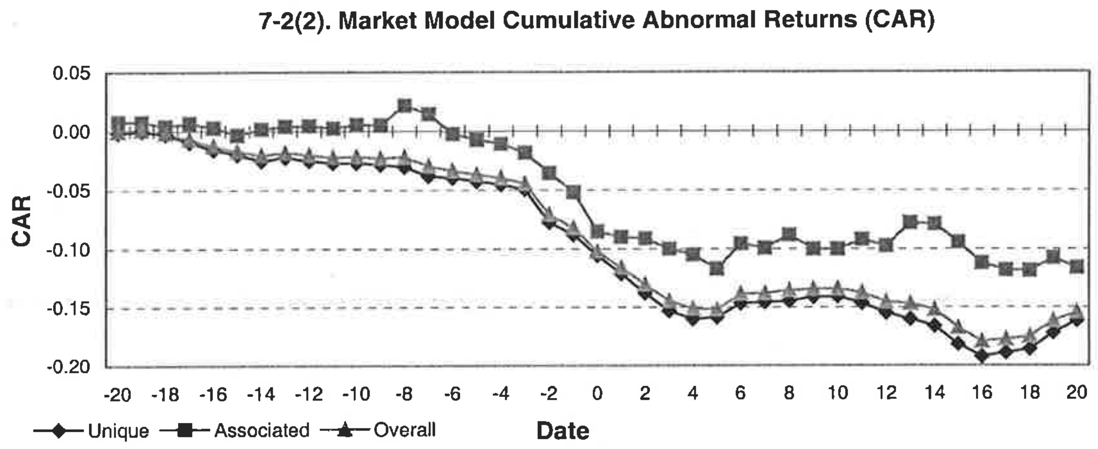
7-2(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

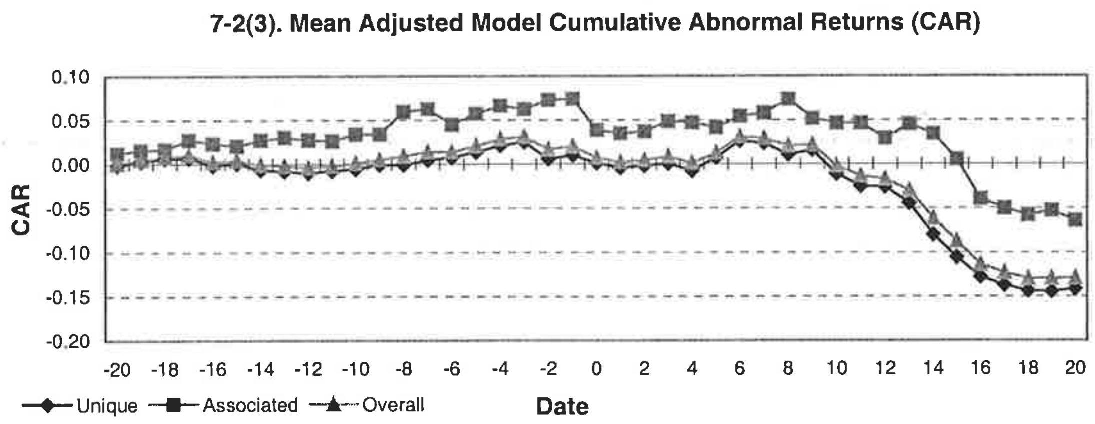
	Market Adjusted Model			*Market Model*			*Mean Adjusted Model*		
Date	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*
	11 Days Around Event Day								
5 before	-3.3835	-3.3041	-3.7616	-3.7489	-3.2741	-4.1439	0.0747	0.9830	0.2236
5 after	-3.6335	-1.9630	-3.7225	-4.1257	-2.1115	-4.2450	0.1901	0.0961	0.1856
11 around	-5.5789	-5.0246	-6.1177	-6.2404	-5.1317	-6.8305	-0.0046	-0.0733	-0.0158
	21 Days Around Event Day								
10 before	-3.0386	-2.5928	-3.3032	-3.3610	-2.5519	-3.6340	0.3819	1.1317	0.5224
10 after	-1.8863	-0.7184	-1.8725	-1.9382	-0.7050	-1.9336	-0.2726	0.1827	-0.2151
21 around	-4.0123	-3.3514	-4.3473	-4.3308	-3.3336	-4.6922	-0.0572	0.3274	0.0010
	41 Days Around Event Day								
20 before	-3.1792	-1.7492	-3.2635	-3.4307	-1.7183	-3.5220	0.1519	1.2445	0.3344
20 after	-2.5342	-1.2128	-2.5651	-2.1823	-1.0219	-2.2253	-2.1924	-1.7368	-2.2404
41 around	-4.4297	-2.8320	-4.6261	-4.4027	-2.6911	-4.6226	-1.5200	-0.7587	-1.4823

Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-2. Cumulative Abnormal Returns (CAR) for Zero-Dividend Proposals of A-shares in China's Stock Market







the estimation window. The CARs of overall sample do not decline everyday in the investigation window. Further, the CARs within 20 days around the announcement date are positive.

The contradictory results for the CARs of zero-dividend stocks in the three sections of Table 7-2(a) are a product of the different measurements based on the market return level or the specific share's average return level. These features may suggest, firstly, that the zero-dividend stocks account for a small part of the market, while the stocks without bad news announcements account for large part. Secondly, most of the companies announce good or neutral news. Thirdly, due to the favourable macroeconomic information being broadcast, the market is experiencing a bullish period. Therefore, the proposed zero-dividend stock returns around the announcement date are significantly lower than the market level, but not less than its average level during the estimation window, a period prior to the announcement date.

An outstanding characteristic is that if a future announcement of bonus or rights issues follows the announcement of zero-dividend proposal in the same financial year, the relevant stock price performance is improved. The CARs in each section of Table 7-2(a) provide consistent evidence of this phenomenon. For example, the CARs of 41 days around the announcement date of the unique-announcement zero-dividend proposals are -17.37%, -16.16% and -14.12%, while they are -12.40%, -11.61% and -6.46% for the future-associated-announcement zero-dividend proposals. From inspection of Table 7-2(a), we notice that every CAR for the "Unique" sample is smaller than that in the "Associated" sample in each section. This is illustrated as well in Figure 7-2, in which the CAR lines of the "Unique" sample lie below the lines of the "Associated" sample.

The parametric and nonparametric (rank) t-test statistics on returns at the event date for the announcement of zero-dividend proposals are reported in Table 7-2(b). It is evident from this table that the t-test statistics on the returns from market adjusted model and the market model for each sample are significantly negative at the event date 0 at the 1% significance level. The parametric t-values on the market adjusted model returns for the overall sample are below -1.97, -3.55, -2.26 and on the market model returns for "Overall" sample are below -2.17, -3.89, -2.64 at the three event dates 0, -1 and +1, respectively. However, the t-test statistics on the mean adjusted model returns for the "Overall" sample are not negative significant despite the fact they are negative and significant for the "Associated" sample at the date 0. The above results imply, in comparison with the market return level, that stock prices strongly react to the announcement of zero-dividend proposals as bad news. In comparison with their own average return level during the estimation period, these reactions are less strong. The reason for this difference was discussed above.

As previously detailed, the performance of the zero-dividend stocks with the future announcement of bonus or rights issues are usually better than those without the future announcement, because the company that wants a future announcement must be profitable before the future announcement is authorised. This is suggested by Table 7-2(a), in which the cumulative abnormal returns in the "Associated" sample are larger than the corresponding values in the "Unique" sample across every model. However, the fact that in Table 7-2(b), the t-values at the date 0 in the "Associated" sample for each sort of model returns are larger than the corresponding returns for the "Unique" sample in absolute value, suggesting that share traders anticipate better performance for the future-associated-announcement zero-dividend stocks than for the unique-announcement zero-dividend stocks. Thus, when the same bad news is announced, the better anticipated stock prices would respond temporarily stronger than the worse anticipated stock prices at the announcement date.

The magnitudes of the nonparametric test statistics are smaller than the corresponding values of the parametric test statistics. Even so, the nonparametric test statistics provide approximately the same conclusion.

Table 7-2(c) concludes the results of tests on cumulative abnormal returns in intervals. Several features are noteworthy from both the market adjusted model and market model sections. Firstly, the *t*-values on CARs in intervals of 11 days, 21 days and 41 days around the announcement date are consistently negative and significant at the 1% significance level. In particularly, the *t*-values for the interval of 11 days are strictly large in absolute value and below -5. These illustrate that the announcement of zero-dividend proposals has a significantly negative influence on the returns in the interval 11 days around the announcement date. Secondly, for more detail, the CARs are significantly negative for the 5 day period before and after, and for the 10 day period before announcement date. As evidence, the zero-dividend proposal affects the prices for 10 days in advance of the announcement and for 5 days following the announcement. Thirdly, the unique-announcement zero-dividend proposed stocks still generate significantly negative CARs during the much longer period of 20 days before and after the announcement date, which indicates the enduring effect of the zero-dividend proposal announcement for the unique-announcement stocks compared to the future-associated-announcement stocks. Nevertheless, in the mean adjusted model return section of Table 7-2(c), the CARs are not significantly different from zero except for the 20 days after the announcement in the "Unique" and "Overall" samples.

7.4.2.2 Assessment of market efficiency for A-shares on the announcement of zero-dividend proposals

In a semi-strong form efficient market, the stock prices should fully reflect all public information. Even though it is difficult to isolate the possible effects of dividend announcements from the others, often closely synchronised, announcements, good news should be associated with positive returns and bad news should be associated negative returns immediately after the announcement is made. Thus, the zero-dividend issue should lead to a drop in the prices along with a significant decline in returns. Trading shares based on public news should not yield excess returns in an efficient market.

If we limit our view merely to market behaviour at the announcement date, the statistical tests imply that the market should be designated as efficient. In the market model and market adjusted model return sections, either the parametric or non-parametric *t*-values at the event date 0 are below -2.58, which shows that the stock prices react to the bad news at the 1% significance level. However, the analysis on CARs and *t*-test statistics on CARs in intervals justify labelling the market inefficient, because it suggests non-instantaneous market reaction to the news. In other words, the zero-dividend proposals influence the stock prices not only at the announcement date, but also at other time else.

The CARs in Table 7-2(a) mostly decrease consecutively during the whole investigation period from day -20 to +20. In particular, the CARs in the "Unique" sample for both the market model and market adjusted model return sections are negative day by day. The returns decline significantly before the announcement date as is evidenced by the *t*-test statistics on CARs in intervals of 5, 10 and 20 days for the "Unique" sample and 5 and 10 days for the "Associated" sample. Those *t*-values below -1.96 or -2.58 suggest, firstly, that the market participants have anticipated the unfavourable news in their trading. Since the poor operation of companies in the "Unique" sample is more obvious than in the "Associated" sample, evidence of anticipation appears early and strongly for the stocks in the "Unique" sample compared to those in the "Associated" sample. Secondly, those significant *t*-values also imply that some traders have incorporated inside information into their trading strategies prior to the announcement date. Although we cannot statistically isolate reasonable anticipation from inside information, the argument that the pre-reaction of the zero-dividend proposal are partially introduced from insider trading should be put forward.[6]

The *t*-test statistics on the CARs in the intervals of 5 and 20 days after the announcement date in the "Unique" sample, and 5 days after the announcement date in the "Associated" sample are below -1.96 or -2.58, which indicates that the announced

[6] In the period which this thesis considers, there was no strict information disclosure legislation in China. It is popular practice for listed companies to release unannounced decisions privately to some financial institutions and to the nearest share traders. Some of the serious cases that were convicted in recent years can be found in the relevant financial newspaper in China.

news was not fully incorporated into the stock prices at the announcement date. The zero-dividend proposal continues to affect the stock prices after the announcement for at least 20 days for the stocks in "Unique" sample and for 5 days for the stocks in "Associated" sample. The stock prices typically underreact to the announcement of zero-dividend proposals in China's stock markets. However, the adjustments to normal are quicker for stocks in the "Associated" sample than for stocks in the "Unique" sample.

That the stock market cannot instantaneously and fully reflect public information creates an opportunity to obtain abnormally high returns. For example of the shares in the "Unique" sample in the market adjusted model return section, if one share trader holds inside information, he may sell shares at the date -20 and buy the shares at the date +20. This strategy would permit the trader to gain abnormally high returns of about 17.37% before considering transaction fees. Even if the trader does not hold inside information, he could sell the shares at date 0 immediately after the public announcement and buys them back at date +20, gaining 6.94% abnormal return without discounting the transaction fees.[7] Despite taking into account the transaction fees of 0.3%, this trading strategy is still profitable. The trading strategy on the shares of the "Associated" sample in the market model and the mean adjusted model sections produce less abnormal excess returns, but it is still economically meaningful. As a consequence, the stock prices inefficiently reflect the announcement of zero-dividend proposals.

[7] The abnormal return to be gained is calculated using the formula: ((-0.1034)-(-0.1737))*100%=6.94%. This formula implies that the abnormal return to be gained or lost is the deviation of the two cumulative abnormal returns at the two specific dates multiplied by 100%. The utilisation of this sort of formula assumes the practice of short selling.

7.4.3 Tests on the announcement of zero-dividend approvals for A-shares: results

In this section we test the announcement of zero-dividend approvals to see whether the stock prices reflect this information effectively. Whether significant abnormal returns are more likely to arise in the trading based on the announcement of zero-dividend proposals or zero-dividend approvals is of interest. Few zero-dividend proposals seem to be rejected, so the zero-dividend proposals studied before constitute part of the zero-dividend approval sample. We sampled 227 zero-dividend approvals in which 144 have been tested previously for zero-dividend proposals. The imprecise records in the references of the Chinese publications usually appear on the proposals, which causes the observation number of proposals in the sample to be less than the observation number of approvals in the sample.[8] Additionally, among the 227 zero-dividend approvals in "Overall" sample, 171 fall in the "Unique" sample with no future announcement in the same year, and the remaining 56 belong to the "Associated" sample for which a company has a future announcement in the same year.

7.4.3.1 A-shares return behaviour around the announcement of zero-dividend approvals

Table 7-3(a) reports that the stock prices react to the announcement of zero-dividend approvals as they do to the announcement of zero-dividend proposals: they incorporate

[8] Because China's Stock Market is an emerging market, the records for the market events and share transactions are not perfect. The database and financial publications frequently loss the records of the proposals. This is why the number of proposals is usually less than the number of approvals in this study.

it as bad news. Nevertheless, the negative effects of zero-dividend approvals are smaller than that of the zero-dividend proposals. The negative CARs for the "Overall" sample, as measured by the market adjusted model, the market model and the mean adjusted model, are respectively -10.89%, -6.60% and -11.82% for the 41 days around the announcement date of the zero-dividend approvals, much smaller in absolute value than -17.37%, -15.42% and -12.93% related to the announcement of zero-dividend proposals reported in Table 7-2(a). This is consistent with Charest's (1978a) study in which the CARs around the announcement of the stock split approvals are smaller than the CARs around the announcement of the stock split proposals.

Identical to the finding in the study of zero-dividend proposals, the stocks with future announcement of bonus or rights issues after the announcement of zero-dividend approvals exhibit relatively better performance than the stocks without future announcements. The CARs of 41 days around the announcement date are -5.87%, -4.81% and -7.98% for the future-associated-announcement stocks in the "associated" sample, but are -12.33%, -7.11% and -12.93% for the unique-announcement stocks in the "Unique" sample. More obviously, the returns of stocks in the "associated" sample decline slowly after the announcement date, as the CAR of 20 days (date +1 to date +20) immediately after the announcement date accounts for less than 22.36% of the CAR of 41 days (date -20 to date +20) for all three model sections. In comparison, the same proportions for the "Unique" sample are more than 45.82%. The documented characteristics of CARs around the announcement of a zero-dividend approvals are illustrated in Figure 7-3.

Table 7-3. Results of the Tests on the Announcement of Zero-Dividend Approvals for A-shares in China's Stock Market

7-3(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*			*Mean Adjusted Model*		
Date	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*	*Unique*	*Associated*	*Overall*
-20	-0.0048	0.0029	-0.0031	-0.0046	0.0036	-0.0028	0.0021	0.0046	0.0026
-18	-0.0098	-0.0151	-0.0110	-0.0076	-0.0146	-0.0091	0.0086	-0.0092	0.0046
-16	-0.0190	-0.0204	-0.0193	-0.0143	-0.0191	-0.0154	-0.0007	-0.0141	-0.0037
-14	-0.0187	-0.0190	-0.0187	-0.0111	-0.0178	-0.0126	-0.0015	-0.0219	-0.0061
-12	-0.0227	-0.0236	-0.0229	-0.0121	-0.0211	-0.0141	-0.0127	-0.0264	-0.0157
-10	-0.0290	-0.0197	-0.0269	-0.0148	-0.0162	-0.0151	-0.0296	-0.0117	-0.0256
-8	-0.0325	-0.0274	-0.0314	-0.0155	-0.0238	-0.0173	-0.0401	-0.0268	-0.0371
-6	-0.0431	-0.0286	-0.0399	-0.0236	-0.0243	-0.0238	-0.0516	-0.0373	-0.0484
-4	-0.0443	-0.0266	-0.0404	-0.0215	-0.0235	-0.0220	-0.0460	-0.0311	-0.0427
-3	-0.0454	-0.0211	-0.0400	-0.0215	-0.0167	-0.0204	-0.0455	-0.0301	-0.0421
-2	-0.0468	-0.0253	-0.0420	-0.0207	-0.0202	-0.0206	-0.0447	-0.0421	-0.0442
-1	-0.0540	-0.0264	-0.0479	-0.0268	-0.0214	-0.0256	-0.0383	-0.0420	-0.0391
0	-0.0668	-0.0478	-0.0626	-0.0386	-0.0422	-0.0394	-0.0461	-0.0618	-0.0496
+1	-0.0738	-0.0469	-0.0679	-0.0447	-0.0398	-0.0437	-0.0580	-0.0677	-0.0602
+2	-0.0791	-0.0524	-0.0732	-0.0490	-0.0454	-0.0482	-0.0640	-0.0708	-0.0655
+3	-0.0866	-0.0570	-0.0800	-0.0549	-0.0496	-0.0538	-0.0678	-0.0820	-0.0710
+4	-0.0923	-0.0565	-0.0844	-0.0597	-0.0488	-0.0573	-0.0738	-0.0765	-0.0744
+6	-0.0909	-0.0557	-0.0830	-0.0552	-0.0470	-0.0534	-0.0889	-0.0704	-0.0848
+8	-0.0959	-0.0543	-0.0866	-0.0576	-0.0439	-0.0545	-0.0997	-0.0682	-0.0927
+10	-0.0970	-0.0526	-0.0872	-0.0563	-0.0424	-0.0532	-0.0872	-0.0723	-0.0839
+12	-0.1047	-0.0491	-0.0923	-0.0622	-0.0389	-0.0570	-0.0795	-0.0746	-0.0784
+14	-0.1052	-0.0500	-0.0929	-0.0607	-0.0397	-0.0560	-0.0846	-0.0723	-0.0818
+16	-0.1120	-0.0488	-0.0979	-0.0650	-0.0376	-0.0589	-0.0987	-0.0745	-0.0933
+18	-0.1176	-0.0557	-0.1038	-0.0683	-0.0435	-0.0628	-0.1152	-0.0739	-0.1060
+20	-0.1233	-0.0587	-0.1089	-0.0711	-0.0481	-0.0660	-0.1293	-0.0796	-0.1182

Notes: 1. Unique: the sample of 171 zero-dividend approvals without the future announcement of rights or bonus issues.
2. Associated: the sample of 56 zero-dividend approvals associated with the future announcement of rights or bonus issues.
3. Overall: total of 227 zero-dividend approvals including the 'Unique' and 'Associated' samples.
4. Date 0: the date of the announcement.
5. Date -1 to -20: the dates before the announcement.
6. Date +1 to +20: the dates after the announcement.

7-3(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model			Market Model			Mean Adjusted Model		
Date	Unique	Associated	Overall	Unique	Associated	Overall	Unique	Associated	Overall
-1	-2.2810	-0.2670	-2.0822	-1.9857	-0.2849	-1.8172	0.9471	0.0194	0.8714
0	-4.0423	-4.9372	-5.2135	-3.8564	-4.8945	-5.0146	-1.1484	-2.9518	-1.8146
+1	-2.2335	0.2018	-1.8808	-1.9946	0.5573	-1.5367	-1.7545	-0.8751	-1.8313

Nonparametric (rank) t-test Statistics

	Market Adjusted Model			Market Model			Mean Adjusted Model		
Date	Unique	Associated	Overall	Unique	Associated	Overall	Unique	Associated	Overall
-1	-1.0554	-0.1051	-0.9563	-1.1235	-0.2701	-1.0683	0.6832	-1.1565	0.3022
0	-3.1769	-3.8403	-4.0598	-3.2110	-3.8323	-4.0733	-1.1795	-2.6596	-1.8470
+1	-1.7984	-0.5257	-1.7456	-1.9238	-0.2110	-1.7455	-1.3713	-0.8531	-1.5101

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

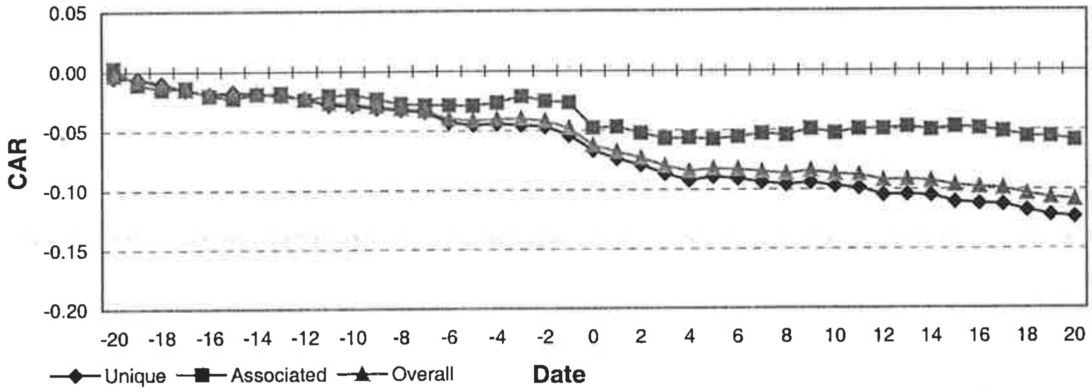
7-3(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model			Market Model			Mean Adjusted Model		
Date	Unique	Associated	Overall	Unique	Associated	Overall	Unique	Associated	Overall
11 Days Around Event Days									
5 before	-1.5441	0.2272	-1.2703	-0.4561	0.3014	-0.2919	0.8729	-0.3157	0.7167
5 after	-3.1973	-1.0002	-3.1322	-2.4306	-0.7909	-2.3757	-2.0020	-0.8777	-2.0584
11 around	-4.4154	-2.0098	-4.5401	-3.1090	-1.8057	-3.3104	-1.1075	-1.6946	-1.4516
21 Days Around Event Days									
10 before	-2.5869	-0.4531	-2.4127	-1.1652	-0.2733	-1.1026	-0.4955	-1.0856	-0.7342
10 after	-3.0274	-0.3504	-2.7622	-1.8249	-0.0119	-1.5845	-1.9155	-0.4907	-1.8790
21 around	-4.7564	-1.6318	-4.7087	-2.9048	-1.2649	-2.9486	-1.9143	-1.7319	-2.1992
41 Days Around Event Days									
20 before	-3.8180	-1.3661	-3.7989	-1.9500	-1.1289	-2.0750	-1.2637	-1.3986	-1.5178
20 after	-3.9957	-0.5634	-3.6801	-2.3648	-0.3108	-2.1543	-2.7428	-0.5920	-2.6619
41 around	-6.0886	-2.1187	-6.0378	-3.6158	-1.7699	-3.7371	-2.9775	-1.8513	-3.2026

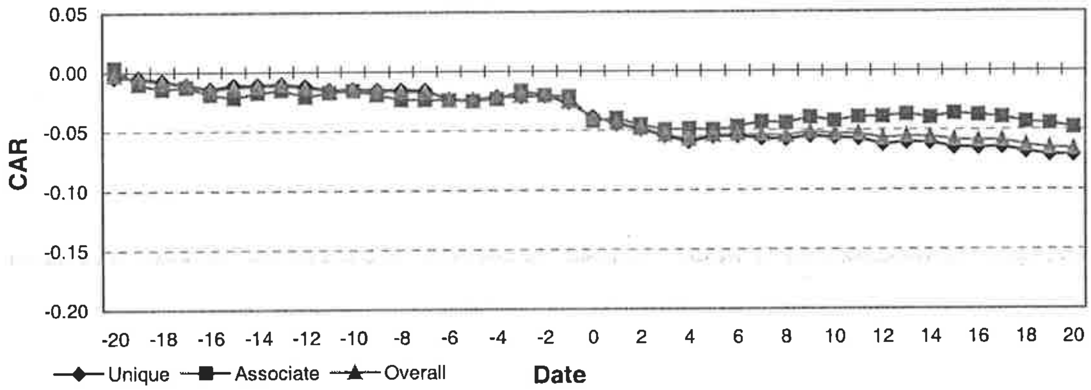
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-3. Cumulative Abnormal Returns (CAR) for Zero-Dividend Approvals of A-shares in China's Stock Market

7-3(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-3(2). Market Model Cumulative Abnormal Returns (CAR)



7-3(3). Mean Adjusted Model Cumulative Abnormal Returns (CAR)

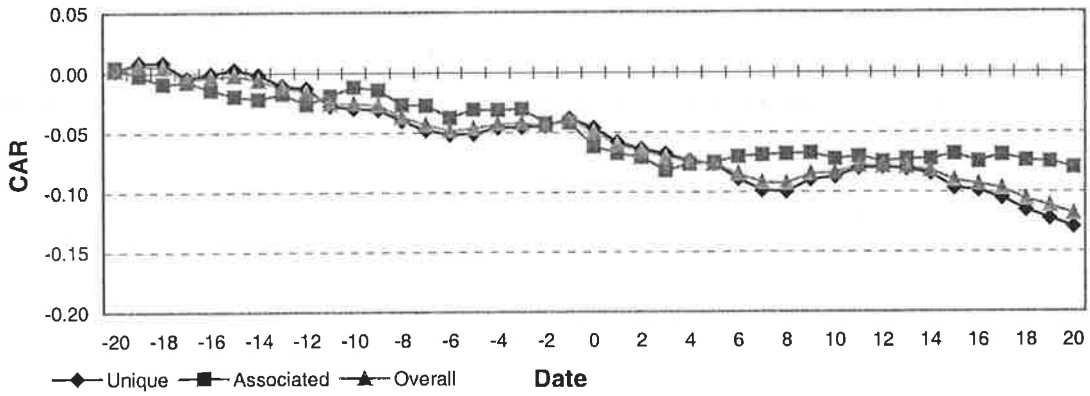


Table 7-3(b) summaries the parametric and non-parametric *t*-test statistics on the announcement of zero-dividend approvals. All of the *t*-values at the date 0, except for those in the "Unique" and "Overall" samples for the mean adjusted model, are below -2.58, which means that significantly negative returns occur at the event date with the 1% significance level. Moreover, almost all the *t*-test statistics on the event date 0 in Table 7-3(b) are larger than the corresponding values in Table 7-2(b). This implies that even though the effect of zero-dividend proposals is more vigorous than that of zero-dividend approval for the 41 day period around the announcement date, the stock prices react to the zero-dividend approvals stronger than they do to the zero-dividend proposals at the announcement date.

The *t*-test statistics for the intervals around the announcement of zero-dividend approvals, which are reported in Table 7-3(c), quantitatively substantiate the analysis on the CARs. The *t*-values of the "Unique" sample in each interval around the announcement date, except for the intervals of 11 and 21 days in the mean adjusted model section, show significantly negative CARs at conventional levels of significance. In contrast, the *t*-values of the "associated" sample denote significantly negative CARs at conventional levels only in the intervals of 11 and 41 days around the announcement date in the market adjusted model section. More importantly, the *t*-values tested on CARs in the intervals of 5 and 20 days after the announcement date are below -1.96 or -2.58 in the "Unique" sample, and are smaller than -1.96 in absolute value in the "associated" sample. Thus, the *t*-test statistics on CARs during intervals again demonstrates that the announcement of zero-dividend approvals impacts the announced stock prices much more strongly and persists longer, if there are no future announcement of bonus or rights issues.

7.4.3.2 Assessment of market efficiency for A-shares on the announcement of zero-dividend approvals

The *t*-test statistics of the "Unique" sample in the two sections of Tables 7-3(b) and in the three sections of 7-3(c) are below -1.96 at both the announcement date and for some intervals after the announcement date. This indicates that the stock prices respond to the unique-announcement zero-dividend approvals statistically significant at the event date, but not fully and instantaneously. That the event maintains successive negative effects on the stock prices after the announcement results in an applicable trading strategy to obtain abnormal returns. As in the previous example, according to the stocks of the "Unique" sample in the market adjusted model section, if a share trader sells the shares at announcement day 0 and purchases them at day +20, he could gain 5.65% abnormal return for the 21 days.[9] Even after taking a 0.3% transaction cost into account, the strategy is still profitable.

In contrast, the *t*-test statistics of the "associated" sample in Tables 7-3(b) and 7-3(c) are below -1.96 at the announcement date only, but not for any intervals before and after the announcement date. Thus, the stock prices respond to the future-associated-announcement zero-dividend approvals fully and instantaneously at the event date. However, in accordance with the tests in the "Unique" sample in the market adjusted model section, if a share trader sells the shares at the announcement date 0, and makes an opposite trade at the date +20, the trader could obtain 1.09% abnormal return before

[9] ((-0.0668)-(-0.1233))*100%=5.65%

considering the transaction cost.[10] Nevertheless, this abnormal return is too small to be economically significant after subtracting the 0.3% transaction cost.

We can conclude from the discussion above, that the stock prices underreact to the unique-announcement zero-dividend approvals at the event date, which suggests that the market is inefficient from both a statistical and an economical point of view. On the other hand, the stock prices fully reflect the announcement of future-associated-announcement zero-dividend approvals at the event date, and this indicates efficiency from a statistical standpoint. Nevertheless, the statistical tests suggest that the stock prices certainly reflect the announcement of zero-dividend approvals much better than the announcement of zero-dividend proposals.

7.4.4 Tests on the announcement of zero-dividend approvals for B-shares: results

Until the end of 1998, the 107 listed B-shares accounted for only 12.97% of the market. Rare observations of zero-dividend proposals and zero-dividend approvals associated with future events were chronicled. Therefore, the tests for B-shares focus on the 35 unique-announcement zero-dividend approvals. In both the Shanghai and Shenzhen markets, more than half of B-shares listed companies had previously issued A-shares. Some of them had once employed dual dividend policies for A-share and B-shares. To eliminate potential biases that the A-shares dividend policy may

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[10] ((-0.0478)-(-0.0587))*100%=0.19%

influence the B-shares prices, the observations relevant to the dual dividend policies for A-shares and B-shares of the same companies are excluded in the sample.[11]

Table 7-4 and Figure 7-4 report the results of the tests on B-shares as well as on A-shares for convenient comparison. Table 7-4 (a) indicates that the announcement of zero-dividend approvals of B-shares conveys bad news as well, in that the CARs visibly decrease around the announcement date. The CARs of B-shares are generally above the corresponding values of A-shares in the market adjusted model and the market model sections, but below and far from the corresponding values of A-shares in the mean adjusted model section. The former illustrates that the response of B-shares to the zero-dividend approvals are not as severe as that of A-shares in comparison with their own market return levels respectively. In contrast, the latter illustrates that the B-shares respond to the zero-dividend approvals more strongly than A-shares when the returns are measured according to their own average levels during the estimation window. Perhaps the announced B-shares performed soundly in the period of estimation, but A-shares did not.

The parametric statistics in Table 7-4(b) suggest bizarre features of B-shares. The *t*-values are significantly positive at date -1, then switch to be significantly negative at date 0. The swift contrary movements of B-shares returns result in an outstanding return peak as described in Figure 7-4. More interestingly, the non-parametric *t*-values of B-shares at date -1 are negative but positive at date 0, which are opposite to the

[11] In the test for A-shares, this sort of observation is also not included in the samples, so as to avoid the biases that B-shares dividend policy may influence the A-shares prices.

Table 7-4. Results of the Tests on the Announcement of Zero-Dividend Approvals for B-shares in China's Stock Market

7-4(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model		Market Model		Mean Adjusted Model	
Date	B-shares	A-shares	B-shares	A-shares	B-shares	A-shares
-20	0.0006	-0.0048	-0.0001	-0.0046	0.0059	0.0021
-18	-0.0111	-0.0098	-0.0115	-0.0076	-0.0124	0.0086
-16	-0.0089	-0.0190	-0.0059	-0.0143	-0.0276	-0.0007
-14	-0.0089	-0.0187	-0.0044	-0.0111	-0.0263	-0.0015
-12	-0.0320	-0.0227	-0.0221	-0.0121	-0.0743	-0.0127
-10	-0.0151	-0.0290	-0.0021	-0.0148	-0.0844	-0.0296
-8	-0.0228	-0.0325	-0.0094	-0.0155	-0.1018	-0.0401
-6	-0.0248	-0.0431	-0.0084	-0.0236	-0.1109	-0.0516
-4	-0.0441	-0.0443	-0.0290	-0.0215	-0.1333	-0.0460
-3	-0.0410	-0.0454	-0.0255	-0.0215	-0.1379	-0.0455
-2	-0.0326	-0.0468	-0.0160	-0.0207	-0.1305	-0.0447
-1	-0.0106	-0.0540	0.0095	-0.0268	-0.1016	-0.0383
0	-0.0433	-0.0668	-0.0191	-0.0386	-0.1250	-0.0461
+1	-0.0446	-0.0738	-0.0155	-0.0447	-0.1326	-0.0580
+2	-0.0608	-0.0791	-0.0297	-0.0490	-0.1528	-0.0640
+3	-0.0695	-0.0866	-0.0363	-0.0549	-0.1687	-0.0678
+4	-0.0721	-0.0923	-0.0373	-0.0597	-0.1769	-0.0738
+6	-0.0637	-0.0909	-0.0236	-0.0552	-0.1789	-0.0889
+8	-0.0745	-0.0959	-0.0352	-0.0576	-0.1953	-0.0997
+10	-0.0758	-0.0970	-0.0367	-0.0563	-0.1954	-0.0872
+12	-0.0873	-0.1047	-0.0452	-0.0622	-0.2156	-0.0795
+14	-0.0940	-0.1052	-0.0470	-0.0607	-0.2108	-0.0846
+16	-0.0851	-0.1120	-0.0359	-0.0650	-0.2244	-0.0987
+18	-0.0880	-0.1176	-0.0350	-0.0683	-0.2542	-0.1152
+20	-0.0836	-0.1233	-0.0272	-0.0711	-0.2635	-0.1293

Notes: 1. B-shares: total of 35 zero-dividend proposals of B-shares.
2. A-shares: total of 227 zero-dividend proposals of A-shares; results are copied from Table-7-2.
4. Date 0: the date of the announcement.
5. Date -1 to -20: the dates before the announcement.
6. Date +1 to +20: the dates after the announcement.

7-4(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model		Market Model		Mean Adjusted Model	
Date	*B-shares*	*A-shares*	*B-shares*	*A-shares*	*B-shares*	*A-shares*
-1	2.6251	*-2.2810*	3.1381	*-1.9857*	2.1261	*0.9471*
0	-3.8971	*-4.0423*	-3.5185	*-3.8564*	-1.9600	*-1.1484*
+1	-0.1590	*-2.2335*	0.4463	*-1.9946*	-0.5629	*-1.7545*

Nonparametric (rank) t-test Statistics

	Market Adjusted Model		Market Model		Mean Adjusted Model	
Date	*B-shares*	*A-shares*	*B-shares*	*A-shares*	*B-shares*	*A-shares*
-1	-1.2980	*-1.0554*	-0.5890	*-1.1235*	-0.5037	*0.6832*
0	0.1949	*-3.1769*	0.6025	*-3.2110*	0.4002	*-1.1795*
+1	-0.6771	*-1.7984*	0.0404	*-1.9238*	-1.1571	*-1.3713*

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

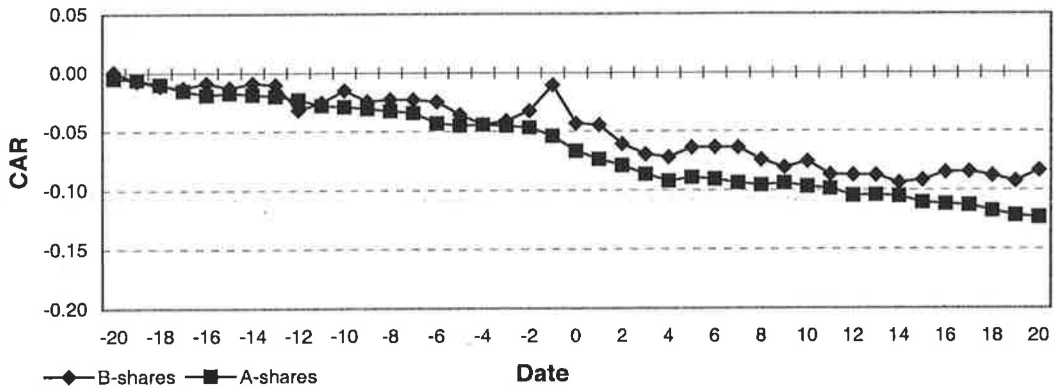
7-4(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model		Market Model		Mean Adjusted Model	
Date	*B-shares*	*A-shares*	*B-shares*	*A-shares*	*B-shares*	*A-shares*
11 Days Around Event Days						
5 before	0.7563	*-1.5441*	0.9849	*-0.4561*	0.3042	*0.8729*
5 after	-1.1007	*-3.1973*	-0.3777	*-2.4306*	-1.4909	*-2.0020*
11 around	-1.4072	*-4.4154*	-0.6515	*-3.1090*	-1.3186	*-1.1075*
21 Days Around Event Days						
10 before	0.5650	*-2.5869*	0.8228	*-1.1652*	-0.0807	*-0.4955*
10 after	-1.2236	*-3.0274*	-0.6842	*-1.8249*	-1.6382	*-1.9155*
21 around	-1.3049	*-4.7564*	-0.6722	*-2.9048*	-1.5615	*-1.9143*
41 Days Around Event Days						
20 before	-0.2820	*-3.8180*	0.2609	*-1.9500*	-1.6723	*-1.2637*
20 after	-1.0727	*-3.9957*	-0.2219	*-2.3648*	-2.2792	*-2.7428*
41 around	-1.5548	*-6.0886*	-0.5223	*-3.6158*	-3.0284	*-2.9775*

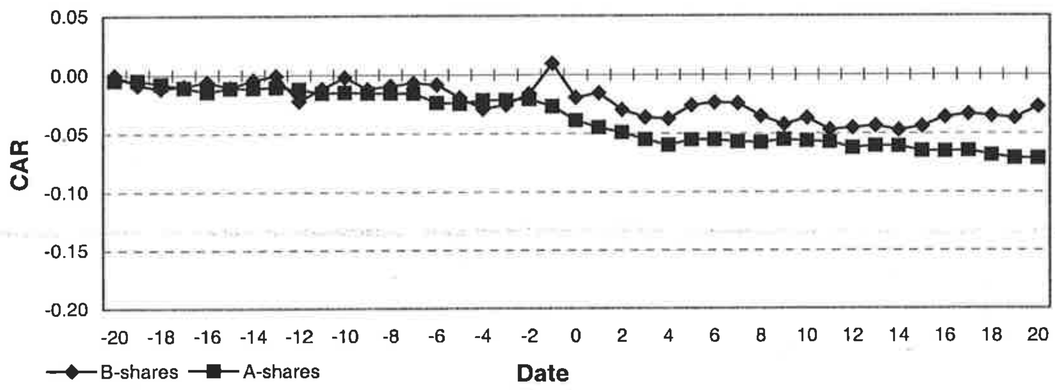
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-4. Cumulative Abnormal Returns (CAR) for Zero-Dividend Approvals of B-shares in China's Stock Market

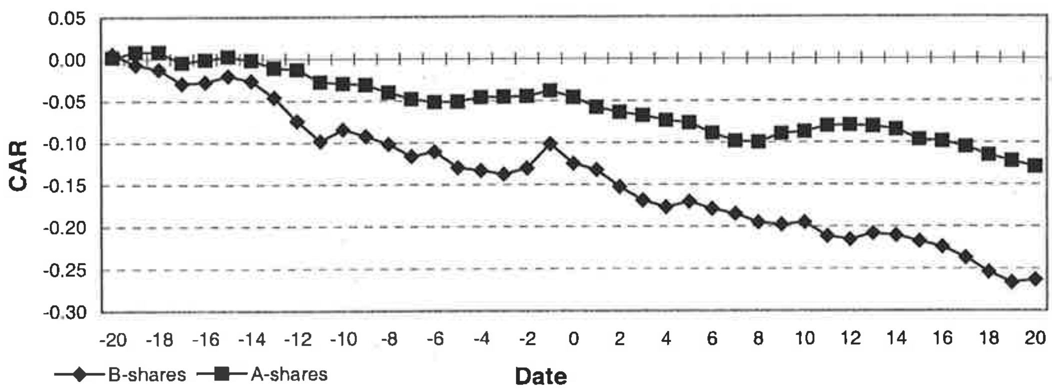
7-4(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-4(2). Market Model Cumulative Abnormal Returns (CAR)



7-4(3). Mean Adjusted Model Cumulative Abnormal Returns (CAR)



parametric t-values. All of the non-parametric t-values of B-shares are statistically insignificant. The inconsistency of parametric and non-parametric statistics suggests that the distribution of B-shares returns is asymmetric in the period surrounding the announcement of zero-dividend approvals.

Furthermore in Table 7-4(c), none of the B-shares t-test statistics on CARs in intervals are statistically significant at conventional levels, except for the intervals of 20 days after and 41 days around the announcement date in the mean adjusted model section. These t-test statistics coincide with the CARs in Table 7-4(a), which show that the cumulative abnormal returns are relatively small in the market adjusted model and the market model sections and dramatically larger in the mean adjusted model section. A sharp increase in the returns at date -1 has led to positive t-values for the intervals of 5 days or 10 days preceding the announcement date.

According to many of the t-test statistics, the behaviour of B-shares prices under the impact of zero-dividend approvals may indicate efficiency. Firstly, the significantly negative t-values at the event date 0 suggest that the B-shares reflect the announcement of zero-dividend approvals instantly. Next, in the market adjusted model and market model sections, the insignificant t-values for the intervals before and after the announcement date imply that there is neither evidence of the use of inside information nor of the underreaction and overreaction phenomena.

In contrast, the remaining t-test statistics suggest an inefficient reaction of the B-shares prices to zero-dividend approvals. Firstly, the significant positive t-values at date -1 in relation to negative t-values at date 0 represent abnormal market behaviour. Next, in the mean adjusted model section, the significantly negative *t*-values for the interval of 20 days after the announcement date 0 still suggests a high abnormal return, even though the high abnormal returns are measured by their average level during the investigation period in lieu of the contemporary market level.

7.5 Reaction of returns to the announcement of cash dividend issues

Cash dividends are paid directly out of profits. Regardless of the type of dividend, be it cash, stock or zero dividends, dividends do not to change shareholder wealth (Miller and Modigliani (1961.) However, dividend events convey information relating to the company future cash flows (Lintner 1956) which stimulates current stock price movement. Brown *et al* (1977) set up samples of interim or final year's dividend increases and dividend decreases respectively according to the previous year's dividends for the Australian stock market. Charest (1978b) distinguished between increased dividends and decreased dividends in terms of the past two years' stable dividend levels for the U.S. stock market. Both of them found that the dividend-increase stocks earn significantly positive abnormal returns and the dividend-decrease stocks earn significantly negative abnormal returns around the dividend announcement months.

Since the majority of shares in China's stock markets have been listed for less than four years, employing a measurement of dividend increase and dividend decrease that is based on the dividends of past two years would unreasonably reduce the sample size. In fact, the measurement of a two-year stable dividend cannot be formed for most stocks. Instead, we calculate the Average Dividend Price Ratio (ADPR)[12] of the market as a standard to group the dividends into "under" and "over" the ADPR samples respectively. Generally, the stocks with a Dividend Price Ratio (DPR) [13] above the ADPR of the market should be expected to have better future cash flows, whereas, the stocks with a DPR under the ADPR of the market should be expected to have worse cash flows in the future.

In the Brown *et al* (1977) and the Charest (1978b) studies, the measurements of dividend increases and decreases are based on the dividends of past one or two years for the specific stock. The mean adjusted model measures abnormal returns in line with the average return of the specific stock in its estimation window, a period preceding announcement date. Thus, the measurements based on past years' dividend levels and the mean adjusted model match each other. On the other hand, the ADPR standard is calculated on all cash dividend stocks of the market. Similarly, the market adjusted model and the market model measure abnormal returns according to the market index or related regression values. The ADPR standard is consistent with the market adjusted model and the market model. Thus, the following studies are undertaken on the abnormal returns generated by the market model and the market adjusted model only.

[12] Average cash dividend price ratio (ADPR) = average cash dividend per shares / average market price per share at the day preceding *ex* date.
[13] Dividend price ratio (DPR) = cash dividend / market price at the day preceding *ex* date.

7.5.1 Tests on the announcement of cash dividend proposals for A-shares: results

We sample 147 cash dividend proposals of A-shares without future announcement of bonus or rights issues in the same year, seventy-three of which have a DPR below the ADPR, while seventy-four of which have a DPR above the ADPR. Besides, A further 33 cash dividend proposals of A-shares, which are associated with future announcement of bonus or rights issues in the same year, have not been sorted due to the small sample size. We will investigate the effect of the announcement of cash dividend proposals on the prices of the stocks, the different effects of announcements on the stocks that have a DPR below the ADPR and the stocks that have a DPR above the ADPR, and the different effects experienced by the unique-announcement stocks and future-associated-announcement stocks.

7.5.1.1 A-shares return behaviour around the announcement of cash dividend proposals

Table 7-5 and Figure 7-5 summarise the results of the tests on the announcement of cash dividend proposals for A-shares. In the table and figure, "Under" and "Over" represent the samples of unique-announcement cash dividend proposals with the DPR below the ADPR and above the ADPR, respectively. "Unique" represents the overall sample of unique-announcement cash dividend proposals, which have been sorted into the "Under" and "Over" categories. "Associated" represents the sample of future-associated-announcement cash dividend proposals, which has not been sorted into further categories due to small sample size.

Table 7- 5. Results of the Tests on the Announcement of Cash Dividend Proposals for A-shares in China's Stock Market

7-5(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-20	-0.0085	-0.0003	-0.0044	0.0065	-0.0085	-0.0004	-0.0045	0.0052
-18	-0.0091	-0.0053	-0.0072	0.0069	-0.0094	-0.0051	-0.0073	0.0036
-16	-0.0099	-0.0090	-0.0095	-0.0011	-0.0101	-0.0093	-0.0097	-0.0039
-14	-0.0143	-0.0132	-0.0138	-0.0027	-0.0145	-0.0131	-0.0138	-0.0074
-12	-0.0172	-0.0151	-0.0161	0.0001	-0.0172	-0.0149	-0.0161	-0.0048
-10	-0.0222	-0.0211	-0.0217	0.0086	-0.0213	-0.0213	-0.0213	0.0023
-8	-0.0288	-0.0229	-0.0258	0.0127	-0.0272	-0.0229	-0.0250	0.0059
-6	-0.0299	-0.0233	-0.0266	0.0063	-0.0275	-0.0234	-0.0255	-0.0022
-4	-0.0364	-0.0170	-0.0268	-0.0081	-0.0326	-0.0166	-0.0246	-0.0169
-3	-0.0412	-0.0232	-0.0323	-0.0050	-0.0365	-0.0224	-0.0295	-0.0139
-2	-0.0449	-0.0260	-0.0355	-0.0014	-0.0408	-0.0252	-0.0330	-0.0114
-1	-0.0515	-0.0252	-0.0384	-0.0001	-0.0457	-0.0238	-0.0348	-0.0109
0	-0.0726	-0.0390	-0.0559	-0.0202	-0.0673	-0.0374	-0.0525	-0.0316
+1	-0.0837	-0.0475	-0.0657	-0.0224	-0.0799	-0.0453	-0.0627	-0.0344
+2	-0.0879	-0.0540	-0.0711	-0.0228	-0.0839	-0.0513	-0.0677	-0.0357
+3	-0.0982	-0.0496	-0.0741	-0.0242	-0.0939	-0.0478	-0.0710	-0.0384
+4	-0.0998	-0.0463	-0.0733	-0.0248	-0.0950	-0.0443	-0.0699	-0.0398
+6	-0.1061	-0.0459	-0.0762	-0.0200	-0.1011	-0.0433	-0.0724	-0.0371
+8	-0.1115	-0.0496	-0.0808	-0.0147	-0.1066	-0.0476	-0.0773	-0.0343
+10	-0.1173	-0.0545	-0.0861	-0.0150	-0.1118	-0.0523	-0.0823	-0.0340
+12	-0.1202	-0.0520	-0.0863	-0.0198	-0.1137	-0.0485	-0.0814	-0.0361
+14	-0.1239	-0.0488	-0.0866	-0.0337	-0.1184	-0.0461	-0.0825	-0.0507
+16	-0.1324	-0.0486	-0.0908	-0.0368	-0.1257	-0.0474	-0.0868	-0.0520
+18	-0.1332	-0.0558	-0.0948	-0.0375	-0.1271	-0.0544	-0.0910	-0.0559
+20	-0.1298	-0.0601	-0.0952	-0.0446	-0.1233	-0.0564	-0.0901	-0.0643

Notes: 1. Under: the sample of 73 cash dividend proposals with dividend price ratios (DPR) under the average dividend price ratio (ADPR) of the market.

2. Over: the sample of 74 cash dividend proposals with dividend price ratios (DPR) over the average dividend price ratio (ADPR) of the market.
3. Unique: total of 147 cash dividend proposals without the future announcement of bonus or rights issues in the same year, including the 'Over' and 'Under' samples.
4. Associated: total of 33 cash dividend proposals associated with the future announcement of bonus or rights issues in the same year.
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-5(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	-2.0636	0.3197	-1.4122	0.3029	-1.5483	0.5227	-0.8589	0.1241
0	-6.6509	-5.3569	-8.5237	-4.7506	-6.8889	-5.2213	-8.5043	-4.9306
+1	-3.4754	-3.3264	-4.7820	-0.5267	-3.9862	-3.0662	-4.9488	-0.6750

Nonparametric (rank) t-test Statistics

	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	-1.1714	-0.6072	-1.0712	0.0077	-0.4639	-0.4703	-0.5594	0.0856
0	-5.3289	-4.6134	-6.0083	-3.1092	-5.3167	-4.6581	-5.9709	-3.3932
+1	-2.5952	-3.1258	-3.3460	-1.2498	-3.0422	-3.1210	-3.6905	-1.4164

Notes: 1. Date 0: event date, the date of the announcement.

2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

7-5(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

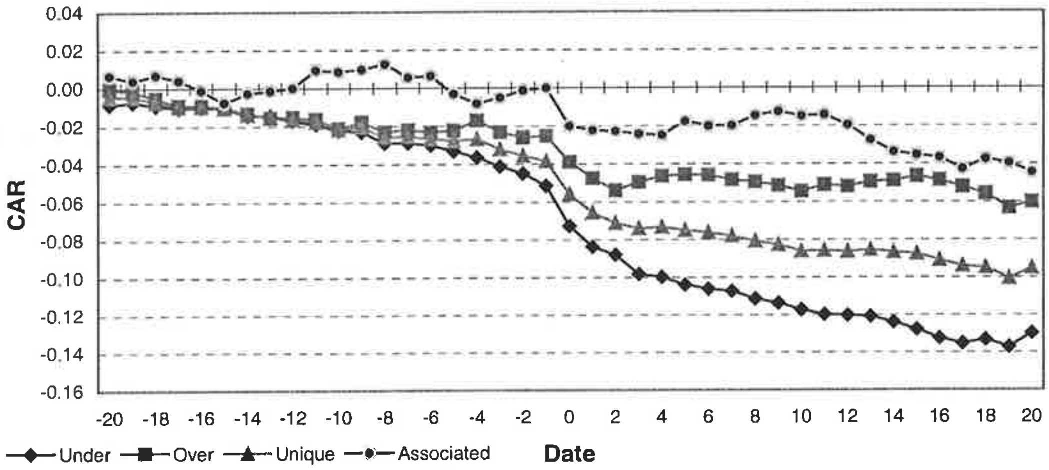
	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
11 Days Around Event Day								
5 before	-3.0265	-0.3312	-2.5686	-0.6795	-2.5785	-0.0697	-2.0137	-0.9315
5 after	-4.3900	-1.1633	-4.1506	0.2681	-4.5756	-1.0528	-4.1499	-0.2391
11 around	-7.0055	-2.6228	-7.1001	-1.7097	-6.9003	-2.3311	-6.7197	-2.2759
21 Days Around Event Days								
10 before	-3.2247	-1.1079	-3.2064	-0.7140	-2.7577	-0.9462	-2.6945	-1.1107
10 after	-4.4379	-1.9132	-4.6543	0.3871	-4.4719	-1.8177	-4.5453	-0.1785
21 around	-6.7390	-3.2537	-7.2844	-1.2623	-6.4922	-3.0467	-6.8518	-1.9656
41 Days Around Event Day								
20 before	-3.6175	-2.1899	-4.1860	-0.0041	-3.2459	-2.0553	-3.7558	-0.5803
20 after	-4.0208	-1.8371	-4.2814	-1.2943	-3.9791	-1.6396	-4.0582	-1.7400
41 around	-6.3735	-3.6492	-7.2451	-1.6488	-6.1220	-3.3960	-6.7857	-2.3906

Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.

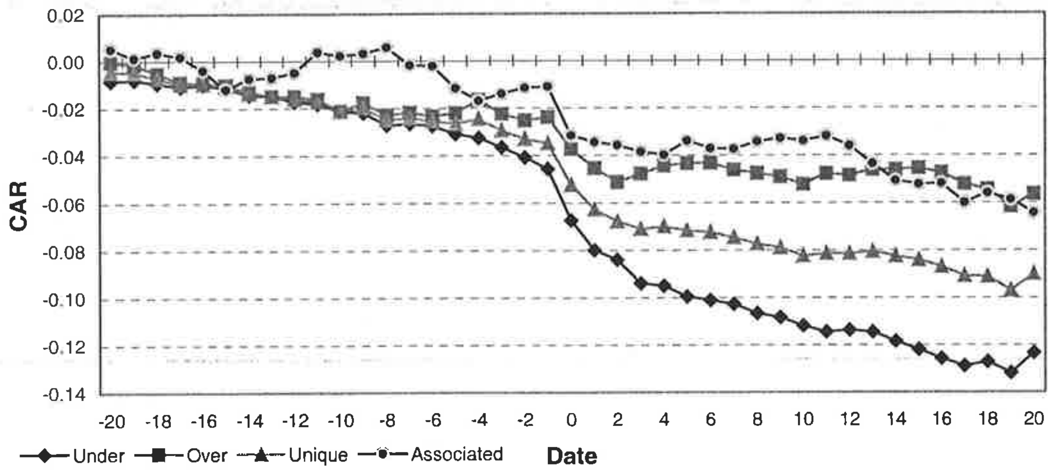
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7- 5. Cumulative Abnormal Returns (CAR) for Cash Dividend Proposals of A-shares in China's Stock Market

7-5(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-5(2). Market Model Cumulative Abnormal Returns (CAR)



The CARs of each classified sample are arranged in Table 7-5(a) and are graphed in Figures 7-5(1) for the market adjusted model section and 7-5(2) for the market model section. From them several features are worth mentioning. Firstly, it is surprising that the announcements of cash dividend proposals have universally negative influences on the A-shares prices. Regardless of the CAR classifications – under-ADPR cash dividend, over-ADPR cash dividend, unique-announcement cash dividend or future-associated-announcement cash dividend – all of them tend to decrease over time during the 41 day investigation period. In particularly, the CAR lines lie underneath the zero return vertical axis except for a small number of points on the CAR lines of the future-associated-announcement sample.

Secondly, the over-ADPR stocks experience relatively greater returns than the under-ADPR stocks, but the returns are still negative. This can be seen from Table 7-5(a) and Figures 7-5(1) and 7-5(2), where the CARs of under-ADPR samples are below those of over-ADPR samples. In particular, the CARs of under-ADPR samples double those of over-ADPR samples in absolute value following the announcement date. Nevertheless, the A-shares traders prefer the high cash dividend stocks rather than the low cash dividend stocks. The behaviour of A-shares returns under the impact of cash dividend proposals is partially consistent with the results of Brown *et al* (1977) and Charest (1978b). They showed that the increased cash dividend stocks earn positive returns during the period of one year preceding and one or two years following the announcement. Conversely, the cash decreased dividend stocks earn negative returns during the periods of two or four years around the announcement. However, by calculating aggregate returns with increased and decreased cash dividend stock returns in Brown *et al*'s (1977) or Charest's (1978b) results, as a whole, the cash dividend announcements have a negative influence on stock returns in the Australian and U. S. stock markets.

Finally, again identical to the findings in the studies on the zero-dividend proposals and approvals, if there is future announcement of bonus or rights issues following the current announcement of cash dividend proposals, the stock performances are not so bad as those of no future announcement stocks. The cash dividend proposals associated with future announcement are always responded to better by the shareholders, even though the shareholders have not known with certainty if there will be a future announcement, nor did they know the content of the future announcement. For example, the CARs of future-associated-announcement stocks in Table 7-5(a) are larger than the CARs of unique-announcement stocks. More obviously, in Figures 7-5(1) and 7-5(2), the CAR lines of future-associated-announcement stocks are above each CAR lines of unique-announcement stocks.

Table 7-5(b) reports the *t*-test statistics at the announcement date of cash dividend proposals. Both the parametric and non-parametric *t*-values of three unique-announcement samples ("Under," "Over" and "Unique") at the event date 0 and date -1 are below -2.58, which implies that the stock prices react to the cash dividend announcement negatively at the 1% significance level for two consecutive event days. The *t*-values of future-associated-announcement samples only at the event date 0 are below -2.58, but smaller in absolute value than those of unique-announcement stocks, which means that the future-associated-announcement stock prices react to the announcement of cash dividend proposals less negatively than the unique-announcement stock prices.

Table 7-5 (c) presents the parametric *t*-test statistics on CARs in intervals around the announcement of cash dividend proposals. Except for the future-associated-announcement stocks in the market adjusted model section, the *t*-values tested for the intervals 11, 21 and 41 days for the rest samples are all below -2.58 or -1.96. This implies that significant negative returns occur in each interval around the announcement of cash dividend proposals. In particular, the *t*-values on the CARs of under-ADPR stocks for 5, 20 and 20 days before and after the announcement date are below -2.58, and hence significantly negative at the 1% significance level. In contrast, only the *t*-values on the CARs of over-ADPR stocks for 20 days before the announcement date are significant at the 5% level. Furthermore, no *t*-values for the intervals before and after the announcement date are significant at conventional levels for the future-associated-announcement stocks.

7.5.1.2 Assessment of market efficiency for A-shares on the announcement of cash dividend proposals

Despite the fact that the statistical tests at the announcement date of cash dividend proposals imply that the stock prices of every sample are significantly affected by the announcement, the diverse ranges of *t*-values for the different intervals suggest varying degrees of efficiency (or inefficiency) for the different samples. Since the *t*-values of under-ADRP stocks for the intervals before and after the announcement date are below -2.58, the under-ADRP stock traders have anticipated the low cash dividend proposals or employed inside information in their trading. Further, the under-ADRP stock prices have not fully reflected the cash dividend proposals at the announcement date, so that the underreaction is adjusted after the announcement date. The existence of underreaction permits a strategy to obtain abnormally high returns. Suppose a market participant sells the shares at the announcement date when the information is published and then buys the same shares after 20 days. This participant should gain abnormal returns of 5.42% on average after transaction costs.[14]

That the *t*-values of over-ADRP stocks for the interval of 20 days before the announcement date are below -1.96 implies the existence of anticipation or inside information that is employed in stock trading. However, the *t*-values of over-ADRP stocks are smaller than -1.96 in absolute value in each interval after the announcement date, and this illustrates that the over-ADRP stock prices reflect the announcement of cash dividend proposals more efficiently than the under-ADRP stock prices. There is no statistically significant underreaction for over-ADRP stocks.

As a whole, the unique-announcement stocks, which were previously divided into the over-ADRP and the under-ADRP samples, show severe inefficiency in response to the announcement of cash dividend proposals. The *t*-values are below -2.58 in every interval before and after the announcement, exhibiting strong anticipation or possibly insider trading and underreaction.

No *t*-values for the future-associated-announcement stocks are below -1.96 in every interval before and after the announcement date. This means that the evidence of insider trading and underreaction is not statistically significant for the future announcement stocks. Consistent with previous finding, regardless of whether the

[14] ((-0.0726)-(-0.1298))*100%-0.3%=5.42%. 0.3% is the transaction cost.

current announcement is a zero-dividend approval or a cash dividend proposal, if there is a future announcement forthcoming, then the stock prices reflect the current announcement more efficiently.

7.5.2 Tests on the announcement of cash dividend approvals for A-shares: results

Among the 262 unique-announcement cash dividend approvals of A-shares, 130 of them are in the under-ADPR sample and the remaining 132 fall into the over-ADPR sample. Additionally, 76 cash dividend approvals of A-shares are associated with future announcement for bonus or rights issues in the same year. It is assumed that all proposed schemes of cash dividend have been approved, since the cases where the schemes have been amended are excluded in the samples. This study will explore the announcement effects of cash dividend approvals in the under-ADPR stocks, the over-ADRP stocks, the unique-announcement stocks and the future-associated-announcement stocks, and will also consider differences in effects among these stock samples.

7.5.2.1 A-shares return behaviour around the announcement of cash dividend approvals

The results of the tests on the announcement of cash dividend approvals are reported in Table 7-6 and Figure 7-6. The CARs of each sample are represented in Table 7-6(a), and graphed in Figure 7-6(1) for the market adjusted model returns and in Figure 7-6(2) for the market model returns. It is evident, from the CARs in the Table and

Figures, that the market participants respond to the announcement of cash dividend approvals more optimistically than they respond to the announcement of cash dividend proposals. Almost all CAR values are negative and gradually decline in Table 7-5(a). The same cases can only be found for the under-ADPR stocks and the "Unique" sample in the market adjusted model section in Table 7-6(a). Moreover, the CARs of every sample in Table 7-6(a) are larger than the corresponding values in Table 7-5(a).

Similarly, as we found in the tests on the cash dividend proposals, the over-ADPR stocks earn relatively better returns than the under-ADPR stocks. This feature is shown in Figures 7-6(1) and 7-6(2), in which the CAR lines for over-ADPR stocks mainly lie above those of under-ADPR stocks. The finding that share traders prefer high cash dividends rather than low cash dividends in Brown *et al* (1977) and Charest (1978b) are again evident. Moreover, in Table 7-6(a), the CARs of over-ADPR stocks measured by the market adjusted model become positive after the announcement date and nearly all CARs of over-ADPR stocks measured by the market model are positive.

As we found in the tests on the cash dividend proposals, the participants of the market feel optimistic for the cash dividend approvals of future-associated-announcement stocks. Not only are the CARs of future-associated-announcement stocks above those of unique-announcement stocks around the announcement date of approvals, but they are also positive. Figures 7-6(1) and 7-6(2) show that the CARs of future-announcement-stocks depart at the beginning of the investigation period and keep growing throughout the whole period.

Table 7- 6. Results of the Tests on the Announcement of Cash Dividend Approvals for A-shares in China's Stock Market

7-6(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-20	-0.0006	0.0006	0.0000	-0.0009	0.0004	0.0015	0.0010	0.0007
-18	-0.0009	0.0018	0.0005	0.0018	0.0020	0.0033	0.0027	0.0038
-16	-0.0028	0.0000	-0.0014	0.0076	0.0015	0.0035	0.0025	0.0101
-14	-0.0012	0.0040	0.0014	0.0139	0.0054	0.0076	0.0065	0.0168
-12	0.0000	0.0001	0.0000	0.0160	0.0084	0.0044	0.0064	0.0191
-10	0.0002	-0.0050	-0.0024	0.0150	0.0115	0.0013	0.0064	0.0197
-8	0.0050	-0.0052	-0.0001	0.0234	0.0180	0.0016	0.0098	0.0286
-6	0.0011	-0.0056	-0.0023	0.0286	0.0160	0.0039	0.0100	0.0353
-4	0.0001	-0.0095	-0.0047	0.0338	0.0167	0.0013	0.0090	0.0402
-3	-0.0040	-0.0113	-0.0077	0.0341	0.0137	0.0001	0.0069	0.0410
-2	-0.0079	-0.0078	-0.0079	0.0342	0.0100	0.0045	0.0072	0.0414
-1	-0.0088	-0.0055	-0.0072	0.0326	0.0105	0.0073	0.0089	0.0405
0	-0.0142	-0.0029	-0.0085	0.0389	0.0065	0.0109	0.0087	0.0473
+1	-0.0191	0.0028	-0.0081	0.0393	0.0031	0.0170	0.0100	0.0486
+2	-0.0231	0.0032	-0.0100	0.0392	0.0000	0.0181	0.0090	0.0497
+3	-0.0232	0.0026	-0.0103	0.0390	0.0005	0.0181	0.0093	0.0501
+4	-0.0242	0.0019	-0.0112	0.0402	0.0001	0.0189	0.0095	0.0517
+6	-0.0259	0.0041	-0.0109	0.0461	0.0012	0.0226	0.0119	0.0589
+8	-0.0272	0.0086	-0.0093	0.0455	0.0016	0.0288	0.0152	0.0599
+10	-0.0326	0.0142	-0.0092	0.0504	-0.0023	0.0349	0.0163	0.0669
+12	-0.0279	0.0093	-0.0093	0.0520	0.0040	0.0311	0.0176	0.0673
+14	-0.0346	0.0051	-0.0148	0.0661	-0.0019	0.0286	0.0133	0.0820
+16	-0.0346	0.0043	-0.0151	0.0702	-0.0005	0.0287	0.0141	0.0868
+18	-0.0320	0.0062	-0.0129	0.0779	0.0040	0.0320	0.0180	0.0953
+20	-0.0338	0.0148	-0.0095	0.0791	0.0052	0.0414	0.0233	0.0975

Notes: 1. Under: the sample of 130 cash dividend approvals with dividend price ratios (DPR) under the average dividend price ratio (ADPR) of the market.
2. Over: the sample of 132 cash dividend approvals with dividend price ratios (DPR) over the average dividend price ratio (ADPR) of the market.
3. Unique: total of 262 cash dividend approvals without the future announcement of bonus or rights issues in the same year, including the 'Over' and 'Under' samples.
4. Associate: total of 76 cash dividend approvals associated with the future announcement of bonus or rights issues in the same year.
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-6(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	-0.3369	1.2668	0.4144	-0.6022	0.1992	1.5924	0.9651	-0.3752
0	-2.1083	1.4526	-0.8010	2.3663	-1.9761	2.1047	-0.0852	2.5775
+1	-1.9015	3.1259	0.2294	0.1488	-1.3769	3.4664	0.7615	0.5258

Nonparametric (rank) t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	-0.4907	-0.2383	-0.4886	-0.6925	-0.2918	-0.5693	-0.5510	-0.6162
0	-2.3347	0.4380	-1.3432	1.9801	-1.8158	0.6732	-0.8881	2.0144
+1	-1.7641	2.0789	0.0764	0.1175	-1.6374	2.0714	0.0817	0.2549

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

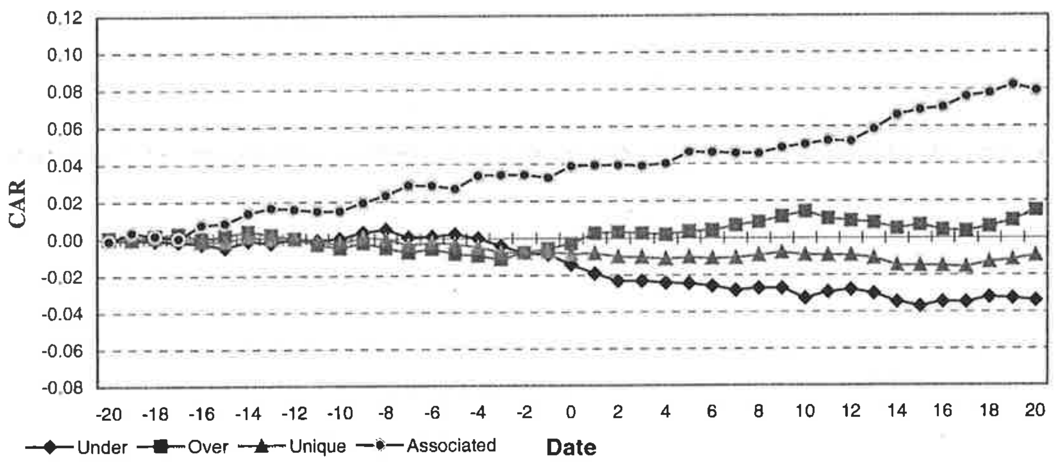
7-6(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
			11 Days Around Event Day					
5 before	-1.7314	0.0346	-1.2650	0.6833	-0.9680	0.8502	-0.2796	0.8664
5 after	-1.7891	1.6112	-0.4813	1.2648	-0.9197	2.7275	0.7203	1.8348
11 around	-3.0092	1.5476	-1.4189	2.0269	-1.7479	3.0467	0.2714	2.5983
			21 Days Around Event Days					
10 before	-0.9814	-0.3992	-0.9366	2.1229	0.2438	0.9497	0.6681	2.6734
10 after	-2.2714	2.9864	-0.1179	1.3707	-1.1048	4.3327	1.4076	2.3556
21 around	-2.7048	2.1023	-0.9025	2.9271	-0.9381	4.1045	1.4138	4.0328
			41 Days Around Event Day					
20 before	-0.7692	-0.6788	-0.9259	2.7627	0.9336	0.9280	1.1672	3.4265
20 after	-1.7122	2.1824	-0.1249	3.3999	-0.1180	3.8973	1.9142	4.2596
41 around	-2.0624	1.2771	-0.8590	4.6737	0.3235	3.6988	2.1389	5.7708

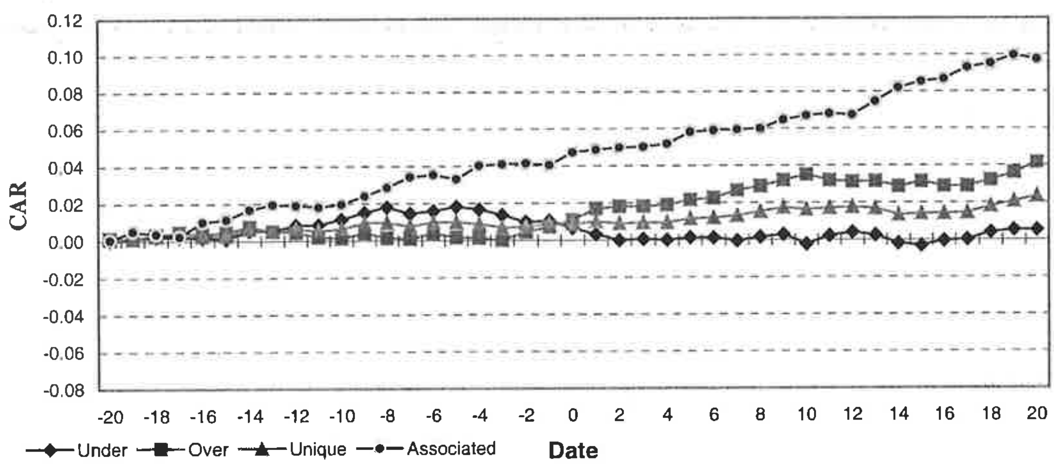
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-6. Cumulative Abnormal Returns (CAR) for Cash Dividend Approvals of A-shares in China's Stock Market

7-6(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-6(2). Market Model Cumulative Abnormal Returns (CAR)



Nevertheless, when we compare the CARs graphed in Figures 7-5(1) and 7-5(2) with the CARs graphed in 7-6(1) and 7-6(2), we should find that the ranks of CAR lines of each stock sample are nearly the same in the tests of cash dividend proposals and approvals. The difference is that all CAR lines in the tests of cash dividend approvals are higher than those in the tests of cash dividend proposals. This phenomenon suggests that the market participants suspected that the cash dividend schemes outlined in the proposals may not be approved. In reality, there are many cases in which the proposed scheme has been replaced by a worse scheme prior to approval.

The parametric and non-parametric *t*-test statistics in Table 7-6(b) provide identical conclusions. In the market adjusted model section of Table 7-6(b), the *t*-values of the under-ADPR stocks are below -1.96 at the event date 0, implying that the announcement of under-ADPR dividend approvals raises significantly negative returns at the event date. Meanwhile, the *t*-values of over-ADPR stocks are larger than +1.96 at the event date +1, implying that the announcement of over-ADPR dividend approvals introduces significantly positive returns at the alternative event date. The *t*-values of the future-associated-announcement stocks are larger than +1.96, suggesting that if there is a future announcement, the current announcement of cash dividend approvals is generally greeted, on average, by significantly positive returns at the event date. The slightly different *t*-values in the market model section are not contradictory to those in the market adjusted model section.

The parametric *t*-test statistics for the intervals on the CARs of cash dividend approvals are reported in Table 7-6(c). In the market adjusted model section, the *t*-values of under-ADPR stocks for the intervals of 10 days after the event date 0 are below -1.96, which illustrates that the under-ADPR stocks earn significantly negative returns in the 10 days after the announcement. However, this cannot be agreed by the relevant *t*-values in the market model section. The *t*-values of over-ADPR stocks in the market adjusted model section are larger than +2.58 or +1.96 for the 10 and 20 days after the event date 0, which shows that the over-ADPR stocks earn significantly positive returns after the announcement. This judgement is strongly supported by the *t*-values in the market model section. In addition, the *t*-values of future-associated-announcement stocks in both the market adjusted model and the market model sections are larger than +1.96 or +2.58 for the 10 days before, and 20 days before and after the event date. Thus, if a future announcement for bonus or rights issues is expected, significantly positive returns can be generated some days before and after the current announcement of cash dividend approvals.

7.5.2.2 Assessment of market efficiency for A-shares on the announcement of cash dividend approvals

The *t*-values on CARs of under-ADPR stocks for the intervals are not consistent between the market adjusted model and the market model sections. Thus, the judgement of market efficiency for under-ADPR stocks is ambiguous. The *t*-values on the CARs of over-ADPR stocks are larger than +1.96 or +2.58 for the intervals of 10 and 20 days after announcement date, which shows that the over-ADPR stock prices did not fully reflect the information at the announcement date. The underreaction is corrected following the announcement date and this leads to an opportunity to generate abnormally high returns.

The same results have been found for the future-associated-announcement stocks. While the *t*-values of future-associated-announcement stocks being larger than +1.96 at the event date, the *t*-values on the CARs for the interval of 20 days after the event date are still larger than +2.58. The future-associated-announcement stock prices reflect significantly, but not fully, the cash dividend approvals at the announcement date. Therefore, share traders can obtain abnormally high returns by buying shares at the announcement date and selling the same shares after 20 days. The *t*-values on the CARs of future-associated-announcement stocks for the intervals of 10 and 20 days before the event date are larger than +1.96 or +2.58 as well, which suggests the existence of anticipation of the information, or the use of inside information. The existence of an available abnormal return generating strategy suggesting that both the over-ADPR and future-associated-announcement stock prices are inefficient in their response to the announcement of cash dividend approvals.

7.5.3 Tests on the announcement of cash dividend approvals for B-shares: results

The 61 unique-announcement cash dividend approvals of B-shares are grouped into two samples. The under-ADPR sample includes 31 observations and the over-ADPR sample includes 30 observations. Another 13 cash dividend approvals of B-shares are related to future announcement of bonus or rights issues. The CARs of each B-shares sample in Table 7-7(a) and Figures 7-7(1) and 7-7(2) display the volatility around an increasing trend of abnormal returns. The volatility may partially result from the small sample size. The increasing trend suggests that the B-shares traders respond to the

Table 7-7. Results of the Tests on the Announcement of Cash Dividend Approvals for B-shares in China's Stock Market

7-7(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model				*Market Model*			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-20	-0.0065	0.0023	-0.0021	0.0034	-0.0073	0.0006	-0.0034	0.0028
-18	-0.0187	0.0055	-0.0066	0.0078	-0.0187	0.0024	-0.0083	0.0043
-16	-0.0239	-0.0011	-0.0125	0.0155	-0.0238	-0.0100	-0.0170	0.0106
-14	-0.0207	-0.0098	-0.0153	0.0118	-0.0185	-0.0179	-0.0182	0.0048
-12	-0.0175	0.0025	-0.0075	0.0056	-0.0160	-0.0049	-0.0105	-0.0016
-10	-0.0102	-0.0011	-0.0056	0.0090	-0.0098	-0.0070	-0.0084	-0.0007
-8	-0.0153	-0.0006	-0.0080	0.0079	-0.0158	-0.0065	-0.0112	-0.0049
-6	-0.0040	0.0008	-0.0016	0.0290	-0.0047	-0.0065	-0.0056	0.0148
-4	-0.0133	0.0193	0.0030	0.0529	-0.0101	0.0048	-0.0028	0.0399
-3	-0.0087	0.0127	0.0020	0.0447	-0.0024	0.0078	0.0026	0.0340
-2	-0.0143	0.0128	-0.0008	0.0466	-0.0070	0.0065	-0.0004	0.0349
-1	-0.0101	0.0080	-0.0010	0.0471	-0.0033	0.0042	0.0004	0.0363
0	0.0020	0.0187	0.0104	0.0591	0.0081	0.0122	0.0101	0.0463
+1	-0.0029	0.0219	0.0095	0.0676	0.0028	0.0135	0.0081	0.0527
+2	-0.0090	0.0240	0.0075	0.0781	-0.0015	0.0199	0.0091	0.0629
+3	-0.0011	0.0176	0.0082	0.0738	0.0098	0.0147	0.0122	0.0583
+4	-0.0077	0.0414	0.0169	0.0861	0.0065	0.0460	0.0259	0.0696
+6	-0.0041	0.0519	0.0239	0.1071	0.0122	0.0593	0.0354	0.0897
+8	0.0062	0.0650	0.0356	0.1217	0.0154	0.0656	0.0401	0.1018
+10	0.0164	0.0607	0.0386	0.1213	0.0244	0.0676	0.0456	0.1000
+12	0.0287	0.0651	0.0469	0.1303	0.0335	0.0681	0.0505	0.1061
+14	0.0235	0.0655	0.0445	0.1176	0.0318	0.0666	0.0489	0.0881
+16	0.0179	0.0655	0.0417	0.1168	0.0316	0.0671	0.0491	0.0854
+18	0.0156	0.0673	0.0415	0.1141	0.0310	0.0631	0.0468	0.0819
+20	0.0087	0.0719	0.0403	0.1412	0.0220	0.0675	0.0444	0.1113

Notes: 1. Under: the sample of 31 cash dividend approvals with dividend price ratios (DPR) under the average dividend price ratio (ADPR) of the market.

2. Over: the sample of 30 cash dividend approvals with dividend price ratios (DPR) over the average dividend price ratio (ADPR) of the market.

3. Unique: total of 61 cash dividend approvals without the future announcement of bonus or rights issues in the same year, including 'Over' and 'Under' samples.

4. Associated: total of 13 cash dividend approvals associated with the future announcement of bonus or rights issues in the same year.

5. Date 0: the date of the announcement.

6. Date -1 to -20: the dates before the announcement.

7. Date +1 to +20: the dates after the announcement.

7-7(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	0.8039	-0.4737	-0.0396	0.0533	0.7076	-0.2773	0.1552	0.1660
0	2.2602	1.0740	2.0693	1.3642	2.1815	0.9744	2.0008	1.1554
+1	-0.9161	0.3153	-0.1583	0.9618	-1.0008	0.1612	-0.4117	0.7422

Nonparametric (rank) t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
-1	1.1268	-2.2199	-0.6982	0.6914	0.6488	-1.0919	-0.1989	0.9721
0	1.7798	2.4087	3.0138	1.8997	1.4974	2.7735	3.0181	1.8504
+1	-0.1387	0.7362	0.4081	0.4900	-0.4686	0.4782	-0.0602	0.3352

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

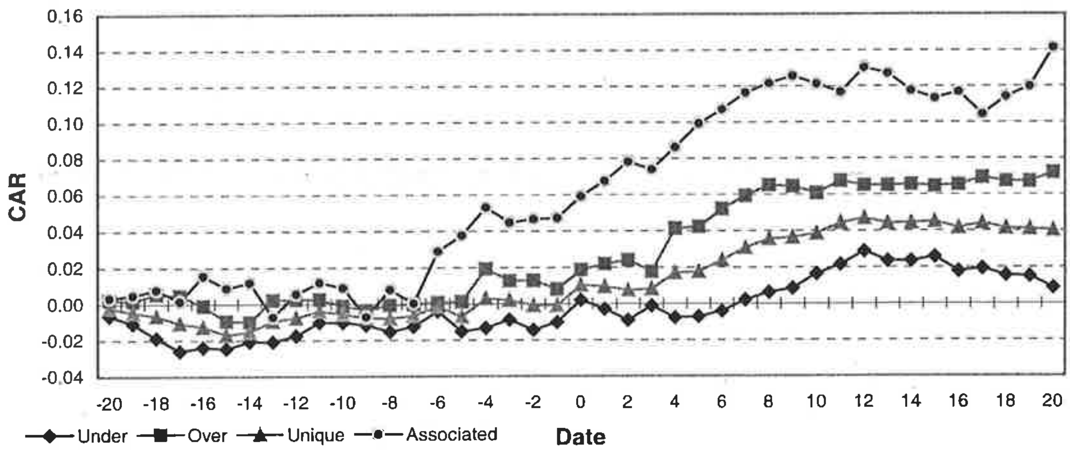
7-7(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model				Market Model			
Date	*Under*	*Over*	*Unique*	*Associated*	*Under*	*Over*	*Unique*	*Associated*
	11 Days Around Event Day							
5 before	-0.5113	0.3222	0.0442	0.9193	0.1201	0.5780	0.5465	1.1126
5 after	-0.7652	1.0573	0.5874	2.0325	-0.0713	1.9206	1.5595	1.8379
11 around	-0.1791	1.2539	1.0497	2.4014	0.6906	1.9783	2.0231	2.3376
	21 Days Around Event Days							
10 before	0.0014	0.1746	0.1589	1.2640	0.3848	0.3537	0.5043	1.2204
10 after	0.8518	1.3311	1.6195	2.2316	0.9909	2.1295	2.3128	1.9630
21 around	1.0820	1.2734	1.6788	2.7099	1.4254	1.9262	2.3806	2.4488
	41 Days Around Event Day							
20 before	-0.4212	0.1798	-0.0412	1.1960	-0.1425	0.1134	0.0167	0.9394
20 after	0.2801	1.1906	1.2150	2.0842	0.5959	1.5047	1.5773	1.6803
41 around	0.2544	1.1249	1.1430	2.5041	0.6574	1.2823	1.4257	2.0102

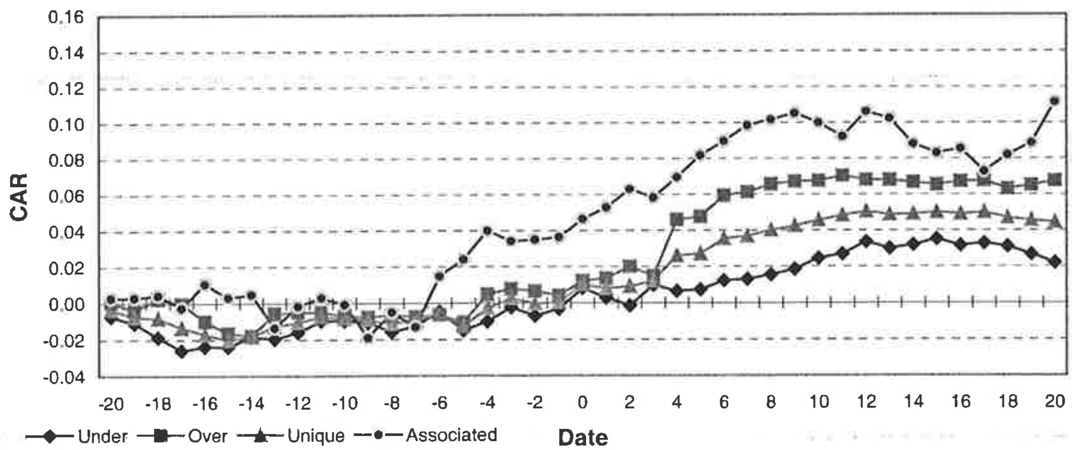
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-7. Cumulative Abnormal Returns (CAR) for Cash Dividend Approvals of B-shares in China's Stock Market

7-7(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-7(2). Market Model Cumulative Abnormal Returns (CAR)



announcement of cash dividend approvals as good news. Moreover, the B-shares traders have the same preferences as those A-shares traders. In the period around the announcement date of cash dividend approvals, the over-ADPR B-shares generate greater positive returns than the under-ADRP B-shares, and the future-associated-announcement B-shares obtain much greater positive returns than the unique-announcement B-shares.

In Table 7-7(b), the parametric *t*-values of under-ADPR and over-ADPR B-shares returns at the event date 0 are larger than +1.96 and less than +1.96 respectively. Conversely, the non-parametric *t*-values of under-ADPR and over-ADPR B-shares returns at the event date 0 are less than +1.96 and larger than +1.96. The inconsistent statistics, as indicated before, may result from the asymmetric distribution of B-shares returns. Even though we have not calculated *t*-values on the abnormal returns for the other days in addition to dates -1, 0 and +1, visual inspection of Figure 7-7 indicates that the most sensitive price movements usually occur on days other than the announcement date. Perhaps, this phenomenon is also a result of the small sample size.

There are no *t*-values for the intervals for the under-ADRP, the over-ADRP and the unique-announcement B-shares are beyond the absolute value of 1.96 in the market adjusted model section of Table 7-7(c). This is not repeated in the market model section, in which the *t*-test statistics of over-ADPR B-shares and the unique-announcement B-shares for the interval of 10 days after the event date are larger than +1.96. Furthermore, the *t*-values of future-associated-announcement B-shares for the intervals of 5, 10 and 20 days in the market adjusted model section and 10 days in the market model section after the announcement date are larger than +1.96.

Because, the under-ADPR B-shares react to the announcement of cash dividend approvals significantly at the announcement date, and no insider trading, underreaction or overreaction have been statistically detected, the under-ADPR B-shares prices should be assessed as efficient in response to the announcement of cash dividend approvals. On the other hand, the *t*-values tested on the CARs for intervals for the over-ADPR B-shares are inconsistent between the market model and the market adjusted model sections. This suggests that it is ambiguous whether the over-ADPR B-shares prices reflect the cash dividend approvals efficiently. However, the test statistics illustrate that future-associated-announcement B-shares consistently show information inefficiency. The future-associated-announcement B-shares prices cannot fully reflect cash dividend approvals at the announcement date. The underreaction is corrected more than 20 days after the announcement. Therefore, the abnormally high returns can be obtained by applying a sell and buy strategy as we previously explained.

7.6 Reaction of returns to the announcement of bonus issues

7.6.1 Bonus issues and informational content

A bonus issue is a "free" issue of shares, without a subscription price, made to existing shareholders in proportion to their current investment. A company can distribute bonus shares by using retained profits (stock dividend) or accumulated capital reserves. In China, the majority of companies prefer to issue the bonus from accumulated capital reserves, or from a composition of both capital reserves and retained profits. As addressed previously, a bonus issue does not alter shareholder wealth.

For example, a company plans to finance a bonus issue from retained profits. The company is just required a simple book entry to allocate retained profits into paid-up capital in the shareholders' funds section of the company balance sheet. Alternatively, a company that decides to realise a bonus issue by using accumulated capital reserves needs only to adjust the accumulated capital reserves into paid-up capital. The company does not receive any cash and its financial position remains the same. The modification triggered by the bonus issue is that the number of outstanding shares is adjusted by the bonus issue ratio, therefore, the price of the shares decline according to the same bonus issue ratio. The total market value of the shares or the values of the shares that are held by each investor should remain unchanged. Richard (1986) provided Australian evidence that bonus issues do not affect shareholders' wealth.

However, in practice there may be an increase in share price following the announcement of a bonus issue. Such an increase can occur because the announcement of a bonus issue may have beneficial informational content (Peterson 1971). Shareholders aware that, after the bonus issue, companies usually raise dividends per share above the extent to maintain the same total dividend payout. This, in turn, indicates the confidence of management in the company's future. Consequently, the share price may increase in response to this information.

Also management may believe that reducing the market price per share to a reasonable level can facilitate transactions and this may increase the demand for the company's shares. If this were true, the market value of the company's equities would increase. An alternative way to reduce market price per share is a stock split, which represents a reduction in the par value. The essential difference between a bonus issue and a stock split is that a stock split need not be accompanied by a book entry to relocate the retained profits or accumulated reserves into paid-up capital in the shareholders' funds section of the company balance sheet.

In addition, according to the regulations, the Chinese shareholders must pay tax for a cash dividend but not for a stock dividend, i.e. they need not pay tax on the bonus, which makes the bonus more favourable. However, this may not mean that the Chinese shareholders welcome all bonus issues. In fact, their preference is for a high ratio bonus rather than a low ratio bonus.[15] The low ratio bonus may not convey the same informational content as the high ratio bonus.

7.6.2 Tests on the announcement of bonus proposals for A-shares: results

A total of 196 bonus proposals of A-shares are classified into three samples. The small-bonus sample includes 103 proposals for which the bonus ratio is less than or equal to 2 for 10. The middle-bonus sample includes 37 proposals for which the bonus ratio is larger than 2 for 10, but less than or equal to 4 for 10. The large-bonus sample includes 56 proposals for which the bonus ratio is larger than 4 for 10. This study

[15] Bonus Ratio = The number of bonus shares in the issue / the number of existing shares applicable for the bonus issue.

considers the different effects of the announcement of bonus proposals for each classification of shares.

7.6.2.1 A-shares return behaviour around the announcement of bonus proposals

The results of the tests on the announcement of bonus proposals are summarised in Table 7-8. Table 7-8(a) presents the CARs of each sample around the announcement date of the bonus proposals. Figure 7-8(1) graphs the CARs measured by the market adjusted model and 7-8(2) graphs the CARs measured by the market model. From them it can be seen that the CARs of all bonus proposals ("Overall" sample) at date +20 are positive and the relevant lines are above the zero return axis. Therefore, on average, the bonus proposals raise positive CARs around the announcement date, which is different from the zero-dividend and cash dividend proposals. That the announcement of bonus proposals, on average, has a positive effect on China's stock prices coincides with the evidence of Ball *et al* (1977) for Australian stock prices. However, this does not make much sense, since the CARs of "Overall" sample are too complex to understand directly. The analysis should be decomposed into the small-bonus, middle-bonus and large-bonus samples individually.

The shareholders discriminate against the small-bonus stocks by responding to the small-bonus proposals with negative returns. The CARs of small-bonus stocks are negative at the start of the investigation period and drop markedly after the announcement date. At the date of +20, the CARs of small-bonus stocks decline below -7.0%. Conversely, the shareholders respond favourably to the middle-bonus and

Table 7-8. Results of the Tests on the Announcement of Bonus Proposals for A-shares in China's Stock Market

7-8(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model				*Market Model*			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-20	-0.0025	0.0086	0.0030	0.0010	-0.0025	0.0087	0.0033	0.0011
-18	-0.0033	0.0227	0.0068	0.0042	-0.0044	0.0237	0.0044	0.0030
-16	-0.0043	0.0282	0.0118	0.0060	-0.0050	0.0296	0.0081	0.0048
-14	-0.0079	0.0289	0.0162	0.0054	-0.0091	0.0323	0.0107	0.0038
-12	-0.0069	0.0298	0.0326	0.0107	-0.0073	0.0331	0.0238	0.0086
-10	-0.0070	0.0408	0.0426	0.0154	-0.0070	0.0442	0.0312	0.0128
-8	-0.0067	0.0490	0.0499	0.0191	-0.0069	0.0532	0.0365	0.0159
-6	-0.0032	0.0521	0.0606	0.0246	-0.0024	0.0573	0.0456	0.0217
-4	-0.0016	0.0589	0.0791	0.0318	-0.0014	0.0655	0.0616	0.0282
-3	-0.0045	0.0682	0.0922	0.0356	-0.0044	0.0756	0.0739	0.0318
-2	-0.0064	0.0835	0.1101	0.0424	-0.0053	0.0917	0.0913	0.0391
-1	-0.0099	0.0844	0.1315	0.0466	-0.0083	0.0921	0.1129	0.0436
0	-0.0163	0.0961	0.1352	0.0462	-0.0156	0.1034	0.1156	0.0424
+1	-0.0253	0.0943	0.1329	0.0404	-0.0240	0.1011	0.1120	0.0364
+2	-0.0279	0.0864	0.1300	0.0368	-0.0266	0.0929	0.1087	0.0327
+3	-0.0342	0.0861	0.1301	0.0334	-0.0328	0.0941	0.1087	0.0295
+4	-0.0390	0.0744	0.1359	0.0304	-0.0364	0.0829	0.1134	0.0269
+6	-0.0469	0.0808	0.1383	0.0279	-0.0444	0.0898	0.1141	0.0240
+8	-0.0543	0.0760	0.1370	0.0227	-0.0527	0.0867	0.1108	0.0180
+10	-0.0584	0.0693	0.1382	0.0196	-0.0569	0.0820	0.1115	0.0151
+12	-0.0612	0.0734	0.1416	0.0197	-0.0602	0.0869	0.1131	0.0146
+14	-0.0611	0.0725	0.1378	0.0186	-0.0609	0.0864	0.1084	0.0128
+16	-0.0677	0.0696	0.1435	0.0161	-0.0665	0.0839	0.1107	0.0100
+18	-0.0758	0.0604	0.1424	0.0098	-0.0738	0.0749	0.1073	0.0035
+20	-0.0768	0.0701	0.1501	0.0131	-0.0747	0.0852	0.1129	0.0064

Notes: 1. Small: the sample of 103 proposals with bonus ratios less than or equal to 2 for 10.
2. Middle: the sample of 37 proposals with bonus ratios larger than 2 for 10, but less than or equal to 4 for 10.
3. Large: the sample of 56 proposals with bonus ratios larger than 4 for 10.
4. Overall: the sample of all 196 bonus proposals.
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-8(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-1	-1.4686	0.2271	4.8274	2.2861	-1.2333	0.1016	4.9716	2.4483
0	-2.6774	2.9840	0.8314	-0.1984	-3.0585	2.9005	0.6280	-0.6539
+1	-3.7246	-0.4711	-0.5208	-3.1188	-3.4846	-0.5993	-0.8397	-3.2213

Nonparametric (rank) t-test Statistics

	Market Adjusted Model				Market Model			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-1	-0.9857	-0.3233	3.7402	2.1075	-0.8704	-0.6090	3.8881	2.1882
0	-2.4690	2.1945	0.1371	-1.4443	-2.9917	2.1627	0.2012	-1.8196
+1	-3.0469	-0.3267	-1.1088	-3.1281	-2.6191	-0.3737	-1.0362	-2.7443

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

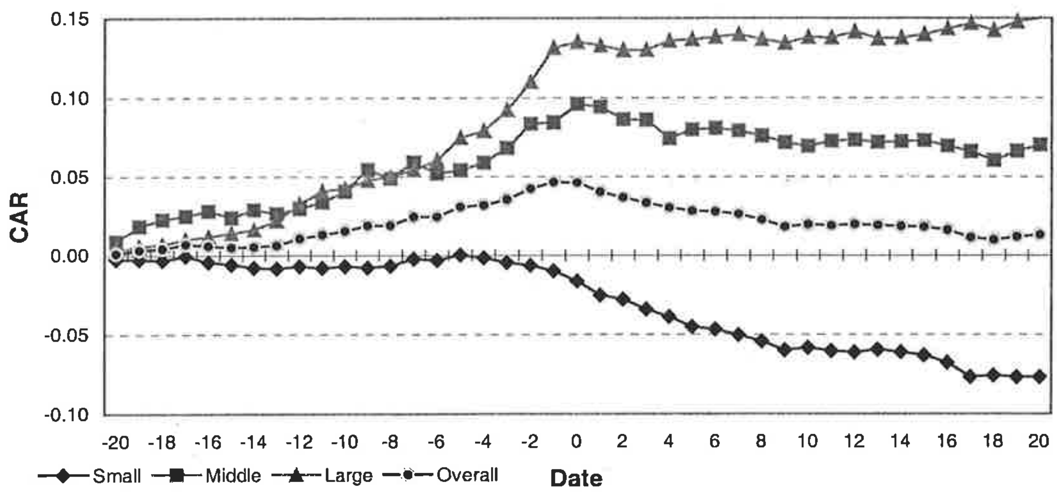
7-8(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model				Market Model			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
				11 Days Around Event Day				
5 before	-1.2563	3.6775	7.1753	5.2882	-1.0922	3.9797	6.9302	5.2798
5 after	-5.3707	-1.8524	0.1694	-4.3195	-4.8561	-1.7378	-0.2943	-4.2475
11 around	-5.2752	2.1302	5.2025	0.5933	-4.9325	2.3860	4.6633	0.4988
				21 Days Around Event Days				
10 before	-0.2522	4.0716	6.4773	5.6685	-0.0294	4.4296	6.0100	5.5865
10 after	-5.5380	-2.1574	0.2154	-4.5190	-5.4226	-1.7356	-0.3036	-4.6505
21 around	-4.5798	1.9720	4.7999	0.7499	-4.4297	2.4920	4.0748	0.5033
				41 Days Around Event Day				
20 before	-0.9225	4.8026	6.6504	5.5894	-0.7688	5.2740	5.8162	5.2539
20 after	-5.6350	-1.4802	0.7536	-3.9747	-5.4880	-1.0414	-0.1409	-4.3310
41 around	-4.9981	2.7865	5.3010	1.0968	-4.8476	3.4091	4.0619	0.5424

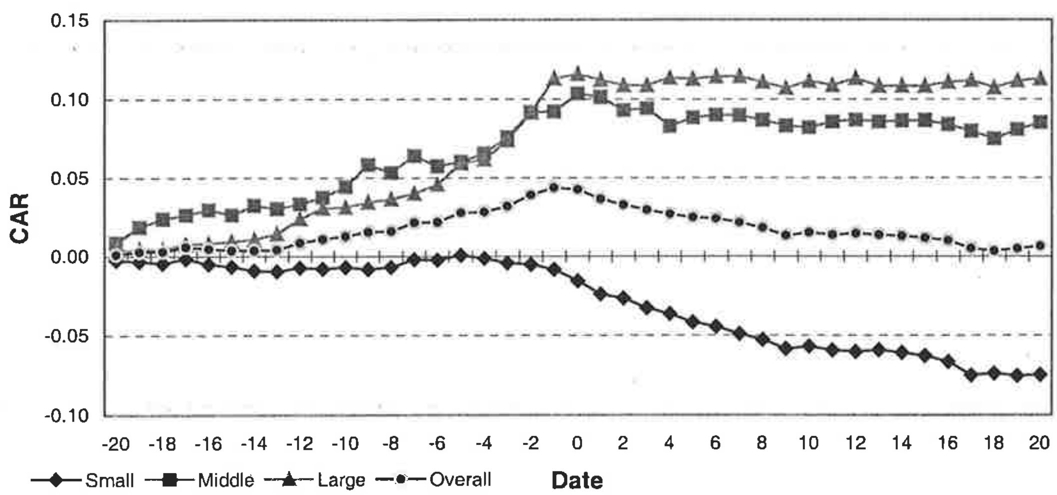
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-8. Cumulative Abnormal Returns (CAR) for Bonus Proposals of A-shares in China's Stock Market

7-8(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-8(2). Market Model Cumulative Abnormal Returns (CAR)



large-bonus proposals resulting in positive returns. The CARs of middle-bonus and large-bonus stocks begin positively and grow rapidly until the announcement date, and then remain relatively stable thereafter. At the end of the investigation period, the CARs of middle-bonus and large-bonus stocks are above 7.0% and 11.0% respectively. The CARs are more explicitly at the levels in line with the bonus ratios following the announcement date.

Both the parametric and non-parametric *t*-test statistics in Table 7-8(b) suggest that the shareholders react to the announcement of bonus proposals at the event dates significantly in suitable directions. The *t*-values of small-bonus stocks are below -1.96 or -2.58 at event dates 0 and +1, which illustrates that the small-bonus proposals represent unfavourable information at conventional levels of significance. Meanwhile, the *t*-values of middle-bonus and large-bonus stocks are larger than +1.98 or +2.58 at the event date 0 or at alternative event date –1. This implies that the middle-bonus and large-bonus proposals are considered to be favourable information at conventional levels.

Table 7-8(c) shows significantly negative CARs in the intervals of 11, 21 and 41 days around the announcement date for the small-bonus stocks, but significantly positive CARs for the middle-bonus and large-bonus stocks. Moreover, the significantly negative CARs are generated mainly in the intervals of 5, 10 and 20 days after the announcement date for the small-bonus stocks. Meanwhile, the significantly positive CARs are generated mainly in the intervals of 5, 10 and 20 days before the announcement date for the middle-bonus and large-bonus stocks. The CARs in intervals are presented graphically in Figures 7-8(1) and 7-8(2).

7.6.2.2 Assessment of market efficiency for A-shares on the announcement of bonus proposals

The *t*-values at the event date 0 are below -1.96 or -2.58, illustrating that the stock prices react to the small-bonus proposals at the 5% or 1% significance level. Hoverer, the *t*-values on the CARs in the intervals of 5, 10 and 20 days after the announcement are below -2.58, which indicates that the small-bonus proposed stock prices underreact to the announcement at the event date. This underreaction is corrected at least in the 20 days after the announcement. Thus, there exists a strategy permitting abnormally high return for the small-bonus stock investors. Suppose that the small-bonus shareholders sell their shares at the announcement date and buy the same shares after 20 days. This strategy will provide a gain of 6%.[16] Thus, the hypothesis of informational efficiency for the small-bonus stock is refuted.

In contrast to the small-bonus stocks, the large-bonus stocks have positive *t*-values greater than +2.58 at the alternative event date -1 and on CARs in the intervals of 5, 10 and 20 days before the announcement date, instead of after announcement date. This implies that despite some shareholders anticipating the information or obtaining inside information before the announcements, the stock prices still react to the large-bonus proposals significantly at the 1% significance level. The information contained in the large-bonus proposals is fully incorporated into the stock prices until the event date 0.

[16] ((-0.0163)-(-0.0768))*100%=6.05%, abnormal returns are measured by the market adjusted model; ((-0.0747)-(-0.0156))*100%=5.91%, abnormal returns are measured by the market model.

If we neglect the uncertainty of using inside information, the stock prices reflect the large-bonus proposals efficiently.

The case of middle-bonus stocks is between those of small-bonus and large-bonus stocks, but close to that of large-bonus stocks. The *t*-values at the event date 0 and on the CARs in intervals before the announcement date are larger than +1.96 or +2.58, which illustrates a significant price reaction to the middle-bonus proposals at the announcement date and the possible anticipation or use of inside information. Furthermore, the negative *t*-values in each interval after the announcement date are comparatively smaller in absolute value (just one is below -1.96), suggesting that there is slight overreaction. In other words, the stocks are overpriced with respect to the middle-bonus proposals prior to and at the event date and then are corrected thereafter. This results in the CARs moving in opposite directions before and after the announcement date. Nevertheless, the stock prices are reasonably efficient in reflecting the information of middle-bonus proposals.

7.6.3 Tests on the announcement of bonus approvals for A-shares: results

Using the same criteria as was used previously in grouping bonus proposals, we construct three bonus approval samples: the small-bonus sample of 172 bonus approvals, the middle-bonus sample of 89 bonus approvals and the large-bonus sample of 94 bonus approvals. The total of 355 bonus approvals includes the 196 cases which have been studied in the last subsection of this chapter. We will seek to understand from this study the effects of the bonus approvals on the announced stock prices, and then, to find out the different influences that the bonus proposals and the bonus approvals have on stock prices.

7.6.3.1 A-shares return behaviour around the announcement of bonus approvals

The results of the tests on the announcement of bonus approvals are summarised in Table 7-9. Table 7-9(a) and Figures 7-9(1) and 7-9(2) report the CARs around the announcement of bonus approvals for each sample. Firstly, the large-bonus approved stocks perform better than the small-bonus approved stocks, which is consistent with the performances of large-bonus proposed stocks. This indicates that the investors are more interested in the announcement of large-bonus proposals and approvals than small-bonus proposals and approvals. Next, there are peaks of CARs at the alternative event date +2 of each sample to display a delayed overreaction procedure to the announcement of bonus approvals. This sort of peaks has not been found in the CARs related to the bonus proposals.

Having compared Table 7-9(a) with 7-8(a), and Figure 7-9 with 7-8, we find that the CARs related to the small-bonus approvals are above those relating to the small-bonus proposals, whereas, the CARs related to the large-bonus approvals is below those relating to the large-bonus proposals. The narrow range of CARs between samples of bonus approvals shows that the influence of bonus approvals is weaker than that of bonus proposals. Since the main informational content of bonus approvals has already disclosed in the announcement of bonus proposals, the bonus approvals convey less information than the bonus proposals do. This finding is consistent with the studies of cash dividend proposals and approvals.

Table 7-9. Results of the Tests on the Announcement of Bonus Approvals for A-shares in China's Stock Market

7-9(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model				*Market Model*			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-20	0.0004	-0.0036	0.0009	-0.0004	0.0002	-0.0036	0.0001	-0.0007
-18	-0.0042	-0.0038	0.0056	-0.0017	-0.0067	-0.0053	0.0017	-0.0041
-16	-0.0119	-0.0077	0.0085	-0.0058	-0.0149	-0.0108	0.0022	-0.0094
-14	-0.0205	-0.0101	0.0159	-0.0088	-0.0251	-0.0158	0.0078	-0.0143
-12	-0.0213	-0.0093	0.0177	-0.0086	-0.0264	-0.0180	0.0078	-0.0154
-10	-0.0225	-0.0099	0.0184	-0.0091	-0.0277	-0.0208	0.0072	-0.0168
-8	-0.0260	-0.0090	0.0231	-0.0095	-0.0319	-0.0229	0.0110	-0.0184
-6	-0.0240	-0.0119	0.0271	-0.0082	-0.0314	-0.0285	0.0136	-0.0188
-4	-0.0302	-0.0111	0.0361	-0.0089	-0.0376	-0.0294	0.0214	-0.0201
-3	-0.0298	-0.0084	0.0412	-0.0067	-0.0381	-0.0272	0.0268	-0.0184
-2	-0.0326	-0.0046	0.0429	-0.0067	-0.0412	-0.0249	0.0277	-0.0191
-1	-0.0302	0.0002	0.0537	-0.0016	-0.0397	-0.0204	0.0382	-0.0146
0	-0.0219	0.0233	0.0802	0.0150	-0.0317	0.0030	0.0639	0.0017
+1	-0.0169	0.0307	0.0926	0.0224	-0.0273	0.0096	0.0754	0.0085
+2	-0.0196	0.0262	0.0908	0.0195	-0.0300	0.0036	0.0730	0.0051
+3	-0.0239	0.0229	0.0878	0.0158	-0.0348	-0.0001	0.0694	0.0009
+4	-0.0263	0.0122	0.0854	0.0112	-0.0371	-0.0112	0.0655	-0.0040
+6	-0.0245	0.0045	0.0781	0.0084	-0.0360	-0.0202	0.0565	-0.0078
+8	-0.0238	-0.0015	0.0657	0.0041	-0.0358	-0.0267	0.0420	-0.0129
+10	-0.0242	-0.0050	0.0635	0.0025	-0.0373	-0.0320	0.0393	-0.0156
+12	-0.0264	0.0033	0.0639	0.0036	-0.0412	-0.0237	0.0379	-0.0157
+14	-0.0324	0.0013	0.0607	-0.0007	-0.0478	-0.0272	0.0326	-0.0212
+16	-0.0352	0.0060	0.0615	-0.0007	-0.0511	-0.0248	0.0320	-0.0223
+18	-0.0354	0.0103	0.0702	0.0024	-0.0525	-0.0213	0.0393	-0.0202
+20	-0.0293	0.0067	0.0712	0.0048	-0.0466	-0.0283	0.0395	-0.0188

Notes: 1. Small: the sample of 172 approvals with bonus ratios less than or equal to 2 for 10.
2. Middle: the sample of 89 approvals with bonus ratios larger than 2 for 10, but less than or equal to 4 for 10.
3. Large: the sample of 94 approvals with bonus ratios larger than 4 for 10.
4. Overall: the sample of all 355 bonus approvals.
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-9(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model				*Market Model*			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-1	1.2017	1.7096	3.0970	3.4240	0.7649	1.6214	3.1329	3.1091
0	4.2438	8.2011	7.5881	11.1515	4.1328	8.6031	7.6457	11.2419
+1	2.5118	2.6124	3.5549	4.9888	2.2740	2.3913	3.4417	4.6551

Nonparametric (rank) t-test Statistics

	Market Adjusted Model				*Market Model*			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
-1	0.1130	0.6029	2.4676	1.4181	0.1103	0.7566	2.5353	1.5055
0	3.6867	5.2322	4.9137	6.4229	3.7220	5.6029	5.0061	6.6120
+1	2.5673	2.1100	1.9140	3.1843	2.4668	2.0746	1.7936	3.0479

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

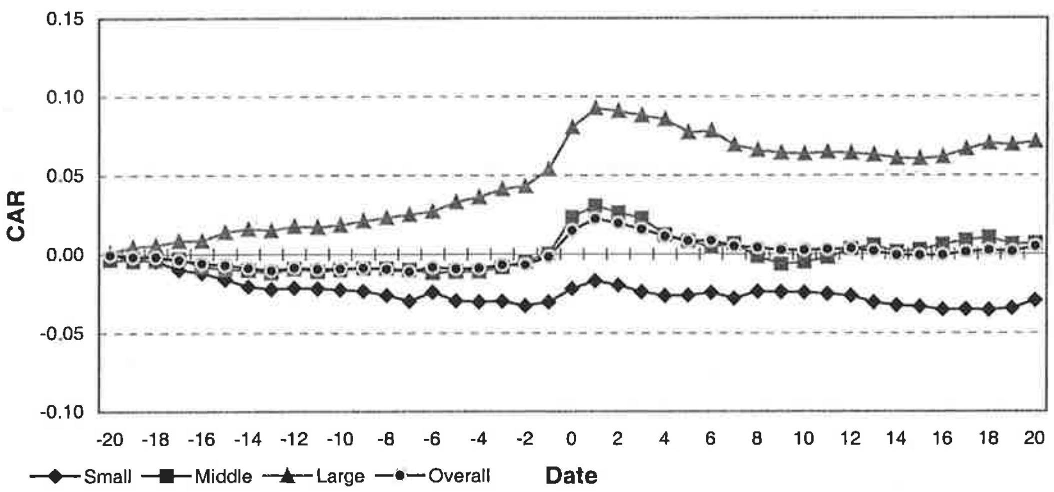
7-9(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model				*Market Model*			
Date	*Small*	*Middle*	*Large*	*Overall*	*Small*	*Middle*	*Large*	*Overall*
11 Days Around Event Day								
5 before	-1.4067	1.9119	3.4125	1.9760	-1.9232	1.3198	3.2822	1.2961
5 after	-0.9485	-2.3942	-0.3895	-1.9916	-1.2704	-3.0690	-0.9265	-2.7627
11 around	-0.3083	2.1476	4.3260	3.3518	-0.9071	1.4147	3.8934	2.4008
21 Days Around Event Days								
10 before	-1.3658	1.2493	3.3036	1.6252	-2.1507	0.0035	2.9316	0.3488
10 after	-0.3766	-3.1730	-1.5166	-2.6429	-0.9155	-4.0619	-2.3189	-3.7716
21 around	-0.2763	0.4621	2.8891	1.7312	-1.2140	-0.9232	2.0912	0.0913
41 Days Around Event Day								
20 before	-3.4292	0.0159	3.4401	-0.2468	-4.5884	-1.6749	2.5501	-2.2490
20 after	-0.8458	-1.3200	-0.5803	-1.5266	-1.7201	-2.5687	-1.6255	-3.1693
41 around	-2.3230	0.3700	3.1824	0.5030	-3.7607	-1.6203	1.8399	-2.0286

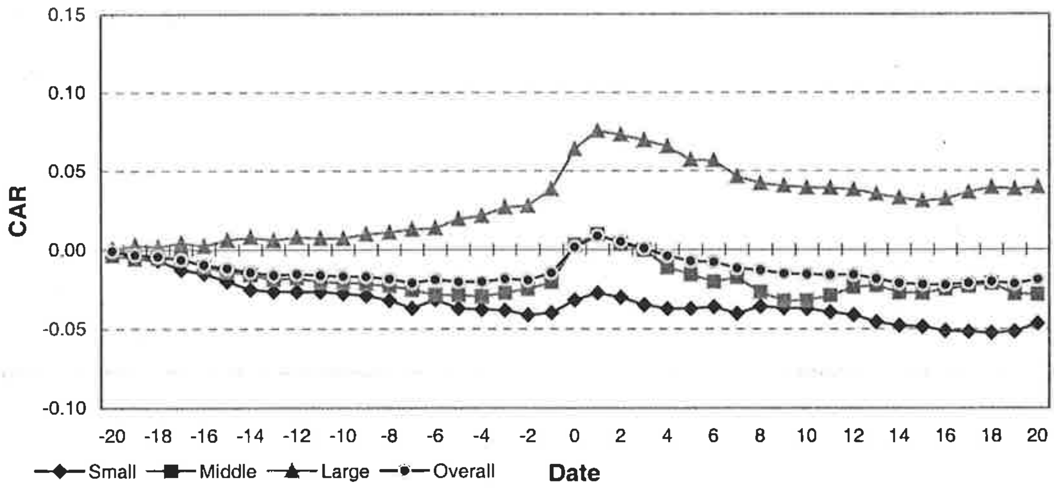
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-9. Cumulative Abnormal Returns (CAR) for Bonus Approvals of A-shares in China's Stock Market

7-9(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-9(2). Market Model Cumulative Abnormal Returns (CAR)



The t-values of the parametric and non-parametric tests on the event dates in Table 7-9(b) are all positive and large. In particular, the t-values that occurred at the event date 0 across every sample are dramatically larger than +2.58. Meanwhile, the majority of t-values at the alternative event dates -1 and +1 are still above +1.96 or +2.58. This is evidence that announcement of bonus approvals generates significantly positive returns at the event dates. However, those significantly positive returns occurring at the event dates are accompanied with significant negative returns in the intervals before or after the event dates.

Table 7-9(c) reports t-tests on the CARs in intervals around the announcement of bonus approvals. The t-values for the interval of 20 days before the event date for the small-bonus sample are below -1.96, which suggests that investors are pessimistic in their anticipation of the small-bonus approvals. The t-values for the intervals of 5 and 10 days after the event date for the middle-bonus sample are below -1.95 or -2.58, which indicates that investment in the middle-bonus stocks gains significantly negative returns after the announcement date of the approvals. For the large-bonus sample, the t-values for each interval before the event date are above +2.58 or +1.96, but for the intervals of 10 days after event date in the market model section they are below -1.96. This evidence suggests that the optimistic anticipation for the large-bonus approvals has been corrected after the announcement.

7.6.3.2 Assessment of market efficiency for A-shares on the announcement of bonus approvals

The *t*-values show that the stock prices reflect the announcement of bonus approvals statistically significant and positive at the event date. However, this cannot be simply concluded as an efficient phenomenon. Firstly, the small-bonus approval should not be good news and should not be reacted to by a large positive return. The significant positive returns at the event date, accompanied with significant negative returns in the intervals before and after the event date, show that the stock prices respond to the small-bonus approvals in the wrong direction at the announcement date. However, due to the negative returns being statistically insignificant after the announcement date, the reaction of A-shares prices to the announcement of small-bonus approvals is included in the efficient category.

Next, the unforeseen informational content of a bonus approval is not as much as that of a bonus proposal, since the major content of the approval is similar to that of the proposal which has been disclosed previously. Therefore, the reaction of stock prices to the bonus approvals should be weaker than that to the bonus proposals. This is true during the 41 day investigation period, but not at the announcement date. The unusually large positive *t*-values at the event date and negative *t*-values for the intervals after the event date show that the middle-bonus stocks have a severe overreaction at the event date. However, for the large-bonus stocks, the overreaction at the event date is relatively smaller. Only in the market model section is a *t*-value significant in the interval of 10 days after the announcement at the 5% significance level. As a consequence, the reaction of A-shares prices to the middle-bonus approvals is inefficient and the reaction to the large-bonus approvals are ambiguous.

7.6.4 Tests on the announcement of bonus approvals for B-shares: results

The sample of bonus proposals of B-shares is not sufficient for the study. Thus, the tests are only conducted on the 56 bonus approvals of B-shares. Among the 56 bonus approvals of B-shares, thirty-four of them fall into the small-bonus sample with a bonus ratio of less than or equal to 2 for 10 and 22 fall into the middle-large-bonus sample with a bonus ratio larger than 2 for 10.

Table 7-10 summarises the results of the tests on the announcement of bonus approvals of B-shares. Table 7-10(a) and Figures 7-10(1) and 7-10(2) illustrate the CARs that are measured by the market adjusted model and the market model. From that table and those figures we can see that the B-shares investors have a similar assessment to that of the A-shares investors on the information of bonus approvals. They prefer investing in the middle-large-bonus stocks to investing in the small bonus stocks. As a result, the CARs of middle-large-bonus B-shares are mainly positive and above the zero return axis, while the CARs of small-bonus B-shares are negative and below the zero return axis.

By comparison of Figure 7-10 to Figures 7-8 and 7-9, the difference in the CAR lines between the small-bonus and middle-large-bonus stocks for the B-shares bonus approvals is more similar to that between the small-bonus and large bonus stocks for the A-shares bonus approvals than for the A-shares proposals. Therefore, while we did

Table 7-10. Results of the Tests on the Announcement of Bonus Approvals for B-shares in China's Stock Market

(a) Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*		
Date	*Small*	*Middle-Large*	*Overall*	*Small*	*Middle-Large*	*Overall*
-20	-0.0020	0.0097	0.0023	-0.0044	0.0079	-0.0003
-18	-0.0202	0.0114	-0.0085	-0.0342	0.0061	-0.0208
-16	-0.0153	0.0154	-0.0039	-0.0305	0.0062	-0.0183
-14	-0.0224	0.0248	-0.0049	-0.0315	0.0124	-0.0169
-12	-0.0294	0.0224	-0.0102	-0.0423	0.0078	-0.0256
-10	-0.0142	0.0109	-0.0049	-0.0252	-0.0091	-0.0199
-8	-0.0208	-0.0032	-0.0143	-0.0326	-0.0249	-0.0301
-6	-0.0232	0.0031	-0.0135	-0.0282	-0.0133	-0.0233
-4	-0.0305	0.0197	-0.0120	-0.0377	0.0076	-0.0226
-3	-0.0408	0.0191	-0.0186	-0.0482	0.0065	-0.0299
-2	-0.0422	0.0307	-0.0152	-0.0510	0.0170	-0.0283
-1	-0.0407	0.0413	-0.0104	-0.0500	0.0254	-0.0249
0	-0.0420	0.0575	-0.0052	-0.0527	0.0411	-0.0214
+1	-0.0469	0.0627	-0.0064	-0.0578	0.0461	-0.0231
+2	-0.0380	0.0599	-0.0018	-0.0479	0.0416	-0.0181
+3	-0.0381	0.0496	-0.0057	-0.0492	0.0318	-0.0222
+4	-0.0322	0.0604	0.0020	-0.0444	0.0424	-0.0155
+6	-0.0181	0.0661	0.0130	-0.0306	0.0510	-0.0034
+8	-0.0255	0.0593	0.0058	-0.0430	0.0467	-0.0131
+10	-0.0319	0.0740	0.0072	-0.0502	0.0629	-0.0125
+12	-0.0313	0.0874	0.0126	-0.0478	0.0730	-0.0075
+14	-0.0424	0.0679	-0.0016	-0.0610	0.0495	-0.0242
+16	-0.0359	0.0747	0.0050	-0.0537	0.0540	-0.0178
+18	-0.0497	0.0638	-0.0077	-0.0676	0.0393	-0.0320
+20	-0.0418	0.0642	-0.0026	-0.0643	0.0387	-0.0299

Notes: 1. Small: the sample of 34 approvals with bonus ratios less than or equal to 2 for 10.
2. Middle-large: the sample of 22 approvals with bonus ratios larger than 2 for 10.
3. Overall: the sample of all 66 bonus approvals, including the small and middle-large samples.
4. Date 0: the date of the announcement.
5. Date -1 to -20: the dates before the announcement.
6. Date +1 to +20: the dates after the announcement.

7-10(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

	Parametric t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Small*	*Middle-Large*	*Overall*	*Small*	*Middle-Large*	*Overall*
-1	0.2202	1.6344	0.9882	0.1449	1.3209	0.7068
0	-0.2010	2.5062	1.0509	-0.4023	2.4854	0.7213
+1	-0.7221	0.8013	-0.2311	-0.7842	0.7993	-0.3585
	Nonparametric (rank) t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Small*	*Middle-Large*	*Overall*	*Small*	*Middle-Large*	*Overall*
-1	0.1245	0.6340	0.5004	-0.1931	0.7671	0.3038
0	0.2373	2.5081	1.7842	0.2167	2.4231	1.6238
+1	-0.3891	0.2331	-0.1489	-0.4925	0.2211	-0.2633

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

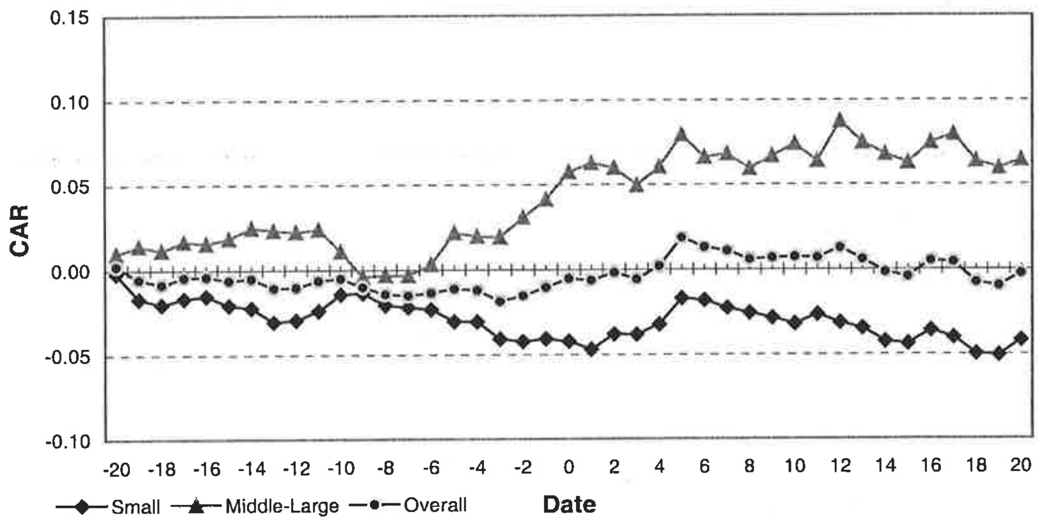
7-10(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model			*Market Model*		
Date	*Small*	*Middle-Large*	*Overall*	*Small*	*Middle-Large*	*Overall*
	11 Days Around Event Day					
5 before	-1.1695	2.6424	0.2825	-1.4911	2.7377	-0.1505
5 after	1.6782	1.5078	2.1832	1.5412	1.5160	2.0510
11 around	0.2823	3.5537	1.9792	-0.0875	3.6172	1.4988
	21 Days Around Event Days					
10 before	-0.7894	0.8538	-0.2634	-0.8146	0.9255	-0.3309
10 after	0.4804	0.8037	0.8067	0.1179	1.0923	0.5827
21 around	-0.2571	1.6907	0.6042	-0.5686	1.9348	0.3312
	41 Days Around Event Day					
20 before	-1.3597	1.4283	-0.4745	-1.7116	0.8970	-1.1521
20 after	0.0087	0.2318	0.1207	-0.3970	-0.0844	-0.3948
41 around	-0.9750	1.5508	-0.0830	-1.5355	0.9557	-0.9678

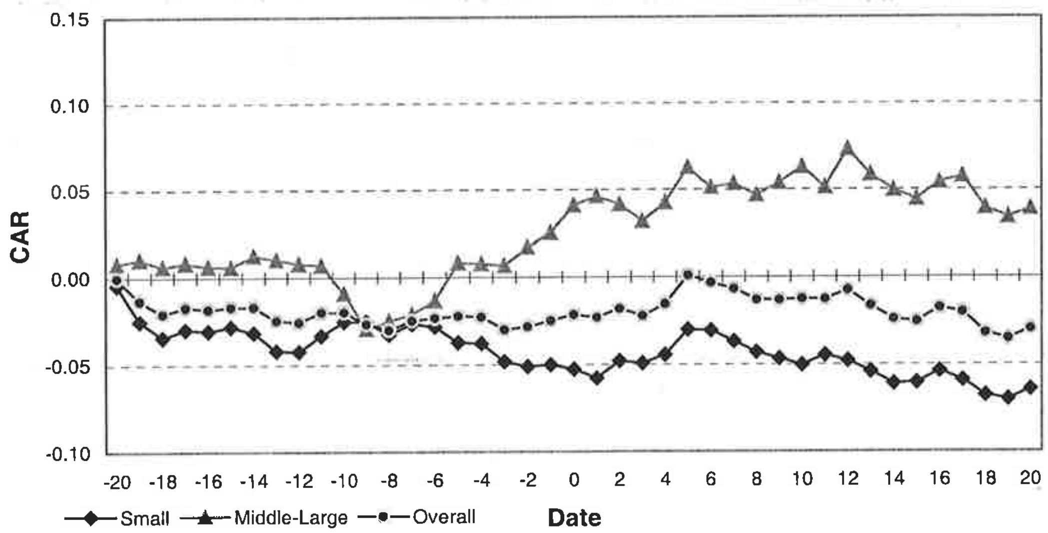
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-10. Cumulative Abnormal Returns (CAR) for Bonus Approvals of B-shares in China's Stock Market

7-10(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-10(2). Market Model Cumulative Abnormal Returns (CAR)



not test the bonus proposals for the B-shares due to the small sample size, we may hypothesise that the B-shares investors may respond to the announcement of bonus approvals more weakly than they respond to the announcement of bonus proposals. However, the CAR lines of the B-shares in Figures 7-10 are more volatile due to the small sample problem.

Table 7-10(b) shows that all parametric and non-parametric *t*-values tested on the announcement of small-bonus approvals for B-shares are less than 1.96 in absolute value, which suggests that the small-bonus B-shares prices have not been significantly affected by the announcement at the event date. On the other hand, the *t*-values at the event date 0 for the middle-large-bonus B-shares are larger than +1.96, which implies that the middle-large-bonus B-shares react significantly and positively to the announcement at the event date at the 5% significance level.

Table 7-10(c) indicates that the *t*-values tested on the CARs in any intervals are less than 1.96 in absolute values for the small-bonus approved B-shares. Thus, there are no significant variations of returns for the small-bonus approved B-shares at or around the event date. By contrast, the *t*-values tested on the CARs in interval of 5 days before the event date for the middle-large-bonus approved B-shares are larger than +2.58, which shows that significant positive returns are generated in the five days before the event dates. Due to the significant positive returns occurred at the event date 0 and five days before the announcement, the cumulative returns of 10 days around the event date for the middle-large-bonus B-shares are significant at the 1% significance level with *t*-values above +2.58.

For the small-bonus B-shares, we fail to find out the evidence of overreaction and underreaction or the application of inside information. Thus, even though the price reaction to the announcement of small-bonus approvals at the event date is statistically insignificant, we cannot conclude that the small-bonus B-shares prices are not efficient in line with the announcement. Similarly, for the middle-large-bonus B-shares, we again fail to find out the evidence of overreaction and underreaction. If we suppose that the significant cumulative abnormal returns of the 5 days before the event date resulted from reasonable anticipation, we should conclude that the middle-large-bonus approved B-shares prices reflect the announcement efficiently.

7.7 Reaction of returns to the announcement of rights issues

7.7.1 Rights issues and informational content

A rights issue is an issue of new shares to existing shareholders on a pro-rata basis. With a rights issue, shareholders receive the rights from the company to subscribe for additional shares at a subscription price and in a fixed ratio to the number of shares already held. The company therefore has to set a subscription price and a fixed ratio for the rights issue. In China, the subscription price for the rights issue used to be attractively below the current market prices of the shares. However, in recent year, companies have made rights issues with subscription prices much closer to current market prices. The fixed ratio of new shares to existing shares in a rights issue can be chosen by the company in lie with the amount of capital required.[17]

Because the subscription price is below the current market price, the rights have value. If a shareholder buys new shares at the subscription price, he obtains the value of the rights. Instead, a shareholder may renounce the rights and realise this value by selling the rights on the stock exchange. A shareholder is unlikely to forgo the right of buying the new shares as well as give up the opportunity of realising the value of the rights, except in the case of non-renounceable rights for which the only choice available to the shareholders is to exercise their rights entitlement or permit it to lapse.

Regardless of whether the shareholders accept the rights by purchasing the new shares or renounce the rights by selling the rights, the rights issues have no net value to shareholders (Peterson 1971). For example, a company that makes a rights issue in a fixed ratio 1 for N existing shares and a shareholder holds q times N of the shares. Before the *ex*-rights date, the value of the investment of the shareholder is the amount of the shares held qN multiplied by the market price M of the shares cum rights, that is qNM. At the *ex*-rights date the value of the investment of the shareholder is qNX plus qR. X is the price of a share at the *ex*-rights date and R is the value of the rights. Since NM is equal to $NX+R$ in market equilibrium, the investment of the shareholder before the *ex*-rights date qNM and at the *ex*-rights date $qNX+q$R are equal. Moreover, suppose that the shareholder has additional amount of cash, qS. If the shareholder realise the rights value by selling the rights on the market, the value of the shareholder's wealth is

[17]The CSRC requires that subscription price should not be below the net assets per share that was published in the recent financial statement. The ratio of issuance should not be over 30% of the original capital. See "Shangshi Gongsi Songpei Gu Zhanxing Guiding (Provisional Requirements for the Bonus and Rights Issues)," China's Securities Regulatory Commission, 17 December 1993.

$qS+qNX+q$R. Alternately, if the shareholder buys the new shares in the subscription price S, the value of shareholder's wealth is $qNX+qX$. Again, because $R+S$ equals to X in equilibrium, the shareholder's wealth is unaffected by selling the rights or buying the new shares. In addition, even for non-renounceable rights issues, shareholders can take up the rights to buy the shares and then to sell the shares in the market to prevent the rights lapsing.

Nevertheless, the above arguments rest on the assumption of no transaction costs and an irrelevant tax regime. In particular, the fact that the rights issue has no value to shareholders does not imply that the announcement of a rights issue may not affect shareholders' wealth. The major reason for the effects on the shareholders' wealth is that the announcement of a rights issue has informational content. Smith (1986) provided U.S. evidence that the market considers a rights issue to be "bad" news. This means that the market considers a rights issue to be an unfavourable indication of the company's future net operation cash flows. A rights issue may appeal to a financial manager as a means of raising capital. Therefore, the announcement of a rights issue typically causes a company's share price to fall. If Smith's (1986) conclusion is generally true, the current shareholders may benefit if the need for such issues is minimised. In other word, the larger the ratio of new shares to original shares is in a rights issue, the more adversely the price is affected by the rights issue.

As addressed previously, China's Stock Market is a new emerging market. Demand dominated over the supply of shares over the period of this study. To test the effects of the announcement of rights issues on the stock prices, and to verify Smith's (1986) claim, therefore, we initially suppose that the Chinese shareholders prefer a rights issue with a high ratio of new shares to existing shares. Additionally, the shareholders may prefer a rights issue with a small ratio of subscription price to market price, in other words, a large discount to the market price. Thus, the shareholders preference for a right issue can be measured by a formula as: ((Market price – Subscription price) / Market price) (New shares / existing shares).[18] This formula will be employed as a criterion to classify observations of rights issues into specific samples.

7.7.2 Tests on the announcement of rights proposals for A-shares: results

Using the formula that was specified in that last paragraph, we calculate ratios for the observations of each rights issue[19]. The median ratio 1.40 is set up as a criterion to divide the 75 rights proposals into two samples. 38 rights proposals make up the low-ratio rights sample with the ratios below or equal to 1.40, the remaining 37 rights proposals make up the high-ratio rights sample with ratios over 1.40.

7.7.2.1 A-shares returns behaviour around the announcement of rights proposals

Table 7-11 and Figure 7-11 summarises the results of the tests on the announcement of rights proposals. The CARs measured by the market adjusted model are represented in the left side of Table 7-11 and Figure 7-11(1), whereas, the CARs measured by the market model are represented on the right side of Table 7-11 and Figure 7-11(2). As

[18] The market price in this formula is the cum right price. In the tests, the market price is selected as the market close price, two days before the announcement of the rights proposal or approval.
[19] Some subscription prices in the right proposals are a price range. The median price of the range is used as representative of the subscription price for the rights proposal.

can be seen from the table and figures, the CARs of overall rights proposals are negative in every day and consecutively decrease over most of the 41 day investigation period. Even though, the negative CARs are not too large in absolute value, they suggest that the rights proposals, as a whole, convey unfavourable information to the market.

However, the CARs of high-ratio rights proposals differ from that of low-ratio right proposals. The CARs of high-ratio rights proposals are randomly distributed around the zero return axis, which implies that the high-ratio rights proposals have ambiguous information. However, on average, this informational content is neutral. On the other hand, the CARs of low-ratio rights proposals are much lower. The negative CARs of low-ratio rights proposals are below -4.84% and -6.31% at the date +20 in the market adjusted model and market model sections respectively. Apparently, the low-ratio rights proposals convey worse information in comparison with the high-ratio rights proposals. As a consequence, the effect of a low-ratio rights proposal of China's stock markets coincides with Smith's (1986) conclusion, in that the rights issues have "bad" news content. In contrast, the high-ratio rights proposals partially refute Smith's (1986) claim, since the high-ratio rights proposals do not depress the stock prices for the entire investigation period.

Table 7-11(b) reports the results of the parametric and non-parametric *t*-tests at the event date. It can be seen that the *t*-values at the event date +1 are below -1.96 or -2.58 for each sample. Since the date +1 is an alternative announcement date due to the facts that the announcement occurs after the market close at the date 0, the *t*-values show

Table 7-11. Results of the Tests on the Announcement of Rights Proposals for A-shares in China's Stock Market

7-11(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-20	-0.0072	0.0007	-0.0033	-0.0068	0.0004	-0.0034
-18	-0.0062	0.0000	-0.0031	-0.0065	-0.0011	-0.0044
-16	-0.0100	-0.0047	-0.0074	-0.0101	-0.0038	-0.0081
-14	-0.0063	-0.0154	-0.0108	-0.0062	-0.0136	-0.0114
-12	-0.0077	-0.0067	-0.0072	-0.0094	-0.0052	-0.0092
-10	-0.0171	-0.0068	-0.0120	-0.0177	-0.0073	-0.0149
-8	-0.0198	-0.0053	-0.0127	-0.0218	-0.0063	-0.0169
-6	-0.0229	-0.0052	-0.0142	-0.0255	-0.0089	-0.0204
-4	-0.0254	-0.0007	-0.0132	-0.0297	-0.0066	-0.0218
-3	-0.0249	0.0094	-0.0080	-0.0303	0.0040	-0.0171
-2	-0.0248	0.0048	-0.0102	-0.0306	-0.0010	-0.0199
-1	-0.0287	0.0032	-0.0130	-0.0353	-0.0030	-0.0235
0	-0.0310	-0.0025	-0.0170	-0.0378	-0.0073	-0.0271
+1	-0.0393	-0.0148	-0.0272	-0.0469	-0.0199	-0.0382
+2	-0.0424	-0.0136	-0.0282	-0.0505	-0.0187	-0.0396
+3	-0.0468	-0.0108	-0.0291	-0.0552	-0.0179	-0.0417
+4	-0.0486	-0.0003	-0.0248	-0.0579	-0.0080	-0.0384
+6	-0.0542	-0.0089	-0.0319	-0.0651	-0.0167	-0.0468
+8	-0.0569	-0.0006	-0.0292	-0.0693	-0.0102	-0.0461
+10	-0.0572	0.0058	-0.0262	-0.0696	-0.0046	-0.0439
+12	-0.0595	-0.0012	-0.0308	-0.0735	-0.0117	-0.0498
+14	-0.0572	0.0057	-0.0263	-0.0716	-0.0055	-0.0462
+16	-0.0525	0.0076	-0.0229	-0.0676	-0.0028	-0.0433
+18	-0.0519	0.0111	-0.0208	-0.0673	0.0005	-0.0419
+20	-0.0484	0.0123	-0.0186	-0.0631	0.0037	-0.0386

Notes: 1. Low: the sample of 38 proposals with rights ratios below or equal to 1.40.
2. High: the sample of 37 proposals with rights ratios higher than 1.40.
3. Overall: the sample of all 95 rights proposals, including the low-rights ratio proposals and the high-rights ratio proposals.
4. Rights ratio = ((Market price - Subscription price) / Market price)(New shares / Existing shares).
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-11(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

	Parametric t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-1	-0.9953	-0.3345	-0.8334	-1.2245	-0.4191	-1.1034
0	-0.5785	-1.1498	-1.1757	-0.6334	-0.8975	-1.0996
+1	-2.1146	-2.4650	-3.0401	-2.3557	-2.6165	-3.3846
	Nonparametric (rank) t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-1	-1.3632	0.1879	-0.7621	-1.3090	0.1162	-0.7756
0	-0.8843	-0.3490	-0.7990	-0.9250	-0.0991	-0.6655
+1	-3.2188	-2.8358	-3.9211	-3.3093	-3.0390	-4.1208

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

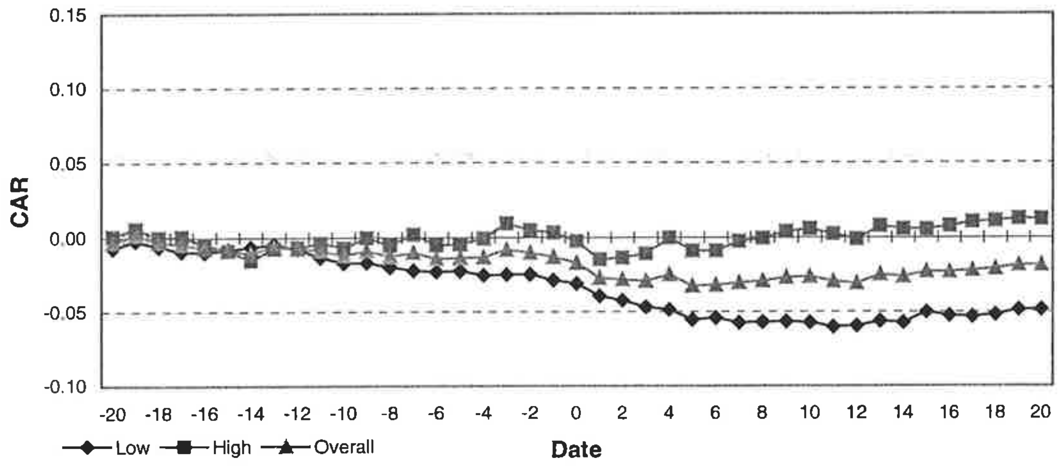
7-11(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model			*Market Model*		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
	11 Days Around Event Day					
5 before	-0.6505	0.7577	0.1618	-1.1387	0.5475	-0.4270
5 after	-2.7567	-0.5718	-2.0517	-3.2790	-0.8196	-2.7048
10 around	-2.4715	-0.2213	-1.6287	-3.1694	-0.4540	-2.4430
	21 Days Around Event Days					
10 before	-1.2232	0.4554	-0.3972	-1.6660	0.0229	-1.1860
10 after	-2.1006	0.5338	-0.8618	-2.5960	0.1796	-1.6274
21 around	-2.4198	0.4317	-1.1254	-3.0793	-0.0562	-2.1814
	41 Days Around Event Day					
20 before	-1.6247	0.1431	-0.8618	-2.0394	-0.1422	-1.6155
20 after	-0.9892	0.6665	-0.1055	-1.4601	0.5175	-0.7875
41 around	-1.9160	0.3859	-0.8592	-2.5431	0.1220	-1.8500

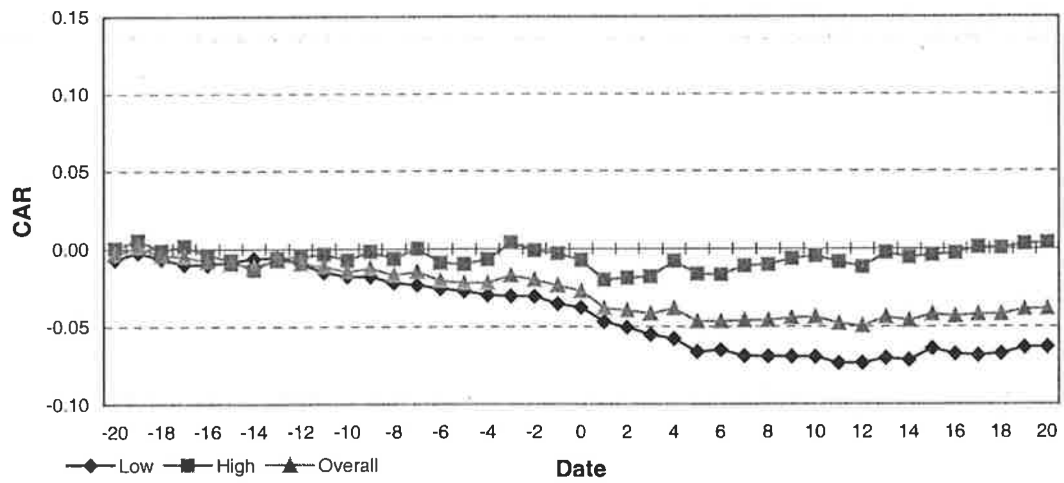
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-11. Cumulative Abnormal Returns (CAR) for Rights Proposals of A-shares in China's Stock Market

7-11(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-11(2). Market Model Cumulative Abnormal Returns (CAR)



that the stock prices react negatively to the announcement at conventional levels of significance at the event date. Nevertheless, the negative reaction to the high-ratio rights proposals disappears in the 41 days investigation period. Conversely, the negative reaction to the low-ratio rights proposal is maintained.

Table 7-11(c) reports the results of parametric *t*-tests for the intervals on the CARs of rights proposals. The *t*-values for the intervals of 5 days and 10 days after the announcement date for the low-ratio rights proposals are below -1.96 or -2.58, which means that negative returns are generated at the 5% or 1% significance levels for these intervals after the announcement. Meanwhile, the *t*-values for the intervals on the CARs of high-ratio rights proposals are between -1.96 and +1.96, which implies that there are no statistically significant abnormal returns before and after the announcement of high-ratio rights proposals.

7.7.2.2 Assessment of market efficiency for A-shares on the announcement of rights proposals

The *t*-values, for the low-ratio rights proposed stocks, verify the existence of significantly negative returns at the event date and for the intervals of 5 and 10 days after the announcement. In fact, the prices of low-ratio rights proposed stocks react significantly to the announcement at the event date, but not fully. The prices of low-ratio rights proposed stocks underact to the announcement at the event date providing a high abnormal return strategy. For example, shareholders would be able to gain abnormally high returns by selling the shares when they receive the announcement and buying the same shares in five or ten days after the announcement.

The *t*-values, for the high-ratio rights proposed stocks, verify the existence of significantly negative returns only at the event date. However, the negative reaction at the event date is immediately corrected by positive returns after the announcement, which shows the CARs of high-ratio rights proposed stocks increase slightly in the period following the announcement. Even so, this adjustment is not statistically significant, and share traders are not be able to make abnormal returns. As a result, the prices of high-ratio rights proposed stocks might be efficient in reaction to the announcement in the investigation period except for on the day of the announcement.

7.7.3 Tests on the announcement of rights approvals for A-shares: results

By applying the same criteria as in the previous study of rights proposals, the 226 rights approvals are classified into two samples. The low-ratio rights sample includes 128 approvals with the rights ratios below or equal to 1.40, and the high-ratio rights sample includes 98 approvals with the rights ratios higher than 1.40. However, due to the fact that some subscription prices are proposed as a range of prices, but approved as a specific value, this means that some rights issue proposals may not be exactly matched by their related approvals.

7.7.3.1 A-shares returns behaviour around the announcement of rights approvals

The results of the tests on the announcement of rights approvals are reported in Table 7-12. Table 7-12(a) gives the CARs measured by the market adjusted model and the market model, which are graphic in Figures 7-12(1) and 7-12(2) respectively. Unlike that of the rights proposals, the CARs of overall rights approvals are positive and mainly keep a stable growing trend, which is the same as the Ball *et al*'s (1977) study of the Australian market. Furthermore, the CARs of low-ratio and high-ratio rights approvals are approximately positive except for four values of low-ratio rights approvals. Obviously, the rights approvals do not convey the "bad" informational content to the market.

The opposite directions of CARs generated from rights proposals and approvals illustrate that the shareholders recognise the uncertainty of rights proposals due to a flexible subscription price. This is true, because a rights proposal is usually put forward several months before the approval, and so the company and shareholders would not able to forecast the share prices of the *ex* date. The flexible price range is used by the company to prevent small capital raising and incompletely subscribed rights. When the uncertainty fades out following the announcement of approvals, the shareholders readjust their expectations to reflect the exact price.

For the separate samples, the CARs of low-ratio rights approvals are positive and close to the zero return axis. In contrast, the CARs of high-ratio rights approvals lie relatively far above the zero return axis. As for the rights proposals, the high is the rights ratio, the better is the stock price performance. The results of tests on the announcement of rights approvals have refuted Smith's (1986) conclusion in two

Table 7-12. Results of the Tests on the Announcement of Rights Approvals for A-shares in China's Stock Market

7-12(a). Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-20	0.0004	0.0016	0.0009	0.0004	0.0027	0.0017
-18	-0.0036	0.0071	0.0010	-0.0037	0.0072	0.0025
-16	-0.0028	0.0111	0.0032	-0.0034	0.0106	0.0046
-14	-0.0030	0.0189	0.0065	-0.0028	0.0180	0.0091
-12	-0.0011	0.0250	0.0101	-0.0004	0.0241	0.0136
-10	0.0001	0.0285	0.0123	0.0012	0.0262	0.0155
-8	0.0003	0.0330	0.0144	0.0019	0.0309	0.0185
-6	0.0005	0.0457	0.0200	0.0028	0.0426	0.0256
-4	0.0047	0.0534	0.0256	0.0073	0.0498	0.0316
-3	0.0091	0.0594	0.0307	0.0119	0.0557	0.0369
-2	0.0125	0.0680	0.0364	0.0156	0.0641	0.0433
-1	0.0112	0.0770	0.0395	0.0145	0.0725	0.0476
0	0.0188	0.0822	0.0461	0.0221	0.0781	0.0541
+1	0.0178	0.0783	0.0438	0.0211	0.0740	0.0513
+2	0.0137	0.0742	0.0397	0.0172	0.0706	0.0477
+3	0.0130	0.0744	0.0394	0.0164	0.0710	0.0476
+4	0.0128	0.0796	0.0416	0.0176	0.0772	0.0517
+6	0.0099	0.0782	0.0393	0.0152	0.0785	0.0514
+8	0.0067	0.0786	0.0376	0.0126	0.0817	0.0521
+10	0.0015	0.0814	0.0359	0.0083	0.0846	0.0519
+12	0.0132	0.0825	0.0430	0.0203	0.0847	0.0571
+14	0.0211	0.0793	0.0461	0.0290	0.0811	0.0587
+16	0.0293	0.0774	0.0500	0.0390	0.0782	0.0614
+18	0.0346	0.0722	0.0508	0.0449	0.0732	0.0611
+20	0.0319	0.0738	0.0499	0.0429	0.0749	0.0612

Notes: 1. Low: the sample of 128 approvals with rights ratios below or equal to 1.40.
2. High: the sample of 98 approvals with rights ratios higher than 1.40.
3. Overall: the sample of all 226 rights approvals, including the low-rights ratio approvals and the high-rights ratio approvals.
4. Rights ratio = ((Market price - Subscription price) / Market price)(New shares / Existing shares).
5. Date 0: the date of the announcement.
6. Date -1 to -20: the dates before the announcement.
7. Date +1 to +20: the dates after the announcement.

7-12(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Parametric t-test Statistics

	Market Adjusted Model			Market Model		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-1	-0.5834	3.5963	1.9696	-0.5128	3.4310	2.6729
0	3.4864	2.1192	4.1582	3.5193	2.3085	4.0077
+1	-0.4810	-1.5732	-1.4378	-0.4426	-1.7030	-1.7252

Nonparametric (rank) t-test Statistics

	Market Adjusted Model			Market Model		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
-1	-0.8311	3.0307	1.3411	-0.6575	2.8712	2.0310
0	2.5520	2.5288	3.5376	2.4621	2.5970	3.4969
+1	-1.7845	0.0830	-1.2762	-1.1233	0.0792	-1.0871

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

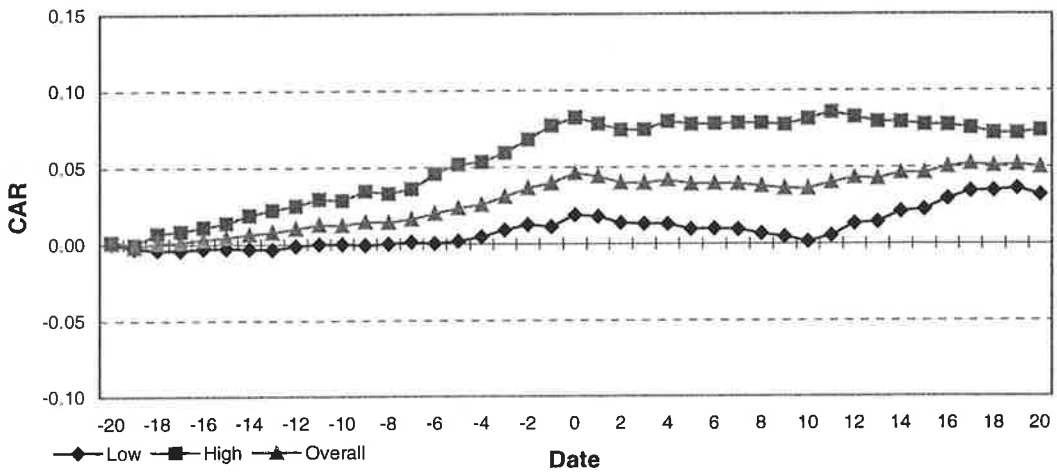
7-12(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model			Market Model		
Date	*Low*	*High*	*Overall*	*Low*	*High*	*Overall*
			11 Days Around Event Day			
5 before	1.1517	6.9340	5.5792	2.4245	5.4706	6.1154
5 after	1.3451	-0.7585	0.5410	-1.5827	-0.3235	-1.1846
10 around	2.2884	4.6441	4.9239	1.6286	4.1662	4.5328
			21 Days Around Event Days			
10 before	1.6181	6.0688	5.3605	2.0280	5.7594	6.1384
10 after	-2.5102	-0.1001	-2.0320	-2.0275	0.8343	-1.9901
21 around	0.1452	4.5813	3.2043	0.7684	5.0538	4.8083
			41 Days Around Event Day			
20 before	1.1517	6.9340	5.5792	1.5056	6.6355	6.5971
20 after	1.9645	-0.7585	0.5410	2.1612	-0.3004	0.9759
41 around	2.2884	4.6441	4.9239	3.1107	4.7851	5.9151

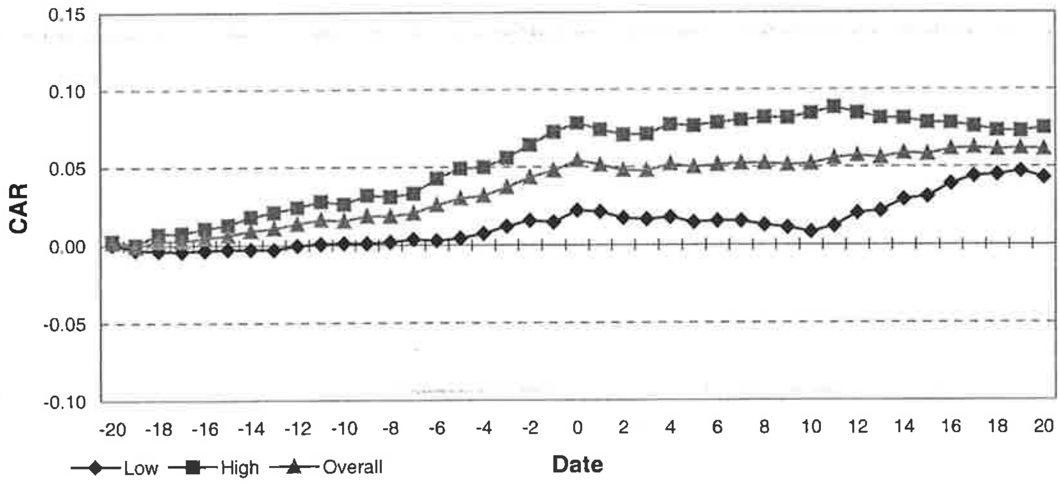
Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-12. Cumulative Abnormal Returns (CAR) for Rights Approvals of A-shares in China's Stock Market

7-12(1). Market Adjusted Model Cumulative Abnormal Returns (CAR)



7-12(2). Market Model Cumulative Abnormal Returns (CAR)



respects: the rights approvals are not "bad" news for China's shareholders, and China's shareholders prefer high-ratio rights issues to low-ratio right issues.[20]

Rights issues conveying unfavourable news and bringing in negative returns have been documented frequently in the literature. However, what informational content of rights approvals might simulate positive returns has not been argued, even in Ball *et al* (1977). A possible explanation for China's Stock Market is the unbalance between the demand for and supply of shares in the period of this study. Since China's Stock Market is an emerging market, the supply of shares is less than the demand, specifically for the primary market in which the stock price is dramatically lower than that in the secondary market. Under the expectation of price increases in the circumstance of excess demand, the greater the number of shares available from the primary market, the larger are the returns being forecasted. Yet, if investors welcome more shares with low prices, why would a company not replace a rights ratio of 3 for 10 by a ratio of, say, 6 for 10 in a rights issue, at half the subscription price but that raises the same amount of capital? There are two limitation: the pro-rata base and subscription price is restricted by the CSRC,[21] and additionally shares with an extraordinarily low price should be considered "rubbish" stocks, in that none would like to invest in them in expectation of bad performance.

The *t*-test statistics in Table 7-12(b) report that both the parametric and non-parametric *t*-values are larger than +1.96 or +2.58 at the event date 0 for every sample, which demonstrates that the stock prices react positively to the announcement of rights

[20] We have sorted the rights approvals of A-shares according to the number of new rights per ten existing shares. Empirical tests show that the stock prices react to the approvals of larger number of rights with higher positive returns than they react to small number of rights. See appendix Table A-9.
[21] See footnote 17 of this Chapter.

approvals at the 5% or 1% significance levels. Recalling the opposite results on the announcement of rights proposals, the stock prices react negatively to the announcement of rights proposals at the same significance levels. The Chinese shareholders consider rights issues to be "bad" news when they are proposed and "good" news when they are approved.

The parametric *t*-test statistics on the CARs for the intervals relating to the announcement of rights approvals are reported on Table 7-12(c). For the low-ratio rights approved stocks, the *t*-values are below -1.96 for the interval of 10 days after announcement date and larger than +1.96 for the interval of 20 days after the announcement date. This illustrates that the low-ratio rights approved stocks have significant negative returns in the first 10 days after the announcement and more significantly positive returns in the following 10 days. For the large-ratio rights approved stocks, the *t*-values in every interval before the announcement date are larger than +2.58, which reveals that significantly positive returns dominate every period before the announcement date.

7.7.3.2 Assessment of market efficiency for A-shares on the announcement of rights approvals

The *t*-values on the CARs in the intervals of 5 or 10 days before the announcement of low-ratio rights approvals are inconsistent in the market adjusted model and the market model sections of Table 7-12(c). As such, it is ambiguous whether there exists significant anticipation or the use of inside information. However, the *t*-values on the CARs in the intervals after the announcement of low-ratio rights approval are identical in the two model sections. The *t*-values are below -1.96 for the 10 day interval and above +1.96 for the 20 day interval for the low-ratio rights approved stocks, suggesting significant inverse adjustments after the announcement. Therefore, the low-ratio rights approved stock prices cannot fully reflect the announcement at the event date and the first direction of the adjustment may be incorrect.

The *t*-values on the CARs in every interval before the announcement of high-ratio rights approval demonstrate significant anticipation or the use of inside information. However, no *t*-values provide evidence for significant adjustment after the announcement date. These mean that the high-ratio rights approved stock prices fully reflect the announcement until the announcement date. Thus, there is no overreaction or underreaction that needs to be corrected after the announcement date. If we suppose that the anticipation is reasonable without the use of inside information, the high-ratio rights approved stock prices reflect the announcement efficiently.

7.7.4 Tests on the announcement of rights approvals for B-shares: results

There are only 18 rights approvals of B-shares available for the tests, and the results are not precise due to the small sample size. Even so, the effects of the announcement of rights approvals on the B-shares prices can be viewed roughly. Table 7-13 presents the results of the tests on the rights approvals of B-shares. The CARs measured by the market adjusted model and the market model are arranged in Table 7-13(a) and graphed in Figure 7-13. The *t*-values on the returns at the event date and tested on the CARs in the intervals are given in Tables 7-13(b) and 7-13(c).

Table 7-13. Results of the Tests on the Announcement of Rights Approvals for B-shares in China's Stock Market

7-13(a). Cumulative Abnormal Returns (CAR)

Market Adjusted Model				Market Model			
Date	*Overall*	**Date**	*Overall*	**Date**	*Overall*	**Date**	*Overall*
-20	0.0017	*0*	0.0267	*-20*	0.0012	*0*	0.0023
-18	0.0060	*+1*	0.0229	*-18*	0.0039	*+1*	-0.0028
-16	0.0220	*+2*	0.0264	*-16*	0.0169	*+2*	-0.0006
-14	0.0212	*+3*	0.0262	*-14*	0.0117	*+3*	-0.0019
-12	0.0099	*+4*	0.0472	*-12*	-0.0026	*+4*	0.0183
-10	0.0052	*+6*	0.0353	*-10*	-0.0097	*+6*	0.0028
-8	0.0147	*+8*	0.0229	*-8*	-0.0004	*+8*	-0.0117
-6	0.0199	*+10*	0.0226	*-6*	0.0025	*+10*	-0.0145
-4	0.0262	*+12*	0.0227	*-4*	0.0073	*+12*	-0.0183
-3	0.0276	*+14*	0.0083	*-3*	0.0078	*+14*	-0.0340
-2	0.0193	*+16*	-0.0112	*-2*	-0.0021	*+16*	-0.0538
-1	0.0180	*+18*	-0.0369	*-1*	-0.0048	*+18*	-0.0800
0	0.0267	*+20*	-0.0364	*0*	0.0023	*+20*	-0.0833

Notes: 1. Overall: total of 18 rights approvals of B-shares without the further grouping.
2. Date 0: the date of the announcement.
3. Date -1 to -20: the dates before the announcement.
4. Date +1 to +20: the dates after the announcement.

7-13(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

Market Adjusted Model			Market Model		
Date	*Parametric*	*Non-parametric*	**Date**	*Parametric*	*Non-parametric*
-1	-0.2132	0.2147	*-1*	-0.4417	0.0987
0	1.4008	1.9491	*0*	1.1699	1.9110
+1	-0.6195	-0.6545	*+1*	-0.8307	-0.6855

Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

7-13(c). Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

Market Adjusted Model				*Market Model*			
Date	*Overall*	***Date***	*Overall*	***Date***	*Overall*	***Date***	*Overall*
5 before	-0.1370	*20 before*	0.6480	*5 before*	-0.5341	*20 before*	-0.1761
5 after	1.3412	*20 after*	-2.2729	*5 after*	0.9295	*20 after*	-3.1205
10 around	1.2342	*41 around*	-0.9161	*10 around*	0.6193	*41 around*	-2.1198

Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.

2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.

3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.

4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure 7-13. Cumulative Abnormal Returns (CAR) for Rights Approvals of B-shares in China's Stock Market

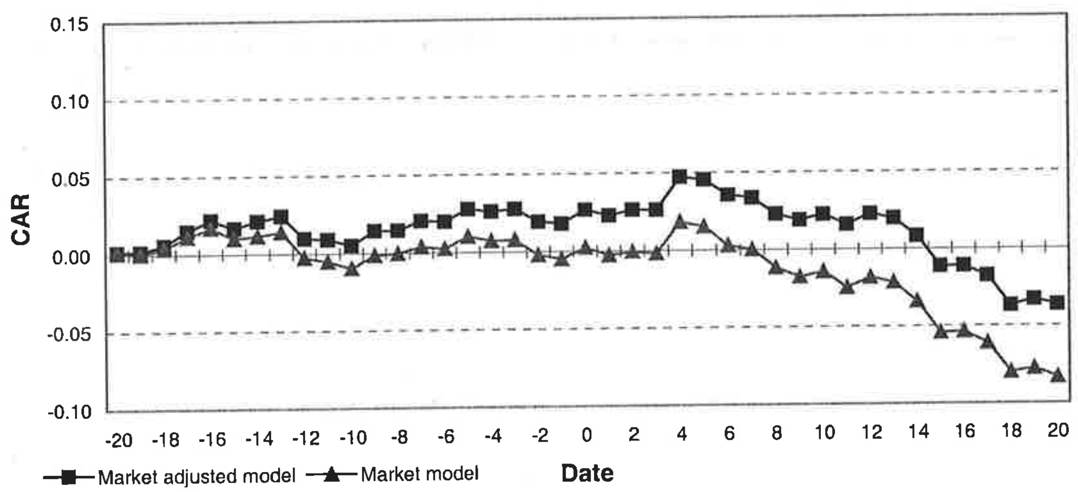


Table 7-13(a) and Figure 7-13 shows us that the CARs are relatively stable until the date +4 after the announcement, and then start declining until the end of the investigation period. After several days of stable prices, the CARs of B-shares suggest that the rights approvals are regarded as unfavourable news. The price behaviour of B-shares, regarding the announcement of rights approvals, differs from the price behaviour of A-shares, but seems to coincide with Smith's (1986) finding. In addition, the CARs measured by the market adjusted model are relatively high with a majority of positive values, while the CARs measured by the market model are relative low with a majority of negative values. The slight deviation of the CARs measured by the two models implies that the trend of the market index varied in the estimation period from the investigation period. This phenomenon has been highlighted before.

No *t*-values in Table 7-13(b) are larger than 1.96 in absolute value, which shows that the B-shares prices do not significantly react to the announcement of rights approvals at the 5% significance level. By contrast, the *t*-values in Table 7-13(c) are below -1.96 or -2.58 for the 20 days after the event date, which shows significantly negative returns are generated in the 20 days after the announcement of rights approvals. Therefore, we conclude that the B-shares prices cannot fully and instantly reflect the information of right approvals at the announcement date. The reaction to the announcement seems to be delayed by four days. In particular, this delayed and insufficient reaction provides a chance to gain abnormally high returns.

7.8 Conclusion

Even though the newly emerging China's Stock Market provides limited data, this chapter has presented diverse event studies on the events of zero-dividend, cash dividend, bonus and rights issues. The tests are carried out on the announcements of event proposals and event approvals, announcements of A-shares events and B-shares events, announcements without future announcements of other events and announcements associated with future announcements of other events respectively. Furthermore, some feasible criteria have been created for constructing more specific samples. All results of the studies are briefly summarised in Table 7-14.

Test statistics show that the announcement of zero-dividend conveys "bad" news to the market. Stock prices react to the announcements of zero-dividend proposals and approvals significantly with negative returns. However, the reaction to the announcement of zero-dividend approvals is weaker than the reaction to the zero-dividend proposals in the whole investigation period. Further, when the announcement will be followed by a future announcement of bonus or rights issues in the same financial year, the price of this stock usually falls less than the unique announced stocks.

The stock prices react to the announcement of cash dividend proposals significantly negatively for each sub-sample. Among them, the under-ADPR proposed A-shares lose almost double that of the over-ADPR proposed A-shares. On average, the A-shares prices react to the announcement of cash dividend approvals as neutral news.

Table 7-14. The Summary of Tests in the Event Studies

Events	Announcements (Samples)	Before	On	After	Assessment
A-shares' Zero-Dividend Proposal	Unique announcement	-S	-S	-S	N
	Future associated announcement	-S	-S	-S	N
	Overall	-S	-S	-S	N
A-shares' Zero-Dividend Approval	Unique announcement	-S	-S	-S	N
	Future associated announcement	-I	-S	-I	E
	Overall	-S	-S	-S	N
B-shares' Zero-Dividend Approval	Overall	-I	±S	C	A
A-shares' Cash Dividend Proposal	Under-ADPR	-S	-S	-S	N
	Over-ADPR	-S	-S	-I	E
	Unique announcement	-S	-S	-S	N
	Future associated announcement	-I	-S	-I	E
A-shares' Cash Dividend Approval	Under-ADPR	-I	-S	C	A
	Over-ADPR	C	+S	+S	N
	Unique announcement	-I	-I	±I	E
	Future associated announcement	+S	+S	+S	N
B-shares' Cash Dividend Approval	Under-ADPR	-I	+S	+I	E
	Over-ADPR	+I	+S	C	A
	Unique announcement	+I	+S	C	A
	Future associated announcement	+I	+I	+S	N
A-shares' Bonus Proposal	Small bonus	-I	-S	-S	N
	Middle bonus	+S	+S	C	E
	Large bonus	+S	+S	±I	E
	Overall	+S	±S	-S	N
A-shares' Bonus Approval	Small bonus	-S	+S	-I	E
	Middle bonus	+I	+S	-S	N
	Large bonus	+S	+S	C	A
	Overall	±S	+S	-S	N
B-shares' Bonus Approval	Small bonus	-I	-I	±I	E
	Middle-large bonus	+S	+S	±I	E
	Overall	-I	+I	+S	N
A-shares' Rights Proposal	Low-ratio rights	C	-S	-S	N
	High-ratio rights	+I	-S	-I	E
	Overall	-I	-S	-S	N
A-shares' Rights Approval	Low-ratio rights	C	+S	±S	N
	High-ratio rights	+S	+S	-I	E
	Overall	+S	+S	C	A
B-shares' Rights Approval	Overall	-I	+I	-S	N

Note: 1. This table can be matched with Table 7-1. The brief results are summarised from the Tables 7-2 to 7-13 and Figures 7-2 to 7-13. The definitions of each sample and the analysis for the assessments have been detailed in relevant sections of this chapter.
2. "Before": tests on the CARs in intervals before the announcement date.
3. "On": tests on the abnormal returns on the announcement date.
4. "After": tests on the CARs in intervals after the announcement date.
5. "S" means significant; "I" means insignificant; "-" means negative; "+" means positive; "E" means efficiency; "N" means inefficiency; "C" means confusion due to the large differences between the statistics obtained from different models; "A" means ambiguous for the assessment of efficiency; *t*-statistics are at the 5% or 1% significance level.

However, the under-ADPR approved A-shares obtain a small negative return and the over-ADPR approved A-shares obtain a small positive return. The B-shares prices react to the announcement of cash dividend approvals as "good" news for each sub-sample. Moreover, the positive returns for the over-ADPR B-shares are larger than that under-ADPR B-shares. Furthermore, regardless of whether the current announcement is a proposal or an approval, and whether the share is belong to A-shares or B-shares, the future announced stocks obtain significantly positive returns starting at the current announcement date.

The A-shares investors prefer the large-bonus and the middle-bonus to the small-bonus issues. The A-shares prices react to the announcements of large-bonus and middle-bonus proposals with significantly positive returns, whereas the A-shares prices react to the announcement of small-bonus proposal with significantly negative returns. The announcement of bonus approvals still has an impact on the A-shares prices. However, the impact of the announcement of bonus approvals is minor in comparison with the impact from the announcement of bonus proposals, as the lines of cumulative abnormal returns of each sample converge to the zero return axis. The B-shares investors have nearly the same preferences as the A-shares investors for the large-bonus and middle-bonus issues.

The A-shares investors view the announcement of rights proposals pessimistically. Moreover, the low-ratio rights (less new rights and a high subscription price) proposals disappoint them, resulting in significantly negative returns. In contrast, the A-shares investors are respond positively to the announcement of rights approvals. In particular, they are more interested in the high-ratio rights (more new rights and a low subscription price), reacting to the announcement of high-ratio rights approvals with significantly positive returns. The B-shares investors seem unhappy with the rights approvals, as significantly negative returns usually appear after four days following the announcement.

The assessments of market efficiency are mainly based on the magnitude of abnormal returns generated after the announcement. The assessment process is quite mechanical by nature and unfortunately cannot take account of insider trading. The role of insider trading is in the category of strong form efficiency, which is not included in this study. Even so, the assessments indicate that whether the stock prices reflect the announcement efficiently depends on the specific announcement. Nevertheless, as can be seen in Table 7-14, the China's stock prices react to the announcements of information inefficiently in the majority of categories.[22]

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[22] In footnote 3 of Chapter 6, we have discussed that the number of observations (length of study period) has an impact on the *t*-statistics. Here we have to discuss the *t*-statistic again for a sample that is aggregated by sub-samples. A *t*-statistic for a sample, in this chapter, is a ratio of a specific abnormal return to the standard deviation of the abnormal returns (see formulas (4-5-7) and (4-5-11)). When two sub-samples are aggregated into one sample, if the data in a sub-sample are positive, but negative in the other sub-sample, there is a chance for the data in the aggregated sample are smaller than the data in either of the two sub-samples in absolute value. As a consequence two phenomena may appear. Firstly, the *t*-statistic of the aggregated sample is smaller than 1.96 in absolute value, but the *t*-statistics of the two sub-samples are larger than 1.96 in absolute value, when the numerator of the *t*-statistic of the aggregated sample is relative smaller. Secondly, the *t*-statistic of the aggregated sample is larger than 1.96 in absolute value, but the *t*-statistics of the two sub-samples are smaller than 1.96 in absolute value, when the denominator of the *t*-statistic of the aggregated sample is more smaller in comparison with the numerator.

The above discussion illustrates why, in Table 7-14, that the reaction of small-bonus B-shares prices or the reaction of middle-large-bonus B-shares prices to the announcement of bonus approvals is assessed as efficiency respectively, while the reaction of overall B-shares prices to the announcement of bonus approvals is assessed as inefficiency. The same case still can be seen in Table 7-14 for the tests on the announcement of A-shares cash dividend approvals. The assessments for the under-ADPR sample and over-ADPR are ambiguous and inefficient, but are efficient for the sample of unique-announcement shares that is the combination of the under-ADPR and over-ADPR samples. This contradiction between the sub-samples and their aggregated sample implies that if an event study is conducted only on an aggregated sample without its sub-samples, the meaning may be lost.

Chapter 8 Conclusion

This thesis has extensively tested the hypotheses of weak form efficiency, semi-strong form efficiency and for the presence of seasonal anomalies in China's Stock Market. Empirical results indicates that China's Stock Market is neither semi-strong nor weak form efficient. Seasonal anomalies in China's Stock Market have also been detected. This chapter provides a general summary drawing together the key findings of the study. Additionally, this chapter suggests possible causes of the inefficiency and offers some possible measures for improving the efficiency of China's Stock Market. The limitations of this study highlight the necessity of future study with more abundant data and more advanced methodology.

8.1 Summary of the study

The stock market is an important element of a modern market economy, embodying the property of private ownership. China had been unequivocally against private ownership and the market economy for thirty years, and as a result that there was not a formal stock market in China before 1990. Since 1978, the stagnation of the economy forced China's authority to begin economic reform, aimed at transforming the centrally-planned economy into a market-oriented economy. As the economic reforms deepened, the stock market emerged and developed. Chapter 2 outlined the growth and characteristics of China's Stock Market.

In the early 1980's, funds and stocks were issued with only limited withdrawal of restriction on private ownership. These issues were intended to raise capital and enable the supervision of companies by the shareholders. The prohibition on security transactions meant that only a small primary market developed, with no secondary market. In fact, a secondary black-market was active accompanying the security issues, which illustrates that the liquidity of securities requires the coexistence of primary and secondary markets. The formal stock markets in Shanghai and Shenzhen were established over 1990 and 1991. Thereafter, China's Stock Market grew rapidly.

However, for political reasons, the economic reforms have not completely established a market economy in China. Private ownership is still limited to be less than fifty-percent of most firms. As a result, China's economy is a hybrid of centrally-planned and market-oriented economies. China's Stock Market is significantly segmented, particularly with respect to accessibility by investors. Chinese residents can only trade A-shares with Chinese currency, while foreigners can only invest in B-shares with U.S. or Hong Kong currencies. The other prominent segmentation relates to the diversity of ownership types. All shares are classified as either Sponsor's Founder shares, Employee's shares, State-owner shares, Legal Person shares and Social Public shares. Generally, only the Employee's shares and Social Public shares are privately owned. Furthermore, only the Social Public shares are tradeable. Due to these market segmentations, the stock prices experience high volatility and the performance of A-shares and B-shares may differ.

The most important role of the stock market is to allocate capital into the most productive sectors. To achieve this mission, the stock market should be operationally efficient and informationally efficient. Chapter 3 focused on the discussion of informational efficiency and reviewed the relevant literature. Theoretical analysis revealed that the stock market cannot reach perfect efficiency due to the expense of collecting and processing information. However, the stock market is able to approach a high standard of efficiency.

The EMH (Fama 1970) provides a testable framework for the study of informational efficiency. The categories of weak form, semi-strong form and strong form efficiency are nested. Classification of market efficiency is comparative. The literature review shows that the tests of the random walk hypothesis have usually found correlated return patterns in less-developed markets. Seasonality is also a common phenomenon of stock markets. Most of the studies show that the stock prices can reflect public information efficiently and insider trading is seldom detected in the developed markets.

The first part of Chapter 4 dealt with the statistical foundation for the methodology of the tests, in which the fair game, martingale and random walk models were highlighted. The findings are that the definitions of fair game and martingale are related to the types of prices. If the prices are *ex post*, the stochastic process of prices is a martingale and the stochastic process of returns is a fair game. If the prices are *ex ante*, the stochastic process of returns is a martingale and the stochastic process of abnormal returns is a fair game. Three adaptations of the random walk model (Campbell *et al* 1997) are presented for the convenience of empirical tests.

The second part of the chapter described the models of the serial correlation coefficient test, the variation ratio test and the runs test for examining the random walk hypothesis. The dummy variable model without a constant term was used for the tests of the day-of-the-week effects and the month-of-the-year effects. The dummy variable model with a constant term was used for the tests of the holiday effects. Having considered the applicability of the data, the event study employed daily data. The market model, the market adjusted model and the mean return model were introduced to measure the abnormal returns. Parametric and non-parametric tests were employed. In particular, the assessment of market efficiency was made considering not only the statistics on the event date, but also on the statistics in the intervals after the event date.

The last part of the chapter formulated a new approach to data processing that allowed for dividend issues. The advantage of the so-called past-price-adjusted procedure is that it is consistent with either the computation of price indices or the calculation of price changes periodically reported in the official finance publications in China.

Chapter 5 tested the random walk hypothesis on China's stock prices. Even though the empirical results of the serial correlation coefficient test, the runs test and the variance ratio test are not completely consistent, the analyses can provide the following conclusions. Firstly, the daily returns in the three main indices (SSE, SSE-A and SSE-B for the Shanghai market; SZS, SZS-A and SZS-B for the Shenzhen market) are statistically significant and correlated. The correlated daily return pattern implies that abnormal returns are predictable. The weekly and monthly returns in the three main indices exhibit correlated return patterns as well, but are not as significant as the patterns found in daily returns.

Secondly, the daily, weekly and monthly returns in sector indices are less correlated than the corresponding returns in the three main indices. Further, the daily behaviour of individual A-shares and B-shares prices in the Shanghai market and the daily behaviour of individual B-shares prices in the Shenzhen market do not follow a random walk. As a consequence, taking into consideration the results for the index returns, China's stock prices are assessed as not following a random walk.

Seasonality tests in Chapter 6 showed that China's Stock Market exhibits day-of-the-week effects, month-of-the-year effects and holiday effects. The day-of-the-week effects of China's Stock Market is similar to the Australian and Japanese pattern. The mean return on Tuesdays is negative and the lowest return of the week. The time zone hypothesis and settlement procedure hypothesis do not properly explain the day-of-the-week effects for China's Stock Market. Instead, the market close hypothesis is seen to be important when the daily returns are decomposed into trading time returns and non-trading time returns.

The month-of-the-year effects of China's Stock Market display a unique pattern that differs from the general pattern of world stock markets. The highest returns occur in August rather than in January, and the January and December returns are negative. Both the tax-loss-selling pressure hypothesis and window-dressing hypothesis fail to indicate the origins of the monthly return pattern of China's Stock Market. On the other hand, the Chinese Spring-festival-related traditional accounting settlement and salary allocation possibly provide an explanation for the negative December and January returns. The information hypothesis supports the significantly positive August return.

The holiday effects of the Shanghai and Shenzhen markets are different. In the Shanghai market, the mean return on the pre-holiday trading days is larger than the mean return on non-holiday trading days. The mean return on the post-holiday trading days is the smallest. In the Shenzhen market, the mean return on the post-holiday trading days is larger than on the pre-holiday and non-holiday trading days. Further study of the three days before the holiday and the four days after the holiday displays a similar return pattern to that of the tests on the pre-holiday and post-holiday trading days for the Shanghai market. However, in the Shenzhen market, the average daily return of the four days after the holiday is smaller than the average daily returns of the three days before the holiday. Nevertheless, the market close hypothesis acceptably explains the patterns of holiday effects present in China's Stock Market.

How do China's stock prices react to the specific announcements of firm-related information? Is their reaction efficient? These questions were answered in Chapter 7 through extensive event studies on the four main events and two types of announcements with diverse samples. Empirical tests show that the announcement of a zero-dividend conveys "bad" news to the stock markets. The A-shares and B-shares prices react to this type of announcement with statistically significant negative returns. However, the negative cumulative abnormal returns in the 41 day investigation period is larger (in absolute value) if the announcement is for a proposal than if the announcement is for an approval. Furthermore, if the announcement will be followed by a future announcement of a bonus or rights issue in the same financial year, the stock price suffers smaller falls.

Generally, the A-shares price reaction to the announcement of cash dividend proposals is significantly negative. The announcement of cash dividend proposals incur negative cumulative returns that are much larger (in absolute value) for the under-ADPR stocks than for the over-ADPR stocks, and are similarly much larger for the unique-announcement stocks than for the future-associated-announcement stocks. Additionally, the A-shares prices react to the announcement of cash dividend approvals with significant positive returns if the announcement will be followed by a future announcement of bonus or rights issues, or if the DPR is larger than the ADPR. All the B-shares prices react to the announcement of cash dividend approvals positively. The cumulatively positive returns are also larger for the over-ADPR and the future-associated-announcement B-shares.

The directions of the stock price reaction to the announcement of bonus issues depend upon the magnitude of the bonus. The A-shares prices usually react to the announcement of middle-bonus and large-bonus proposals with significantly positive returns, particularly with significantly positive CARs in the investigation period. In contrast, the A-shares prices react to the announcement of small-bonus proposals with negative and significant returns. However, when the bonus approvals are announced, except for the significant positive returns on the event date, the CARs of the middle-bonus A-shares become negative. On the other hand, the B-shares prices react to the announcement of small-bonus approvals with negative returns and to the announcement of middle-larger-bonus approvals with statistically significant and positive returns.

The A-shares prices react to the announcement of rights proposals with negative and significant returns on the event date. The negative returns are still significant for a period after the announcement for the low-rights ratio A-shares, but not for high-rights ratio A-shares. However, when the rights approvals are announced, all A-shares prices respond with significant positive returns. The positive CARs of the high-rights A-shares are larger than that of the low-rights A-shares in the 41 day investigation period. The B-shares prices react to the announcement of rights approvals with positive returns on the event date and with statistically significant and negative CARs in the period following the announcement.

The above event studies demonstrate that the stock prices in 19 samples underreact or overreact to the announcements; in 12 samples they seem to properly react to the announcements, and in 6 samples the reaction is ambiguous. This assessment is mainly based upon the CARs in the intervals after the event date, which has not taken into consideration whether the CARs in the intervals before the event date are introduced by insider trading or by rational anticipation. However, it may reasonably be concluded that China's stock prices reflect public information inefficiently.

In this study, the random walk hypothesis tests show predicability of returns. The seasonality tests show regular return patterns and the event studies display the inefficient reflection of public information in the stock prices. Therefore, there are opportunities to obtain abnormally high returns in China's Stock Market by using historical and public information. China's Stock Market is neither weak form nor semi-strong form efficient.

8.2 Policy implications

8.2.1 Origins of the inefficiency

Empirical studies have provided limited arguments against the market efficiency of China's Stock Market. Accordingly, some of the test results would typically be interpreted in the following ways: thin markets and infrequent trading result in serially correlated return patterns of B-shares; cross-effects lead to high predicability of returns in A-shares indices; closed-market and information hypotheses explain the day-of-the-week effects and the month-of-the-year effects; share traders underreact (or overreact) to the announcement of information. However, the underlying reasons for the inefficiency of China's Stock Market are multiple. Major issues that should be addressed are market segmentation, excessive government intervention, incompleteness of regulations, and insufficient transparency of information.

One of the contributors to market inefficiency is market segmentation due to inaccessibility. The shares traded in the domestic market are segmented into A-shares and B-shares. The Chinese residents can trade A-shares with Chinese currency and foreign investors are allowed to trade B-shares with U.S. and Hong Kong currencies. Despite the B-shares firms implementing a more internationally standard accounting system and information disclosure procedure than the A-shares firms adopt, the financial status and decision transparency of B-shares firms are still below the general requirements of foreign investors. Moreover, foreign investors may be discouraged by the uncertainty of the country's political situation and by frequent market intervention of governmental administration. Some Chinese residents who illegally access the B-shares market expose themselves to penalties from the authorities. Considering the risk of punishment and the difficulty of converting Chinese currency into foreign currency, the expected gains for Chinese residents investing in B-shares is much smaller than investing in A-shares.

Thus, the B-shares market has not drawn much attention from either foreign investors or Chinese investors. The B-shares market is illiquid and inactive in trading. The less liquid and active in trading the market is, the less interested the investors are in investing in shares. As a consequence, the B-shares market is thin with merely 106 listed firms (in 1998), accounting for 11.39% of all of the markets. This unattractiveness of the B-shares to investors is a barrier for the Chinese authority in extending the B-shares market. Therefore, the characteristics of thinness and discontinuous trading have remained in the B-shares market.

The market segmentation by ownership still contributes to the inefficiency of China's Stock Market. From Chapter 2, it can be seen that the state-owned shares, legal person shares and sponsor's shares account for 71.86% of share ownership. The majority of legal person shares and sponsor's shares are transferred from state assets. The tradeable social public shares account for only 25.14% of the stock market. This ownership structure leads to the listed firms adopting the traditional planning management of the government. Their managers are nominated by the related governmental departments, so the managers have allegiance to the leaders of governmental departments rather than to general shareholders. The public shareholders have no power to supervise the companies in which they invest.

Market segmentation by trading abilities inevitably distorts the transmission and interpretation of the information. It can be imagined that a dividend issue is related to the overall number of shares of the specific company. Because the majority of shares are non-tradeable, the announcement of this issue affects only the prices of tradeable shares. Therefore, the effect of the information on tradeable shares' prices is inevitably amplified or minimised. If all shares were made tradeable, the impact of the announcement on the stock prices may change. This is why rumours concerning the conversion of state shares into tradeable shares always cause stock prices to fluctuate.

Government intervention is another cause of market inefficiency. The most significant intervention in the primary market is the annual plan of stock issuance, which is negotiated by the CSRC. The plan of stock issuance is used to maintain tight control over the size of the stock markets in order to prevent "crowding out" of the financial resources available for bank deposits and government bond purchases. For a long time, banking deposits were the main source of finance for the government to achieve its objectives such as financing state enterprises and maintaining regional development. The bond has been another convenient vehicle to mobilise resources specifically for key development projects and for covering fiscal deficits. The plan of stock issuance also intends to influence the regional and sectoral distribution of resources by the nomination of numbers of listing firms.

Government intervention leads to the distortion of stock prices, which is an obstacle to the efficient allocation of resources. In particular, the periodic announcements of the issuance plan each year have contributed seasonality to the markets as indicated in Chapter 6. Furthermore, the adjustments in the scale and timing of the issuance plan usually gives rise to a huge impact on the stock prices, which is adopted as a tool by the government to intervene in the secondary market prices. For example, the CSRC imposed a moratorium on all further public issues of A-shares in May 1995 to stimulate the depressed stock market.

Excessive bureaucratic intervention comes not only from the central government, but also from the local authorities. To attract capital inflow into local enterprises, the local authority often involves itself in campaigns for local companies to be listed and imposes impact on local company to be underwritten by the local financial institutes. To maintain the financial qualification for being a listed company, the local authority always participates in deals with companies that have under-performing assets. Also the local authority interferes in the merger and acquisition processes between listed companies.

The most remarkable phenomenon of China's Stock Market is the coexistence of serious government intervention and soft government oversight with primitive regulation. The regulation is primitive because it does not adequately address many fundamental issues, such as the accounting system and the sufficient and reliable disclosure of the issuers' financial information. It is true that the market regulations have been improved in recent years, but the enforcement of these regulations is still insufficient. For example, as previously indicated in Chapter 6, the accounting systems employed by various listed companies are not consistent. The accounting standard in China has remained very different from that utilised in the developed countries.

The fact that information disclosure is not perfect and that there remain the lack of transparency about companies' financial status are still serious problems for China's Stock Market. A comparatively large amount of listed companies seldom report their important events in accordance with the regulation. Generally, shareholders are often bewildered by interim and annual reports which show a dramatic increase in debts or a decrease in profits without adequate explanation. It can be summarised as a rule for some listed companies: the forecasted profits are high and actual profits ares low. The profit ratios in registration statements and interim reports are significantly higher than that in annual reports.

Due to the lack of information transparency and ineffective implementation of regulation, the incidences of fraudulence and insider trading are not uncommon in China's Stock Market. Firstly, some underwriting institutions collude with expected listing companies to negotiate inaccurate registration statements for listing approval from the CSRC. This is why the profit ratios in registration statements are always higher than that in annual reports. Secondly, some financial institutions[1] that have the licences for self-trading ally themselves with the listed companies, and using insider information, manipulate share prices to their own advantage. Therefore, both the financial institutions and listed companies can get benefits. Thirdly, some financial institutions join hand with big traders to share the inside information and attack shares simultaneously. They usually obtain sound profits from the price shake they create.

In Chapter 7, we found that the abnormal returns were significant in the intervals before the announcements. The question was whether the significant abnormal returns

[1] These companies are the security companies and trust and investment companies. They usually have licences for underwriting, brokage and self-trading.

are generated from reasonable anticipation or from the utilisation of inside information. According to the above discussion, it is explicit that the significantly abnormal returns occurring in a period before the announcements may result mainly from insider trading.

The lack of severe penalties is complemented by the asymmetric information of different shares in encouraging insiders trading. There are four classes of share traders with different access to information in China. The first class is the mutual funds that were organised in the last two years (starting in the second half of 1998). Each mutual fund controls more than 2 billion RMB. The second class is the financial institutions that have self-trading licences. Each institution usually controls one hundred million to one billion RMB. Each of these classes of share traders has an excellent ability to access public and inside information since they have strong financial capabilities and broad relations with the relevant official departments of the country. The third class is of prestigious individual investors who usually control more than three hundred thousand RMB. They usually enjoy more facilities provided by brokers, including personal computer terminals to current transactions and newspaper updates. The fourth class is the "small" individual investors. They can only use the public screen for messages about transactions and are the last to be informed of public information. The share traders in the third class and fourth class do not generally have the ability to access inside information, particularly the share traders in the fourth class.

8.2.2 Possible policies for improving market efficiency

How can the efficiency of China's Stock Market be improved? As with trading in a stock market, the contrarian strategy of losing money is the strategy of winning money. Measures needed to improve the efficiency of China's Stock Market include the appropriate unification of segmented markets, the mitigation of government intervention, the enforcement of regulations and the promotion of information transparency.

The B-shares market is in a vicious circle of inactive trading and small capitalisation. Hsiao (1996) suggested the merger of the A-shares and B-shares markets. However since China's Stock Market is currently immature, this may not be a good time to allow foreign capital to move in and out freely in the whole market. An alternative is to legalise Chinese residents investing in the B-shares market. As more Chinese investors enter in the B-share market, the B-shares market will become more active and have higher liquidity. Therefore, the foreign investors will be more interested in investing in the B-shares and the B-shares market will be expanded. The complete merger of A-shares and B-shares should be an objective of future market development.

As indicated earlier, the state shares and legal person shares account for the majority of the total outstanding stocks. The non-liquidity of state and legal person shares has become an artificial obstacle to improving market efficiency. Therefore, the proportion of state shares and legal person shares should be reduced. Both the state shares and legal person shares should be allowed to be traded in the A-shares and B-shares markets. Current government prohibition policies are a result of two major concerns: reducing state shares may erode the state's leading position; trading state shares may lead to a market crash. However, it should be realised that reducing the proportion of state shares in a company does not lessen the amount of total state assets in the country, because the capital obtained by selling state shares in a firm will be able to be invested in other state assets. In particular, reducing the proportion of state shares in a firm can introduce greater market discipline for the firm's operation. In addition, a market crash can be avoided if the government chooses to trade the state shares at a time of market upturns. By listing of state and legal person shares, the market will provide a correct evaluation of the state and legal person assets. Thus the state and legal assets will be able to be restructured on a profitable bases and to be saved form the situation of under-performing.

Government administrations usually emphasise the capital raising function and neglect the capital allocating function of the stock market. Their interventions distort the stock prices, so that the stock prices cannot be a correct signal to guide the capital inflow into the most productive sectors. In turn, the inefficient capital allocation eventually obstructs further capital raising. Therefore, it is apparent that the central government agencies, such as the CSRC, should cease the planning of aspiring listed companies according to the regions, industries and ownership. Meanwhile, the local governments should extricate themselves from the business events of the local listed companies. The cessation of local government intervention would also be beneficial to the prevention of financial scandals associated with local authorities.

The government role in the stock market should be swapped from business intervention to normalising regulations and supervising the market. Currently, two signals show that the markets are far from effectively controlled. First, the regulations are not complete. For example, the responsibilities of the underwriters, the responsibilities of the brokerage houses, the principles for establishing a potential listing company, and other definitive matters have not been perfectly finalised. Next, the existing regulations have not been enforced. For example, some institutional traders illegally use several accounts to trades shares so that they need not report, in accordance with the regulations of the market, when they hold 5 percent of the shares of a listed company. Therefore both the formulation and the implementation of market regulations are important.

Currently, since there are not harsh penalties for the violations, the distribution of fraudulent information and manipulation of the market are common features of China's Stock Market. According to the successful experiences of developed markets, harsh penalties are necessary for the enforcement of information disclosure and market transparency. Strict penalties can also effectively ban inside trading. As well, the dismissal of unprofessional financial institutions and the merging of small financial institutions into large financial institutions will improve market efficiency. The small professional financial institutions are characterised by weakness in obeying market regulations and in resisting market risks.

8.3 Prospects for future study

Although this study has made use of all the available data, the sample periods are still short due to the recent emergence of China's Stock Market. The results calculated using short data time series, in comparison with that using long data time series in the tests of developed markets, may provide less solid evidence. In addition, when the periods of the different data time series varies and the test statistics are not completely identical, it may arouse suspicions about whether the return pattern is a characteristic of the time period or of the specific shares. For example, the individual shares were not listed at the same time, and the tests on some individual shares show different correlated return patterns. However, to maximise the use of the applicable data, it would not be sound to apply the study only to the handful of shares listed in early years, or to cut the data in a way that suits to the shares listed in recent years. Therefore, replicating this study using long and equivalent period time series after several years would be meaningful for justifying this study and for indicating the possible changes to the share's return patterns.

The tests of the random walk hypothesis have employed diverse categories of data. Empirical results calculated by using daily data, weekly data, monthly data, index data and individual share's data are different. The inefficiency of China's Stock Market is mainly determined by the evidence tested on the daily data and index data. In the literature on market efficiency of other countries, the tests tend to be conducted on one sort of data and accordingly a market assessment is made. Thus, the reason why the results calculated using different sorts of data are not identical has not been discussed properly. Further study should build the mathematical and theoretical relations between the results calculated using different frequencies of data.

Market efficiency has been tested in this study on A-shares and B-shares, on the shares listed in the Shanghai market and Shenzhen market. Additional studies incorporating the tests on H-shares that are listed in the Hong Kong market, and on N-shares that are listed in overseas stock markets would strengthen the robustness of the analysis. If the share prices of Chinese domestic companies reflect information efficiently in overseas stock markets, the inefficient reflection of information in share prices within China's Stock Market should surely be attributed to market regulations and the share traders.

Because of data limitations, strong form efficiency (insider trading) has not been tested in this study. However, insider trading is obviously present in China's Stock Market. In particular, the statistically significant abnormal returns in the intervals before the announcement date are no doubt generated from both reasonable anticipation and insider trading. Therefore quantitatively detecting the abnormal returns from insider trading will not only make a great contribution to the efficient market literature, but may also improve market administration.

The most outstanding phenomenon indicated in Chapters 5 and 6 is that some statistics tested on China's Stock Market are not of the same statistical significance as those tested on some developed markets that have been declared efficient. In other words, by historical market efficiency assessment standard, the China's Stock Market would be efficient than developed markets. However, sufficient evidence of correlated return pattern has refuted the random walk hypothesis. Also, there is some statistical evidence of seasonal effects, and a lot of evidence of "economic significance". As a consequence, we argue that China's Stock Market is inefficient. Nevertheless, this phenomenon that some statistics tested on China's Stock Market are not of the same statistical significance as those tested on some developed markets that have been declared efficient is still a puzzle, so we provide following hypothesis for further study.

Theoretically, the stock prices in a weak form efficient market have incorporated all of the historical information of past prices. The past stock prices cannot be used to predict future prices to gain abnormal returns. However, in the initial years of an emerging market, there is no historical information on past prices. The share traders are typically inexperienced. Therefore, even though the statistics are not too significant, this does not mean that the stock prices have reflected historical information. Furthermore, information fraud and insider trading can, at the beginning, have a greater impact on prices than using historical information. The stock price volatility provoked by the information fraud and insider trading erode the predictability of current prices depending upon past stock prices. When the nascent market becomes relatively mature, information fraud and insider trading will probably abate to some extent. The gradual cumulation of historical information regarding past prices would be able to be exploited to obtain abnormal returns. These regularities will gradually disappear as the market further matures and the regularities have been generally exploited. In brief, the statistics in the tests of the random walk and seasonality may not be so significant in the initial years of the market's emergence, but the statistics may be more significant after this period. Eventually, the statistics will be less significant as the market efficiency increases. Future research on the market efficiency of emerging markets should consider and account for these potential methodological limitations.

Appendix

Table A-1. Serial Correlation Coefficients of Weekly and Monthly Returns in Sector Indices for Lags 1 through 10 and Q-Statistics

	No.	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Q-stat.	LB-stat.
PANEL A: Test Statistics on Shanghai Stock Market													
Weekly returns													
Manufacturing	254	-0.0073	-0.0916	-0.0136	0.0252	-0.0430	0.0539	0.0113	-0.1163	-0.0118	-0.0479	7.5880	7.8350
Commercial	254	-0.0262	-0.0600	-0.0359	-0.0016	0.0149	-0.0007	0.0304	-0.1250	-0.0205	-0.0465	6.2853	6.5119
Real Estate	254	0.0909	0.0327	0.0238	-0.0514	-0.0291	-0.0300	-0.0046	-0.0790	-0.0487	-0.0501	6.4077	6.5924
Utility	253	-0.0126	-0.0602	0.0049	-0.0450	-0.0181	0.0285	0.0030	-0.0899	-0.0176	-0.0389	4.2406	4.3832
Miscellaneous	255	-0.0215	-0.0355	-0.0216	-0.0295	-0.0418	-0.0269	-0.0182	-0.1092	-0.0327	-0.0670	5.9084	6.1355
Monthly returns													
Manufacturing	61	-0.1383	-0.1021	0.1043	-0.0717	-0.1133	0.1151	0.0261	-0.2307	*.3181	-0.1254	14.7890	17.3468
Commercial	60	-0.2018	-0.0855	0.0460	-0.1349	-0.0592	0.0702	0.0673	-0.2408	**.3613	-0.1653	17.8266	*20.9773
Real Estate	60	-0.2398	-0.0990	0.0703	-0.1623	-0.1410	0.0438	0.1471	-0.2236	*.3053	-0.1676	*18.8017	*21.7903
Utility	60	-0.2351	-0.0306	0.1333	-0.0677	-0.0992	0.0080	0.0962	-0.1827	0.2460	-0.0774	11.8562	13.5763
Miscellaneous	61	**-.3104	-0.1143	0.1221	-0.0927	-0.2314	0.2020	0.1063	*-.3187	**.3464	-0.1595	**29.6182	**34.067
PANEL B: Test Statistics on Shenzhen Stock Market													
Weekly returns													
Manufacturing	192	-0.0232	-0.0592	0.0110	0.0014	0.1048	0.0069	0.0375	-0.0855	-0.1030	-0.0281	6.7105	7.0283
Commercial	192	0.0231	-0.0319	-0.0454	-0.0455	0.1129	0.0758	0.0844	-0.0767	0.0152	0.0105	7.1281	7.4282
Property	192	-0.0036	0.0069	-0.0298	-0.0533	0.0070	0.0524	0.0640	-0.1323	-0.0611	-0.0242	6.1739	6.4905
Utility	191	0.0463	-0.0437	-0.0029	-0.0134	-0.0007	0.0392	-0.0072	-0.1000	-0.0684	-0.0572	4.4935	4.7219
Conglomerate	129	0.1614	-0.0378	0.1427	-0.0666	-0.1148	0.1446	*.1929	-0.0657	-0.1523	0.0540	*19.5615	*20.7626
Financial	192	0.0866	*.1581	0.0220	0.0197	**.1816	0.1076	**.1928	0.0091	-0.1124	0.0362	**24.536	**25.508
Monthly returns													
Manufacturing	65	0.0460	-0.0774	0.2367	-0.0876	-0.1653	0.1006	0.0191	-0.1911	0.1618	-0.2966	12.2362	15.0659
Commercial	65	0.1108	0.0032	0.2877	-0.0617	-0.1700	0.2238	0.0395	-0.1949	0.0846	*-.3525	16.0463	*19.7195
Property	65	-0.0989	-0.0652	0.2026	0.0088	-0.1089	0.0828	0.1358	-0.2427	0.1404	-0.2835	11.5583	14.3929
Utility	65	-0.0855	-0.1476	0.1547	-0.0472	-0.1896	0.0876	0.0654	-0.2265	0.1124	-0.2511	10.5825	12.9967
Conglomerate	62	0.0138	0.0764	0.2659	0.0122	-0.0113	0.0551	0.0088	-0.3065	-0.0529	*-.4689	12.6966	18.2788
Financial	65	**.3528	0.1392	0.0013	-0.1772	-0.1239	-0.0616	-0.0559	-0.1199	0.0896	-0.0776	10.3913	11.6250

Notes: 1. The data period for Shanghai market is 8/1993 - 4/1998; for Shenzhen market is 7/1994 - 4/1998.

2. '*','**' indicate significance at the 5% and 1% levels.

3. LB-statistic is adjusted Q-statistic for small sample.

Table A-2. Numbers and Proportions of Positive and Negative Serial Correlation Coefficients of Daily Returns in Individual Shares

	Day - lag	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
Panel-A Shanghai Stock Market											
A-shares	No. of Plus sign	153	234	250	227	254	82	177	81	166	148
	No. of Minus sign	220	139	123	146	119	291	196	292	207	225
	No.plus / No.minus	*0.70*	*1.68*	*2.03*	*1.55*	*2.13*	*0.28*	*0.90*	*0.28*	*0.80*	*0.66*
B-shares	No. of Plus sign	23	17	15	11	25	22	11	15	18	26
	No. of Minus sign	26	32	34	38	24	27	38	34	31	23
	No.plus / No.minus	*0.88*	*0.53*	*0.44*	*0.29*	*1.04*	*0.81*	*0.29*	*0.44*	*0.58*	*1.13*
Overall	No. of Plus sign	176	251	265	238	279	104	188	96	184	174
	No. of Minus sign	246	171	157	184	143	318	234	326	238	248
	No.plus / No.minus	*0.72*	*1.47*	*1.69*	*1.29*	*1.95*	*0.33*	*0.80*	*0.29*	*0.77*	*0.70*
Panel-B Shenzhen Stock Market											
A-shares	No. of Plus sign	208	196	237	256	210	114	157	87	124	116
	No. of Minus sign	139	151	110	91	137	233	190	260	223	231
	No.plus / No.minus	*1.50*	*1.30*	*2.15*	*2.81*	*1.53*	*0.49*	*0.83*	*0.34*	*0.56*	*0.50*
B-shares	No. of Plus sign	30	26	27	22	29	8	10	25	25	17
	No. of Minus sign	22	26	25	30	23	44	42	27	27	35
	No.plus / No.minus	*1.36*	*1.00*	*1.08*	*0.73*	*1.26*	*0.18*	*0.24*	*0.93*	*0.93*	*0.49*
Overall	No. of Plus sign	238	222	264	278	239	122	167	112	149	133
	No. of Minus sign	161	177	135	121	160	277	232	287	250	266
	No.plus / No.minus	*1.48*	*1.25*	*1.96*	*2.30*	*1.49*	*0.44*	*0.72*	*0.39*	*0.60*	*0.50*

Notes: 1. The tests are conducted on 422 shares listed on Shanghai market, including 373 A-shares and 49 B-shares.
2. The tests are conducted on 399 shares listed on Shanghai market, including 347 A-shares and 52 B-shares.

Table A-3. Numbers and Proportions of Positive and Negative Serial Correlation Coefficients of Weekly Returns in Individual Shares

	Week - lag	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
Panel-A Shanghai Stock Market											
A-shares	No. of Plus sign	200	97	168	169	98	270	191	68	124	135
	No. of Minus sign	173	276	205	204	274	103	182	305	249	238
	No.plus / No.minus	*1.16*	*0.35*	*0.82*	*0.83*	*0.36*	*2.62*	*1.05*	*0.22*	*0.50*	*0.57*
B-shares	No. of Plus sign	23	21	29	28	12	34	30	30	18	14
	No. of Minus sign	26	27	19	21	37	15	19	19	31	35
	No.plus / No.minus	*0.88*	*0.78*	*1.53*	*1.33*	*0.32*	*2.27*	*1.58*	*1.58*	*0.58*	*0.40*
Overall	No. of Plus sign	223	118	197	197	110	304	221	98	142	149
	No. of Minus sign	199	303	224	225	311	118	201	324	280	273
	No.plus / No.minus	*1.12*	*0.39*	*0.88*	*0.88*	*0.35*	*2.58*	*1.10*	*0.30*	*0.51*	*0.55*
Panel-B Shenzhen Stock Market											
A-shares	No. of Plus sign	243	140	140	105	128	188	244	63	85	100
	No. of Minus sign	103	206	206	241	218	157	102	283	261	246
	No.plus / No.minus	*2.36*	*0.68*	*0.68*	*0.44*	*0.58*	*1.19*	*2.39*	*0.22*	*0.33*	*0.41*
B-shares	No. of Plus sign	25	9	16	21	30	28	42	40	28	23
	No. of Minus sign	26	42	35	30	21	23	9	11	23	28
	No.plus / No.minus	*0.96*	*0.21*	*0.46*	*0.70*	*1.43*	*1.22*	*4.67*	*3.64*	*1.22*	*0.82*
Overall	No. of Plus sign	268	149	156	126	158	216	286	103	113	123
	No. of Minus sign	129	248	241	271	239	180	111	294	284	274
	No.plus / No.minus	*2.08*	*0.60*	*0.65*	*0.46*	*0.66*	*1.20*	*2.58*	*0.35*	*0.40*	*0.45*

Notes: 1. The tests are conducted on 422 shares listed on Shanghai market, including 373 A-shares and 49 B-shares.
2. The tests are conducted on 397 shares listed on Shanghai market, including 346 A-shares and 51 B-shares.

Table A-4. Numbers and Proportions of Positive and Negative Serial Correlation Coefficients of Monthly Returns in Individual Shares

	Month - lag	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
Panel-A Shanghai Stock Market											
A-shares	No. of Plus sign	72	76	145	80	114	160	160	44	255	74
	No. of Minus sign	230	226	157	222	188	142	142	258	47	228
	No.plus / No.minus	*0.31*	*0.34*	*0.92*	*0.36*	*0.61*	*1.13*	*1.13*	*0.17*	*5.43*	*0.32*
B-shares	No. of Plus sign	18	14	17	14	15	21	7	22	16	21
	No. of Minus sign	23	27	24	27	26	20	34	19	25	20
	No.plus / No.minus	*0.78*	*0.52*	*0.71*	*0.52*	*0.58*	*1.05*	*0.21*	*1.16*	*0.62*	*1.05*
Overall	No. of Plus sign	90	90	162	94	129	181	167	66	271	95
	No. of Minus sign	253	253	181	249	214	162	176	277	72	248
	No.plus / No.minus	*0.36*	*0.36*	*0.90*	*0.38*	*0.60*	*1.12*	*0.95*	*0.24*	*3.76*	*0.38*
Panel-B Shenzhen Stock Market											
A-shares	No. of Plus sign	96	71	169	150	57	188	154	64	194	51
	No. of Minus sign	175	200	102	121	214	83	117	207	77	220
	No.plus / No.minus	*0.55*	*0.36*	*1.66*	*1.24*	*0.27*	*2.27*	*1.32*	*0.31*	*2.52*	*0.23*
B-shares	No. of Plus sign	22	39	16	33	31	17	25	10	36	15
	No. of Minus sign	24	7	30	13	15	29	21	36	10	31
	No.plus / No.minus	*0.92*	*5.57*	*0.53*	*2.54*	*2.07*	*0.59*	*1.19*	*0.28*	*3.60*	*0.48*
Overall	No. of Plus sign	118	110	185	183	88	205	179	74	230	66
	No. of Minus sign	199	207	132	134	229	112	138	243	87	251
	No.plus / No.minus	*0.59*	*0.53*	*1.40*	*1.37*	*0.38*	*1.83*	*1.30*	*0.30*	*2.64*	*0.26*

Notes: 1. The tests is conducted on 343 shares listed on Shanghai market, including 302 A-shares and 41 B-shares.

2. The tests is conducted on 317 shares listed on Shanghai market, including 271 A-shares and 46 B-shares.

Table A-5. Variance Ratio Test for Intervals 2, 4, 8, 12 and 16 on Weekly Returns in Sector Indices of Shanghai and Shenzhen Stock Markets

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL A: Shanghai Stock Market							
Manufacturing	254	VR(q)	1.0007	0.9076	0.8950	0.8048	0.7964
		Z(q)	0.0107	-0.7813	-0.5569	-0.8102	-0.7135
		Z*(q)	0.0095	-0.6730	-0.4777	-0.7024	-0.6416
Commercial	254	VR(q)	0.9814	0.8997	0.8732	0.7557	0.6943
		Z(q)	-0.2957	-0.8473	-0.6724	-1.0138	-1.0713
		Z*(q)	-0.2081	-0.6322	-0.5104	-0.7802	-0.8595
Real Estate	254	VR(q)	1.0971	1.1906	1.1839	1.0425	0.9573
		Z(q)	1.5414	1.6112	0.9752	0.1763	-0.1496
		Z*(q)	1.0588	1.1301	0.6756	0.1271	-0.1139
Utility	253	VR(q)	0.9947	0.9322	0.8866	0.8025	0.8213
		Z(q)	-0.0840	-0.5718	-0.5998	-0.8176	-0.6250
		Z*(q)	-0.0741	-0.5131	-0.5413	-0.7442	-0.5835
Miscellaneous	255	VR(q)	0.9848	0.9262	0.8263	0.6362	0.5920
		Z(q)	-0.2413	-0.6247	-0.9229	-1.5126	-1.4329
		Z*(q)	-0.1923	-0.4791	-0.6751	-1.1276	-1.1196
PANEL B: Shenzhen Stock Market							
Manufacturing	192	VR(q)	0.9863	0.8331	0.8512	0.7903	0.8847
		Z(q)	-0.1884	-1.2235	-0.6825	-0.7506	-0.3474
		Z*(q)	-0.1850	-1.3238	-0.7021	-0.7675	-0.3663
Commercial	192	VR(q)	0.9863	0.9188	0.9414	0.9883	1.1995
		Z(q)	-0.1884	-0.5949	-0.2687	-0.0418	0.6014
		Z*(q)	-0.1850	-0.5687	-0.2576	-0.0413	0.6229
Property	192	VR(q)	1.0075	0.9170	0.8609	0.7700	0.8359
		Z(q)	0.1031	-0.6083	-0.6378	-0.8230	-0.4945
		Z*(q)	0.0880	-0.5925	-0.6245	-0.8228	-0.5134
Utility	191	VR(q)	1.0576	0.9405	0.8712	0.7177	0.7594
		Z(q)	0.7923	-0.4350	-0.5889	-1.0073	-0.7232
		Z*(q)	0.7083	-0.4440	-0.5985	-1.0286	-0.7672
Conglomerate	129	VR(q)	1.1754	1.3273	1.5701	1.7077	1.9543
		Z(q)	*1.9761	1.9560	*2.1200	*2.0420	*2.3047
		Z*(q)	*2.0727	*2.2802	**2.5057	**2.3838	**2.6963
Financial	192	VR(q)	1.0979	1.3273	1.6052	1.8744	2.0974
		Z(q)	1.3494	1.9560	**2.7754	**3.129	**3.3074
		Z*(q)	1.0210	*2.2802	**2.3821	**2.7663	**3.0591

Notes: 1. VR(q) is the variance ratio; q is the interval of the observations, '*' indicates significance at the 5% level, '**' at the 1% level.
2. Z(q) is distributed as standard normal under the assumption of homoscedasticity.
3. Z*(q) is distributed as standard normal under the assumption of heteroscedasticity.

Table A-6. Variance Ratio Test for Intervals 2, 4, 8, 12 and 16 on Monthly Returns in Sector Indices of Shanghai and Shenzhen Stock Markets

	Obs.		q=2	q=4	q=8	q=12	q=16
PANEL A: Shanghai Stock Market							
Industrial	61	VR(q)	0.8919	0.8244	0.8414	0.9571	1.0458
		Z(q)	-0.8307	-0.7085	-0.3904	-0.0802	0.0697
		Z*(q)	-0.5461	-0.5103	-0.3347	-0.0765	0.0730
Commercial	60	VR(q)	0.8271	0.6905	0.5549	0.5809	0.5165
		Z(q)	-1.3169	-1.2381	-1.0850	-0.7744	-0.7286
		Z*(q)	-0.8836	-0.9199	-0.9698	-0.7769	-0.8031
Real Estate	60	VR(q)	0.7864	0.6420	0.4107	0.3923	0.3455
		Z(q)	-1.6266	-1.4322	-1.4366	-1.1230	-0.9863
		Z*(q)	-1.0027	-1.0149	-1.2659	-1.1250	-1.0912
Utility	60	VR(q)	0.7864	0.7613	0.7912	0.9293	1.1626
		Z(q)	-1.6269	-0.9548	-0.5090	-0.1306	0.2450
		Z*(q)	-1.1166	-0.7199	-0.4647	-0.1343	0.2806
Miscellaneous	61	VR(q)	0.7124	0.5336	0.3845	0.3832	0.3506
		Z(q)	*-2.2091	-1.8824	-1.5149	-1.1516	-0.9897
		Z*(q)	-1.1845	-1.1859	-1.1930	-1.0315	-0.9824
PANEL B: Shenzhen Stock Market							
Industrial	47	VR(q)	0.9704	1.0520	1.4588	2.0248	2.9423
		Z(q)	-0.1985	0.1823	0.9685	1.6172	**2.4568
		Z*(q)	-0.2715	0.2040	1.1138	*2.0524	**3.4494
Commercial	46	VR(q)	1.0526	1.2743	1.9815	3.1577	2.9423
		Z(q)	0.3492	0.9503	*2.0454	**3.3559	**2.4568
		Z*(q)	0.3874	1.0330	*2.2867	**4.2401	**3.4494
Property	46	VR(q)	0.8623	0.8835	1.3535	2.0215	2.8856
		Z(q)	-0.9132	-0.4036	0.7367	1.5888	**2.3463
		Z*(q)	-1.2125	-0.4583	0.8527	*1.9876	**3.2015
Utility	46	VR(q)	0.8344	0.7112	0.8944	1.1850	1.8286
		Z(q)	-1.0982	-1.0006	-0.2202	0.2877	1.0311
		Z*(q)	-1.4797	-1.1336	-0.2589	0.3871	1.5472
Conglomerate	30	VR(q)	1.0820	1.5427	3.1392	8.6787	48.3206
		Z(q)	0.4337	1.4791	**3.392	**8.6896	**40.2247
		Z*(q)	0.6270	1.8223	**4.1423	**11.8397	**63.1424
Financial	46	VR(q)	1.2947	1.7294	3.1392	2.6547	4.4049
		Z(q)	1.9548	**2.5266	**3.392	**2.5736	**4.2368
		Z*(q)	1.4893	*2.1554	**4.1423	**3.2299	**6.2404

Notes: 1. VR(q) is the variance ratio; q is the interval of the observations, '*' indicates significance at the 5% level, '**' at the 1% level.
2. Z(q) is distributed as standard normal under the assumption of homoscedasticity.
3. Z*(q) is distributed as standard normal under the assumption of heteroscedasticity.

Table A-7. Average Monthly Return of the Year on China's Stock Market

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	F-test
Panel-A: Shanghai Market					SSE (February 1992 - April 1998)								
Mean Return	0.04172	0.02983	-0.00634	0.09400	0.10573	-0.02174	-0.08788	0.11282	-0.03142	-0.07127	0.08304	-0.06048	0.61770
T-test	0.46493	0.33242	-0.07632	1.13146	1.27260	-0.24227	-0.97931	1.25720	-0.35007	-0.79420	0.92534	-0.67396	
Standard Deviation	0.20201	0.05358	0.18414	0.18841	0.43749	0.11197	0.15188	0.37892	0.08589	0.16507	0.16757	0.10139	
Observations	6	6	7	7	7	6	6	6	6	6	6	6	
					SSE-A (February 1992 - April 1998)								
Mean Return	0.04266	0.02886	-0.00298	0.09721	0.09790	-0.00588	-0.09077	0.11667	-0.02962	-0.07932	0.08919	-0.06413	0.57840
T-test	0.45250	0.30616	-0.03417	1.11374	1.12159	-0.06239	-0.96281	1.23748	-0.31416	-0.84128	0.94601	-0.68025	
Standard Deviation	0.19858	0.05610	0.18979	0.19429	0.45801	0.14281	0.16105	0.39836	0.08444	0.18464	0.17591	0.10941	
Observations	6	6	7	7	7	6	6	6	6	6	6	6	
					SSE-B (February 1992 - April 1998)								
Mean Return	-0.04516	0.07219	-0.07095	0.01639	-0.00208	-0.06236	-0.06052	0.07786	-0.05886	-0.05327	-0.01461	0.06167	1.23539
T-test	-0.92164	1.47317	-1.56390	0.36139	-0.04593	-1.27256	-1.23506	1.58898	-1.20126	-1.08711	-0.29825	1.25864	
Standard Deviation	0.18842	0.08509	0.10608	0.10884	0.12185	0.06869	0.13191	0.13629	0.09334	0.06717	0.14396	0.13638	
Observations	6	6	7	7	7	6	6	6	6	6	6	6	
Panel-B: Shenzhen Market					SZS (October 1992 - April 1998)								
Mean Return	-0.00928	0.04533	-0.00772	0.04971	-0.00821	-0.01533	-0.02658	0.13028	-0.00449	0.02647	0.00185	-0.05729	0.61613
T-test	-0.16809	0.82097	-0.13986	0.90025	-0.14860	-0.25344	-0.43944	*2.15392	-0.07420	0.43753	0.03355	-1.03763	
Standard Deviation	0.12561	0.07895	0.12521	0.20361	0.09613	0.12587	0.15979	0.18435	0.08900	0.18346	0.08065	0.11306	
Observations	6	6	6	6	6	5	5	5	5	5	6	6	
					SZS-A (October 1992 - April 1998)								
Mean Return	-0.01210	0.04863	-0.00338	0.05548	-0.00883	-0.02132	-0.02251	0.14056	-0.00507	0.02424	-0.00016	-0.05608	0.62639
T-test	-0.20852	0.83806	-0.05829	0.95614	-0.15222	-0.33538	-0.35411	*2.21135	-0.07979	0.38132	-0.00270	-0.96657	
Standard Deviation	0.13514	0.07664	0.13236	0.21229	0.09079	0.13312	0.16127	0.20747	0.09579	0.19871	0.06985	0.11836	
Observations	6	6	6	6	6	5	5	5	5	5	6	6	
					SZS-B (October 1992 - April 1998)								
Mean Return	-0.01985	0.03695	-0.04709	-0.01888	-0.07055	0.02490	-0.08111	0.05753	0.01072	-0.03221	0.03436	-0.06163	0.56941
T-test	-0.35294	0.65693	-0.83732	-0.33576	-1.25440	0.40414	-1.31657	0.93381	0.17401	-0.52291	0.61089	-1.09584	
Standard Deviation	0.10272	0.15660	0.07395	0.08764	0.13731	0.08391	0.22415	0.12376	0.06681	0.06445	0.25782	0.10114	
Observations	6	6	6	6	6	5	5	5	5	5	6	6	

Notes: 1. t-statistics test the null hypothesis that the mean return is equal to zero.

2. F-statistics test the null hypothesis that the mean returns are equal to zero across all months of the year.

3. ' *' indicates rejections of the null hypothesis at the 5% significance level.

Table A-8. The Dates of Shanghai and Shenzhen Stock Markets Closure for Public Holidays

	1991	1992	1993	1994	1995	1996	1997	1998
New Year's Day	1/1 (Tue.)^ na*	1/1 (Wed.) ^*	1/1 (Fri.) ^* 2/1 (Sat.) ^* 3/1 (Sun) ^	1/1 (Sat.) ^* 2/1 (Sun.) ^*	31/12 (Sat.) ^* 1/1 (Sun.) ^* 2/1 (Mon.) ^*	30/12 (Sat.) ^* 31/12 (Sun.) ^* 1/1 (Mon.) ^*	1/1 (Wed.) ^*	1/1 (Tue.) ^* 2/1 (Fri.) ^* 3/1 (Sat.) ^* 4/1 (Sun.) ^*
Spring Festival	15/2 (Fri.) ^ 16/2 (Sat.) ^ 17/2 (Sun.) ^ 18/2 (Mon.) ^ na*	3/2 (Tue.)* 4/2 (Tue.) ^* 5/2 (Wed.) ^* 6/2 (The.) ^* 7/2 (Fri.)* 8/2 (Sat.)* 9/2 (Sun.)*	19/1 (Tue.)* 20/1 (Wed.)* 21/1 (The.)* 22/1 (Fri.) * 23/1 (Sat.) ^* 24/1 (Sun.) ^* 25/1 (Mon.) ^* 26/1 (Tue.) ^* 27/1 (Wed.)* 28/1 (The.)* 29/1 (Fri.)* 30/1 (Sat.)* 31/1 (Sun.)*	5/2 (Sat.) ^* 6/2 (Sun.) ^* 7/2 (Mon.) ^* 8/2 (Tue.) ^* 9/2 (Wed.) ^* 10/2 (The.) ^* 11/2 (Fri.) ^* 12/2 (Sat.) ^* 13/2 (Sun.) ^*	28/1 (Sat.) ^* 29/1 (Sun.) ^* 30/1 (Mon.) ^* 31/1 (Tue.) ^* 1/2 (Wed.) ^* 2/2 (Tue.) ^* 3/2 (Fri.) ^* 4/2 (Sat.) ^* 5/2 (Sun.) ^* 6/2 (Mon.)* 7/2 (Tue.)* 8/2 (Wed.)* 9/2 (The.)* 10/2 (Fri.)* 11/2 (Sat.)* 12/2 (Sun.)*	17/2 (Sat.) ^* 18/2 (Sun.) ^* 19/2 (Mon.) ^* 20/2 (Tue.) ^* 21/2 (Wed.) ^* 22/2 (The.) ^* 23/2 (Fri.) ^* 24/2 (Sat.) ^* 25/2 (Sun.) ^* 26/2 (Mon.) ^* 27/2 (Tue.) ^* 28/2 (Wed.) ^* 29/2 (The.) ^* 1/3 (Fri.) ^* 2/3 (Sat.) ^* 3/3 (Sun.) ^*	1/2 (Sat.) ^* 2/2 (Sun.) ^* 3/2 (Mon.) ^* 4/2 (Tue.) ^* 5/2 (Wed.) ^* 6/2 (The.) ^* 7/2 (Fri.) ^* 8/2 (Sat.) ^* 9/2 (Sun.) ^* 10/2 (Mon.) ^* 11/2 (Tue.) ^* 12/2 (Wed.) ^* 13/2 (The.) ^* 14/2 (Fri.) ^* 15/2 (Sat.) ^* 16/2 (Sun.) ^*	24/1 (Sat.) ^* 25/1 (Sun.) ^* 26/1 (Mon.) ^* 27/1 (Tue.) ^* 28/1 (Wed.) ^* 29/1 (The.) ^* 30/1 (Fri.) ^* 31/1 (Sat.) ^* 1/2 (Sun.) ^* 2/2 (Mon.) ^* 3/2 (Tue.) ^* 4/2 (Wed.) ^* 5/2 (The.) ^* 6/2 (Fri.) ^* 7/2 (Sat.) ^* 8/2 (Sun.) ^*
Labor's Day	1/5 (Wed.) ^*	1/5 (Fri.) ^* 2/5 (Sat.) ^* 3/5 (Sun.) ^	1/5 (Sat.) ^* 2/5 (Sun.) ^*	30/4 (Sat.) ^* 1/5 (Sun.) ^* 2/5 (Mon.) ^*	29/4 (Sat.) ^* 30//4 (Sun.) ^* 1/5 (Mon.) ^*	1/5 (Wed.) ^*	1/5 (The.) ^* 2/5 (Fri.) ^* 3/5 (Sat.) ^* 4/5 (Sun.) ^*	1/5 (Fri.) ^* 2/5 (Sat.) ^* 3/5 (Sun.) ^*
National Day	30/9 (Mon.) * 1/10 (Tue.) ^* 2/10 (Wed.) ^*	1/10 (The.) ^* 2/10 (Fri.) ^* 3/10 (Sat.) ^* 4/10 (Sun.) ^	1/10 (Fri.) ^* 2/10 (Sat.) ^* 3/10 (Sun.) ^*	1/10 (Sat.) ^* 2/10 (Sun.) ^* 3/10 (Mon.) ^* 4/10 (Tue.) ^*	30/9 (Sat.) ^* 1/10 (Sun.) ^* 2/10 (Mon.) ^* 3/10 (Tue.) ^*	28/9 (Sat.) ^* 29/9 (Sun.) ^* 30/9 (Mon.) ^* 1/10 (Tue.) ^* 2/10 (Wed.) ^*	1/10 (Wed.) ^* 2/10 (Tue.) ^* 3/10 (Fri.) ^* 4/10 (Sat.) ^* 5/10 (Sun.) ^*	31/9 (Wed.) 1/10 (The.) 2/10 (Fri.) 3/10 (Sat.) 4/10 (Sun.)

Notes: 1. '^' denotes Shanghai market closure for public holiday; '*' denotes Shenzhen market closure for public holiday; 'na' means not applicable.
2. If the dates of market closure for New Year's Day are in December, the December is in the last year.
3. The dates and duration of market closure for public holidays were scheduled by each stock exchange individually until the end of 1995, and by the CSRC uniformly after 1995.

A-9. Results of the Tests on the Announcement of Rights Approvals for A-shares of China's Stock Market

(a) Cumulative Abnormal Returns (CAR)

	Market Adjusted Model			*Market Model*		
Date	*Samll*	*Large*	*All*	*Samll*	*Large*	*All*
-20	0.0018	-0.0007	0.0009	0.0017	-0.0007	0.0009
-18	0.0025	-0.0021	0.0010	0.0016	-0.0047	-0.0006
-16	0.0058	-0.0019	0.0032	0.0028	-0.0054	0.0000
-14	0.0104	-0.0012	0.0065	0.0063	-0.0049	0.0025
-12	0.0134	0.0037	0.0101	0.0082	0.0003	0.0055
-10	0.0135	0.0101	0.0123	0.0072	0.0045	0.0062
-8	0.0139	0.0154	0.0144	0.0063	0.0102	0.0076
-6	0.0182	0.0234	0.0200	0.0097	0.0169	0.0121
-4	0.0200	0.0367	0.0256	0.0104	0.0292	0.0167
-3	0.0273	0.0374	0.0307	0.0170	0.0300	0.0214
-2	0.0330	0.0431	0.0364	0.0222	0.0352	0.0266
-1	0.0357	0.0470	0.0395	0.0245	0.0381	0.0291
0	0.0441	0.0500	0.0461	0.0328	0.0402	0.0353
1	0.0392	0.0529	0.0438	0.0269	0.0432	0.0324
2	0.0342	0.0505	0.0397	0.0222	0.0400	0.0282
3	0.0337	0.0508	0.0394	0.0213	0.0393	0.0274
4	0.0364	0.0517	0.0416	0.0246	0.0413	0.0302
6	0.0333	0.0512	0.0393	0.0215	0.0420	0.0284
8	0.0287	0.0551	0.0376	0.0176	0.0461	0.0273
10	0.0231	0.0610	0.0359	0.0108	0.0528	0.0250
12	0.0272	0.0741	0.0430	0.0142	0.0634	0.0309
14	0.0323	0.0733	0.0461	0.0190	0.0609	0.0332
16	0.0332	0.0830	0.0500	0.0201	0.0688	0.0366
18	0.0327	0.0862	0.0508	0.0195	0.0706	0.0368
20	0.0325	0.0841	0.0499	0.0187	0.0679	0.0353

Notes: 1. Small: the sample of 148 approvals with the number of new rights issue less than 3 for 10.
2. Large: the sample of 78 approvals with the number of new rights issue equal to or larger than 3 for 10.
3. Overall: totally 226 rights approvals including 'small' and ''large' rights issue samples.
4. Date 0: the date of the announcement.
5. Date +1 to +20: the dates before the announcement.
6. Date -1 to -20: the dates after the announcement.

(b). Parametric and Nonparametric t-test Statistics on the Abnormal Returns for the Specific Event Date

	Parametric t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Samll*	*Large*	*All*	*Samll*	*Large*	*All*
-1	1.3734	1.4238	1.9696	1.0907	0.9550	1.3764
0	4.3107	1.0602	4.1582	3.7418	1.1153	3.5359
1	-2.5313	1.0684	-1.4378	-2.1026	0.1878	-1.5398
	Nonparametric (rank) t-test Statistics					
	Market Adjusted Model			*Market Model*		
Date	*Samll*	*Large*	*All*	*Samll*	*Large*	*All*
-1	0.9565	1.1004	1.3411	-0.6575	2.8712	2.0310
0	3.6083	1.3403	3.5376	2.4621	2.5970	3.4969
1	-1.7096	0.1038	-1.2762	-2.1233	0.0792	-1.0871

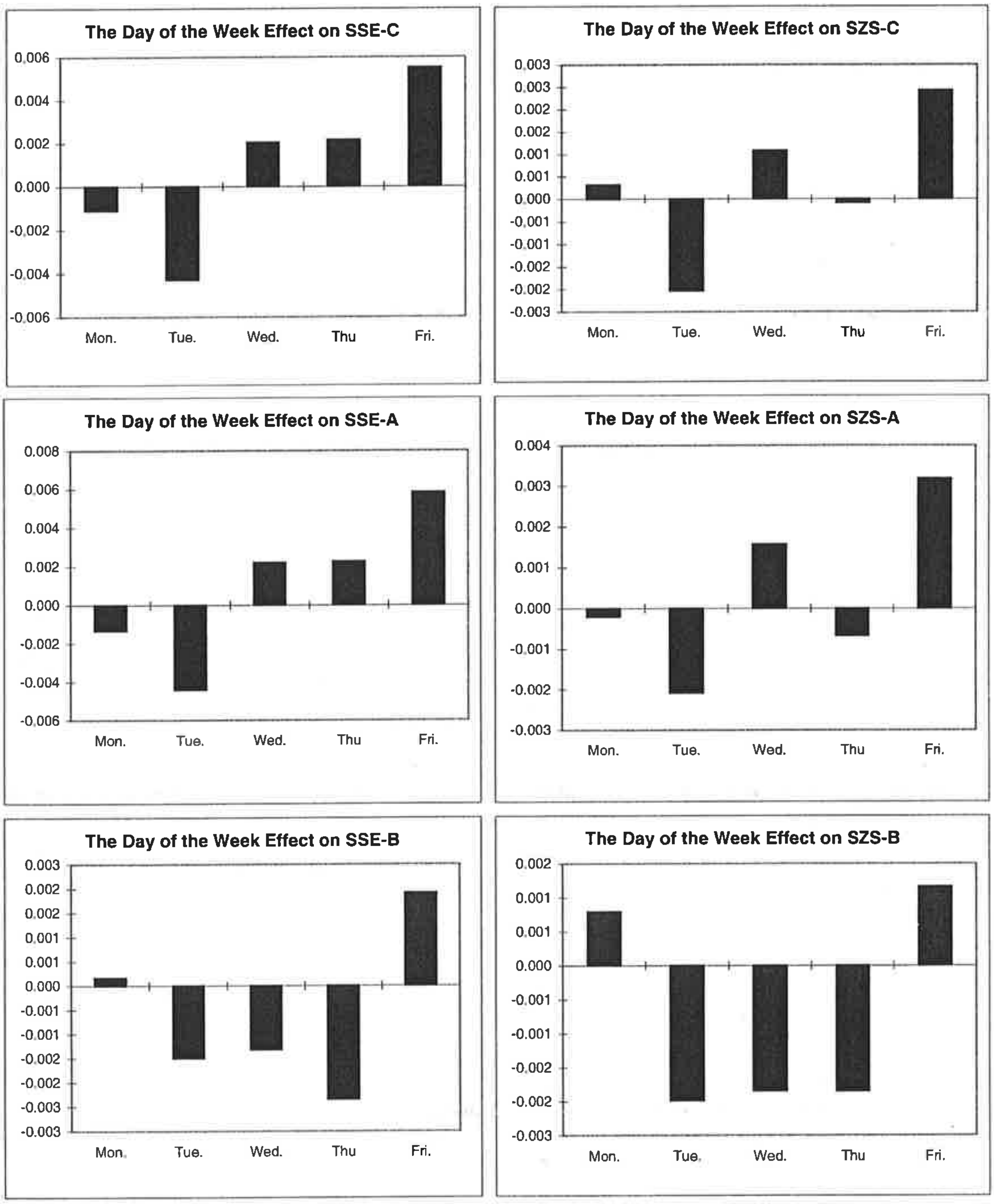
Notes: 1. Date 0: event date, the date of the announcement.
2. Date -1: alternative event date, the announcement may occur one day in advance of that on record.
3. Date +1: alternative event date, the announcement may occur one day later than that on record.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant abnormal return is statistically non-zero at the 5% or 1% significance level, respectively.

(c) Parametric t-test Statistics on the Cumulative Abnormal Returns (CAR) in Intervals around the Event Date

	Market Adjusted Model			*Market Model*		
Date	*Samll*	*Large*	*All*	*Samll*	*Large*	*All*
	11 Days Around Event Day					
5 before	4.5322	3.7899	5.5241	2.4245	5.4706	6.1154
5 after	-1.1468	0.0401	-2.0071	-1.5827	-0.3235	-1.1846
10 around	3.3329	2.9018	3.6249	1.6286	4.1662	4.5328
	21 Days Around Event Days					
10 before	3.4693	4.2457	5.3605	2.7461	3.7761	4.4368
10 after	-3.3951	1.2585	-2.0320	-3.6527	1.4739	-2.0948
21 around	0.9919	4.0296	3.2043	0.3277	3.7960	2.4898
	41 Days Around Event Day					
20 before	3.9997	3.7899	5.5241	3.4671	3.5096	4.8646
20 after	-2.4810	0.0401	-2.0071	-2.6977	-0.0544	-2.2168
41 around	2.3237	2.9018	3.6249	1.8359	2.5687	2.9921

Notes: 1. 5 before, 10 before and 20 before: tests on the CARs in the intervals of 5 days, 10 days and 20 days before the announcement date.
2. 5 after, 10 after and 20 after: tests on the CARs in the intervals of 5 days, 10 days and 20 days after the announcement date.
3. 11 around, 21 around and 41 around: tests on the CARs in the intervals of 11 days, 21 days and 41 days around (including) the announcement date.
4. If the *t*-test statistic is larger in absolute value than 1.96 or 2.58, the relevant CARs of the intervals are statistically non-zero at the 5% or 1% significance level, respectively.

Figure A-1. The Day of the Week Effects on China's Stock Market



Notes: Data are in Table 6-1.

Figure A-2. Average Daily Return of Month in the Year on the Shanghai Stock Market

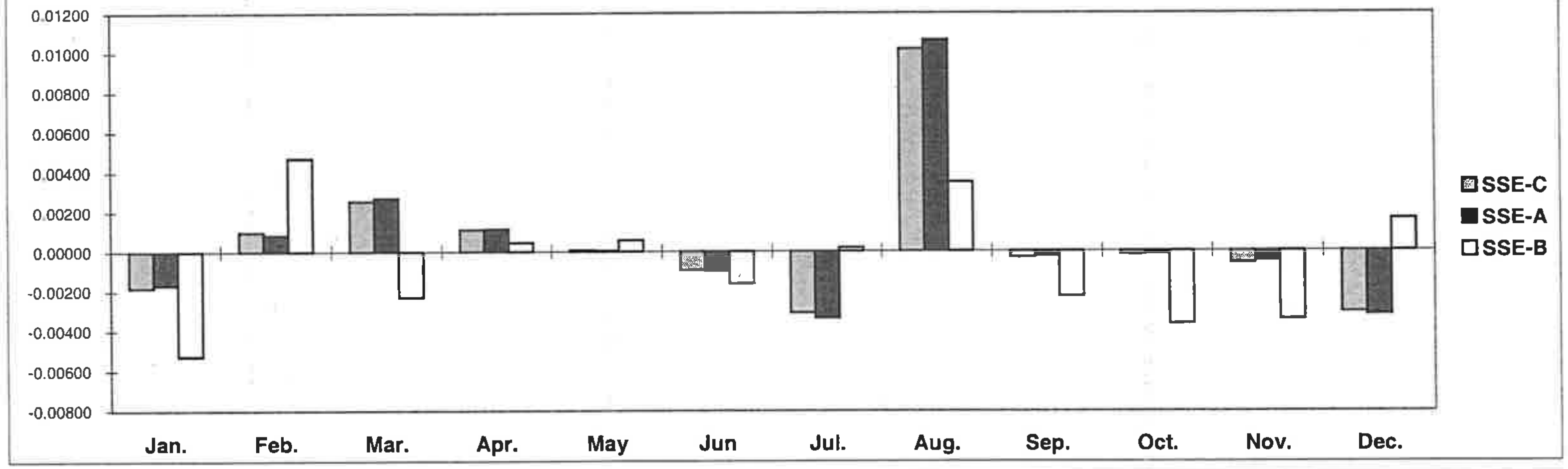
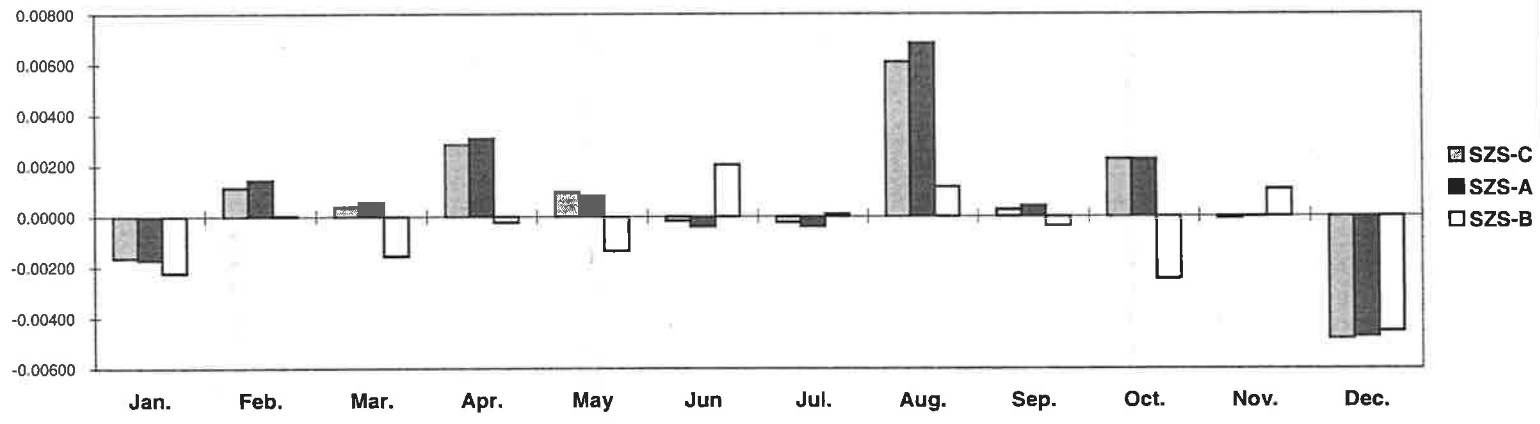
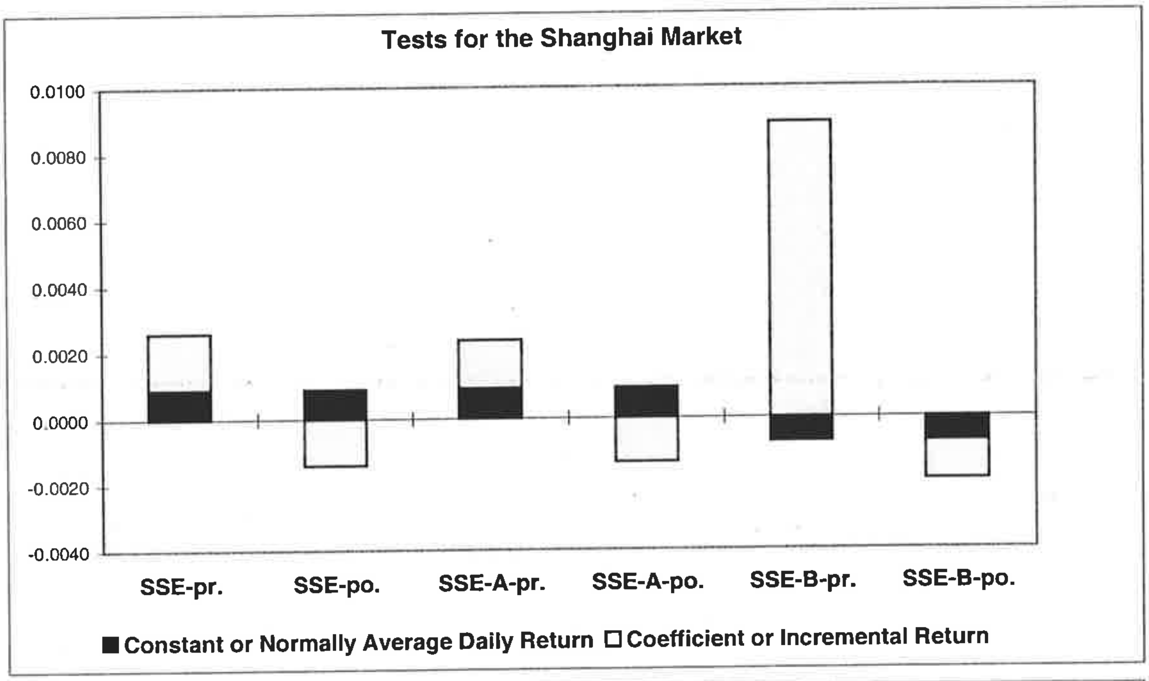


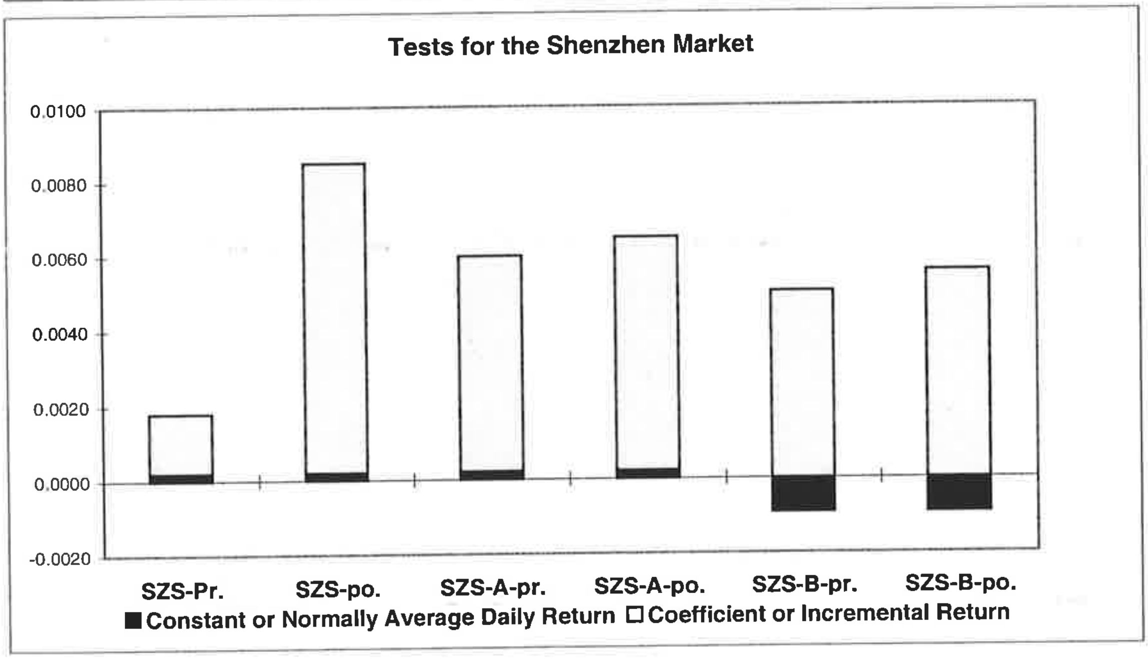
Figure A-3. Average Daily Return of Month in the Year on the Shenzhen Stock Market



Notes: Data are in Table 6-5.

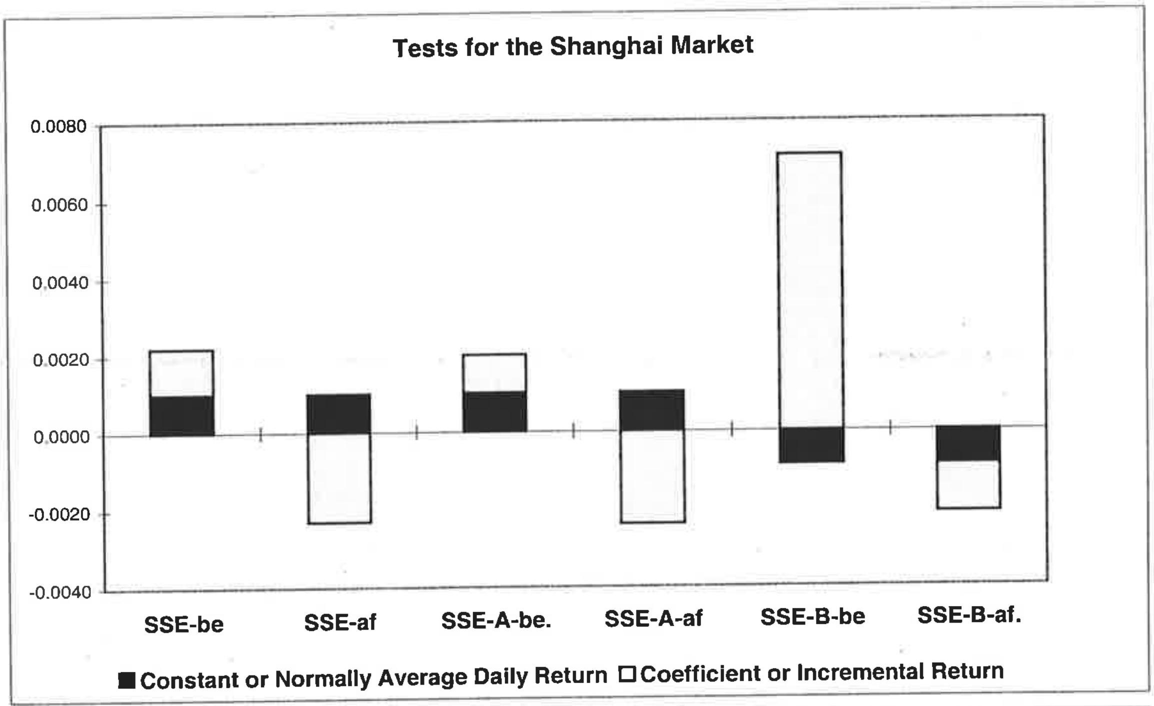
Figure A-4. Holiday Effect Tests on Pre-Holiday and Post-holiday Trading Days

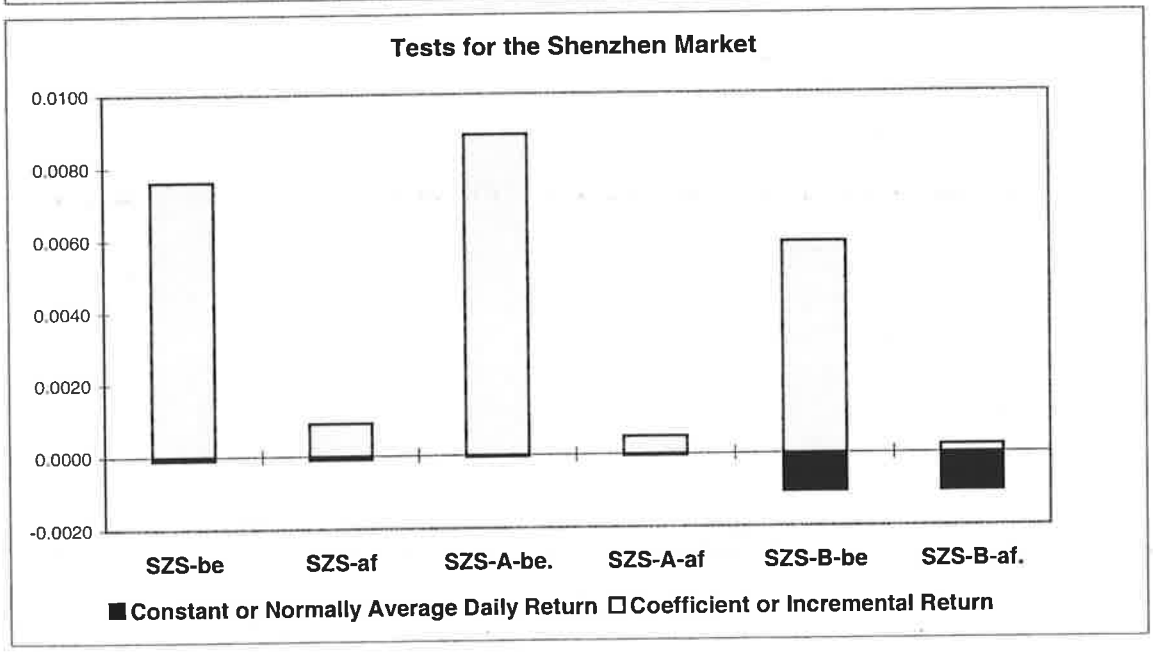




Notes: Data are in Table 6-10.
'pr' means pre-holiday trading days.
'po' means post-holiday trading days.

Table A-5. Holiday Effect Tests on Three Days Preceding Holidays and Four Days Succeeding Holidays





Notes: Data are in Table 6-10.
'be' means before holidays.
'af' means after holidays.

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