

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

Date 28.23.8.68 Signed



A SOURCES AND USES OF FUNDS STUDY

on

SOUTH AUSTRALIAN FARMS

R.K. Lindner, B.Ag.Sc., B.Ec.,
University of Adelaide,
Department of Economics,
November, 1967.

Acknowledgements

This study would not have been possible without the help of a large number of people, including most members of the staff of the Economics Department, but the following deserve special mention. The Reserve Bank of Australia provided generous financial assistance through the Rural Credits Development Fund. The large volume of computational work carried out by Mrs. J. Simmons is gratefully acknowledged, as is the processing of data on the computer by Mrs. L. Ward. Mrs. C. Leckie is also to be thanked for typing a long and by no means easy final draft, while the advice and encouragement so freely given by Mr. J. Ball and Mr. A. Watson were appreciated greatly.

I am especially indebted to Dr. F.G. Jarrett, who was always ready to comment, advise, and assist in the many other ways required of a supervisor. I am also deeply indebted to my wife, who not only transformed illegible copy into readable drafts, but also displayed great patience and understanding for the past three years.

Most important of all however, were the fifty-nine farmers, who through no fault of their own, were selected to participate in the survey, and without whose cooperation this study could never have been contemplated. Nevertheless, the author, as usual, takes full responsibility for all errors and omissions.

R.K. Lindner

University of Adelaide,
November, 1967.

Table of Contents

<u>Chapter</u>		<u>Page</u>
1	INTRODUCTION	1
	Background	1
	Scope of the Study	3
2	PROCEDURE AND DESCRIPTION OF THE AREA	5
	Selection of the Area	5
	Procedure	8
	Selection of the Sample	8
	Reliability of the Results	10
	Description of the Area	14
	Some Sample Characteristics	16
3	FARM FUNDS FLOWS	18
	Introduction	18
	Definitions	19
	Methodology	22
	Results and Discussion	28
4	CREDIT - A REVIEW OF THE LITERATURE	43
5	FARM INDEBTEDNESS	53
	Methodology	53
	Debt Levels	55
	Credit Sources	58
	Credit Uses	63
	The Interaction Between Sources and Uses	69
	Factors Related to Farm Indebtedness	74
6	CREDIT THEORY	79
	Introduction	79
	Empirical Evidence	81
	Capital Rationing - Internal	82
	External	83
	The Supply of Capital	84
	A Conceptual Problem	89
	The Role of Time	94

<u>Chapter</u>		<u>Page</u>
7	AVAILABILITY OF CREDIT	98
	Introduction	98
	Methodology	99
	The Supply of Capital	102
	External Capital Rationing	115
	Results and Discussion	117
8	CREDIT RATIONING - A THEORETICAL MODEL	124
	Introduction	124
	The Simple Model under Conditions of Perfect Knowledge	127
	Hodgman's Model	132
	The Modified Model	134
	Results and Discussion	149
APPENDIX	1	160
APPENDIX	2	163
APPENDIX	3	168
APPENDIX	4	171
APPENDIX	5	173
APPENDIX	6	176
SELECTED	BIBLIOGRAPHY	178

SUMMARY

The twin aims of this study were to derive information on farmers' expenditure patterns and the methods used to finance their expenditure; and to investigate in more detail several aspects of borrowing to finance farm expenditure. Because of the lack of empirical work in both of the above fields which has been carried out in established, well developed, and relatively prosperous regions, this study was conducted in a typical wheat-sheep area in the mid-North of South Australia. The actual area selected was the hundreds of Belalie, Booyoolie, Bundaleer, Caltowie, Crystal Brook, Narridy, Reynolds and Yangya in the county Victoria. Data was collected by way of a random sample survey of fifty-nine wheat-sheep farmers, and covered the three financial years 1961/2 to 1963/4.

Where possible, separate flow of funds statements were constructed for each farm for the years 1961/2, 1962/3, and 1963/4. Unfortunately it was only possible to derive a complete set of funds statements for twenty-six farms. However, the fact that no significant differences were found to exist between the sub-sample of twenty-six farmers and the full sample of fifty-nine with respect to five important farm and personal characteristics suggests that any results derived from the subsample are unlikely to be seriously biased. As expected, farm income was the dominant source of funds, but the most significant feature of cash inflows was the fact that the use of past savings was at least as important as the use of external finance when expenditure exceeded farm cash receipts.

Farmers' expenditure was dominated by farm operating expenses, farm investment, and family living expenses. The results suggested that the survey farmers had a low average and marginal propensity to consume, while closer investigation of an apparent relationship between farm receipts and farm investment suggested that short-run changes in farm income may not exert an important influence on farm investment.

An investigation of farmers' borrowing practices showed that the trading banks were the main source of credit in the area studied, but that credit from non-institutional sources also accounted for a large proportion of outstanding debt. Purchase of farm land was by far the most important use made of borrowed funds. However, a breakdown of loans by source and purpose revealed some interesting relationships between the source of the loan and the purpose for which it was used.

To assess the adequacy of the borrowing facilities available to farmers, a method of estimating external capital rationing was devised. Application of this method confirmed the view that, at least in the area studied, farm investment was only rarely constrained by limited availability of credit.

Finally, the application of probability theory to the decision making process was used to construct a theoretical model of lender behaviour under conditions of uncertainty. The model assumed that all lenders base their lending decisions solely on the borrower's ability to repay debt, and was used to demonstrate the conditions under which credit rationing will occur, and to investigate various aspects of the supply of credit.

This thesis is submitted in partial fulfilment of the requirements for the degree of Master of Agricultural Science. It does not contain any material which has been accepted for the award of any other degree or diploma in any University. Nor to the best of my knowledge does it contain any material previously published or written by another person, except when due reference is made in the text.

R.K. Lindner.

CHAPTER 1

INTRODUCTION

Background

For a sector of the economy which plays such an important role in providing much needed export earnings, surprisingly little is known about farmers' expenditure patterns, or about the methods they employ to finance their expenditure. Although estimates of individual components, such as investment and debt to specified lenders have been made by Gutman¹ and the Reserve Bank of Australia² respectively, no overall picture is available. At the aggregate level, the data is insufficiently detailed to provide the type of information outlined above. In fact, in a flow of funds study at the national level, Holmes was not able to treat agriculture as a separate sector, but had to amalgamate it with certain other types of production.³

On the other hand, studies at the farm gate have tended to concentrate on specific problems, or have been general economic surveys measuring revenues and expenses rather than receipts and disbursements. Examples of the former include investment and credit studies by Pearse,⁴

1. G.O. Gutman, "Investment and Production in Australian Agriculture", Review of Marketing and Agricultural Economics, Vol. 23, (Dec. 1955), pp. 237-310.

2. Reserve Bank of Australia, Australian Rural Credit Facilities, prepared by the Rural Liaison Service (Sydney: Simmons Ltd, 1964) p. 12 (mimeo).

3. A.S. Holmes, Flow of Funds, Australia, 1953-4 to 1957-8, Reserve Bank of Australia Staff Paper, (mimeo).

4. R.A. Pearse, "An Empirical Micro-Study of some Factors Influencing Farm Net Investment", Economic Record, Vol. 31, (Dec. 1955).



Molnar,⁵ and Gruen,⁶ while industry surveys by the Bureau of Agricultural Economics are typical of the latter.⁷ Furthermore, a high proportion of the research in this field has been carried out either in depressed or developing areas, or in response to an unfavourable change in the environment, either physical or economic. Respective examples include an economic survey of dairy farms by Jarrett and Penny,⁸ a credit study by Hefford,⁹ and a drought survey by the Reserve Bank of Australia.¹⁰ While not denying the importance of such work, there is also a need to carry out research in some of the long established and relatively well developed and prosperous areas.

Finally one recent development in farm management, most of it post-dating the commencement of this study, needs to be mentioned. This is the computerized processing of farm accounts by farm management

5. I. Molnar, "Factors Influencing Recent Farm Improvements", Review of Marketing and Agricultural Economics, Vol. 27, (1959), pp. 51-73.

6. F.H. Gruen, "Wool Prices, Credit Restrictions and Development", Review of Marketing and Agricultural Economics, Vol. 24 (June 1956) pp. 61-73.

7. For example see, Bureau of Agricultural Economics, The Australian Sheep Industry Survey, 1963-4, (Canberra: Government Printer, 1967).

8. F.G. Jarrett and D.H. Penny, An Economic Survey of the Reclaimed Area of the Lower Murray, (Adelaide: Griffin Press, 1960).

9. R.K. Hefford, An Investigation into the Need for, and Use of Rural Credit in Selected Areas in South Australia, (Unpublished M.Ec. thesis Barr Smith Library, University of Adelaide, 1961).

10. Reserve Bank of Australia, A Survey of the Physical and Financial Effects of Drought in Northern N.S.W., A report prepared by the Rural Liaison Service, (Sydney: Reserve Bank of Australia, 1966).

service centres, and in particular the inclusion of a cash flow statement in the financial statements produced. As these service centres accumulate a log of this type of information, they should be able to make a significant addition to the body of knowledge on sources and uses of farm funds. There will however, still be a need for additional research into this subject, as the information obtained in the above manner will only apply to a limited and probably unrepresentative proportion of the farming community.

Scope of the Study

Because of the limited resources available, it was only possible to collect data from a limited cross section of farmers, and consequently this study must be considered to be only exploratory in nature. Therefore, the primary aim of the study was to give a composite view of the sources and uses of farm funds in a region typical of the relatively well developed and prosperous wheat-sheep areas in the mid-North of South Australia. The necessary data was collected by way of a random sample survey of fifty-nine wheat-sheep farmers in part of the county Victoria, and covered the three financial years 1961/2 to 1963/4. The method used was to construct where possible, flow of funds statements for each farm, and for each year for which data was collected.

However, if farmers are to cope successfully with the technology race and the cost-price squeeze, they will need to continually adjust their pattern of expenditure. Often borrowing is the only way to finance the necessary adjustments. Obviously

then, the way in which farmers use credit, and the availability of credit are crucially important in determining future sources and uses of farm funds. Therefore the secondary aim of this study was to use the data to derive information on sources and uses of farm credit, and to try and assess the availability of such credit. Finally, a theoretical model was constructed to examine the effect on the availability of credit if all lenders based their lending decisions solely on their estimates of the borrower's ability to repay debt.

CHAPTER 2.

PROCEDURE AND DESCRIPTION OF THE AREA

Selection of the Area

The selection of the area in which to conduct the survey involved several considerations. For reasons outlined in Chapter One, it was decided to work in a well established and relatively prosperous wheat-sheep area. However, with only limited resources with which to carry out the survey, other factors such as distance from Adelaide also had to be considered. The area finally selected consisted of the hundreds of Belalie, Booyoolie, Bundaleer, Caltowie, Crystal Brook, Narridy, Reynolds and Yangya. The location of this area, which makes up roughly half of County Victoria, is illustrated in diagram one.

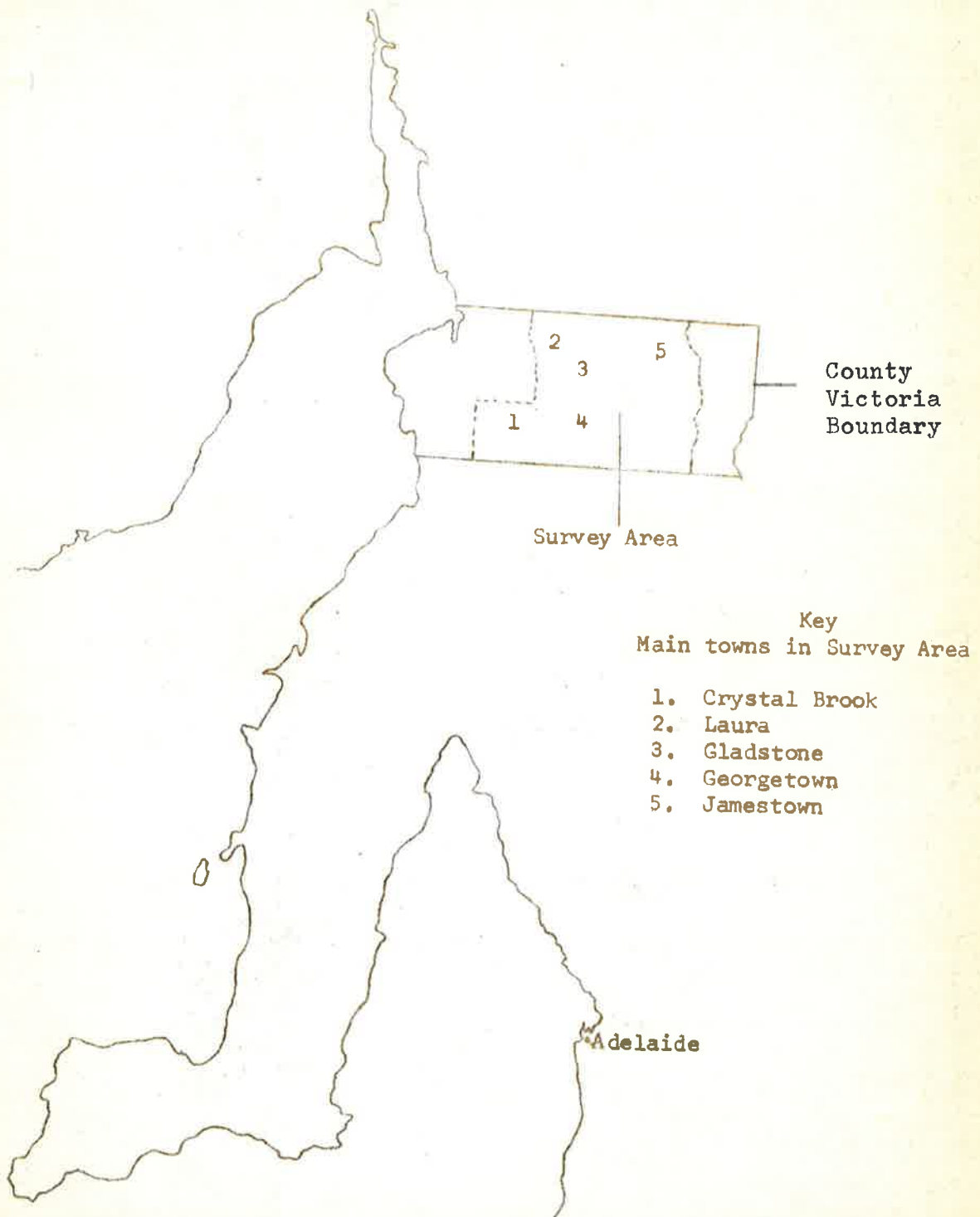
The following points influenced the selection of this area.

(1) The dominant form of farm organisation in the area is a combination of cereal cropping and sheep enterprises.¹

(2) As most of the area was settled before the turn of the century, and is now well established and relatively well developed; the problems and atypical capital profiles associated with farms still in the early development stages were largely avoided. On the other hand, the general concensus is that profitable investment opportunities still exist.² Consequently the problems associated with a stagnating

1. On the basis of unpublished Bureau of Census and Statistics data, roughly 83% of the 538 holdings in the area were planted to over 20 acres of wheat in 1963/4. As no properties in the area produce wheat exclusively, presumably the majority of these were wheat-sheep properties.

2. Private discussion with the Department of Agriculture officers, many farmers etc., see also appendix 5.



County
Victoria
Boundary

Survey Area

Key
Main towns in Survey Area

- 1. Crystal Brook
- 2. Laura
- 3. Gladstone
- 4. Georgetown
- 5. Jamestown

Adelaide

Diagram 1 Location Map

area were not encountered.

(3) Compared with many other, although by no means all, established agricultural areas in Australia, the area is a relatively prosperous one;³ and, if the upward trend in land prices in recent years is any indication, many people believe it will remain so.

(4) The area selected was a sufficient distance from any major city to be outside the range of influence of any urban development, either now or in the foreseeable future; and yet close enough for convenience in conducting a survey.

(5) Although the environment of the region is by no means homogeneous, it was felt that the range of variability in climatic conditions, soil types and topography encountered in the area is sufficiently small⁴ for differences in the nature of the funds' flows between farms to be attributed mainly to differences in management, or to some measured characteristic, rather than to differences in environment.

(6) Finally, the fact that the Department of Agriculture had been carrying out an economic survey of the region for several years meant that some prior information, albeit incomplete for the purposes of this study, was available on the economics of farming in the area studied.

3. South Australian Department of Agriculture, (unpublished data).

4. For further discussion of environment in the area, see "Description of the Area" below.

Procedure

The data for this study was obtained from a sample survey of wheat-sheep farmers in the area described above. The survey was based on two personal interviews conducted by the author with a sample of producers during 1965. To ensure maximum possible co-operation, the interviews were timed to coincide with the two seasonal troughs in labour requirements on wheat-sheep farms. Thus the first series of interviews was carried out during February and March, in the interval between the completion of the harvest and the start of sowing. The questionnaire for this interview sought information on physical and financial aspects of farming, including data on income, investment expenditure, and use of credit. Additional information needed to draw up flow of funds statements was obtained in the second round of interviews conducted during August.

Selection of the Sample

The sampling frame used was the assessment books for the relevant wards of the six district councils whose jurisdiction extended into the area surveyed. Although these books listed all ratepayers who owned land, it was possible to identify and exclude owners of town blocks. As the aim of this study was to make inferences about certain population parameters, a stratified random sampling technique was used to select the farmers to be interviewed. It was necessary to stratify the sample on a geographical basis as the sampling frame did not contain any information on farm characteristics.

Unfortunately, not all of the boundaries of the district council areas coincided with the hundred boundaries, and consequently district council areas had to be used to define the seven strata.

Thus the sampling frame contained seven separate components, each component consisting of a list of rural ratepayers for a particular strata. Because no information about the relative variability of farm characteristics between strata was available, the constant sampling fraction technique was used to determine the proportion of the total sample to be drawn from each strata. Using Bureau of Census and Statistics data,⁵ it was possible to determine what proportion of the total of 538 holdings in the survey area were in each strata, and hence calculate the required sampling fraction. A table of random numbers was used to select the required number of producers from each section of the sampling frame.

A primary sample of 60 names was drawn, along with a smaller replacement sample. One reason for drawing a replacement sample was to allow for the possibility that some farmers might be unwilling to co-operate. The other reason was that the population to be sampled was confined to full time, commercial wheat-sheep farmers, and that this population was only a sub-set of the sampling frame. Thus various criteria of eligibility for inclusion in the sample were adopted to ensure that only the desired population was sampled, and consequently it was necessary to replace some members of the primary

5. Commonwealth Bureau of Census and Statistics, (unpublished data).

sample who failed to meet these criteria during the interview stage.

The criteria actually used were:-

(1) The property had to be greater than 300 acres in size, and more than half of the previous year's income had to be derived from farm activities.

(2) The sheep enterprises had to consist mainly of the production of wool and/or meat, and not the production of breeding stock.

(3) More than half of the previous year's farm income had to be derived from wheat cropping and sheep enterprises.

(4) As the study covered the three financial years 1961/2, 1962/3 and 1963/4, the final condition was that the farmer interviewed had been operating the property concerned for at least the last three years.

During the limited time available for the first series of interviews, 73 farmers were contacted and 59 were interviewed. In most cases, the operator, who was usually also the owner was interviewed. Permission was also sought, in most cases successfully, to obtain access to income tax returns and other relevant financial documents.

Reliability of the Results

Although in some quarters farmers have a reputation for supplying inaccurate or misleading information, there does not appear to be any reason for suspecting the data used in this study on the above grounds. In nearly every case, both the farmer, and

the accountant he employed to handle his tax returns and other financial business, were frank and more than anxious to co-operate. Most farmers kept at least a primitive set of records, and where there was any doubt, the information was usually verified by access to financial documents or third parties. Furthermore, several cross checks were built in at various stages of the analysis, and in cases where any discrepancy could not be reconciled relatively easily, the farm in question was excluded from at least part of the analysis.

However, if the sample survey results are to be used to make inferences about the population in general, the problem of biased samples also has to be considered. In this study there are two possible sources of bias which are likely to be important. The first arises from the fact that the sample frame was a list of individual properties, while the questionnaire was framed in terms of firms (i.e. assets under unified control) which may or may not include more than one property. Thus firms consisting of more than one property, which also tended to be the larger firms, were more likely to be selected in the sample. Because it would have been very difficult to eliminate this source of bias, it had to be accepted; but it does not appear to have been very serious as most firms consisted of only one property.

Although a random sampling process was used, bias can also arise if firms rejected from all or part of the analysis are significantly different to the rest of the sample. It is therefore necessary to consider the reasons for rejection. Of the 73 producers

contacted in February and March, only 59 were interviewed. The remaining 14 were made up as follows. Seven stud properties, three cases where farm income was less than 50 per cent of total income, one farm less than 300 acres and one farmer who had only acquired his property recently were all rejected on eligibility grounds, and two farmers refused to co-operate at all. The rejection of the twelve ineligible farmers would not introduce any bias, as they were not part of the population to be sampled; and although bias can result from non-co-operation it is unlikely to be very important where the co-operation rate is in excess of 95 per cent. With a sampling fraction of about one in ten, the sampling error should also be reasonably small.

Unfortunately, it was only possible to obtain complete financial data from 52 of the 59 producers interviewed; in the remaining seven cases complete information was only obtained on physical and personal characteristics as well as on use of credit. Thus the use of credit section is the only part of the results based on data from 59 interviews, in most other sections only the 52 completed schedules were used.

One important exception is the flow of funds section, which also used data from the second series of interviews. In this second stage of the survey, only the 52 farmers for whom usable schedules were available from stage one, were contacted in August. However, it was only possible to successfully interview 36 co-operators on the second visit, the remainder consisting of 10 farmers who no longer wished to co-operate, four who were either ill or on holidays and 2

cases where insufficient records were available. Unfortunately, when an attempt was made to construct flow of funds statements, the results suggested that another ten co-operators provided either incomplete or erroneous data.⁶ Therefore it was only possible to use data from 26 farms in the flow of funds section. With such a low co-operation rate, the danger of biased results is admittedly considerable. Although it is impossible to objectively determine if the smaller sub-sample is in fact biased, it was possible to test indirectly whether there was any significant degree of correlation between five important farm and farmer characteristics, and co-operation rate. This was done in appendix 1, by treating the above mentioned 26 farmers as a sub-sample of the 59 farmers who were interviewed in the first stage, and using tests to see if there were any significant differences between the two samples with respect to formal education of farmer, family size, age of farmer, size of farm in acres and size of debt load. None of the differences in this test proved to be significant, and although it by no means conclusively proves that the results are unbiased, it does lend weight to the hypothesis that unwillingness to co-operate is not significantly related to the data in the funds statements, and consequently that the results from the 26 farmers are of some use in making inferences about the population in general.

6. To see how this conclusion was reached, see Chapter 3.

Description of the Area

The topography of the area is dominated by two parallel ranges of hills running in a North-South direction. The southernmost tip of the Flinders Range also intrudes into the North-East corner of the area. Peaks in these ranges are as high as 3,000 feet above sea level. Many of the steeper slopes of the ranges are covered in timber, and are usually used only for grazing; with cultivation being confined to the gentler slopes and broad valleys between the ranges.

The area has a typical Mediterranean type environment with a marked winter rainfall incidence. The pattern of rainfall distribution appears to be closely related to topography, with the belts of higher rainfall falling on the ranges. Mean annual rainfall in the principal towns varies from 15.7" at Crystal Brook, to 16.2" at Gladstone, 17.7" at Jamestown and Laura, and 18.1" at Georgetown, but is as high as 27" in the Bundaleer hills. However, virtually all of the area lies within the 15" to 20" isohyets. The mean rainfall season varies from 5.8 months at Crystal Brook to 6.7 months at Laura; while mean July air temperature at Jamestown is 47°F, and at Crystal Brook 51°F.

Although soil type also appears to be related to topography, almost all the soils except those on the steepest slopes are variants of the red brown earths.⁷ The relatively deep alluvial

7. C.G. Stephen et. al. "A Soil, Land Use and Erosion Survey of Part of County Victoria, S.A.", C.S.I.R.O. Bulletin No. 188, 1945.

red brown earths in the valleys are mainly Belalie loams and Belalie clay loams, and are the most important group of soils in the area. Several soil series occur on the slopes and ridge tops, but are mainly red brown earths or shallow skeletal soils.

The original vegetation almost certainly consisted of Eucalyptus odorata savannah woodland mostly in the mallee form, with Eucalyptus camaldulensis on deeper soils, or in the creek lines. The important native grasses were Stipa, Danthonia and Themeda. With the exception of some of the steeper slopes, most of the timber has been removed from the area, and annual introduced grasses such as Hordeum, Bromus, Vulpia and Avena now predominate in unimproved pastures, along with annual medics and Trifolium.

Wheat is the most important crop grown, with the best yields in good seasons as high as 60 bushels per acre, compared with an average yield of approximately 20 bushels per acre.⁸ Barley is also important, while oats are also planted for both grazing and grain. Annual improved pastures usually consist of Subterranean clover and Wimmera ryegrass, although a grass is not always sown, in which case the volunteer annuals mentioned above predominate. Lucerne is common in perennial pastures, and is best when regularly renovated using oats or Wimmera ryegrass. Sheep are by far the most common type of livestock run in the area, with cattle and pigs a very poor second and third, while other types are virtually non-existent.

8. Commonwealth Bureau of Census and Statistics, S.A. Statistical Register, Vol. 5.

Some Sample Characteristics

The following section sets out some statistics on the personal, physical and financial characteristics of the members of the sample. These statistics were derived from the group of 52 farmers who supplied a complete set of information at the first interview.

The average age of the farmers was 53.7 years, with a standard deviation of 12.5 years. Actual ages ranged from as young as 31 years to as old as 87 years. The average producer had been married for 24 years, and his household included four other persons. His formal education consisted of a primary school education plus one year at high school, and by June 1964, he had been farming for 25 years.

Farm sizes ranged from 364 acres up to as large as 5499 acres, with an average of 1495 acres and a standard deviation of 339 acres. Over 98 per cent of the area of the average farm had been cleared, and was used mainly for pastures and cropping. Of the area used for pastures, 392 acres (26.1 per cent) was improved in the sense that it was topdressed regularly and had been sown with at least a legume, usually Subterranean clover. The 410 acres (27.3 per cent) of unimproved pasture consisted mainly of volunteer annual grasses, often with some volunteer medics. Wheat was by far the most important crop, on average occupying 320 acres (21.3 per cent). Next in importance were barley, 73 acres (4.8 per cent), and oats, 59 acres (3.9 per cent) followed by field peas 18 acres (1.2 per cent), while small

seed production and other miscellaneous uses accounted for an additional 9 acres (0.6 per cent). Land under fallow, 187 acres (12.4 per cent) and space occupied by yards and buildings, 9 acres (0.6 per cent), made up the additional acreage. The average farm carried 1,021 sheep, 9 dairy cattle, 3 beef cattle and 6 pigs.

The average value of assets controlled by farmers in the survey was \$133,830, with a standard deviation of \$33,520 and a range from \$17,590 to \$329,498. However, only \$112,890 of the \$133,830 was invested in the farm. The remainder was either held as cash reserves in the bank, or invested in such items as recreational activities including caravans and holiday shacks, financial securities, urban land and other miscellaneous investments. The average survey farmer borrowed \$6,760,⁹ leaving him with a 95 per cent equity in the assets he controlled; but several farmers were debt free while the maximum level of indebtedness was \$63,602. The average level of taxable income earned from the assets controlled was \$8,037, with a standard deviation of \$2,830, and varied from as little as \$1248 to as much as \$29,484.

9. The reason for this figure differing from those quoted later is that the figures in Chapter 5 are based on the total sample of 59 farmers, rather than on the 52 farmers used above.

CHAPTER 3

FARM FUNDS FLOWS

Introduction

"In its infancy, the income statement was largely a summary of inflows and outflows of funds. With the lengthening of the life span of the enterprise, however, it gradually became apparent that a more appropriate definition of current income was necessary. Modern notions of inventoried costs, periodic amortizations and liability accruals developed in response to this need, and in the process the income statement became less and less a reflection of current funds flows",¹

In its modern form, the income statement summarizes the revenues, expenses, and profit which arise as a result of operations carried out during the accounting period in question. A study of sources and uses of farm funds however, required a summary of the effect of all financial transactions which change the farmer's stock of funds. Such a summary is usually presented in a flow of funds, or simply funds statement. Although net income forms an important part of the annual inflow of funds, it is an inexact measure of the contribution that current operations make to the supply of funds available for use by the farmer. This is because a number of expenses which are deducted from revenue to arrive at a net profit figure do not represent a current drain on funds. Because of this, and because certain transactions which change the level of funds are not included in an income statement, additional data is needed to prepare a funds statement.

1. R.H. Gregory and G. Shillinglaw, "Analysis of the Sources and Uses of Funds", (unpublished mimeo), p. 2.

The other type of financial statement is the balance sheet, which shows the value of the farmer's assets, liabilities and equity at a certain point in time. Thus a comparison of successive balance sheets will show in what way these values have changed over time, and is sufficient in itself to construct a simple form of funds statement.

However, this method was rejected in this study for two reasons. First, the only financial statement at present prepared regularly by, or on behalf of, all farmers in Australia is a form of annual income statement for taxation purposes. Preparation of a balance sheet, either by the farmer or by his accountant, is still relatively rare, as only an income statement is required by law, and a balance sheet probably has little value for managerial purposes as long as values are based on historical cost. Secondly, for a study of this nature, funds statements prepared from successive balance sheets contain insufficient detail, as there is no way of differentiating between changes in equity due to current operations and those due to other causes. Also, important fund flows which occur in opposite directions will tend to cancel out and will therefore not appear. Therefore the procedure adopted in this study was to use any relevant data included in taxation returns, and to obtain details of other relevant transactions not included in the returns by personal interview.

Definitions

However, before proceeding to discuss this procedure in more

detail, it is first necessary to define what is meant by funds, for "although all assets represent funds in some sense of the term, differences in liquidity generally limit the term to all or a portion of the firm's working capital, the excess of current assets over current liabilities".² Basically, the choice will depend on the use to which the funds statement is to be put, and on the nature of the firm's operations. Traditionally, funds statements have been used in the business sector for two reasons. Investors in public companies have used them as a guide in appraising the funds-generating capacity of a company, its financing policy, and the performance of the company in using these funds. Alternatively, management often use funds statements in establishing and reviewing cash budgets, to ensure that funds are not under-employed, and yet are adequate to finance future plans. Obviously, when funds statements are used in this way, the time horizon of the plans involved is an important factor in defining funds.

However, in this study, funds statements were used to summarize financial transactions. For this purpose, funds should theoretically be defined as net quick assets.³ Unfortunately, practical considerations make this definition infeasible when the funds statements are to be prepared for farm firms. The main difficulty

2. Myron J. Gordon and Gordon Shillinglaw, Accounting; A Management Approach (3rd ed.; Homewood, Ill.; Richard D. Irwin Inc., 1964), p. 487.

3. Defined by Gordon and Shillinglaw, op. cit., p. 488; as cash plus marketable securities plus accounts receivable less current liabilities.

lies in the fact that all wheat is sold to the Australian Wheat Board, and that the price for wheat in a given pool is not finally determined until all the wheat in that pool has been sold. Thus, although the transaction of selling wheat to the Australian Wheat Board is carried out in the year in which the wheat is produced, the final payment is usually not determined or received until several years later. Therefore, as amounts owing from the Australian Wheat Board constitute a major component of accounts receivable for farms in the area surveyed, it is not possible to objectively determine the value of accounts receivable at the time of the sale.

Consequently, for the purpose of this study funds were defined as cash. To use any other definition which included accounts receivable as a component of funds would have meant that any funds statement would be several years out of date by the time it could be prepared.

Just as there are different ways of defining funds, so are there different forms of presentation of funds statements. Of the two general types, the one known as the "balanced form"⁴ is used in this study. The reason for using this type of statement was the desire to keep the co-operation rate as high as possible, because in contrast to the other general type of funds statement which shows the opening and closing balances of funds, the balanced form treats decreases in cash balances as a source of funds, and vice versa. Hence, funds statements could still be constructed for those farmers who were not willing to divulge the absolute level of their savings,

4. Gordon and Shillinglaw, op. cit., p. 508.

but were prepared to supply information on changes in the level of savings. However, with the advantage of hindsight, it would probably have been better to use the more informative form of statement as the rate of co-operation achieved was very poor anyhow.

In constructing the funds statement, the accounting entity was defined as the firm-household complex. Although a funds statement summarising only the financial transactions of the farm firm could have been constructed, it seemed appropriate to include the financial transactions of the household as well. This approach was adopted because on the owner-operator type of farm that dominate agriculture there is almost certainly a real interaction between the producing and consuming units, due to the farmer trying to maximize his overall utility rather than solely profits from the farm firm.⁵ In addition, there would be real practical difficulties in deciding what part of certain transactions such as loans, apply to the farm business, and what part to the household.

Methodology

The general format of the funds statement used in this study is illustrated in tables 1A and 1B.⁶ Fundamentally, decreases in assets (including cash) and increases in liabilities and equities⁷ represent

5. Earl O. Heady, W.B. Back and G.A. Peterson, Interdependence between the Farm Business and the Farm Household with Implications on Economic Efficiency, Iowa State University Ag. Exptl. Stn. Research Bulletin 398 (Ames, Iowa: Iowa State University, 1953).

6. For complete definitions of all of the items used in the statement, see appendix 2.

7. Where equities are defined as the value of ownership capital.

sources of funds; while increases in assets (including cash), and decreases in liabilities and equities represent uses of funds. It follows that total sources of funds will always equal total uses of funds because assets always equals liabilities plus equities. Use was made of this equality in the present study to derive family living expenses as a residual, since it would have been a time consuming and tedious process to measure this item of expenditure directly. However, as a result of using this method, the value for family living expenses will also contain any errors in measurement of the other items in the funds statement. For this reason, it is necessary to discuss in some detail how each item was derived, and to point out any likely sources of error.

As was mentioned above, farmers' income tax returns were one of the two sources of basic data used. Fortunately, in measuring income for tax purposes, all revenue, with the exception of profit on livestock trading is measured on a cash, rather than an accrual basis. Thus all items of farm cash receipts and off-farm income, apart from the above mentioned exception, were taken directly from income tax returns; and hence the only errors of measurement in these items would be those due to tax evasion. Although farm produce consumed by the family should have been included in farm cash receipts and family living expenses, this particular "transaction" was ignored due to the generally insignificant amounts involved, and also because of difficulties in valuation. Nevertheless, to the extent that farmers consumed their own produce, both of the items above are understated.

Although the profit on livestock trading in income tax returns is not measured on a cash basis, the cash values of all purchases and sales of livestock are shown, and hence the net effect of livestock trading on the level of funds is only subject to those errors mentioned above. However there is a real definitional problem in deciding which purchases of livestock represent capital investment, and which represent current operating expenses to be set off against livestock sales in determining net livestock profit. For the purpose of this study, net livestock profit was defined as the amount by which sales exceeded purchases with the exception of purchases of breeding stock; where breeding stock were defined as bulls, rams, boars, etc., plus any female stud stock.⁸ If the profit figure was negative, the absolute value was added to purchases of breeding stock and classed as the livestock component of farm investment. Obviously, the choice of a solution to the definitional problem above will only affect the importance of livestock profit relative to livestock investment, and will not in any way affect the determination of the value of family living expenses.

The other two major components of cash inflows are loan proceeds and other cash receipts, and both were determined by personal interview. As all of the information on institutional credit, which comprised the major proportion of all credit transactions during the period surveyed, was either supplied or verified by the

8. Female stud stock were defined as breeding ewes and the equivalent categories of other types of livestock purchased from a stud property for the express purpose of improving the quality of farm livestock.

lending agency concerned, the accuracy of loan proceeds and the corresponding item, debt repayment, is likely to be very high. Although not relevant to the question of accuracy, the derivation of these two items provides an illustration of how extra detail can be presented if some of the flows are not netted out. Thus, while it would have been possible to use the difference between total loans outstanding at the beginning and end of the year to determine the value of these two items; by taking the differences between opening and closing balances for each individual lender, and not netting out changes in the pattern of external financing, additional useful information was obtained.

In contrast to loan proceeds, there is a possibility of errors in the values for the various items in other cash receipts. These errors are more likely to be errors of omission, rather than errors due to incorrect statement, for although values were verified wherever possible by reference to the relevant documents, there is no guarantee that the farmer remembered to produce all of the necessary documents. One example is a forgotten bank account, which could significantly alter the amount recorded for past savings used. Although there is no way of determining the magnitude of these errors, one check, which will be discussed later, was used to make sure that these errors were not too serious. Corresponding to the items in other cash receipts are the cash disbursements due to non-farm investment, increase in financial assets, tax payments and other cash payments; and the comments above on accuracy also apply to these items.

The derivation of farm cash operating expenses and the remainder of farm investments presents much the same definitional problem as that encountered when dealing with the livestock accounts; only in this case the problem is more serious because the two sources of information which had to be used were not always consistent. Once again, income tax returns were the major source of information used. Apart from the fact that land transactions, which form an important component of farm investment, are not recorded in tax returns; the federal government has allowed certain items of capital expenditure to be classed as operating expenses in the computation of a farmer's taxable income (i.e. net profit for taxation purposes). Compounding these difficulties are the diverse methods accountants use to classify allowable deductions when preparing farmers' tax returns. In order to sort out which of the allowable deductions were capital expenditure, and which were really operating expenses, it was necessary to collect from the farmer information on all forms of capital expenditure with the exception of transactions in plant and machinery, which are always separated from operating expenses in tax returns. The inconsistency arose from the fact that while farmers often seemed to think in terms of the execution of the investment act, rather than of the purchase of the materials used in the act, it is the latter which is mixed up with operating expenses in tax returns, and which is relevant to a study of this nature. Although every attempt was made to prevent this type of error, it became obvious during preparation of the funds statements that these attempts were

not always completely successful. Therefore, the figure for family living expenses is likely to differ from the true value to the extent that the above mentioned potential sources of error did in fact eventuate.

To ensure that no serious discrepancies in the value of family living expenses occurred, farmers were asked to estimate the value of this item as accurately as possible; and in cases where the farmer's estimate differed significantly from the figure derived by the residual method described above, the funds statement from the farm in question was not included in the results presented in tables 1, 2 and 3. This check resulted in the exclusion of ten farms from the final results. In the one case where a farmer did keep accurate records of family living expenses, and the error item could be measured, it was found to be less than 0.5 per cent of the total cash flows in each year.

However, there is a more fundamental source of error in the data than that due to the problems discussed above. While funds statements are an excellent method of presenting sources and uses of funds for enterprises that are going concerns, they do not record flows that result from individuals leaving or entering the farming sector. Worse still, in a pilot survey of this nature which is concerned with only one small area, fund flows generated by farmers entering or leaving the area concerned are also not measured, and yet will not necessarily cancel out. This is not a serious theoretical problem as it could have been overcome by interviewing

individuals who had entered or left the area in the period studied. Unfortunately, however, limitations on the time of the author and on the financial resources available for the study made the extensive travel necessary to interview such people infeasible from a practical point of view. Consequently, the population sampled was defined to exclude not only those farmers who left the area during the period covered by the survey, but also those who commenced farming in the area during this period. Therefore the results only present a "picture" of the sources and uses of funds of farm firms that were continuing entities during the period studied, and does not include fund flows generated by investment or disinvestment in agriculture which arose as a result of people entering or leaving the survey region during the financial years 1961-2 to 1963-4.⁹

Results and Discussion

The results of the flow of funds analysis are presented in tables 1, 2 and 3 and diagrams 2 and 3.¹⁰ The value for each item of cash receipts presented in table 1A is the average of the individual values from the 26 farms for which funds statements were completed. Similarly, the values in table 1B are averages of the cash disbursements of the same 26 farms. Table 2 gives a further

9. The item of capital injection from a new partner in the sources of funds under Other Cash Receipts only covers those cases of new partnerships which resulted from matrimony.

10. See appendix 2 for a complete definition of all terms used in these tables.

breakdown of some of the items listed in Table 1A. Originally, it was also intended to present a breakdown of farm cash operating expenses, but unfortunately this had to be omitted because it proved impossible to reconcile the different methods of classifying expenses used by the various accountants when preparing farmers' income tax returns. No breakdown of family living expenses was possible either, since this item was derived as a residual. In tables 3A and 3B, the values in tables 1A and 1B respectively are expressed as a percentage of total cash flows. Diagrams 2 and 3 provide a graphical summary of the main items in tables 1A and 1B respectively.

Probably the most striking feature in tables 1A and 3A is the dominating role of farm cash receipts in financing the various avenues of expenditure. This result was by no means unexpected, as it has been documented by various authors in the past.¹¹ Perhaps more interesting is the relative importance of the other three major sources of funds. Of these, off-farm income plays the least important role, being almost insignificant; and its importance is further reduced when it is realized that it includes the earnings of farmers' children employed in off-farm occupations. This picture is in marked contrast to that reported in many overseas studies, where off-farm income quite often is a much more important method

11. For example see F.H. Gruen, "Capital and Credit in Agriculture" International Journal of Agrarian Affairs, 11, No. 4. (Jan. 1958), p. 287, and K.O. Campbell, "Current Agricultural Development and its Implications as Regards the Utilization of Resources" Economic Record, May 1956, p. 125.

TABLE 1A

Average Per Farm Cash Receipts

for 1961/2, 1962/3 and 1963/4

	1961/2		1962/3		1963/4	
	\$	\$	\$	\$	\$	\$
(1) FARM CASH RECEIPTS						
(a) Sale of Produce	9787		11762		15044	
(b) Livestock Profits	1502		2176		1848	
(c) Miscellaneous Receipts (incl. rent, agistment, sale of farm assets, insurance proceeds etc.)	149		88		61	
		11438		14026		16953
(2) OFF FARM INCOME						
(a) Contracts etc.	44		40		97	
(b) Wages	50		72		95	
(c) Interest and Dividends	414		356		404	
(d) Commissions, Govt. grants, etc.	9		13		16	
(e) Other	8	525	11	492	9	621
(3) LOAN PROCEEDS						
(a) Trading Banks	394		29		5	
(b) Savings Bank of S.A.	1384		384		0	
(c) Relatives	0		85		0	
(d) Other individuals	0		0		1279	
(e) Pastoral Companies	109		15		443	
(f) Commonwealth Development Bank	0		0		77	
(g) Insurance Companies	0		74		21	
(h) Hire Purchase	50		0		0	
(i) Trade Credit	0	1937	11	598	0	1825
(4) OTHER CASH RECEIPTS						
(a) Redemption of Financial Assets (incl. shares, bonds, past savings, and fixed deposits)	2797		447		1060	
(b) Private loans repaid	661		0		0	
(c) Capital Injections (incl. windfall gains, new partner etc.)	117		337		303	
(d) Miscellaneous (incl. sale of non-farm assets, tax rebate & life assurance proceeds)	268		122		381	
		3843		906		1744
TOTAL RECEIPTS		17743		16022		21143

TABLE 1B

Average Per Farm Cash Paymentsfor 1961/2, 1962/3 and 1963/4

	1961/2		1962/3		1963/4	
	\$	\$	\$	\$	\$	\$
(1) <u>FARM CASH OPERATING EXPENSES</u>		3868		4048		4802
(2) <u>FARM INVESTMENTS</u>						
(a) Land	4212		1288		2384	
(b) Improvements	311		417		585	
(c) Plant and Machinery	963		989		2575	
(d) Livestock	206	5692	207	2901	396	5940
(3) <u>DEBT REPAYMENT</u>						
(a) Interest (all lenders)	255		305		292	
Principal Repayment to						
(b) Trading Banks	145		422		597	
(c) Savings Bank of S.A.	14		42		153	
(d) Relatives	0		0		146	
(e) Other Individuals	154		0		0	
(f) Pastoral Companies	101		192		70	
(g) Commonwealth Develop-						
-ment Bank	137		0		0	
(h) Dept. Lands	8		9		9	
(i) Hire Purchase	0		21		22	
(j) State Bank	17	831	17	1008	18	1307
(4) <u>FAMILY LIVING EXPENSES</u>		4193		4345		5153
(5) <u>NON FARM INVESTMENT</u>						
(a) Physical Assets	239		378		27	
(b) Financial Assets						
(incl. shares, bonds,	115		508		758	
private loans etc.)		354		886		785
(6) <u>INCREASE IN FINANCIAL ASSETS</u>						
(a) Fixed Deposits	278		426		118	
(b) Other Savings	1058	1336	1347	1773	1372	1490
(7) <u>TAX PAYMENTS</u>						
(incl. income tax and						
probate)		777		557		1089
(8) <u>OTHER CASH PAYMENTS</u>						
(incl. share of profits						
remitted)		692		504		577
TOTAL PAYMENTS		17743		16022		21143

TABLE 2 Selected Average Per Farm Cash Receiptsfor 1961/2, 1962/3 and 1963/4

	1961/2		1962/3		1963/4	
	\$	\$	\$	\$	\$	\$
<u>FARM CASH RECEIPTS</u>						
(a) Sale of Produce						
(i) Wheat	4311		5973		8419	
(ii) Barley	971		1004		810	
(iii) Oats	45		45		14	
(iv) Wool	3386		3810		4644	
(v) Milk and Cream	366		413		376	
(vi) Other	708	9787	517	11762	781	15044
(b) Livestock Profits						
(i) Sheep	1080		1568		1417	
(ii) Cattle	198		246		173	
(iii) Other	224	1502	362	2176	258	1848
(c) Miscellaneous Receipts						
(i) Rent & Agistment	10		26		58	
(ii) Sale of Farm Assets	61		5		2	
(iii) Insurance Proceeds	78	149	57	88	1	61
<u>OFF FARM INCOME</u>		525		492		621
<u>LOAN PROCEEDS</u>		1937		598		1825
<u>OTHER CASH RECEIPTS</u>						
(a) Redemption of Financial Assets						
(i) Past Savings	1143		278		689	
(ii) Fixed Deposits	39		146		120	
(iii) Shares, bonds etc.	1615	2797	23	447	251	1060
(b) Private loans repaid		661		0		0
(c) Capital Injections						
(i) Windfall gains	117		337		271	
(ii) New Partner	0	11.7	0	337	32	303
(d) Miscellaneous						
(i) Sale of Non-Farm Assets	268		0		381	
(ii) Tax Rebate	0		122		0	
(iii) Life Assurance Proceeds	0	268	0	122	0	381
T O T A L		17743		16022		21143

TABLE 3A Cash Receipts as a Percentage of Total Cash Flowsfor 1961/2, 1962/3 and 1963/4

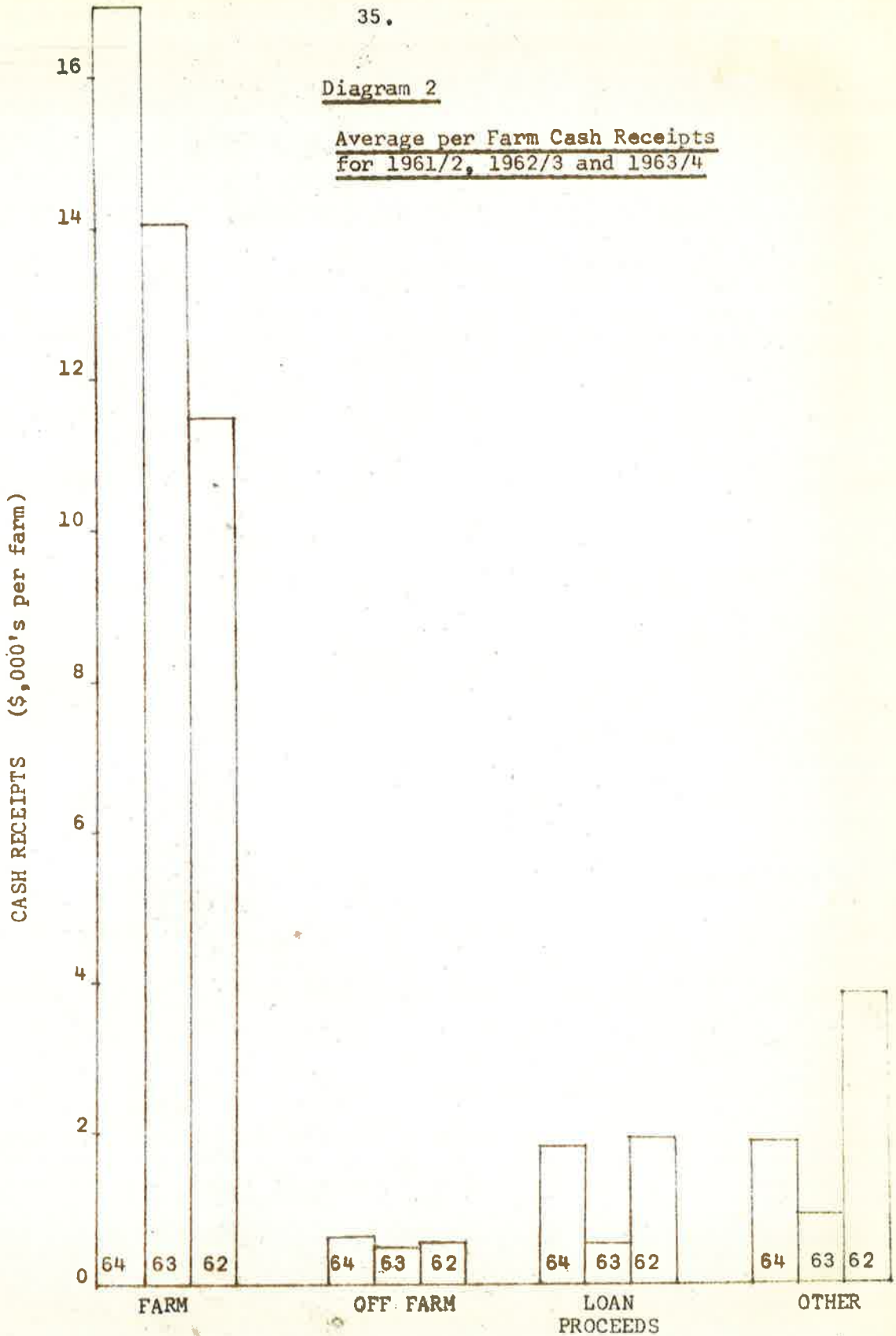
	1961/2		1962/3		1963/4	
	\$	\$	\$	\$	\$	\$
(1) <u>FARM CASH RECEIPTS</u>						
(a) Sale of Produce	55.16		73.41		71.15	
(b) Livestock Profits	8.46		13.58		8.74	
(c) Miscellaneous Receipts (incl. rent, agistment, sale of farm assets, insurance proceeds etc.)	0.84		0.55		0.29	
		64.46		87.54		80.18
(2) <u>OFF FARM INCOME</u>						
(a) Contracts etc.	0.25		0.25		0.46	
(b) Wages	0.28		0.45		0.45	
(c) Interest & Dividends	2.33		2.22		1.91	
(d) Commissions, Govt. grants, etc.	0.05		0.08		0.08	
(e) Other	0.05	2.96	0.07	3.07	0.04	2.94
(3) <u>LOAN PROCEEDS</u>						
(a) Trading Banks	2.22		0.18		0.02	
(b) Savings Bank of S.A.	7.80		2.40		0	
(c) Relatives	0		0.53		0	
(d) Other individuals	0		0		6.05	
(e) Pastoral Companies	0.62		0.09		2.10	
(f) Commonwealth Development Bank	0		0		0.36	
(g) Insurance Companies	0		0.46		0.10	
(h) Hire Purchase	0.28		0		0	
(i) Trade Credit	0	10.92	0.07	3.73	0	8.63
(4) <u>OTHER CASH RECEIPTS</u>						
(a) Redemption of Financial Assets (incl. shares, bonds, past savings, and fixed deposits)	15.76		2.79		5.02	
(b) Private loans repaid	3.73		0		0	
(c) Capital Injections (incl. windfall gains, new partner etc.)	0.66		2.11		1.43	
(d) Miscellaneous (incl. sale of nonfarm assets, tax rebate and life assurance proceeds)	1.51		0.76		1.80	
		21.66		5.66		8.25
TOTAL RECEIPTS		100.00		100.00		100.00

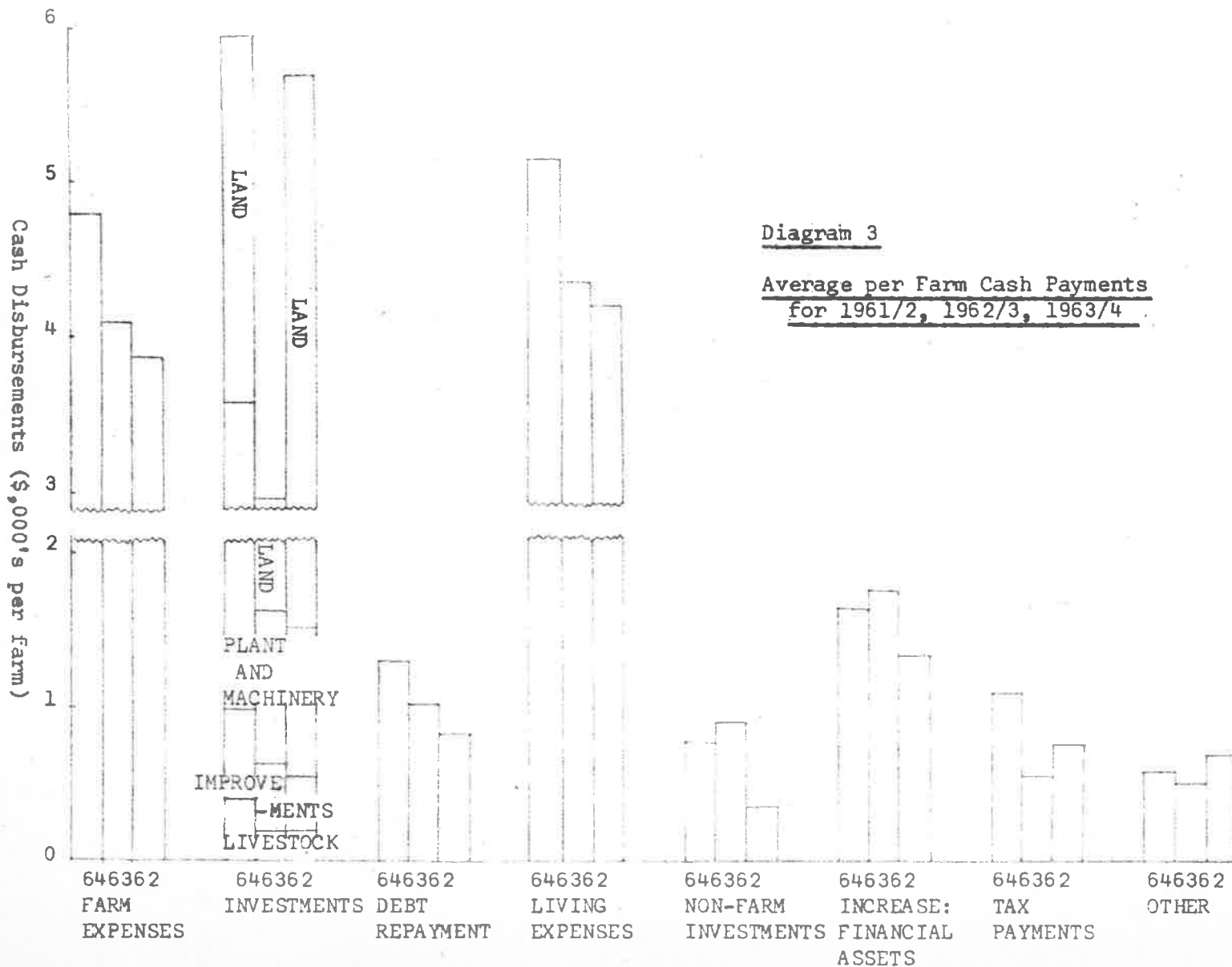
TABLE 3B Cash Payments as a Percentage of Total Cash Flowsfor 1961/2, 1962/3 and 1963/4

	1961/2		1962/3		1963/4	
	\$	\$	\$	\$	\$	\$
(1) <u>FARM CASH OPERATING EXPENSES</u>		21.80		25.26		22.71
(2) <u>FARM INVESTMENTS</u>						
(a) Land	23.74		8.04		11.28	
(b) Improvements	1.75		2.60		2.77	
(c) Plant and Machinery	5.43		6.17		12.18	
(d) Livestock	1.16	32.08	1.29	18.10	1.87	28.10
(3) <u>DEBT REPAYMENT</u>						
(a) Interest (all lenders)	1.44		1.90		1.38	
Principal Repayment to						
(b) Trading Banks	0.82		2.63		2.82	
(c) Savings Bank of S.A.	0.08		0.26		0.72	
(d) Relatives	0		0		0.69	
(e) Other Individuals	0.87		0		0	
(f) Pastoral Companies	0.57		1.20		0.33	
(g) Commonwealth Development Bank	0.77		0		0	
(h) Dept. Lands	0.04		0.06		0.04	
(i) Hire Purchase	0		0.13		0.11	
(j) State Bank	0.09	4.68	0.11	6.29	0.09	6.18
(4) <u>FAMILY LIVING EXPENSES</u>		23.63		27.12		24.37
(5) <u>NON FARM INVESTMENT</u>						
(a) Physical Assets	1.35		2.36		0.13	
(b) Financial Assets (incl. share, bonds, private loans etc.)	0.65	2.00	3.17	5.53	3.58	3.71
(6) <u>INCREASE IN FINANCIAL ASSETS</u>						
(a) Fixed Deposits	1.57		2.66		0.56	
(b) Other Savings	5.96	7.53	8.41	11.07	6.49	7.05
(7) <u>TAX PAYMENTS</u> (incl. income tax & probate)		4.38		3.48		5.15
(8) <u>OTHER CASH PAYMENTS</u> (incl. share of profits remitted)		3.90		3.15		2.73
TOTAL DISBURSEMENTS		100.0		100.0		100.0

Diagram 2

Average per Farm Cash Receipts
for 1961/2, 1962/3 and 1963/4





of financing farmers' expenditure.¹² The relative contribution of from 4 to 11 per cent made by loan proceeds to total cash receipts in this study is also less than the 25 per cent contribution recorded in the study by Wirth and Brake.¹³ Off-setting the above is the quite considerable use farmers made of other sources of finance, and in particular past savings. This is probably a reflection of the fact that the area studied is a relatively prosperous one, and consequently that when uses of funds exceeded current sources, farmers were able to run down accumulated reserves to a greater extent, and resort less to external finance than their counterparts in less affluent regions. The fact that many farmers tended to use internal sources of funds in preference to external sources whenever possible suggests that at least a considerable proportion of farmers still prefer not to borrow if they can avoid it. In fact, only 50 per cent of the 26 farmers resorted to borrowing at all during the survey period.

In contrast to the studies of Wirth and Brake,¹⁴ and of A.

12. For example, in a study made in England by A. Harrison "Some Features of Farm Business Structures" Journal of Agricultural Economics Vol. XVI No. 3, he reported that in the county of Buckinghamshire only about 5 per cent of the farmers had a farm income greater than that from other occupations, while in a study by M.J. Wirth and J. Brake "The Michigan Farm Credit Panel - Cash Flows and Use of Credit - 1961" Michigan State University Research Report 8, p. 3, off-farm income was 6 per cent of total cash receipts.

13. Wirth and Brake, op. cit., p. 3.

14. Ibid.

Mueller,¹⁵ in which farm operating expenses made up between 40 to 50 per cent of total cash disbursements, this item was not the largest item of expenditure in the area surveyed, and accounted for only 22 to 25 per cent of all expenditure. Part of this difference could be due to different methods of resolving the problem of how to allocate expenditures between current operating expenses and expenditure on items of a capital nature. Farm investment accounted for only 6 per cent of total cash flows in Mueller's study, and 20 per cent in the study by Wirth and Brake as against an average of 26 per cent over the three year period in this study. However, different definitions cannot explain all of the above mentioned discrepancy, for the proportion of total cash disbursements accounted for by family living expenses also differed significantly between the studies (from 24 to 27 per cent in this study as against less than 20 per cent in both American studies.)

Although the average value for family living expenses, ranging from \$4193 in 1961/2 to \$5152 in 1963/4, might appear to be over-estimates, some families were living on less than \$1,800 per annum. Furthermore, quite a few of the larger values for family living expenses, a few of them in excess of \$8,000 per annum, were for farms run by partnerships, and represented the living expenses of more than one family. Consequently, if the aggregate value for family living expenses had been divided by the number of families involved, rather

15. A. Mueller, "Flow of Funds Analysis in Farm Financial Management". Journal of Farm Economics Vol. 48 No. 3. Part 1, August 1966, p. 662.

than the 26 farming units, the average value for this item would have been somewhat lower. Nevertheless, the modal and median values, which probably give a better idea of the standard of living in the area, are also quite high. The modal values ranged from \$3,200 in 1961/2 to \$5,200 in 1963/4, and the median values from \$3,600 to \$4,900, and tend to confirm the impression gained while interviewing that most farmers in the area were enjoying a relatively high standard of living.

Average values for investment in farm land are also somewhat misleading, for in each of the three years studied only three of the twenty six farmers actually purchased real estate. Therefore, the average size of individual land transactions was in fact roughly nine times as great as the amounts shown in table 1B.

One other interesting point emerges from the second half of the funds statement. If savings are defined as debt repayment plus non-farm investments plus increases in financial assets, and personal disposable income as savings plus family living expenses; then the "average farmer" had an average propensity to save of .37 in 1961/2, .45 in 1962/3 and .41 in 1963/4. These results tend to confirm the generally accepted view that farmers have a very high propensity to save.

Unfortunately, any discussion of changes in cash flows over time must be rather inconclusive, for with observations from only three points in time, there is insufficient data to undertake any formal time series analysis. However, several comments on changes

in cash flows over time do seem worth making, even if only of a tentative nature.

The most striking feature was the substantial increases in farm cash receipts that occurred during the period studied. Contributing factors seem to have been a 33 per cent increase in wool and livestock prices. In addition, wheat acreages increased slightly, and 1963/4 was an above average year with a wheat yield of 24.5 bushels/acre after two years in which yields were slightly below average (15.5 to 16.5 bushels/acre).¹⁶ The relatively small increase in cash operating expenses nowhere near matched the increase in farm cash receipts, and consequently farmers' disposable cash surplus from farm operations also increased substantially during the three years. Off-farm income, on the other hand, remained relatively constant. An interesting point is that family living expenses seemed to follow the upward trend in incomes, but no doubt this was partly due to inflation. The magnitude of increases in the value of the former type of expenditure tends to suggest a quite low marginal propensity to consume. Debt repayment also increased slightly each year.

Because taxes are actually paid in the financial year following that in which the income used to assess the tax is earned,

16. Commonwealth Bureau of Census and Statistics, S.A. Statistical Register, Vol. 5.

tax payments followed movements in income, only with a one year lag.¹⁷ The interesting fact is that farm investment also appeared to show a lagged response to movements in income. However, this does not apply to most of the individual components of investment, as can be seen from table 1B and diagram 2. Thus, investments in livestock, improvements, and plant and machinery were relatively stable from 1961/2 to 1962/3, but while the former two items only showed small increases in 1963/4, investment in plant and machinery nearly trebled. The most likely reason for the very large increase in the latter was the introduction by the federal government in 1963/4 of an investment allowance which applied only to purchases of new plant and machinery.¹⁸ Land purchase is the other item of farm investment. At first sight this item does appear to show a lagged response to income movements, but since differences in levels of this form of expenditure are due to differences in the acreage of land purchased rather than to differences in price per acre or changes in the number of farmers purchasing land,¹⁹ tends to suggest that this lagged response might be an artefact also. The reason for this conclusion is the fact that the size of land transactions tends to be determined

17. The large tax payment in 1961/2 was due to an exceptional season in 1960/1 when the County Victoria average wheat yield was 29.4 bushels/acre.

18. This investment allowance allowed farmers to amortize 40 per cent of the cost of the asset in the first year, and 20 per cent in each of four subsequent years (i.e. in all, 120 per cent of cost of asset could be claimed as deduction from taxable income.)

19. In each year, only three farmers purchased land.

by the size of properties coming onto the market, rather than any demand conditions which are only likely to affect the price per acre.

It is no coincidence that changes in the level of loan proceeds and other cash receipts closely parallel changes in land purchases, since the use of savings and external funds by those farmers financing investment in land accounted for a large proportion of the total value of other cash receipts and loan proceeds respectively. The fact that non-farm investments and increase in financial assets were larger in 1962/3 than the following year is also probably due to the relationship between land purchases and the level of savings hypothesized above.

In conclusion, it seems that for a study of this nature to be useful in understanding how farmers adjust expenditure in response to changes in income etc., funds statements need to be constructed for quite a long period of time to provide sufficient observations in a time dimension. Unfortunately, this implies a continuing study in which information is collected each year, as farmers' memories in many cases were stretched to the limit in remembering events only three years previously in this study.

CHAPTER 4

CREDIT - A REVIEW OF THE LITERATURE

"Although the volume of new farm capital financed with credit has usually been small when compared to that which was financed by farmers themselves, such capital has often been substantial in amount and of high importance".¹

In the previous chapter, an examination was made of the current sources and uses of farm funds in County Victoria in S.A. As was expected, the results confirmed the generally accepted view that farm income was the dominant source of farm finance. However, an examination of the status quo, although necessary, has only limited usefulness in a dynamic world. With constantly changing economic and social conditions, it is extremely unlikely that the results reported above will remain valid for any significant period of time. On the basis of evidence currently available, there is every reason to believe that farmers will have to continue to increase productivity if their enterprises are to remain commercially viable. Although a controversy exists over whether technological advance or investment is the crucial determinant of increased productivity,² no doubt can exist that ever increasing amounts of capital will be required by today's farmers. The reason for this is that even if technological advance is the most important variable,

1. A.S. Tostlebe, Capital in Agriculture : Its Formation and Financing since 1870. (Princeton, N.J. : Princeton University Press, 1957), p. 19

2. William McD. Herr, "Capital Formation : Its Importance and Determinants". Australian Journal of Agricultural Economics, Vol. 8, No. 2, (Dec. 1964), p. 97.

capital is almost invariably required to put such advance into practice.³

On the other side of the coin, rising living standards in the non-farm sector have resulted in an expanded demand for, and supply of consumption goods and services. Naturally enough, farm families are eager to share in this trend, with the result that the demand for funds to finance living expenses has risen dramatically, and shows no real signs of abating. Although a close relationship does not need to be maintained between consumption and income in the short run, the only way to maintain increased living standards is to raise farm income. Increased farm income in turn depends on increased productivity, which requires once again increasing amounts of capital.

This trend towards the employment of more, and yet more capital on today's farms presents a basic and recurring problem for the farmer if he is going to rely on farm income as the sole, or even major source of funds. Obviously, the only way to break out of this vicious cycle is to use borrowed funds. Agricultural firms in general are organised in the form of single proprietorships or simple family partnerships and hence have no access to the share market. Consequently, credit has played, and will continue to play a vital, even crucial role in farm financing.⁴ Because of the

3. Ibid., p. 98.

4. It should be noted in passing that rural credit also plays a very important role in refinancing farm businesses as they pass from one generation to the next, as well as helping to overcome temporary financial difficulties due to droughts, floods and other catastrophies. However, credit for these purposes involves special considerations and will be largely ignored in this study.

importance of this particular source of farm funds, this and the following four chapters are devoted to a study of some aspects of the rural credit market, and in particular to the availability of credit.

For the reasons discussed above, one would expect to find ample evidence in the literature of a considerable amount of research in this field. Unfortunately, and despite the popularity of the subject as a topic for articles and comment, knowledge about the subject remains pitifully slight in this country. Politicians and farmer organisations alone have produced sufficient verbiage on the topic to sink the proverbial battleship, but in many cases without any substantial evidence to back their views. To illustrate the point, in December 1965 Mr. McEwen was reported as stressing the need for long term mortgage finance for primary industry.⁵ Considering the same problem, the Committee of Economic Enquiry stated, "We have not made a thorough investigation of this matter, especially as the information available is notoriously deficient".⁶ Again, a little later they state, "It has been represented to us by some primary producer organisations that inadequate credit of suitable kinds is available to the rural sector. -----Because of the lack of adequate information, it is difficult to evaluate these claims".⁷

5. "Pressure mounts for long-term rural finance", The Australian Financial Review, Dec. 13, 1965, p. 1.

6. Commonwealth of Australia, Report of the Committee of Economic Enquiry, I, May, 1965, p. 8.38.

7. Ibid., p. 10.19.

In the academic literature, work orientated towards policy objectives tends to have predominated at the expense of behavioural research, in spite of the fact pointed out by Professor Baker that "substantial research that is behaviourally orientated often is required before a policy-orientated research problem can be formulated for effective investigation".⁸

Like most types of research, work in the field of rural credit has been conducted on both "macro" and "micro" systems. Because this study is based on a survey of individual farms, the following discussion concentrates mainly on the latter, although the aggregate approach will not be ignored. Of the research on "micro" systems which has set out to answer positive questions, most has been fairly unsophisticated and has aimed at providing information on the average level of outstanding debt among a group of farmers, and in some cases this has been sub-classified by various farm or personal characteristics and/or by the sources and uses of this debt. Furthermore, in many of these studies, the enumeration of information about credit has been to varying degrees a subsidiary aim of the investigation. In defence of this approach, it can be argued that credit is only relevant when related to other variables such as investment.

One early study of this type was "A Comparative Survey of

8. C.B. Baker, "Research Orientations and their Implications for Agricultural Economists", paper presented at the Conference of the Australian Agricultural Economics Society, Armidale, Feb. 1967, p. 3. (mimeo).

Economic Conditions in Two Pastoral Areas of South Australia" by A.P. Bailey,⁹ in which some measures of indebtedness were recorded. More recent studies include a drought survey by the Reserve Bank which took a quite comprehensive look at farmers' borrowing practices,¹⁰ several general economic surveys by the B.A.E. which have included some information of debt level,¹¹ and an economic survey of River Murray dairy farms by Jarrett and Penny¹² along similar lines to the B.A.E. studies. A few studies, concentrating largely or exclusively on credit, have provided more detailed information of the same type. Examples include investigations of "Indebtedness in the Dried Vine Fruits Industry" by Edwards,¹³ "The Source and Use of Funds for the Fruit Industry" by Quilkey,¹⁴ and a study by Mallyon which employed comparative analysis to look at several different aspects of farmers' borrowing.¹⁵

9. A.P. Bailey, A Comparative Survey of Economic Conditions in Two Pastoral Areas of South Australia. (Canberra : Bureau of Agricultural Economics, 1952.)

10. Reserve Bank of Australia, A Survey of the Physical and Financial Effects of Drought in Northern N.S.W.

11. For example, D.B. Williams and F.H. Bollman, "Capital Expenditure on Queensland Dairy Farms", Quarterly Review of Agricultural Economics, IX (Oct. 1956), pp. 168ff. ; F.H. Bollman, "Capital Expenditure on Australian Dairy Farms", Quarterly Review of Agricultural Economics, XI (Jan. 1958), pp. 35ff. ; V.G. O'Neill and S.F. Harris, "Some Aspects of the Sheep Industries Capital Account. - A Case Study", Quarterly Review of Agricultural Economics, XVII (Jan. 1964), pp. 24ff.

12. F.G. Jarrett and D.H. Penny, op. cit.

13. G.W. Edwards, "Indebtedness in the Dried Vine Fruits Industry". Quarterly Review of Agricultural Economics, XIX (April 1966).

14. J.J. Quilkey, "The Source and Use of Funds for the Fruit Industry", Proceedings of Bankers' Residential Conference on Fruit in Victoria, (Shepparton, Vict., 1962) pp. 7. 31-7. 49.

15. C.A. Mallyon, "The Structure of Funds on Farming Properties - A Tentative Analysis", Australian Accountant, XXXV (Aug. 1965), pp. 415-21.

Other studies have attempted to answer somewhat more sophisticated questions. For example, Molnar¹⁶ and Gruen¹⁷ have investigated how various factors, including the availability of credit, influence farm development and investment. Taplin, in looking at influence of working capital on farm organisation, used both a linear programming approach and an empirical approach.¹⁸ The latter provided some information on the credit experiences of a group of farmers. Work by Williams, Parish and Bollen included a section on farmers' attitude and expectations about rural credit.¹⁹ All of these studies are characterized by the fact that they relied to a greater or lesser extent on farmers' answers to questions about their experiences of, or attitudes to borrowing. In view of the difficulty in interpreting farmers' answers, especially those dealing with attitudes, satisfactorily, the results of this type of research have to be accepted with a certain amount of caution. One Australian work which has attempted to investigate the adequacy of credit, and compare groups of farms with access to different forms of credit is

16. I. Molnar, op. cit., pp. 51-73.

17. F.H. Gruen, "Wool Prices, Credit Restrictions and Development", pp. 61-73.

18. J.E. Taplin, "Influence of Working Capital on Farm Organisation - How Appropriate is a Linear Programming Analysis", Australian Journal of Agricultural Economics, X (June, 1966), pp. 60-69.

19. D.B. Williams, R. Parish and A.G. Bollen, "Attitudes and Expectations of Wheat Growers in N.S.W.", Review of Marketing and Agricultural Economics, XXI (March 1953), pp. 7-72.

a study by Hefford.²⁰

At the aggregate level, factual data is even scarcer. The main source of information is the much quoted table of "estimated rural debt to specified lenders" published by the Rural Liaison Service of the Reserve Bank of Australia.²¹ However, probably because aggregate data, in contrast to the farm survey data, is available over a considerable time span; Jarrett,²² Jarrett, Dillon and Burley,²³ and Jarrett and Dillon²⁴ have applied some sophisticated techniques in analysing the rural credit market at the "macro" level.

One other important source of information is articles such as the Joseph Fisher Lecture by Crawford,²⁵ "Rural Credit Developments in Australia" by Coombs,²⁶ "The Role of the Development Bank in Rural

20. R.K. Hefford, op. cit.

21. Reserve Bank of Australia, Australian Rural Credit Facilities, p. 12.

22. F.G. Jarrett, "Pastoral Finance Houses and Rural Credit, 1949-50 to 1958-9", Australian Journal of Agricultural Economics, VI (Dec. 1962), pp. 62ff.

23. F.G. Jarrett, J.L. Dillon and H.T. Burley, "Forecasting Outstanding Advances of the Major Trading Banks and Pastoral Finance Companies" Australian Journal of Agricultural Economics, VII (Dec. 1963), pp. 160-171.

24. F.G. Jarrett and J.L. Dillon, "Some Aspects of the Rural Credit Market", Australian Journal of Agricultural Economics, IX (Dec. 1965), pp. 152-168.

25. J.G. Crawford, "Australian Agricultural Policy", Joseph Fisher Lecture, (Adelaide : Hassell Press, 1952).

26. H.C. Coombs, "Rural Credit Developments in Australia.", Australian Journal of Agricultural Economics, III (July 1959), pp. 57-69.

Credit" by McDonald,²⁷ and "Development Loans - Principle and Practice" by Callaghan,²⁸ where the authors, by virtue of their position, were able to make a significant contribution to the body of knowledge on rural credit.

Despite the paucity of the data, however, the literature abounds with a whole range of policy-orientated articles. The report of the Rural Reconstruction Commission,²⁹ and articles by Campbell,³⁰ Dowsett,³¹ Druce,³² Lewis,³³ and Waring,³⁴ are among some of the more useful articles in this group, and also give a comprehensive picture of what are considered to be the problems and solutions to problems in the rural credit market.

27. W.D. McDonald, "The Role of the Development Bank in Rural Credit", Australian Journal of Agricultural Economics, IV (Dec. 1960), pp. 97-105.

28. B. Callaghan, "Development Loans - Principle and Practice", Paper presented at the Conference of the Australian Agricultural Economics Society, Perth, Feb. 1965. (mimeo.)

29. Fifth Report of the Rural Reconstruction Commission - Rural Credit. (Canberra : Government Printing Office, 1945)

30. K.O. Campbell, "Current Agricultural Development and its Implications as regards the Utilization of Resources". Economic Record, (May, 1956), pp. 119-134.

31. C.P. Dowsett, "Some Thoughts on the Farm Credit Supply". Australian Journal of Agricultural Economics, VIII (June 1964), pp. 1-10.

32. P.C. Druce, "Credit Policy for Rural Development" Review of Marketing and Agricultural Economics, XXIV (Dec. 1956) pp. 181ff.

33. J.N. Lewis, "Rural Credit Facilities" Proceedings of the Conference on the Primary Industry Cost-Price Squeeze. (Melbourne, Vic. 1962).

34. E.J. Waring, "Rural Credit", Farm Policy, II (Dec. 1962). pp. 81-86.

It is not proposed to undertake an extensive survey of literature on this subject from other countries, as to do so would involve a disproportionate amount of time. However, a few articles from the U.S.A. have influenced the nature of this study. One such group is typified by the studies by Dickins³⁵ and Bivens, Ball, Liston and Miller³⁶ on the use of credit by farm families. In these reports of surveys, not only is data presented on the levels of different types of debt such as mortgage finance, production credit and consumption credit suitably subclassified by sources and uses, but an attempt is also made to relate levels of indebtedness to various farm and personal characteristics such as farm size, farmer's age, etc. Another article which was influential was the attempt by Hesser and Janssen³⁷ to investigate the extent and causes of capital rationing. Although the same basic approach was used in chapter 7, some modifications were made for reasons which will be discussed later. Finally, a chapter dealing with some theoretical aspects of credit rationing was inspired by a paper by Hodgman,³⁸

35. Dorothy Dickins, Factors Related to the Use of Credit Resources by Farm Families, Mississippi Agricultural Experiment Station Bulletin 658 (Mississippi : Mississippi State University, 1963).

36. G.E. Bivens, A.G. Ball, M.J. Liston and F. Miller, Use of Credit by Farm Families in Southern Iowa and Northern Missouri, Agricultural and Home Economics Experiment Station, Iowa State University Special Report No. 35. (Ames, Iowa : Iowa State University, 1963).

37. L.F. Hesser and M.R. Janssen. Capital Rationing Among Farmers. Purdue University Agricultural Experiment Station Research Bulletin No. 703 (Lafayette, Indiana : Purdue University, 1960).

38. Donald R. Hodgman, "Credit Risk and Credit Rationing", Quarterly Journal of Economics, LXXIV (May, 1960), pp. 258-278.

and subsequent comments by Chase,³⁹ Ryder,⁴⁰ Miller,⁴¹ Catt⁴² and Freimer and Gordon.⁴³

39. Sam. B. Chase Jnr., "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, LXXV (May, 1961), pp. 319-327.

40. Harl. E. Ryder Jnr. "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, LXXVI (Aug. 1962), pp. 471-479.

41. Merton H. Miller, "Further Comment", Quarterly Journal of Economics, LXXVI (Aug. 1962), pp. 480-488.

42. A.J.L. Catt, "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, LXXVII (Aug. 1963), pp. 505-510.

43. Marshall Freimer and Myron J. Gordon, "Why Bankers Ration Credit", Quarterly Journal of Economics, LXXIX (Aug. 1965), pp. 397-416.

CHAPTER 5

FARM INDEBTEDNESS

The scarcity of empirical data on rural debt has already been discussed in chapter four. In this chapter, the results of an attempt to collect information on farmers' borrowing habits in a well established, relatively prosperous wheat-sheep area of South Australia are reported. These results are based on the total sample of fifty-nine farmers.

Methodology

First however, a comment on the method used to calculate the level of outstanding debt is warranted. Several methods are possible, one of the most common being the amount outstanding on a certain date each year, usually the end of the financial year. This method was felt to be unsuitable for measuring overdrafts, where the amount outstanding not only fluctuates, but also usually follows a distinct seasonal pattern. Thus recording debt at a given date is likely to give a biased result. Similar objections apply to measuring the maximum, or minimum amounts outstanding, or even the average of these two measures. An average of debt levels at different times during the year would have been more satisfactory, but was rejected as impractical because of the difficulty in obtaining satisfactory data. Therefore it was decided to capitalize up the annual interest payments using the actual rates of interest charged. This method is particularly appropriate for overdrafts, where interest is calculated on the daily balance outstanding, but like all methods has its disadvantages.

The first of these is the possibility of overlooking interest free loans, and also the possibility of errors in the amount of interest recorded in tax returns. To try and overcome these problems, data on all sources of debt was obtained from the farmer independently of that obtained from tax returns, and used as a check to make sure no credit sources had been overlooked. Levels of outstanding debt at the beginning and end of each financial year were also collected as a rough check on the amounts of interest paid. Because farmers' knowledge about loans obtained was not always completely accurate,¹ a further cross-check was made in cases of loans from institutional sources by interviewing the relevant lender.

In cases where no interest was charged, capitalization of interest payments is obviously useless, and the average of outstanding debt at the beginning and end of the year had to be used. Fortunately, this approximation was quite satisfactory in most cases, as the amount borrowed rarely varied on this type of loan.

However, short term loans of about one month or less on which no interest was charged, such as monthly store accounts, were ignored because of the difficulty of collecting accurate data. To the extent that farmers used this form of credit, debt levels are underestimated, and this may be of some importance with regard to loans from pastoral finance companies where interest is not always charged on very short-term debts.

1. See below, chapter 7.

The interest rate charged was also cross-checked with the lender, as relatively small errors in the rate used to capitalize interest payments can cause large errors in the estimate of debt levels.

A problem which was not as easy to overcome arose in cases where a loan was obtained so late in the financial year that the first interest payment did not fall due to the following year, resulting in all of the debt being recorded in the latter period rather than a fraction in the earlier year. In most cases, the errors involved were small, and were ignored; but where large discrepancies arose adjustments were made by dividing the interest payment up on a time basis using information obtained from the farmer about the date on which the loan was obtained. Although some errors undoubtedly remain, the advantages of the technique used were felt to outweigh any such disadvantages.

Debt Levels

Of the 59 farmers in the survey, 17 farmers (29 per cent) were debt free during the three years covered in the survey. A further 11 farmers (19 per cent) were debt free for part of the survey period. The 42 farmers who had borrowed had an average outstanding debt of \$9496 during the period from 1st July 1961 to 30 June 1964, with a range from as little as a few dollars to in excess of \$60,000. The position varied only slightly from year to year, with \$9528, \$9534 and \$9428 being owed on average during 1961/2, 1962/3 and 1963/4 respectively.

Averages, however, are at best uninformative, and at worst positively misleading. Therefore, as far as is possible within the limits set by the need to preserve the confidential nature of the information supplied by individual farmers, the averages are broken down into various classifications in the following discussion.

In table 4, farmers' borrowings are classified by the number of loans per farm. The average number of loans per farm was approximately 2, but ranged as high as 9 loans for a single farm. The fifteen farmers who had used only one source of credit were further subdivided into two groups. The reason for this division was to separate those farmers who had borrowed to increase the amount of capital assets they controlled (group 1b) from those farmers where the loan was more than offset by positive balances in other accounts (group 1a). In most cases, "loans" in the latter group only arose as a result of the financial transactions of the farm being kept separate from those of the household.

One interesting fact that emerges from table 4 is that as the number of loans increased, the average debt per farm tended to increase and the farmer's equity tended to fall; while the average loan size stayed relatively constant at between \$3,000 and \$5,000. This suggests that the amount a particular borrower can obtain from any one lender is limited to a relatively small proportion of his total borrowing potential. The implications of this finding will be discussed later.

TABLE 4

Debt Classified by No. of Loans
Average Values for the 3 Years 1961/2 to 1963/4

No. Loans per farm	No. Farms		Total no. Loans		Total Debt		Debt per Farm (\$'s)			Debt per Loan (\$'s)			Av. % Equity on 30/6/64	
	No.	%	No.	%	\$'s	%	Av.	Min.	Max	Av.	Min.	Max		
0	17	28.8	0	0	0	0	0	0	0	0	0	0	100	
1	a	8	13.5	8	7.5	7254	1.8	907	144	2856	907	144	2,856	99
	b	7	11.9	7	6.6	26118	6.6	3731	482	9140	3731	482	9,140	93
2	10	17.0	20	18.9	60292	15.1	6029	1270	12880	3015	114	10,502	94	
3	7	11.9	21	19.8	111402	27.9	15915	3848	35718	5305	36	28,876	88	
4	4	6.8	16	15.1	47166	11.8	11792	1558	18858	2948	34	17,000	81	
5 & over ^c	6	10.1	34	32.1	146638	36.8	24440	5898	63602	4313	62	24,000	83	
TOTAL	59	100	106	100	398870	100								
AVERAGE							9496			3763				

^a Loans for this group of farms were very small both absolutely and relative to holdings of liquid assets such as bank deposits.

^b Outstanding debt in excess of holdings of liquid assets.

^c Includes five farms with five loans each, and one with nine loans.

Credit Sources

The sample farmers borrowed from a wide variety of sources, with loans for developmental purposes from the Commonwealth Development Bank being the only notable source which was not used. A complete list of credit sources with the terms and conditions of the different types of loans is included in appendix 3.

In table 5, debt is classified by sources of loan. Where possible similar types of loans have been grouped into a single category in order to simplify the presentation. Thus overdrafts from the Commonwealth Trading Bank and the State Bank of S.A. as well as from the commercial trading banks are included in the category of "Overdrafts". "Long Term Loans" includes credit obtained from the Savings Bank of S.A. and loans made by the State Bank of S.A. under the State Advances Act; while loans made from funds held in trust by insurance companies, trading banks and other bodies are grouped together under the heading of "Trust Fund Loans".

The results agree with the generally accepted view that trading banks are the most important source of rural credit. Overdrafts accounted for just over 30 per cent of all loans and for nearly 37 per cent of total indebtedness, while trading bank term loans make up an additional 3.8 per cent of loans and 3.3 per cent of indebtedness. Furthermore, if loans from trading banks' provident funds, which in table 5 are an element of trust fund loans, are included in loans from trading banks, then nearly 42 per cent of rural debt was borrowed from this single source. Long term loans from other banks

TABLE 5

Debt Classified by Source of Loan
Average Values for the 3 Years, 1961/2 to 1963/4

Source	No. Farms	No. Loans		Total Debt		Av. Debt per farm (\$'s)	Av. Debt per loan (\$'s)
		No.	%	\$'s	%		
Overdraft	32	32	30.2	147,292	36.9	4,603	4,603
Private Individuals	8	10	9.4	71,990	18.0	8,999	7,199
Trust Fund Loans	6	6	5.7	58,256	14.6	9,709	9,709
Long Term Loans	6	6	5.7	54,924	13.8	9,154	9,154
Relatives Pastoral	7	8	7.5	20,892	5.2	2,985	2,612
Finance Cos. Trading Bank	21	21	19.8	19,630	4.9	935	935
Term Loans	4	4	3.8	13,180	3.3	3,295	3,295
Dept. of Lands	2	2	1.9	7,032	1.8	3,516	3,516
Development Bank	7	7	6.6	2,564	0.6	366	366
Life Policy Loans	5	5	4.7	1,466	0.4	293	293
Trade Credit	3	3	2.8	984	0.3	328	328
Hire Purchase	2	2	1.9	660	0.2	330	330
TOTAL	42	106	100.0	398,870	100.0		
AVERAGE						9496	3763

contributed an additional 13.8 per cent of total indebtedness. Individuals, including mainly vendors of land and relatives, are the next most important group of lenders, and supply 23.2 per cent of farmers' external funds. The only other major providers of funds were the insurance companies (11.1 per cent of total debt) and the pastoral finance companies (4.9 per cent). Credit from the former group included both loans from trust funds and advances made against the collateral of life insurance policies.

The most important suppliers of credit also tended to be the lenders who on average made the largest loans. Thus loans from the first four sources of credit in table 5 made up only 51 per cent of loans, and yet provided over 83 per cent of the total amount borrowed. Loans from trust funds, and long term loans from the Savings Bank of S.A. and the State Bank of S.A. were on average the largest made. However, loans from these two sources were mainly used to purchase land, and although the average size of overdrafts and loans from private individuals were somewhat smaller, the average size of loans from these latter two sources for land purchase was roughly comparable to loans from the other two most important sources of credit. For most loans from these four sources, a first mortgage on land was required as collateral. In contrast, stock mortgages or liens on the wool clip were used to secure loans from the pastoral finance companies, who made a large number of loans (20 per cent), but of relatively small amounts. Loans on life policies, Development Bank loans, trade credit and hire purchase agreements fall into a similar

category inasmuch as a mortgage on land was not required as security and the amount of debt per loan was very small.

The only breakdown of rural debt by sources at the aggregate level is the table of Estimated Rural Debt to Specified Lenders published by the Reserve Bank.² However, these figures do not include hire purchase and trade credit debt, nor do they include non-institutional debt, of which loans from relatives and other private individuals are the most important sources. On the basis of results obtained in this study, it would appear that the Reserve Bank figures only account for about 75 per cent of total rural indebtedness. This estimate is supported by results of a drought survey carried out by the Reserve Bank in Northern New South Wales,³ and of a credit survey of producers in the South East and Southern Hills of South Australia by Hefford.⁴ Indebtedness to sources not included in the aggregate figures ranged from 20 to 30 per cent in these two studies. However, in a similar study by Mallyon in the Riverina⁵ the non-institutional sources accounted for nearly 70 per cent of indebtedness. It appears from the article that older

2. Reserve Bank of Australia, Australian Rural Credit Facilities, p. 12.

3. Reserve Bank of Australia, A Survey of the Physical and Financial Effects of Drought in Northern New South Wales, p. 38.

4. Hefford, op. cit.

5. Mallyon, op. cit.

producers in the area tended to sell their properties to other members of the family on mortgage rather than forming father-son or similar types of family partnership common in other areas.

If the major institutional sources of credit only are considered, the relative importance of the various lenders found in this study are remarkably similar to those in the aggregate figures and the other studies cited. Trading banks are the most important source of credit in all studies accounting for between 40 to 60 per cent of total indebtedness to the lenders specified in the aggregate figures. Although the relative importance of all lenders varied somewhat from study to study, only two seem worth commenting on. These are the very low proportions of external funds borrowed by farmers in this study from the Development Bank and the pastoral finance companies when compared with the aggregate figures. The former can be dismissed without further ado, as the reasons for it have already been discussed above.

On the other hand, the relatively small amounts borrowed from the pastoral finance companies (7 per cent) presents a much more interesting case. Probably, the most important reason for this low proportion of debt is the practice used by the pastoral finance companies of obtaining a stock mortgage or lien on the wool clip as security for a loan. Thus, the amount borrowed from this source tends to be related to the relative and absolute importance of livestock enterprises, and in particular sheep in an area.⁶ This

6. In the area studied, wool receipts equal less than one third of all farm produce receipts.

hypothesis can be supported by reference to the Reserve Bank drought study, and to Hefford's study. In the drought survey, if the sample is divided into a region containing mainly wool growers and another region in which about 50 per cent of the producers operate wheat-sheep farms, then pastoral finance companies account for over 20 per cent of institutional indebtedness in the former region, but only about 11 per cent in the latter. Similarly, in Hefford's study, producers in the South East were more important producers of wool in both relative and absolute terms than those in the Southern Hills, and borrowed 15 per cent of their outstanding debt from pastoral finance companies as against 8 per cent in the latter area. In fact, the cases above are excellent examples of the interaction between lender and area on debt levels found by Baker and Irwin in a study in the United States.⁷

Credit Uses

In this section, an attempt is made to classify loans by the purpose for which they were used. However, the results presented below have to be interpreted with a degree of caution for two reasons. The first relates to the fact that once a farmer has obtained a loan for a given purpose, he will often tend to finance additional or different types of expenditure with the additional funds generated rather than repay the loan. If the process continues

7. C.B. Baker and G.D. Irwin, Effects of Borrowing from Commercial Lenders on Farm Organisation, University of Illinois Agricultural Experiment Station Bulletin 671 (Urbana, Illinois ; University of Illinois, 1961.)

long enough, the situation might eventually be reached where the loan is effectively financing an entirely different type of expenditure from that for which it was originally borrowed. This type of situation is especially common with overdrafts where there is no fixed repayment schedule. Because this problem could not be solved satisfactorily, the original reason for borrowing was used unless clear-cut evidence was available that the loan was subsequently used to finance a different type of expenditure.

Secondly, the stated purpose for borrowing in a loan application may not always be the real reason for seeking credit; where the latter is the item of expenditure which would not be undertaken if the application were rejected. The reason why this situation might arise is that for certain lenders, and to a lesser extent for lenders in general, a loan is not only more likely to be granted for some purposes than others, but it is also possible to obtain larger amounts. Therefore, because any loan adds generally to the pool of funds available for various types of expenditure, it will be natural for a farmer to nominate as the purpose of the loan the type of expenditure out of those planned which he considers will give the application the best chance of success. However, just because financing one type of expenditure with external funds may make it possible to increase other types of expenditure from internal funds does not imply that credit is completely fluid or non-specialized. As Baker and Irwin point out, borrowing for some purposes such as the purchase of land will create new borrowing power, and hence erode

equity less than other types of borrowing such as augmenting the supply of working capital.⁸ It is therefore very important to know the real reason why farmers obtain credit. On the other hand, because the real reason for applying for a loan can only be objectively determined if the application is rejected, the classification of loans by purpose presented below had to be based on the nominal purpose for which the loan was used.

Loan purposes were divided into four main groups. Land purchase loans are self explanatory, but production loans were used to buy plant and machinery with one exception where funds were borrowed to build a shed. Working capital loans were used to finance purchase of livestock as well as annual inputs such as fertilizers, while loans for consumption were used mainly to build houses or purchase automobiles. In addition, it was not possible to classify two loans. The classification of debt by purpose is set out in table 6.

Of the 40 farmers for whom it was possible to classify debt by purpose, 62.5 per cent had borrowed an average amount of \$12,807 to purchase land, while a similar proportion (65 per cent) had used on average \$1667 of external funds as working capital. Production credit and consumer credit were less popular, the former being used by only 22.5 per cent of the 40 producers, and the latter by 20 per cent. The average amount borrowed for these two purposes was \$811 and \$2813 respectively.

8. Baker and Irwin, op. cit.

Only two farmers, (5 per cent) were using credit for all four purposes. Four farmers (10 per cent) were using three types of credit. Use of external funds as working capital was the only purpose common to the three different combinations of types of credit used by these four producers. Thirteen farmers (32.5 per cent) had various combinations of two types of debt still outstanding. The most important combination of uses was loans for land purchase and to augment working capital (8 farmers), while a combination of loans for working capital and consumption was also quite important (3 farmers). Twenty one producers (52.5 per cent) were using only one type of credit. Credit solely for land purchase was used by nine farmers (22.5 per cent), and the same number were only using working capital credit. Only three farmers (7.5 per cent) used credit exclusively for production purposes, while no one used consumer credit by itself.

It is significant that loans to purchase land, which create the most pledgeable form of new assets and hence increase borrowing power most, accounted for over 80 per cent of outstanding debt. The fact that the average size of loans for this purpose was larger than for any other is no doubt due mainly to the large outlays necessary to buy most lots of land coming onto the market; but could also be due in part to lenders being willing to make larger amounts available for this purpose. Most assets created by consumer credit (i.e. houses and cars), although less pledgeable than land, also provided some security for the lender, a fact which could be important in

TABLE 6 Debt classified by purpose of loan
Average values for the 3 years, 1961/2 to 1963/4

Purpose	No. Farms	No. Loans		Total Debt		Av. Debt per Farm (\$'s)	Av. Debt per Loan (\$'s)
		No.	%	\$'s	%		
Land Purchase	25	48	45.3	320,168	80.3	12,807	6,670
Working Capital	26	34	32.1	43,346	10.9	1,667	1,275
Production	9	12	11.3	7,296	1.8	811	608
Consumption	8	10	9.4	22,504	5.6	2,813	2,250
Unclassified	2	2	1.9	5,556	1.4	2,778	2,778
TOTAL	42	106	100.0	398,870	100.0		
Av.						9,496	3,763

67.

explaining why lenders were prepared to make relatively large loans available for non-productive purposes. On this basis, it is not as easy to see why lenders were prepared to make nearly 11 per cent of borrowed funds available for use as working capital, which at first sight does not appear to create any pledgeable assets. However, a significant proportion of this type of loan was provided by pastoral finance companies to purchase livestock, which were a pledgeable asset as a stock mortgage was usually used to secure the loan. Furthermore, although annual inputs such as fertilizer to topdress pastures do not create new pledgeable assets, it can increase the size of a pledgeable asset where a lien is taken out over the wool clip. If lenders were to take out liens over the wheat crop as well, a further increase in the importance of working capital loans might well occur.

Finally, the very small proportion of loans for production purposes possibly reflects the fact that the assets created are not very pledgeable. Although hire purchase contracts use the machinery purchased as security, the relatively rapid rate at which the value of farm machinery depreciates detracts from their value as collateral for the loan. Of even more significance, virtually all production loans were made for the purchase of trucks or tractors, probably the most saleable of all items of farm plant and machinery. On the other hand, loans for buildings, fencing and other types of farm improvements were virtually non-existent. Although it could be argued that this was due to the established and well developed nature of the area, these items of expenditure still made up a significant

proportion of total investment on farms in the survey.

The Interaction between Sources and Uses

As mentioned above, it is easier to obtain credit for some uses than others from a particular source. Conversely, it is also true that it is easier to obtain credit from some sources than others for a given use. These aspects are illustrated in tables 7 and 8.

From table 7 it can be seen that overdrafts are the most important source accounting for 38 per cent of the credit used to purchase land. Finance from private individuals (19.1 per cent), trust fund loans (18.2 per cent) and long term loans (15.5 per cent) are also very important, while loans from relatives (5.7 per cent) is the only other source which supplies a significant amount of funds for this purpose. A comparison of the first and last columns in table 7, reveals that supply of credit to purchase land dominates the overall pattern of credit supply from different sources.

In contrast to the above position, the supply of credit for working capital is dominated by two sources. Overdrafts were the most important source for this purpose, supplying over 57 per cent of outstanding debt. Pastoral finance companies were the other important source, and although they made over 58 per cent of the loans, only 39 per cent of funds for working capital were borrowed from this source.

The Commonwealth Development Bank (35.1 per cent), relatives (28.8 per cent) and term loans from the trading banks (26.4 per cent) provided most of the funds used for production purposes, while a much

smaller amount (9.7 per cent) was financed by way of overdrafts. The main sources of consumer credit were private individuals (35.6 per cent), term loans from the trading banks (32.7 per cent) and long term loans (23.2 per cent). However, these three sources only made 30 per cent of the loans for consumption purposes, as against 40 per cent of loans made by trade credit and hire purchase sources. The latter were not important sources of credit however, as only very small amounts per loan were involved.

Table 8 demonstrates the way in which most credit sources lend most of their funds for one or two purposes. Trading banks are probably the most interesting group of lenders, both because they are the most important source of credit and also because their method of lending is not as simple as some other sources. For example, overdrafts were used mainly to finance the purchase of land, and to a lesser extent as working capital, while term loans, with their less flexible schedule of repayments, were used to finance home building, farm structures and the purchase of plant and machinery, as well as augmenting loans to purchase land. Because assets created by loans for the latter group of purposes are not as readily pledgeable as assets created by overdrafts, term loans would appear to be used for more "risky" purposes than overdrafts. No doubt the banks have very good reasons for adopting this procedure, but in the absence of more information it is only possible to hazard guesses at what the reasons might be. One reason might be that bankers regard a fixed schedule of repayments as more suited to a "risky" loan than the extremely flexible method of repaying overdrafts. Alternatively,

TABLE 8

The relative importance of different uses of
credit from each source.

Average values for the 3 years 1961/2 to 1963/4

Purpose Source		Land Purchase	Working Capital	Production	Consumption	Unclassified	TOTAL
	% of Value	82.4	16.8	0.5	0.3	0.0	100
Overdraft	% of Loans	59.4	31.3	6.2	3.1	0.0	100
Private	% of Value	85.0	0.0	0.0	11.1	3.9	100
Individuals	% of Loans	80.0	0.0	0.0	10.0	10.0	100
Trust Fund	% of Value	100.0	0.0	0.0	0.0	0.0	100
Loans	% of Loans	100.0	0.0	0.0	0.0	0.0	100
Long Term	% of Value	90.5	0.0	0.0	9.5	0.0	100
Loans	% of Loans	83.3	0.0	0.0	16.7	0.0	100
Relatives	% of Value	87.8	0.0	10.0	2.2	0.0	100
	% of Loans	62.5	0.0	25.0	12.5	0.0	100
Pastoral Finance	% of Value	0.0	86.0	0.0	0.0	14.0	100
Companies	% of Loans	0.0	95.2	0.0	0.0	4.8	100
Trading Bank	% of Value	29.5	0.0	14.6	55.9	0.0	100
Term Loans	% of Loans	50.0	0.0	25.0	25.0	0.0	100
Dept.	% of Value	100.0	0.0	0.0	0.0	0.0	100
Lands	% of Loans	100.0	0.0	0.0	0.0	0.0	100
Development	% of Value	0.0	0.0	100.0	0.0	0.0	100
Bank	% of Loans	0.0	0.0	100.0	0.0	0.0	100
Life Policy	% of Value	27.4	65.8	0.0	6.8	0.0	100
Loans	% of Loans	20.0	60.0	0.0	20.0	0.0	100
Trade Credit	% of Value	0.0	72.0	0.0	28.0	0.0	100
	% of Loans	0.0	33.3	0.0	66.7	0.0	100
Hire	% of Value	0.0	0.0	0.0	100.0	0.0	100
Purchase	% of Loans	0.0	0.0	0.0	100.0	0.0	100
All sources	% of Value	80.3	10.9	1.8	5.6	1.4	100
	% of Loans	45.3	32.1	11.3	9.4	1.9	100

bankers might not wish to use term loans for the more traditional purposes of land purchase and working capital because term loans were extended to augment existing credit facilities.

Loans from private individuals, trust funds, state savings and trading banks, government departments and relatives were all used largely or exclusively to finance the purchase of land. For nearly all of these lenders a high degree of security is essential, which probably explains why they have restricted their activities to loans for the purchase of land.

In contrast to the cases discussed above, loans from the pastoral finance companies were used overwhelmingly as working capital. Although working capital loans can create, or at least increase the value of pledgeable assets in the manner outlined above, they are still more "risky" than real estate loans. Perhaps to offset this extra risk, pastoral finance company loans were almost invariably of a short-term nature, the usual arrangement being for the loan to be liquidated annually.

It is significant that the Development Bank loans enumerated in this study were all of a hire purchase nature used to purchase plant and machinery, while loans for developmental purposes were not found. Because considerable potential for developmental activities such as pasture improvement, fencing and water and soil conservation still existed in the area, it can only be concluded that producers were able to obtain on reasonable and suitable terms and conditions all of the finance they required from other sources. This in turn

implies that external capital rationing was not prevalent in the area studied. In contrast to the Development Bank which only charged 8 $\frac{1}{2}$ -9 per cent simple interest on its hire purchase contracts, commercial sources of hire purchase debt charged about 6 per cent flat, and were only used by producers to finance purchases of automobiles, a field not covered by the former source.

Insurance company loans based on life policies are an exception to most other forms of credit inasmuch as the lender is not concerned with the use made of the loan. Hence credit from this source was used for all purposes except production, and with a larger sample it is quite possible loans for all purposes would have been enumerated. The freedom from restrictions on the use made of credit from this source arises from the fact that repayment is guaranteed by the use of the surrender value of the policy as security for the loan. Trade credit covered a heterogeneous group of lenders who supplied working capital and consumer credit, and about whom no generalization could be made.

Factors Related to Farm Indebtedness

From time to time, it has been suggested that the use of credit by farmers is associated with various personal and farm characteristics.⁹ To test these suggestions, the following hypotheses were set up:-

(1) That linear relationships **exist** between the amount borrowed and the following variables:-

9. For example, see Bivens et. al., op. cit., and Dickins, op. cit.

- (a) Age of farmer
- (b) Family size
- (c) Years spent farming
- (d) Level of formal education
- (e) Level of informal education
- (f) Knowledge of credit sources
- (g) Number of loans used
- (h) Farm acreage
- (i) Value of all assets owned by farmer
- (j) Net worth
- (k) Average income

However it has been postulated that the relationship between indebtedness and age will be curvilinear rather than linear, because it is only in the middle stages of the family life cycle that a farmer will be willing and able to borrow substantial amounts of credit. Prior to this stage, his ability to borrow will be limited, while in his later years, he will be unwilling to borrow.¹⁰ Therefore, another hypothesis was framed as follows:-

(2) That the average amounts borrowed by farmers in the following three age groups are significantly different.

- (i) less than or equal to 46 years of age.
- (ii) 47 to 59 years of age inclusive.
- (iii) greater than or equal to 60 years of age.

Because scale relationships might produce spurious correlations between the absolute level of debt and certain other variables such as farm acreage, it seemed necessary to include another indicator of farmers' borrowing performance. The variable chosen, hereafter referred to as the debt ratio, was the absolute level of debt expressed as a proportion of an estimate of the maximum amount of credit available to the producer. Derivation of this latter estimate

10. Heady, Back and Peterson, op. cit., p. 384.

was based on the security requirements of lenders, and is outlined in more detail below. Hence the final set of hypotheses to be tested was:-

(3) That linear relationships exist between the debt ratio and the eleven variables (a) to (k) listed above.

Most of the variables are self explanatory, but the following deserve some comment. A numerical value for level of formal education was obtained by crediting each farmer with one point for every year spent in an institution of learning. However, the fact that many farmers are largely self-educated will not be reflected in such a score. Consequently, a second education index, called informal education, was devised by awarding points for membership in agricultural and community orientated organisations, subscription to agricultural publications, and use of advisory and information services. Similarly, a measure of knowledge of credit sources was arrived at by scoring points for the number of credit sources and the costs, terms and conditions attaching to different types of loans that the producer was aware of. The assumptions used to calculate asset values are set out in appendix 4.

A correlation matrix including the amount borrowed and the debt ratio as well as the variables (a) to (k) was used to test hypotheses (1) and (3) above. Only three variables proved to be significantly correlated¹¹ with the absolute amount borrowed. The relationship between level of indebtedness and farm acreage, although

11. At the 5 per cent probability level.

highly significant, proved to be an artefact due to scale effects, as the correlation between farm acreage and the debt ratio was not significant. In fact, variability in the former explained less than 3.5 per cent of the variability in the latter. Knowledge of credit sources was also correlated with the absolute level of debt, but not with the debt ratio. However, variability in credit knowledge only explained a relatively small amount of the variability in absolute debt and the debt ratio (i.e. 14 per cent and 4 per cent respectively). On the other hand, number of loans used was not only significantly related to both the absolute level of debt and the debt ratio, but also was more highly correlated with the latter than the former. This tends to confirm an earlier observation that a farmer must diversify his borrowing practices if he is to tap all of the credit potentially available to him. No other variables were significantly correlated with the debt ratio.

A t test was used to test the hypothesis that the average amounts borrowed by young, middle-aged and old farmers were significantly different. Average debt levels for the three groups were \$7655, \$9996 and \$2788 respectively, but the differences, although appreciable, were not statistically significant at the five per cent probability level.

Probably the main conclusion to be drawn from these results is that credit is a complicated subject to study, and hence is not amenable to the simple type of analysis attempted above. The degree of correlation between the number of loans used and the

amount borrowed may have important implications for extension work however, especially in view of the limited knowledge most producers have about different credit sources, as improving the latter could prove to be a necessary condition for the adoption of new technology financed by external funds.

CHAPTER 6

CREDIT THEORY

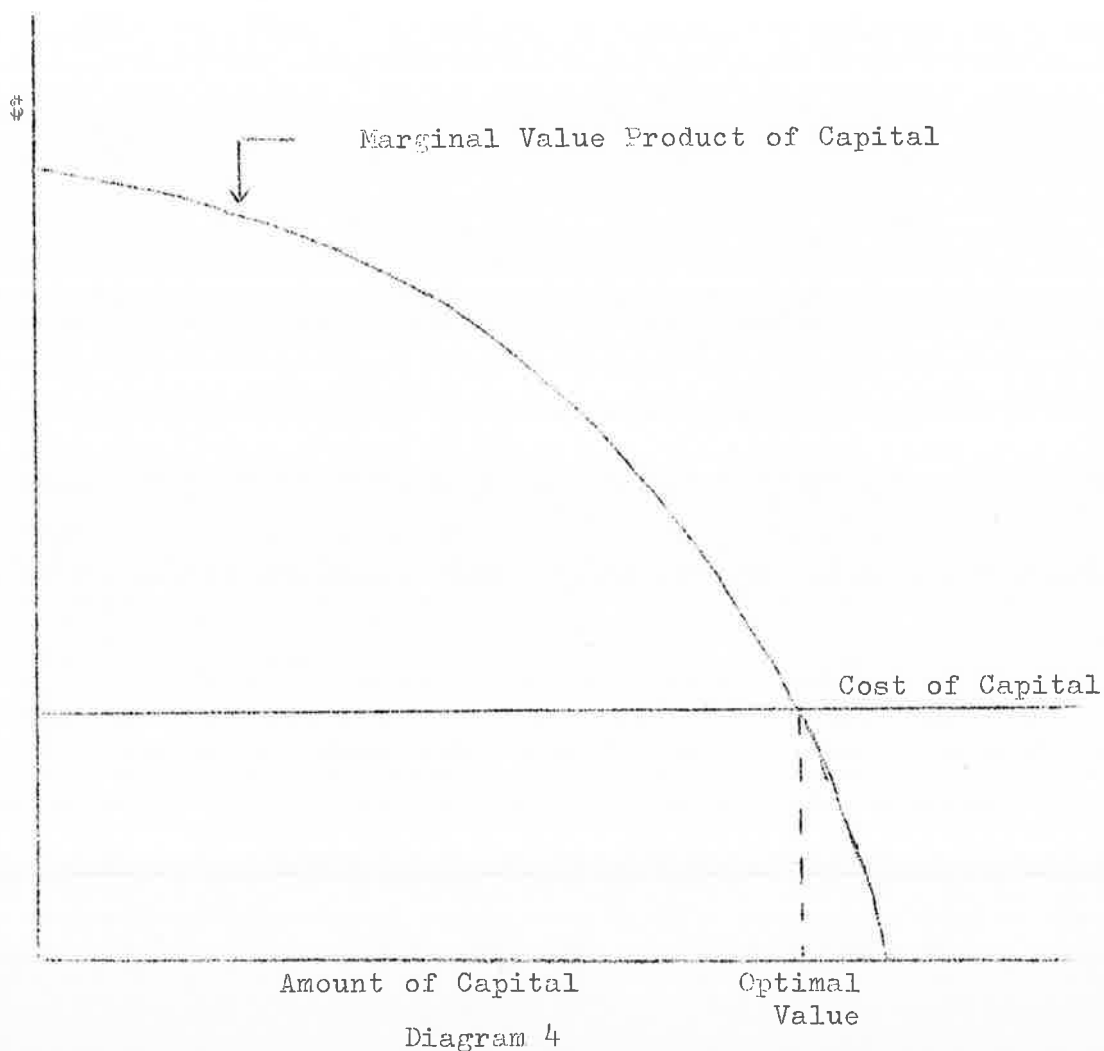
Introduction

The theory of credit at the micro level has evolved mainly from the traditional value theory of the firm, and consequently has inherited many of the deficiencies of the latter, especially those arising from the assumption of perfect knowledge. Subsequently, credit theory has been modified in an attempt to allow for uncertainty, but only in an abstract way, with the result that credit theory is often inappropriate or not applicable in an empirical study. No doubt this has been part of the reason why most credit studies at the farm level have been descriptive rather than analytical in nature. In this chapter, some of the theory on credit is reviewed in an attempt to establish a theoretical framework on which an analysis of availability and adequacy of credit can be based.

Under the assumptions made in the theory of perfect competition, capital¹ is available to the individual firm at constant cost, and without limit. Thus the supply of capital curve is completely interest elastic. If the supply of all resources is assumed to be unlimited, then constant returns to capital will ensue, and farm size will be indeterminate. To allow the optimum size of the firm to be defined, at least in theory, the management input was commonly assumed to be a fixed factor of production. Hence

1. Where capital is defined to include the value of real estate, livestock and working capital in addition to the more traditional forms of fixed capital such as plant and machinery and fixed farm improvements.

diminishing returns to capital will set in as the level of the capital input is raised, and the optimum value of capital input is the point where the demand for capital curve (i.e. the marginal value product of capital schedule) intersects with the supply of capital curve. This type of situation is represented in diagram four.



Empirical Evidence

On the other hand, empirical evidence suggests that at least some of the assumptions on which the theory of perfect competition is founded are unrealistic. To take one example, the fact that a wide range of farm sizes² exist side by side in all forms of agriculture would seem to imply that either there is no unique optimum farm size, or that nearly all farms are sub-optimal, or a combination of both. Among others, Heady has presented a forceful argument for the case "that an optimum size of farm exists for each individual".³ Basically he argues that because of uncertainty, management will become a limiting factor as the scale of farm operations increases. Furthermore, there will be wide variations in the level of the managerial input, and hence in the shape of the marginal value product schedule between agricultural firms. Therefore, it should be obvious from diagram four that the optimum level of capital inputs has no unique value, but rather is related to the managerial ability of the farmer.

Some empirical support for this point of view can be adduced from the existence of a significant number of farms of various sizes on which the operator is not only debt free but also "satisfied" in the sense that he is not trying to increase his scale of operations, and is therefore at an optimal position in at least the utility

2. In this case farm size refers to the value of capital inputs employed on the farm. The statement remains valid, however, no matter how farm size is defined.

3. Earl O. Heady, Economics of Agricultural Production and Resource Use, (New York : Prentice Hall, 1952) p. 537.

maximizing sense.

On the other hand, there is also quite strong evidence that many farm sizes are sub-optimal. In line with the last argument above, it seems almost tautological that any rational farmer who is striving to increase his scale of operations is operating at a level below the optimum. The fact then, that any rural population includes a significant proportion of operators in this category suggests that the second proposition is also quite important. Production function studies also lend weighty support to this point of view, as they almost invariably report that the marginal revenue of most inputs exceeds their marginal cost.⁴ Therefore the proposition is made, and accepted without further proof, that although no unique optimum farm size exists, all sectors of agriculture include at least a proportion of operators whose level of operations is sub-optimal.

Internal Capital Rationing

It is of course the latter half of this proposition, and in particular the reasons for it, that are relevant to this study. Two explanations for the apparent reluctance of farmers to equate the marginal cost of capital with its marginal revenue are now generally accepted. Both recognise that capital is neither homogeneous nor available without limit as is assumed in the theory of perfect

4. Examples quoted in Earl O. Heady and John L. Dillon Agricultural Production Functions (Ames : Iowa State University Press, 1961) p. 602 include a dairying study in South Australia in which the ratio of marginal returns to opportunity costs was greater than unity for inputs of land, capital services, supplementary feed and agistment, but less than unity for labour; and a sheep study in N.S.W. in which the above ratio was greater than unity for labour and capital services, but less than unity for land.

competition. In 1939 Kalecki developed the "principle of increasing risk", and in doing so gave explicit recognition to the need to distinguish between internally generated capital and borrowed funds.⁵ Basically, this principle shows that to raise the level of capital inputs beyond a certain limit, the producer will have to resort to the use of external funds, and in doing so will increasingly expose his equity. For example, the percentage variation in equity resulting from a change in the price of assets will be greater for a farmer who has borrowed than one whose position of equity is identical, but who is debt free. Because borrowing involves additional risk, it will be logical for producers to restrict the amount of credit they use, and hence the amount of the capital input to a level which is commensurate with the degree of risk they are prepared to accept.⁶ This type of reaction is referred to as internal capital rationing or risk aversion.

External Capital Rationing

One year later, Schultz advanced the concept of external capital rationing, or more simply capital rationing.⁷ This concept postulates that capital, and specifically credit, is often rationed. Thus "if a farmer is not allowed to purchase the use of as much

5. Michal Kalecki, Essays in the Theory of Economic Fluctuations (London : Irwin Ltd., 1939) pp. 95-106.

6. In a utility maximizing sense, this reaction probably results in an optimal solution. However, for the purposes of the ensuing discussion it is treated as being sub-optimal as marginal revenue is not equated with marginal cost.

7. T.W. Schultz, "Capital Rationing, Uncertainty and Tenancy Reform", Journal of Political Economy XLVlll (1940) pp. 309-324.

capital as is necessary to permit him to add resources up to the point where marginal cost equals marginal revenue, ... the farm is kept below its best combination of resources".⁸

The proposition then is quite simple. If the reason for sub-optimal farm size is lender imposed restraints on credit availability, then capital rationing is involved, but if the borrower is unwilling to use available credit to increase capital inputs to an optimal level, then it is a case of risk aversion. Obviously, external capital rationing not only implies that the supply of capital curve is not completely elastic as in diagram four, but also that it becomes completely inelastic at a finite level of capital input. Before discussing the shape of this curve from a theoretical viewpoint however, it is necessary to disaggregate the supply schedule into its component parts.

The Supply of Capital

Basically, capital can be supplied from either internal or external sources. The latter can be further broken down into the individual supply of credit schedules from different lenders. Although internally supplied or equity capital can also come from different sources it is usually treated as having come from an homogeneous source.

The supply of capital from each source, whether internal or external, will be distinguished by three characteristics. These are the cost of the capital, usually expressed as an annual rate of interest; the limit, if any, to the amount of capital that is

8. Ibid., p. 313.

supplied; and the limit, if any, to the time for which the capital is made available.

The main feature distinguishing equity capital is that it is available indefinitely. Theoretically, it is also available without limit, but this proposition is doubtful even where firms have access to the share market. In the case of the great majority of agricultural firms which are organised as a proprietorship or simple partnership, the supply of equity capital has a very definite finite limit, as the principal ways of obtaining it are "patrimony, matrimony and parsimony".⁹ The supply of equity capital in theory is equal to its opportunity cost. However, the fact that farmers tend to resort to credit only when the supply of internally generated funds is exhausted, even in the rare cases where the cost of the loan is apparently less than the opportunity cost of equity capital, suggests that farmers discount the latter in some manner.¹⁰

Obviously, if operators do discount the opportunity cost of equity capital to a rate of interest less than the lowest rate of interest charged on external funds, then the supply of capital cannot be perfectly elastic. It will however, be completely elastic up to the finite limit of the supply of equity capital, at which point a discontinuity will occur. Beyond this point, the shape of the rest of the supply of capital curve, henceforth referred to as the aggregate supply of credit curve, will depend on what terms different

9. K.O. Campbell, op. cit., p. 132

10. For further discussion of this point, see Chapter 7.

lenders are prepared to supply credit.

In any situation where there is an atomistic market structure, the supply of most inputs to an individual firm will be perfectly elastic. However, capital differs from most other inputs in that the price is paid over a considerable period of time, rather than at the time of acquisition of the input. Therefore the final price the lender will receive for supplying capital in the world of imperfect knowledge will be uncertain at the time the service is provided. Consequently, there also is a degree of risk for the lender associated with a loan, and furthermore, this risk will increase as the size of the loan increases. Faced with this situation, the lender can react in one of two ways. The first is to lend at a constant rate of interest, but at the same time set a finite limit to the amount he is prepared to lend to any one borrower in order to keep the risk below some acceptable level. This type of reaction is commonly referred to as credit rationing. The alternative, known as interest rationing, is to increase the cost (i.e. the rate of interest) of the loan as the size of the loan increases in order to offset the disadvantage of increasing risk.

If at least a proportion of lenders resort to interest rationing only, the supply of capital curve will never become completely inelastic, although it will curve upwards. Therefore external capital rationing would not occur. However it is now generally agreed that in practice most, if not all lenders resort to credit rationing as well as, but usually instead of interest rationing when allocating loanable funds. Although a controversy

still exists as to reasons why profit maximizing lenders should deny themselves the advantages of higher interest income, a discussion of this aspect is deferred until Chapter 8. Given that lenders do not use interest rationing, the shape of the supply of capital curve will depend on additional considerations. For instance, if all lenders charge substantially the same rate of interest and set approximately the same limit to the amount they are prepared to advance to any given operator, then the supply of capital curve would be something like the curve in diagram 5 below. In this diagram, $O C_1$ represents the amount of equity capital, and $C_1 C_2$ the amount of credit lenders are prepared to make available to the farmer in question.

Alternatively, if lenders differ significantly not only with respect to the interest rates they charge but also in the amounts they are prepared to lend to any given borrower, then the shape of the supply of capital curve will be a stepped function as in diagram 6. Once again, $O C_1$ represents the amount of equity capital, and $C_1 C_2$ the maximum amount of credit potentially obtainable by the farmer. An attempt to resolve some of the questions raised above is made in later chapters.

Diagram 5

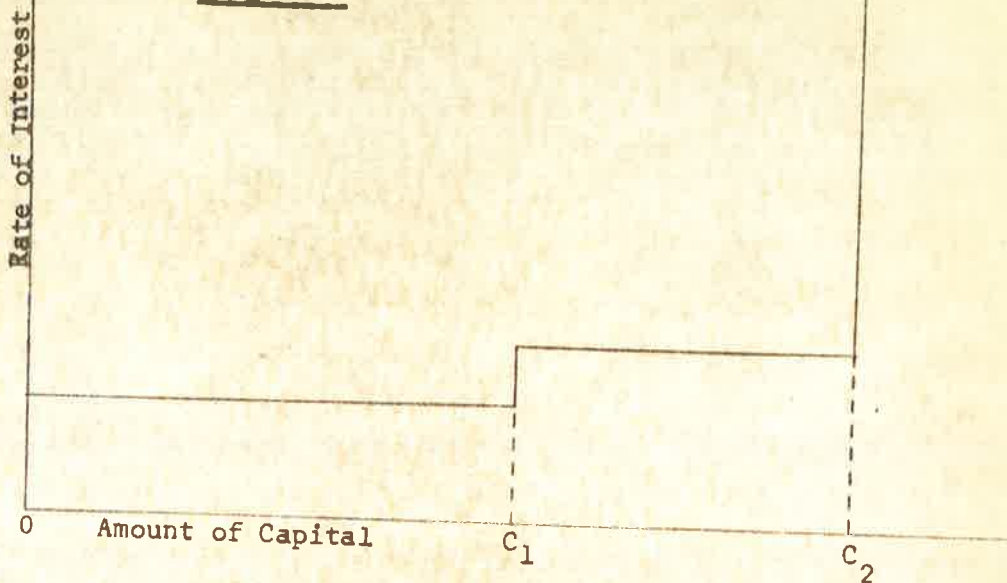
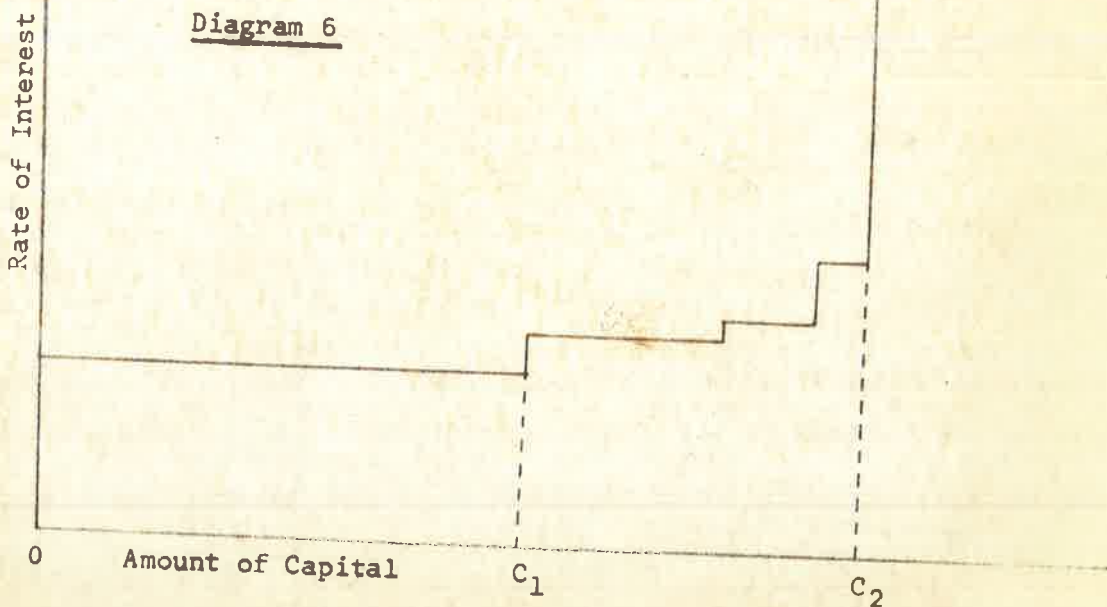


Diagram 6



A Conceptual Problem

In contrast to external capital rationing, internal capital rationing is assumed to alter the shape of the demand for capital curve. For example, Heady has postulated that because of risk and uncertainty, farmers will subjectively discount the expected marginal value product of any proposed use of capital when making a decision on whether to invest and/or borrow. Thus the discounted marginal value product of capital schedule will serve "as the borrower's effective demand curve since it indicates the amount of capital which would be used at any one interest rate were funds available at that price".¹¹

It is now possible to illustrate the concepts of external and internal capital rationing diagrammatically. A hypothetical situation in which three farm firms with different demand for capital schedules are faced by a common supply of capital curve is illustrated in diagram 7. As Heady was one of the first to fully develop these concepts in terms of economic theory, the supply and demand schedules used in this diagram follow the exposition by Heady.¹² The shape of the supply curve, which is denoted by S , is similar to the stepped function in diagram 6, except that the last portion is a continuous curve rather than discrete steps. The marginal value product schedules of the three firms are denoted in the diagram by VP_1 , VP_2 and VP_3 and the respective discounted or "effective demand" schedules

11. Heady, op. cit., p. 551

12. Ibid., pp. 551-553.

90.

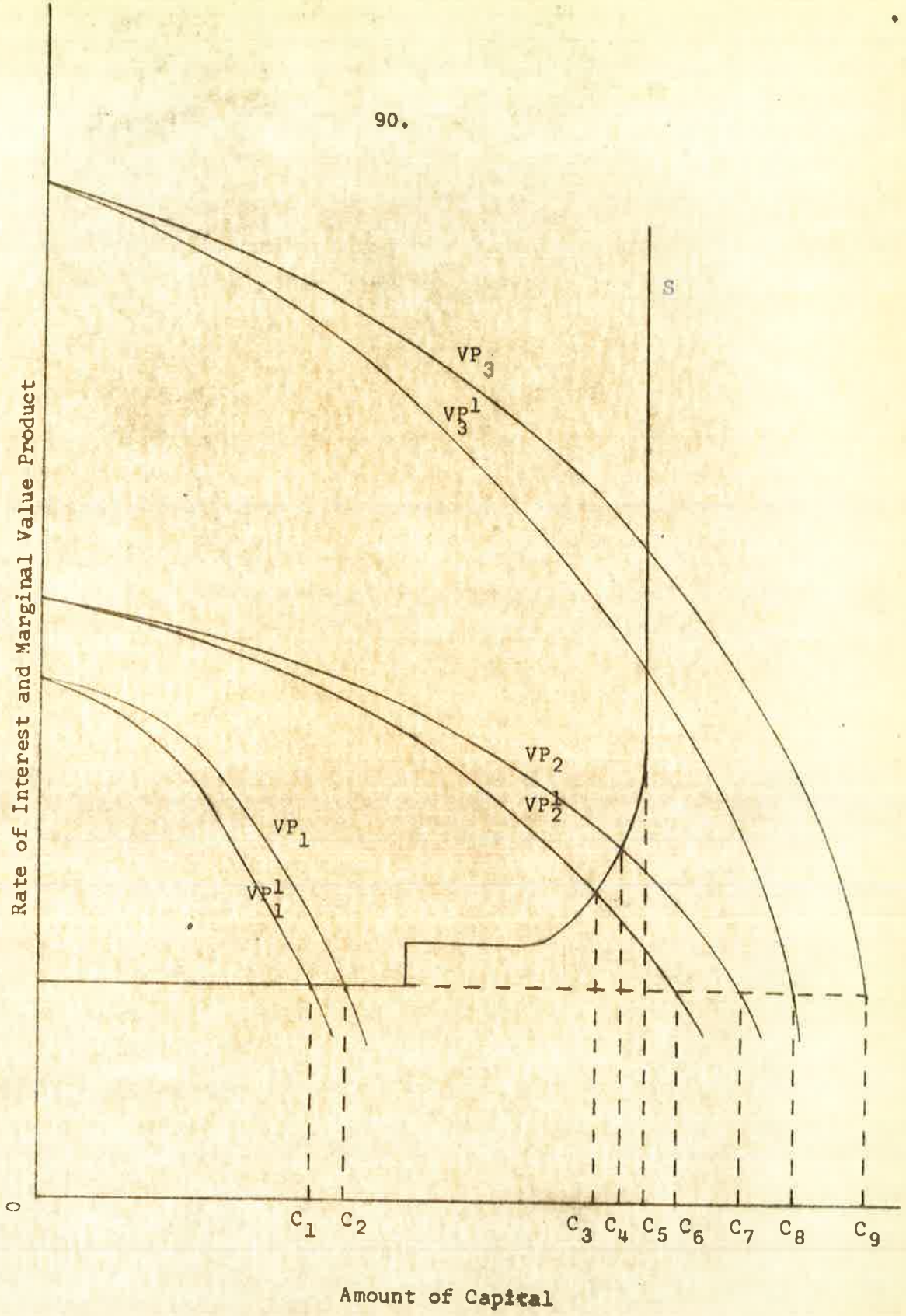


Diagram 7

by VP'_1 , VP'_2 and VP'_3 .

It should be obvious from diagram 7 that if firm one only uses OC_1 of capital, then internal capital rationing is involved; as additional credit is available and yet the marginal cost will not equal marginal revenue until OC_2 of capital is used. Farm three, on the other hand will use OC_5 of capital irrespective of whether the farmer subjectively discounts the marginal value product schedule or not. Clearly then, external capital rationing is involved in this case; for although marginal cost once again is less than marginal revenue, unavailability of credit, and not the farmer's reaction to risk and uncertainty is limiting the level of capital inputs.

Although the two cases above seem clear cut, difficulties arise as soon as an attempt is made to use the concepts of external and internal capital rationing in an empirical study. The logical approach in such a study would appear to be to define the optimum level of the capital input of each farm, and then class those farms which were found to be sub-optimal as facing either external or internal capital rationing. However, apart from the considerable practical difficulties in using this approach, a conceptual problem also exists which can be illustrated with reference to diagram 7. Basically, the problem is that whereas there is an obvious optimum level of capital, OC_2 , for farm one, there does not seem to be any optimum size for farm three, even though the level of capital employed is obviously sub-optimal. One way to overcome this problem

is to define the optimum size of farm three as OC_9 . This approach implies that external capital rationing is the result of imperfections in the capital market which cause the supply of capital curve to take the form postulated in diagram 7 rather than the perfectly elastic shape as in the theory of perfect competition. The definition of external capital rationing by Gale Johnson as "the inability of the borrower to obtain all the capital funds desired at the going rate of interest"¹³, while not unambiguous, does seem to imply support for this point of view. In fact, Hesser and Janssen used this interpretation in an empirical study of capital rationing by defining optimum sizes for farms facing external capital rationing as "the point at which the marginal efficiency of capital (M.E.C.) equals the interest rate"¹⁴; and although they only suggested six per cent as THE rate of interest, the important point is that they assumed a constant rate of interest existed, thus implying a perfectly elastic supply of capital. Heady's definition, essentially the same as Johnson's except that he substitutes "at current or possible interest rates"¹⁵ for "at the going rates of interest", is even more ambiguous than Johnson's.

The difficulty in accepting the point of view presented above becomes obvious when farm two in diagram 7 is considered. Using

13. D. Gale Johnson, Forward Prices for Agriculture, (Chicago : University of Chicago Press, 1947) p. 62.

14. Hesser and Janssen, op. cit., p. 5.

15. Heady, op. cit., p. 550

the arguments in the previous paragraph, OC_7 is the optimal level of capital to use, and yet marginal revenue equals marginal cost when only OC_4 of capital is employed. Furthermore, a supply of capital curve that is less than perfectly elastic will not necessarily be the result of imperfections in the capital market, as it has already been shown that a perfectly elastic supply curve would probably not exist under conditions of imperfect knowledge.¹⁶ Consequently, if the optimum amount of capital is still defined as the amount at which marginal revenue equals marginal cost, then it will be impossible, even on theoretical grounds, to define this optimum in cases of external capital rationing. A more explicit definition of external capital rationing is obviously also needed. In this study it was defined as the inability of the borrower to obtain at any rate of interest all of the capital funds required to equate marginal revenue with marginal cost. Thus external capital rationing presupposes credit rationing by all lenders. Internal capital rationing is now defined as a reluctance on the part of the borrower to use available credit to equate marginal revenue with marginal cost.

Therefore, on a theoretical basis, two criteria would seem relevant to a study of external and internal capital rationing. The first criterion for a case of external capital rationing would be that the marginal revenue of capital exceeded its marginal cost, and the second that the farmer could not obtain any additional credit.

16. For further discussion on this point, see Chapter 8.

Cases which met the first criterion but not the second would be classed as exhibiting internal capital rationing. If it seemed desirable to measure the degree of either external or internal capital rationing, this would have to be gauged from the extent by which marginal revenue exceeded marginal cost.

The Role of Time

To date, however, the third dimension of credit, namely the term of the loan, has not been considered. The importance of this dimension to a discussion of internal and external capital rationing can not be demonstrated in traditional supply and demand diagrams, but the following example will serve to illustrate the point. Consider the case of a farmer who has the ability to borrow sufficient capital to equate marginal revenue with marginal cost, but who can only obtain these loans for a given short period. To take a specific example, assume that the operator could borrow \$1,000 at 5% rate of interest. Using static analysis one would expect that he would make use of this opportunity as long as he was able to employ the funds in a manner which earned greater than a 5% rate of return. However, if the loan was only available for a period of five years, and the funds were invested in a long-term asset, then the project would have to earn sufficient profit to not only pay the \$50 annual interest charge, but also to repay the \$1,000 at the end of the 5 year term. After discounting, this represents a required rate of return of nearly 23% per annum. Therefore, although in many cases it will be profitable to borrow in the sense that marginal

revenue exceeds marginal cost, the farmer quite often will not be able to borrow because his ability to repay is not sufficient to meet the repayment conditions set by the lender.

Of course, in a world of perfect knowledge, the lender would only be prepared to lend as much as the borrower was prepared to borrow, as both would have the same expectations about the latter's ability to repay. Strictly speaking, this will still constitute external capital rationing, as the borrower is UNABLE to obtain sufficient capital to equate marginal cost with marginal revenue. However, the basic cause of this type of capital rationing is the fact that most agricultural firms, because of the small scale of their operations, are denied access to the share market; where even under conditions of uncertainty, other firms are at least able to obtain capital for an unlimited time, if not in unlimited amounts at constant cost.

Consequently, this type of capital rationing can be considered to be the result of an imperfection in the capital market. In fact it is often referred to as the "MacMillan gap" as a result of recognition of the problem in the Radcliffe Report.¹⁷ The importance of this aspect of credit naturally will be inversely related to the length of time for which an operator can obtain credit, and will also be mitigated to the extent that he is able to amortize the principal with funds generated from other sources.

17. Great Britain, Committee on the Working of the Monetary System Report, (London : Her Majesty's Stationery Office, 1959), p. 323.

It is a little more difficult to classify this type of situation under conditions of imperfect knowledge, where it is highly likely that the borrower's expectations about his ability to repay will differ significantly from those of the lender. It is obviously external capital rationing if the lender adopts the more conservative attitude, but not so obvious if the reverse holds. The fact that the farmer could obtain additional credit under the existing terms and conditions set by the lender suggests that the latter case is one of internal capital rationing. On the other hand, the fact that the producer would borrow more if the terms and conditions of the loan were sufficiently liberalized seems to imply a case of external capital rationing. However, if a choice has to be made, the verdict probably should be given to internal capital rationing on the grounds that this concept was conceived as a reaction by borrowers to limit the exposure of their equity. Obviously with a long term loan, a borrower will be able to borrow more than with a short term loan before he exposes his equity to the same degree. Although the importance of the length of the loan was recognized as early as 1947 by Gale Johnson,¹⁸ it seems to have received very little attention in the development of credit theory, which probably explains the difficulty of introducing a consideration of this aspect into the concepts of internal and external capital rationing. Because of the unsatisfactory state of credit theory in this respect, it was not possible to give any explicit recognition to the importance of the

18. Gale Johnson, op. cit., p. 47.

time dimension in the empirical study of internal and external credit rationing reported in the following chapter.

CHAPTER 7

AVAILABILITY OF CREDIT

"No simple meaning can be attached to the expression 'availability of credit'. Most commodities may be said always to be available at a price, and under a free market system, movements in their prices will indicate changes in their availability. Credit always has a price, that is a rate of interest, but credit is not automatically available to all at that price. Lenders take other factors into account in deciding whether or not to make a loan, the most important being the credit-worthiness of the applicant and the quality of the security he has to offer".¹

Introduction

In chapter five, the amount of credit used by farmers was investigated. However, the information presented in that chapter left another question begging; namely how adequate were the existing credit facilities to meet primary producers' needs. This question of course, raises many issues of which only a few can be dealt with in this study. The main question to be investigated in this chapter is whether any misallocation of resources occurred as a result of insufficient credit being available to farmers. It should be obvious from the preceding chapter that one method of answering this question would be to estimate the proportion of sample farmers facing external

1. Commonwealth of Australia, Report of the Committee of Economic Enquiry, p. 10. 2.

capital rationing.

Methodology

However, there are a number of inherent difficulties in this approach which have to be overcome before it can be applied in an empirical study. The conceptual problem of defining optimum farm size in cases of external capital rationing has already been discussed above. Even where there is no external capital rationing, it is probably impossible to empirically determine the optimum level of the capital input; as to do so involves defining the marginal value product of capital schedule. Although production function studies have been used to estimate the marginal revenue of capital, this technique only makes it possible to estimate one point on the marginal revenue schedule. Furthermore, production function studies can be criticized on a number of grounds. Two of the most important are that the management factor has to be ignored because it is impossible to quantify this input, and an assumption has to be made as to the nature of returns to scale that apply. Therefore, it was decided to try and estimate external capital rationing without estimating optimum farm size.

One method, which was used by Hefford,² is to use the number of loan applications which were rejected to assess capital rationing. Several objections to this approach can be raised. Rejected loan applications are a measure of credit rationing rather than external

2. Hefford, op. cit.

capital rationing, since an operator who is "knocked back" by one lender may well be able to obtain additional credit from another lender, even if at a somewhat higher rate of interest. Furthermore, the number of formal loan applications which are rejected is likely to underestimate the extent of credit rationing. Even if all farmers can be relied upon to disclose what must be for many an embarrassing experience, it is still impossible to know how many farmers were dissuaded, either directly or indirectly, from formally applying for a loan.

The only other method which seems to have been used to gauge the extent of external capital rationing is described in an article by Hesser and Janssen.³ Basically, their approach involved estimating for each farm the optimum amount of capital to use and the maximum amount of capital that could be obtained, as well as measuring the actual amounts of capital used from both internal and external sources. Farmers were then classed as belonging to one of the following categories.⁴

- (1) Operating at optimum investment (actual capital employed is equal to optimum investment)
- (2) Operating at less than optimum investment (actual capital employed is less than optimum investment)

3. Hesser and Janssen, op. cit.

4. Hesser and Janssen also used a fourth category called operating at less than optimum investment due to limitations in management (e.g. poor health, old age). However, this category is superfluous and could be included in the first category above as optimum level of investment will be a function of management.



- (a) On the threshold of external capital rationing (actual capital used equals maximum amount that could be obtained)
- (b) In the area of internal capital rationing (actual capital used is less than the maximum amount that could be obtained).

Optimum investment was estimated from the amount farmers indicated they would invest if they had plenty of money. By implication, this approach assumes a perfectly elastic supply of capital, and consequently Hesser and Janssen avoided the conceptual problem of defining optimum investment in cases of external capital rationing. Their approach however, did suggest a method of gauging the importance of external capital rationing which does not involve trying to estimate optimum farm size.

Because it was necessary to make several assumptions in this method, there was a real danger that the result would be determined by the assumptions made. The following steps were taken to overcome this problem. On the basis of personal discussions with various lending agencies and extension workers, it seemed reasonable to test the hypothesis that the incidence of external capital rationing was low in the area of South Australia studied.⁵ Therefore every assumption was deliberately and consistently biased so as to over-estimate the extent of external capital rationing. Thus more realistic assumptions would only tend to reinforce any results obtained which support the above hypothesis.

The first assumption to be made was that all farms were operating

5. For additional evidence, see above (p. 74).

at less than optimum investment.⁶ It follows from the definitions of Hesser and Janssen that any farmer who had used all of the capital which could be obtained would be classed as being on the threshold of external capital rationing. Hence only two parameters, actual capital employed, and the maximum amount of capital available to the farmer, need to be estimated. If it is assumed that equity capital is common to both parameters, a further simplification can be achieved by only estimating actual indebtedness and the maximum amount of credit that could be obtained. First however, a discussion of the supply of capital is warranted.

The Supply of Capital

It has already been demonstrated in chapter six that external capital rationing will only occur if the supply of capital curve becomes completely inelastic, which in turn presupposes that all lenders eventually resort to credit rationing. All banks will obviously resort to credit rationing as "the Reserve Bank, with the approval of the Treasurer, - - - regulates bank interest rates"⁷, although interest rationing is also used in cases where a higher rate of interest is charged on additional funds lent by way of second mortgage.⁸ Similarly, rates of interest charged on loans made by government agencies are fixed and independent of the size of the loan.

6. The effect of relaxing this assumption is discussed later.

7. Reserve Bank of Australia, Australian Rural Credit Facilities, p. 2

8. However, the fact that banks charge different rates of interest to different types of borrowers does not constitute interest rationing, as for any given type of borrower the rate of interest charged is constant and independent of the amount lent.

Pastoral finance companies and insurance companies also charge a fixed and uniform rate of interest, but this is probably due to the oligopolistic market structure in these sections of the rural credit market. The other likely sources of credit are private lenders, hire purchase companies, trade credit and co-operative producer organisations. Although no conclusive proof exists that all such lenders resort to credit rationing, the lenders interviewed in this study all charged a constant rate of interest. Furthermore, as far as could be ascertained, no cases of lenders using interest rationing exclusively in the Australian rural credit market have been reported.

Therefore, given that all lenders resort to credit rationing, the only information needed to construct an aggregate supply of credit schedule for any particular farmer is the rate of interest charged by different lenders and the methods they use to ration their loanable funds between competing borrowers. Before proceeding however, the treatment of equity capital needs to be considered. The amount of equity capital can be measured in an objective manner by valuing assets and subtracting liabilities, but measuring the cost of this capital is not as easy. In economic theory, cost of equity capital equals its opportunity cost. Even allowing for difficulties in interpreting this concept in an uncertain world, the opportunity cost of farmers' funds would at least equal the six to seven per cent rate of interest paid on riskless investments such as long term government or semi-government securities. On the other hand, interest rates charged by banks were as low as 5¼ per cent, and for certain loans

from other sources were even lower. In spite of these facts, farmers almost universally only resorted to credit when it was no longer possible to finance all expenditure from internal sources. As mentioned above, only one explanation appears to be feasible, namely that farmers subjectively discount the opportunity cost of equity capital. The following discussion outlines a few possible explanations of this reaction.

One such explanation relies on the same sort of reasoning invoked in the concept of internal capital rationing. If some farmers limit the amount of funds they borrow in order to restrict the extent to which their equity is exposed, it also seems reasonable to postulate that where a choice exists between financing expenditure from internal or external sources that the producer will choose the former for the same reasons. Thus farmers prefer to invest any available funds in their own business, and by implication discount the opportunity cost of funds so invested. This preference is encouraged by depreciation allowances and other forms of taxation deductions, and also by the fact that certain forms of farm investment, such as land, tend to appreciate over time. Another reason for discounting the opportunity cost of proprietorship funds relies on the fact that in farming, the producing and consuming units are not distinct entities and therefore interact with each other. It follows that farmers will be endeavouring to maximize utility rather than profits. Because of this, and because capital is almost always a scarce resource, then the alternative to investing available funds in the farm is often to consume it, rather than invest it

elsewhere. In this sort of situation, the opportunity cost of proprietorship in monetary terms is not the 6-7 per cent rate of return which could be earned in an outside investment but a 0 per cent monetary rate of return, as the funds are used for consumption expenditure. Finally, by investing funds in his property, the operator may be able to earn a positive rate of return on resources such as family labour which otherwise would be entirely unproductive.

For the reasons listed above, it seemed reasonable to postulate that the cost to the farmer of his proprietorship funds is considerably lower than their apparent opportunity cost. Although it is obvious that any estimate of the actual cost could only be a guess, it also seemed a reasonable assumption that it would be lower than the prevailing rates of interest on any of the common forms of external funds, and for the purposes of this study was arbitrarily set at 3 per cent.

In contrast to equity capital, the cost of credit is well defined, but the amount available to the farmer can only be estimated. The approach used by Hesser and Janssen was to ask the farmer to estimate the largest total amount he could borrow. Apart from the subjective nature of this method, many of the answers are likely to be under-estimates as a large proportion of operators are very poorly informed about credit matters. To illustrate the point, the questionnaire used in this study included a section designed to test farmers' knowledge of sources of external funds. Approximately 75 per cent of the farmers obtained a score less than or equal to half

that obtained by the most knowledgeable respondent, who did not obtain the maximum score possible.

Therefore, an attempt was made to use a more objective approach in this study based on the methods lenders use to allocate their loanable funds. It is now generally agreed that lenders use three criteria when making loan decisions. In decreasing order of subjectivity, they are creditworthiness, ability to repay, and collateral of the borrower. The relevance of creditworthiness, which is interpreted to mean "willingness to repay", and ability to repay; is that both will be of concern to the lender insofar as they reduce the possibility that he will have to resort to a claim on the borrower's assets to collect the loan. Consequently, lenders place most emphasis on the borrower's collateral, because in an uncertain world where expectations often fail to materialize, it is the factor which is least likely to change in value over time. Hence it provides the best guarantee that repayment of the loan contract, expressed in fixed monetary units, will be made. For this reason, and also because it can be measured more objectively than the other two criteria, it was decided to estimate the aggregate supply of credit schedule on the basis of the value of collateral owned by the producer.

To estimate the maximum amount a farmer could borrow, the first step was to classify the different types of loans into groups according to the rate of interest charged and the security required.⁹

9. Interest rates and conditions used were those applying during the survey period from 1st July 1961 to 30th June 1964.

The groups used are outlined in table 9, which also includes estimates of the amount which can be borrowed from each source. These estimates were based mainly on information obtained during personal discussions with various lenders. Most banks and other lenders who required a first mortgage on land as security for the loan claimed they were prepared to lend up to 70 to 80 per cent of the value of the collateral offered. However, when evaluating a loan proposal, lenders used their own valuation of the land, which was almost invariably conservative, and usually between 70 to 75 per cent of current market values. Hence the assumption that lenders in this group were prepared to lend up to 50 per cent of current market values for land seemed a reasonable, if not slightly conservative, approximation. On the other hand, the estimate that borrowers could obtain an additional ten per cent of the market value of land by way of second mortgage may be a little generous, as this type of credit is probably restricted to the more creditworthy clients.

Pastoral finance companies claimed they were prepared to lend up to 50 per cent of market values of livestock, or up to 90 per cent of the value of the wool clip. Using current prices for wool and sheep, and average wool cuts per head, these two criteria result in much the same amount of credit being made available. Consequently, the former was adopted in this study for the sake of simplicity. In contrast to the above, the amount of hire-purchase credit which can be obtained is not related to any physical assets owned by the farmer but instead is a multiple of the amount of cash which he can afford to use as a deposit. To simplify the calculations, it was assumed

TABLE 9 Sources of Credit classified by rate of interest and type of security required

Group	Security Required (a)	Interest Rate (simple)	Amount Available	Credit Sources
1A	1st mortgage on land	Usually 5-5½ per cent	50% of market value of collateral (b)	Savings Bank of S.A., loans from the State Bank of S.A. under the State Advances Act.
1B	Ditto	5½-6 per cent	Ditto	Trading bank and State Bank of S.A. overdrafts, some private sources
1C	Ditto	7 per cent	Ditto	Trading bank term loan funds and provident funds, insurance and trustee company trust funds, some private sources
2	2nd mortgage on land	6-7 per cent	Additional 10% of market value of collateral	Mainly trading bank overdrafts, some private sources
3	Stock mortgage or lien on wool clip	6¾ per cent	50% of market value of livestock	Pastoral finance companies
4	Life insurance policy	7 per cent	90% of surrender value of policy	Insurance companies

TABLE 9 (Cont'd)

Group	Security Required ^(a)	Interest Rate (simple)	Amount Available	Credit Sources
5A	Asset purchased	8-9 per cent	About 67% of cost of asset	Development Bank (loans only for certain types of machinery)
5B	Ditto	10-15 per cent	Varies, but usually 60-80% of cost of asset	Hire Purchase companies
6A	Miscellaneous	Variable	Small amounts	Relatives, other private sources, trade credit and other miscellaneous sources
6B	Promissory note	12-20 per cent	Small amounts	Finance companies

- (a) Plant and machinery are also sometimes accepted as collateral, but the practice is rare outside of hire purchase contracts.
- (b) For group 1A, in addition to the limit imposed by the amount of collateral tendered, an absolute limit also exists in practice. For the Savings Bank of S.A., this absolute limit during the survey period was \$30,000, which is probably fairly close to the maximum amount that could be borrowed from the other credit source in this group.

that all hire purchase lenders require the borrower to pay a deposit equal to one third of the value of the asset to be purchased.

Therefore, the total amount of hire purchase credit that can be obtained will be double the amount of liquid reserves held by the producer.

Obviously however, a particular asset can only be used to meet the security requirements of one lender. Consequently the amount that can be borrowed using a first mortgage on land is determined by the amount of land owned by the farmer, and is independent of his borrowing practices. In other words, the source or combination of sources used out of those listed in groups 1A, 1B and 1C will only influence the cost of the credit obtained, and not the maximum amount that can be obtained. Similarly an additional amount, also related to the value of land owned, can be obtained on second mortgage; while the extent to which further sums can be borrowed from the pastoral finance companies will depend on the value of the farmer's livestock. In this manner, it is possible to build up a complete hypothetical supply of capital schedule for any farmer. Unfortunately, several difficulties arose in trying to apply this approach. The major problem centred around how to treat the miscellaneous group of credit sources, for which there were often no formal security requirements. Not only did the terms and conditions attaching to credit from these sources vary from case to case, but in addition some forms such as loans from relatives were apparently available to some farmers but not to others. A problem also arose with loans secured by life insurance

policies, as it proved impractical to estimate the surrender value of such policies. Therefore, the only sources of credit included in the following analysis were those which required as security a first and/or second mortgage on real estate, or a stock mortgage or lien on the wool clip, or a hire purchase contract on the asset purchased. This approximation did not cause any serious error in the estimate of the total amount of capital available to the farmer, as the amounts that could be obtained from sources not included above was in most cases insignificant compared with the total amount of capital. On the other hand, the shape of the supply schedule may have been altered significantly by this simplification. Although actual examples of individual cases can not be presented for obvious reasons, the hypothetical cases of a small and large farm presented in diagrams 8 and 9 respectively serve to illustrate the approach.

However, as was discussed above, it is not necessary to estimate the supply of capital schedule, but merely the amount of credit available to the producer in order to gauge the extent of external capital rationing. Therefore it was assumed that the maximum amount of available credit was equal to half the value of the land and livestock owned by the producer. The reason for so obviously under-estimating potential borrowing power was to ensure that the extent of external capital rationing was over-estimated.

Obviously, this method of estimating the supply of credit has severe limitations. One of the most important is that no allowance can be made for the effect which the reason for borrowing will have

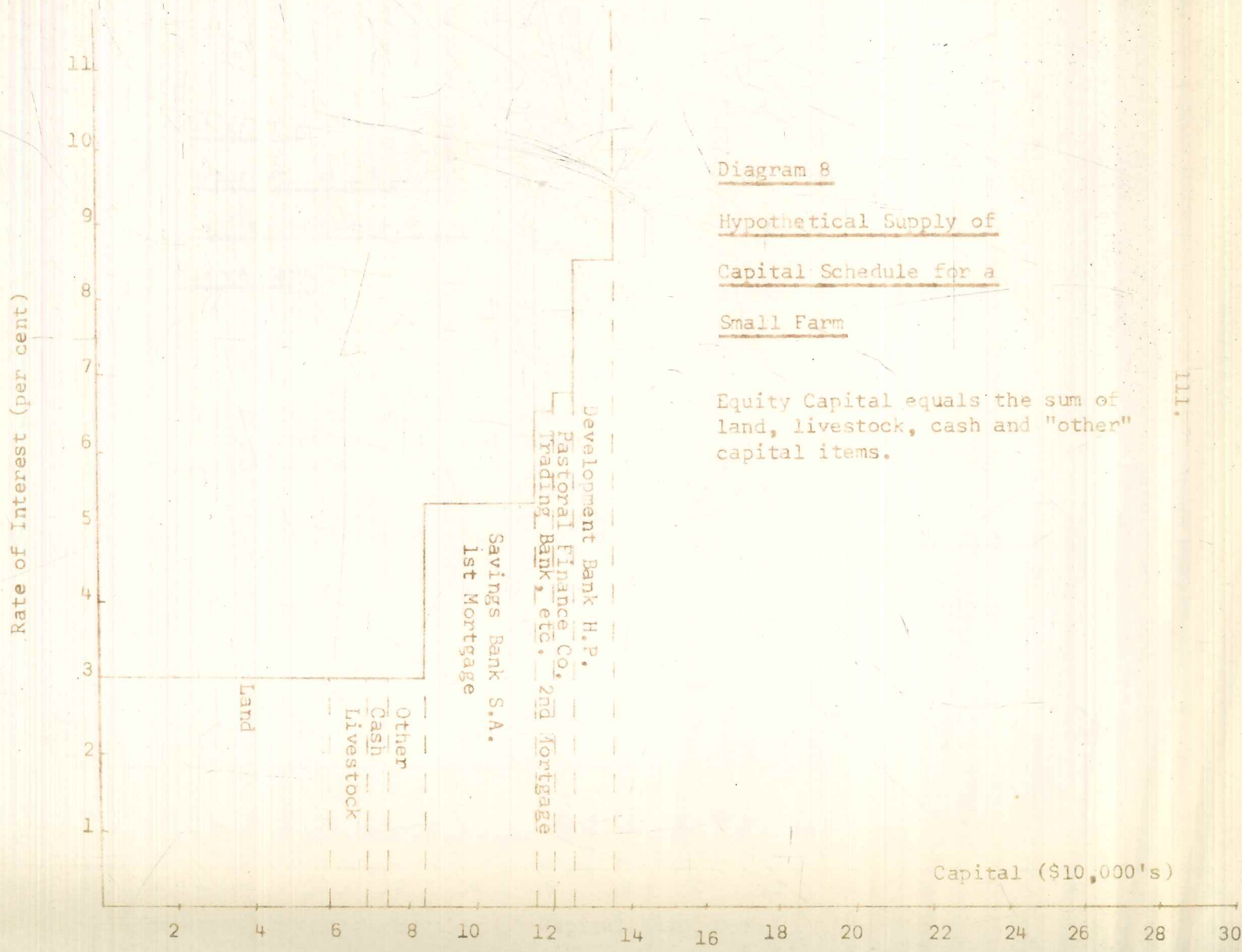
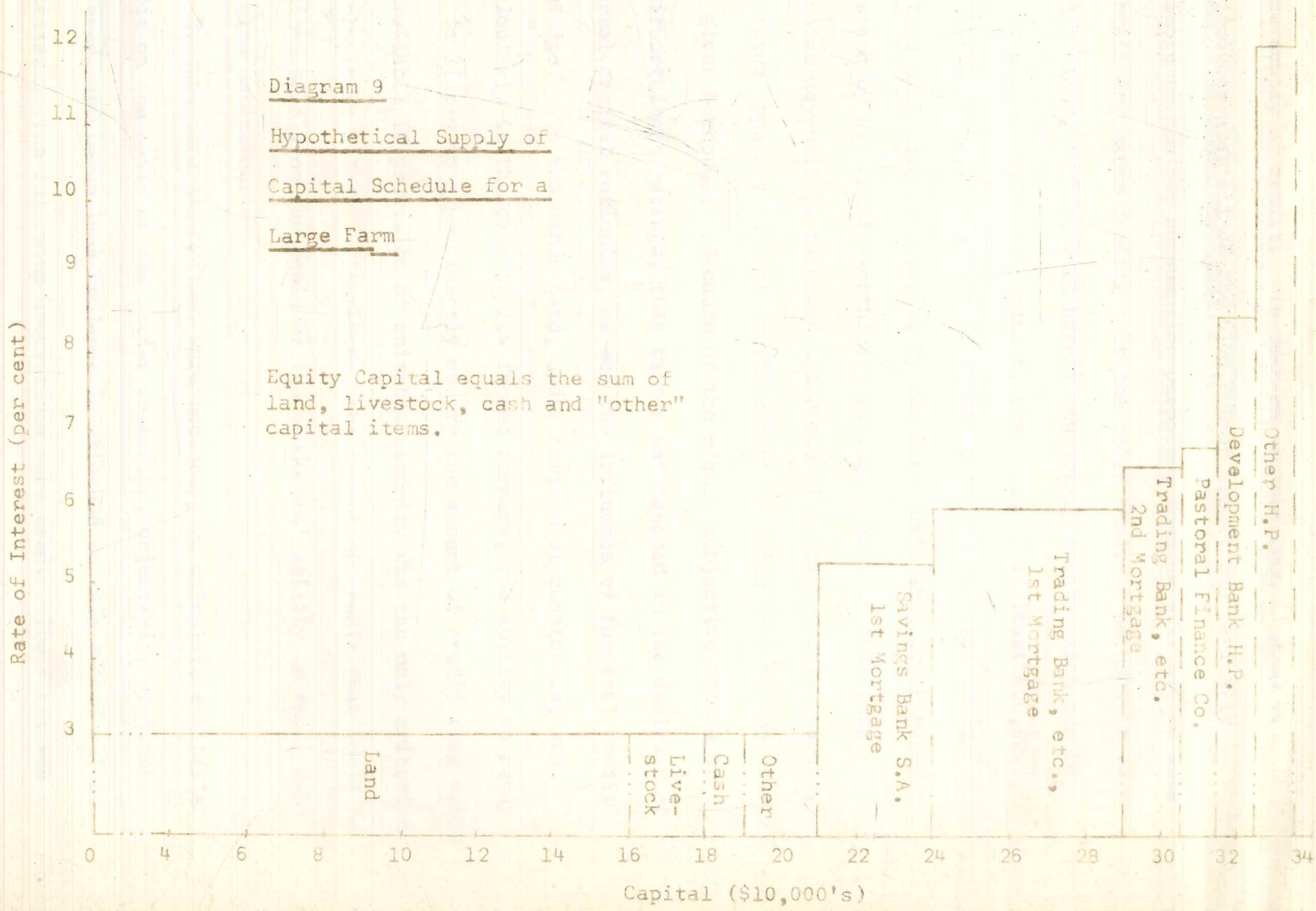


Diagram 8
Hypothetical Supply of
Capital Schedule for a
Small Farm

Equity Capital equals the sum of land, livestock, cash and "other" capital items.



on the supply of credit. To take an example from diagram 9. If the producer uses all of the \$125,000 of credit theoretically available to him for consumption purposes, then he will not be able to obtain any extra credit. On the other hand, if he uses it to purchase land, then he will have a new lot of assets which can be used to secure additional loans to the value of at least \$60,000.

Furthermore, the amount of credit that can be obtained in practice will also be modified by the borrower's ability to repay debts and by his credit-worthiness rating. Another modifying influence may well be farmers' ignorance of certain credit sources, as lenders appear to differ in the extent to which they ration credit to a given borrower. Because of the highly subjective nature of creditworthiness ratings, this factor was ignored in the analysis of external capital rationing, as was the influence of farmers' credit knowledge. On the other hand, under certain circumstances, and particularly in the case of low income farmers, the ability to repay debt is likely to significantly modify the amount of credit that would be available if provision of suitable security was the only criterion for obtaining a loan. Therefore, the amount of credit that could be obtained solely on the basis of the producers' ability to repay debt was also estimated.

Because more assumptions were necessary to calculate available credit on the basis of the latter criterion, objectivity no doubt suffered, and hence less credence is attached to this second set of estimates. The following assumptions were used. The first was

that the only funds available to repay debt were net farm income less living expenses. The net income figure used was the average value of net farm income for taxation purposes for the previous three years. This will be an underestimate for two reasons. Firstly, it will be subject to all the inherent tendencies to under-estimate income present in tax returns. Secondly, taking an average of the last three years takes no account of likely increases in returns resulting from investment during the three year period and/or increases in productivity due to technological change. The income figure arrived at above was discounted by 10% to allow for the conservative nature of lenders. Although in private discussions, several lenders insisted that discounting to this extent was not normal practice; when a trial application was submitted for consideration the above figure was found to be fairly realistic.

An amount of \$2,500 was subtracted from the discounted net income figure to derive the annual amount of funds available for making principal repayments. This amount represents an allowance for family living expenses. As several lending institutions were still using a figure of \$2,000 for living expenses in 1965/66, this assumption will also tend to under-estimate ability to repay.

However, to estimate credit availability from the annual amount of funds available for debt repayment, it is necessary to make an assumption about the term of the loan. Although most types of agricultural credit are nominally available on a short term basis only, in practice many loans extend over a period of up to twenty

years, and even longer in some cases. Furthermore, an astute financial manager can extend the effective term of repayment of his borrowed funds considerably by extensions and refinancing of short term loans. Therefore, it was assumed that a producer could make repayments over a period of ten years, and consequently the estimate of available credit was arrived at by capitalizing up the funds available for repayment at a rate of ten per cent.

External Capital Rationing

The first step involved in gauging the extent of external capital rationing was to estimate the amount of credit potentially available to each farmer using the two methods outlined above. The methods used to derive the value of land and livestock are outlined in appendix 4, while net income figures were calculated from taxation returns. One problem encountered was that the estimates of available credit based on the security requirements of lenders varied over time as the amount of investment in land and livestock changed. Although changes in the credit base due to changes in livestock inventories were relatively insignificant, and consequently ignored, changes in the credit base due to the purchase or sale of land were too large to be ignored. Therefore, separate estimates of available credit before and after any such changes were calculated.

The method used in chapter five of deriving debt figures by capitalizing up the interest payments is obviously not satisfactory for this part of the analysis, as what is required is a maximum, not average, debt figure. The procedure actually used was to obtain from

the farmer the actual amount of debt outstanding on each loan on the 30th June, for each of the four years 1961 to 1964 inclusive, the highest total debt figure during this period being used in the analysis. Where the farmer could not supply accurate data, permission was obtained to ask the lender for the relevant information. In cases where the credit base changed during the three years due to investment in additional land, the highest total debt figures before and after the purchase of land were used. Although this procedure did not produce a true maximum debt figure due to seasonal fluctuations in debt levels, it appeared to be the best practical alternative. It should be noted that loans from non-institutional sources of credit ARE included in the debt figures.

In theory, a producer does not reach the point of external capital rationing until the amount of capital actually used on the farm has increased to the limit of the supply curve. That is, until the farmer is unable to borrow any additional funds whatsoever. In practice however, investment acts are not infinitely divisible, and although a farmer may be able to borrow additional funds, in some circumstances they may not be sufficient to finance any profitable opportunities. Therefore, some allowance needs to be made for the lumpy nature of investment. The difficulty arises in deciding just how much adjustment to make, for the range of costs of possible investment opportunities is almost infinite. However, as the aim of all assumptions made has been to increase the extent of external capital rationing found, then to be consistent the smallest

practicable increment of the most expensive investment opportunity must be the logical choice. Investment in new land is almost certainly the most expensive, yet profitable, investment opportunity for this area of South Australia. In practice, land in the area is rarely sold in lots of under 200 acres, even allowing for neighbours dividing up a jointly purchased property. Bearing in mind that land sold in smaller plots usually costs more per acre, it was felt that \$70 per acre was a fair average figure to value the land at for the district concerned. Hence, the final assumption made was that the only profitable investment opportunity was the purchase of 200 acres of land at \$70 per acre. However, acquisition of the land will provide half of the security required by a lender advancing the full cost of the investment, and will also increase the borrower's ability to service the loan. Therefore a farmer was deemed to be facing external capital rationing when the maximum amount of credit he could obtain did not exceed his current level of indebtedness by more than \$7,000.

Results and Discussion

The above techniques were applied on an individual basis to data from all of the farmers in the sample who supplied complete financial data. Of the 52 farmers included in the analysis, 14 were initially classified as facing external capital rationing at some time during the three year period. However, it became obvious on closer examination that at least some of these producers were in fact nowhere near the point of external capital rationing. Part of the reason was that as

intended, the amount of available credit was under-estimated substantially, but failure to take account of other relevant factors also played a part. To illustrate the former point first; in seven of the fourteen cases mentioned above, actual debt levels exceeded one or both estimates of available credit. Even more dramatic proof of the same point came to light when it was found that two farmers who were classed as facing external capital rationing in the early stages of the three year period subsequently borrowed additional credit in excess of \$23,000 each! Furthermore, one of these farmers was no longer classified as facing external capital rationing after using the new loan to help purchase additional land, and obviously should never have been included in the group of fourteen producers in the first place.

The explanation of this peculiar result is that the producer concerned had access to considerable internal sources of funds (e.g. savings, etc.) which could have been used to retire existing debt, but instead were kept in reserve to purchase additional land. This ties in with the second reason mentioned above that to date, certain factors such as farmers' levels of savings have not been considered. Therefore, the analysis was carried a step further by assuming that farmers only need \$2,000 in cash for the purpose of working capital.¹⁰ Hence liquid assets in excess of this value could have been used to retire outstanding debt and/or undertake additional investment, and

10. Holdings of liquid assets were recorded as at the 30th June, and there are still substantial operating costs to be met after this date before the main revenue items are received early in the following year.

consequently should be offset against the value of maximum indebtedness used in the analysis. On this basis, two more cases were no longer classed as facing external capital rationing. In addition, another three farmers who were unencumbered, were initially classed as facing external capital rationing. Whether or not they could in fact service a loan is irrelevant to the question being examined, as the fact that they were not only unencumbered, but also all held substantial sums in the form of liquid assets indicates they were wrongly classified. Thus the field was smartly reduced to eight possible starters.

Of the eight, at least two were almost certainly facing external capital rationing or very close to it. Not only did actual debt levels exceed both estimates of available credit, but cash reserves were also negligible. The other six however, could only be classed as facing external capital rationing if the estimates of available capital based on ability to repay were used, and not if the estimates based on the security requirements by lenders were used. Furthermore, the results of the analysis implied that three of the six farmers above would not have any funds available to retire debt after meeting necessary farm operating and family living expenses. However, in estimating ability to repay, the very restrictive assumption that the investment financed by the loan did not generate any funds to repay the loan was made. This assumption may be a realistic approximation in cases where a very short term loan is used to finance an investment which creates assets with a very long or indefinite life. Conversely,

where the life of the assets is less than the term of the loan, the investment if profitable will generate all of the funds necessary to repay the loan. For intermediate cases between these two extremes, the result will depend on the profitability of the investment and the cost and term of the loan.

Therefore, it seemed pertinent to test the assumption that investments financed by loans did not generate any funds to repay the loan. The investment act used to test this assumption was an increase in the scale of farm operations involving the purchase of an additional 200 acres of land. Data from three surveys farms of about 800, 1600 and 2600 acres were used to construct three partial budgets.¹¹ Assuming no additional plant and machinery was needed, the annual rate of return on the hypothetical investment would be 16.1 per cent for the small farm, 18.2 per cent for the medium farm and 18.8 per cent for the large farm. If additional plant and machinery was purchased, then the respective rates of return would be 10.9, 12.6 and 13.1 per cent.

After allowing for interest charges at a rate of 5 to 6 per cent, it seems reasonable to postulate that most farmers would be able to "pay off" at least 5 per cent of the capital cost of the most profitable investment opportunity each year. Assuming that annual reductions can be made from the outstanding debt, and that interest is charged on the reducing balance, then it would take approximately

11. For detailed description of approach used in partial budgets, see appendix 5.

14 years to repay the loan if repayment was financed solely by funds generated by the new investment.¹²

The Savings Bank of S.A. was the only lender to consistently make credit available for at least a 15 year term and at a rate of interest less than 6 per cent. However during the survey period, the maximum amount that could be obtained from this source was \$30,000, and the only acceptable security for loans was a first mortgage on freehold or perpetual leasehold land. Consequently it was assumed that the minimum amount of credit obtainable by any farmer in the area studied was the lesser of \$30,000, or half the value of freehold land owned by the farmer. The result of applying this additional assumption was to reclassify a further five farmers as no longer facing external capital rationing. Therefore, it was concluded that a maximum of three out of fifty two farmers were facing external capital rationing.

One other obviously unrealistic assumption remains to be considered, namely that all farmers are at less than the optimum level of investment. To gain some insight about the extent to which this assumption was unrealistic, and also to provide a rough cross-check on the results presented above, two sets of questions were included in separate sections of the questionnaire. However, no claims to objectivity can be made for this part of the analysis, and the results need to be interpreted with a considerable degree of caution.

12. Note that if the investment opportunity considered above was not the most profitable, then logically any more profitable investments would be carried out first, and hence could be "paid off" even faster.

In the first set of questions, after asking the farmer for his ideas on the optimal size for farms in his area, he was asked whether he was trying to achieve this optimum. Of the fourteen cases discussed above, eight including 2 of the 3 cases classified above as facing external capital rationing, indicated that they had already achieved optimum size (i.e. they were not trying to increase the level of capital invested in their businesses). This suggests that although three farmers may have been unable to borrow any more funds, only one of these was facing external capital rationing. This farmer, along with two others, were the only ones to give "financial difficulties" as the answer when the other six farmers were asked for reasons why they had not reached an optimal level of investment. The second set of questions were used mainly as a check for consistency. They consisted of a series of questions about various types of investment undertaken in the three years 1961/2 to 1963/4, after which the respondent was asked whether lack of finance had held up farm development in this period, and if so, was this due to inability to borrow additional funds. The only one of the fourteen producers to answer in the affirmative to both questions was the same farmer who appeared to have exhausted his ability to borrow and also felt he was operating at a sub-optimal level. However, one other farmer not included in the discussion to date also consistently indicated in his replies to the above mentioned questions that he was facing external capital rationing. Therefore it was concluded that a maximum of four out of fifty-two farmers were facing external capital rationing, but that it was more likely that

only one, or possibly two were in this position. The other two, although unable to obtain any additional credit, claimed they had already reached a position of optimum investment.

CHAPTER 8

CREDIT RATIONING - A THEORETICAL MODEL

"Credit rationing is a much debated phenomenon. Although practical borrowers and lenders long have regarded credit rationing as a fact of experience, economists of a more analytical persuasion have been reluctant to accept it at face value because of their difficulty in providing a theoretical explanation for the phenomenon which is consistent with the tenets of rational economic behaviour. Why should lenders allocate credit by non-price means and thus deny themselves the advantage of higher interest income?"¹

Introduction

The way in which the existence of external capital rationing is conditional on all lenders resorting to credit rationing as well as, or instead of, interest rationing has already been discussed in chapter 6. Therefore, it seemed appropriate to conclude this study with an attempt to explain why profit maximizing lenders should behave in the manner outlined above.

Traditionally, explanations of credit rationing have relied on sticky interest rates, or on interest rate ceilings imposed on lenders. Although these explanations may be important for some lenders, there are significant sections of the credit market where it would be unrealistic to assume that they apply. More recently, concepts of risk and uncertainty have been invoked, but until a recent paper by Hodgman,² the treatment of the problem has been far from rigorous,

1. Hodgman, op. cit., p. 258

2. Ibid.

and the explanations less than satisfactory. However, although Hodgman's article obviously represented a very significant advance in the field of credit theory, it soon became apparent from comments³ on his paper that his analysis contained some unrealistic assumptions. For various reasons, subsequent attempts by other authors⁴ to construct more realistic models were also unsatisfactory. This chapter attempts to show that a model which remedies some of the deficiencies in Hodgman's model leads to substantially the same conclusions.

The model is developed in three stages, but basically involves a consideration of the situation where a single lender is confronted with an application for a loan from a particular borrower. The lender uses his estimate of the borrower's ability to repay the loan as the criterion in deciding how much he is prepared to lend at different rates of interest. It was however, also necessary to make certain assumptions about the rural credit market in general, but a fuller discussion is deferred until later. A simple model under conditions of perfect knowledge is developed first. This is followed by a brief summary of Hodgman's model, which serves to introduce uncertainty into the analysis. To cope with uncertainty, Hodgman utilized recent developments in the application of probability

3. For example, see Chase, op. cit.

4. See Ryder, op. cit.; Miller, op. cit.; and Freimer and Gordon, op. cit.

theory to the decision making process.⁵ The third or modified model attempts to remedy some of the deficiencies in Hodgman's model. In the modified model, assumptions were also made about the lender's subjective expectations about the borrower's ability to service the debt. This allows it to be used to test the effect of varying the values of the various parameters in the model. Finally, the results of assuming hypothetical values for these parameters are discussed, along with some speculation on possible implications for current rural credit policy.

Before proceeding, several issues need to be discussed. The terms risk and uncertainty are often used to describe situations where the probability distributions of possible events can be estimated on an objective and subjective basis respectively. As all expectations in this chapter are assumed to be subjectively estimated, the distinction serves no useful purpose and consequently is ignored. Instead uncertainty is used to describe all types of imperfect knowledge, while in the models, risk is defined as the expected value of loss on a loan. Secondly, because the model is intended as a static, rather than dynamic analysis, the time horizon of the decision-maker (i.e. the lender) will be very short-run, where very short-run is defined as insufficient time for supply and demand conditions in the credit market to alter.

A conceptual problem also arises if the lender practices

5. An excellent text on this approach is Robert Schlaifer, Probability and Statistics for Business Decisions (Tokyo : McGraw - Hill, 1959).

both interest and credit rationing, as opposed to credit rationing only. In the latter case, a borrower will be able to obtain any amount of credit up to a finite limit a_q at constant cost. However, in the former case, the cost of credit will increase as the size of the loan increases up to the point where the supply of credit curve becomes inelastic. The conceptual problem arises because in certain circumstances, (such as where the interest rate is constant for most possible loan sizes, but rises sharply at the tail end of the curve and becomes asymptotic to the vertical) only interest rationing will occur, although the additional credit that could be obtained if the lender used credit rationing only would be infinitesimal. Such a situation is obviously closer to the concept of credit rationing than interest rationing, and in practice a lender would probably not use interest rationing, if only because it would be administratively simpler not to do so.

The Simple Model under Conditions of Perfect Knowledge

The framework for all three models consists of a hypothetical situation, in which a previously unencumbered borrower tries to borrow from one particular lender. As not all lenders are subject to constraints on the rate of interest they can charge, no such constraints will be assumed for our hypothetical lender. For the sake of simplicity, the type of loan considered will be a one year loan of the type common in the U.S.A., where a lender loans an amount (a) on the basis of a promise by the borrower to repay an amount (s)

one year later. Hence, there is an implicit rate of interest (r) charged on the loan, where

$$r = \frac{s-a}{a} \text{ -----(I)}$$

The implications of loans for more than one year will be discussed later.

As a first step in building the model, the following assumptions were made:-

(1) Both borrower and lender have perfect knowledge (i.e. no uncertainty), and are profit maximizers.

(2) The borrower will never promise to repay an amount in excess of his ability to do so (i.e. s is less than or equal to z) where:- z is the maximum amount the borrower will have available for repayment at maturity.

(3) The ability to repay the loan (z) is related to the size of the loan (a) in the following manner

$$z = p(b+a) \text{ -----(II)}$$

where:- b = equity capital

p = the rate of return on funds employed, and is

assumed to be constant and independent of a .⁶

(4) The lender has a fixed and finite supply of loanable funds,⁷ and will allocate these funds between competing borrowers so as to maximize his profits.

6. Strictly speaking, equation II should be written $z = p_1b + p_2a$, in which case only p_1 , the rate of return on equity capital is necessarily constant and independent of a . Although the rate of return on external funds, p_2 , will not be constant and independent of a unless the farmer is operating in the region of constant returns to scale; p_2 is unlikely to change significantly over the range of a involved in most loans. Consequently the above assumption does not seem to represent a serious departure from reality. However, writing equation II as $z = p(b+a)$ also implicitly assumes that $p_1 = p_2$, and this condition will, of course, not always be satisfied. One example would be a situation where the loan was used for non-productive purposes, such as consumption. In this case, there would be no relationship between z and a ; and z would simply equal pb . There are, however, other reasons for a difference between the two rates of return. If the borrower is operating in the region of diminishing returns to scale, then the rate of return on external funds will be less than that on equity capital. On the other hand, as a result of new technology, the position might be reversed. In fact, the reason for the borrower's application for a loan might well be that he needs additional funds to finance new technological developments, which will yield a higher rate of return than he has been receiving. Finally, in calculating ability to repay on an owner-operator type farm, the relevant deduction from return on labour and capital is family living expenses rather than wages expense, which is normally used in calculating a rate of return. However, for reasons that will be obvious later, the form used in the text is more desirable, and if the difference between p_1 and p_2 is significant, it will be necessary to substitute bk for b , where k is an adjustment factor such that $kp_2 = p_1$.

7. Admittedly, the validity of this assumption is debatable. In fact, Freimer and Gordon, op. cit., p. 400, assumed that lenders could borrow infinite amounts at a fixed rate of interest. However, Hodgman, op. cit., p. 271, Ryder, op. cit., p. 474, and Miller, op. cit., p. 483 all assume that lenders' funds are limited. Certainly in the short-run case applicable to this discussion, the cost of significantly increasing the supply of loanable funds would be high, and probably prohibitive.

As the costs associated with making loans will be almost entirely fixed costs, at least in the short-run, it follows that profits will be maximized by maximizing revenue. Under the assumptions made above, this implies that the lender will endeavour to maximize the yield (i) which he receives on his loanable funds, and in doing so will use i as the criterion to allocate his limited supply of these funds. In the case of an individual loan, of amount (a), the yield (i) will be given by:-

$$i = \frac{w-a}{a} \dots\dots\dots(III)$$

where w is the amount the lender is repaid after one year.

In a competitive credit market, all lenders will be trying to maximize i , while all borrowers will be trying to minimize the cost of credit (r). However, under assumption 2 above, w will equal s , and hence r will equal i . Therefore, an equilibrium will be reached where i equals a constant i^* , for all lenders.⁸ The cost of credit (r) will also equal i^* and hence will be constant and independent of the size of the loan.

In this simple model, the borrower will either not borrow at all if p is less than or equal to i^* , or borrow as much as possible if p is greater than i^* . Credit will not be available without limit, however, for s must be less than or equal to z , and thus the

8. There will however, be a lower bound to possible values of i^* , set by the rate of return on certain forms of investment, such as government securities, which involve no allocation costs, and are a real alternative to lending.

maximum yield (i') a given borrower can offer a lender will be inversely related to the size of the loan. This can be derived by substituting in equation (III) thus:-

$$i' = \frac{z-a}{a} = \frac{p(b+a)-a}{a} \dots\dots\dots(IV)$$

and therefore there will be some maximum amount of credit (a_q), also referred to as the point of credit rationing, that a borrower can obtain, as i' must be greater than or equal to i^* .

Thus
$$a_q = \frac{pb}{1+i^* - p} \dots\dots\dots(V)$$

Although the simple model is completely unrealistic, it is of some use in understanding the supply of credit curve. First, as was demonstrated above, the rate of interest charged will not vary with the size of the loan, and therefore interest rationing will not exist under the assumptions made above. On the other hand, credit rationing will occur.⁹ Thus it would appear that the direct cause of credit rationing is the borrower's limited ability to repay, and not the lender's reaction to risk and uncertainty as implied by Heady.¹⁰ However, this conclusion is conditional on the assumption of a single period loan. With a loan for n years, equation (V) becomes

$$a_q = \frac{pb}{\frac{1}{n} + 1^* - p} \dots\dots\dots(VI)$$

Hence credit rationing will only occur if the length of the loan is

9. Only in the completely unrealistic case of p equalling $(1+i^*)$ would a_q be infinite, and hence credit rationing never occur.

10. Heady, op. cit., p. 550

less than the reciprocal of the difference between i^* and p . A complete analysis of the reasons for the short-term nature of most loans is outside the scope of this study, but it will be shown later that uncertainty is one possible reason why lenders do not make long term loans. To the extent that this is the only reason, uncertainty is, after all, the fundamental cause of credit rationing.

It is obvious from equations (V) and (VI) that the point of credit rationing for any given borrower is a function of the value of i^* .¹¹ Therefore, the supply of credit to the farm sector as a whole will only alter when i^* changes from one equilibrium position to another as a result of a change in either the supply of loanable funds available to lenders, or in the total demand for credit by borrowers.

Hodgman's Model¹²

As Hodgman used the recent developments in probability theory mentioned above to construct a model under conditions of imperfect knowledge; assumptions (1) and (2) in the simple model have to be dropped. In their place he assumes:-

- (5) There is, in the mind of the lender, a probability

11. This assumes that compensatory changes in the value of i^* would occur if n was changed without a corresponding change in the lender's supply of loanable funds.

12. The above description is based on Chase's concise and extremely lucid summary of Hodgman's model; see, Chase, op. cit., pp. 319-321. However, some of Hodgman's and Chase's notations have been changed to fit in with those used in the simple model above.

distribution of \tilde{z} ,¹³ the borrower's ability to repay the loan. This distribution is denoted as $\theta(\tilde{z})$. He also assumes that the lender attaches zero probability to the borrower being able to repay any amount greater than some maximum m .¹⁴

(6) The borrower will always honour his promise to repay if able to do so.

Assumption (3) also has to be temporarily dropped, as Hodgman implicitly assumes that:-

(7) The borrower's ability to repay is independent of the size of the loan.

As the lender does not know the amount he will receive at maturity (w) with certainty, he will be concerned with its expected value $[E(w)]$, where $E(w)$ is given by,

$$E(w) = \int_0^s \tilde{z} \theta(\tilde{z}) d\tilde{z} + s \int_s^m \theta(\tilde{z}) d\tilde{z} \dots\dots\dots(VII)$$

The rationale behind this expression is that if the borrower is in a position to pay s or more (i.e. $z \geq s$), he will only pay s , while if he cannot pay s , he will whatever he can (i.e. z).

In a situation of risky choice, Hodgman postulates that the lender will be concerned not only with the expected value of repayment per dollar loaned $[\frac{E(w)}{a}]$, but also with the risk attaching to the

13. Care should be taken to distinguish between the parameter z , the true value of the borrower's ability to repay, and the random variable \tilde{z} , which is the lender's estimate of z .

14. Although Hodgman does not explicitly state what form $\theta(\tilde{z})$ will take it appears from his diagrams and discussion that he is assuming a symmetrical, bell shaped distribution, with a finite lower bound greater than or equal to zero, and, as stated above, a finite upper bound equal to m .

loan. The risk is due to the fact that for any given loan, there is a possibility that the lender will incur a loss (y) given by

$$y = (a - z) \quad (\text{for values of } z < a) \dots \dots \dots (\text{VIII})$$

Hodgman postulates that the risk attached to the loan can be conveniently quantified as the expected value of this loss, thus:-

$$\begin{aligned} E(y) &= \int_0^a y \theta(z) dz \\ &= a \int_0^a \theta(z) dz - \int_0^a z \theta(z) dz \dots \dots \dots (\text{IX}) \end{aligned}$$

To allocate their loanable funds between potential borrowers, Hodgman suggests that lenders would use the expected value of repayment per dollar $[\frac{E(w)}{a}]$, weighted in some manner by the risk per dollar loaned $[\frac{E(y)}{a}]$. He advances $\frac{E(w)}{E(y)}$ as a possible criterion for making decisions. Although he proceeds to draw certain conclusions about the nature of the supply of credit curve on the basis of the above model, his conclusions are not presented here, as his model has been criticised on a number of grounds. In the following section, Hodgman's model is modified in an attempt to overcome some of these shortcomings.

The Modified Model

Chase was the first to comment on Hodgman's model, and criticised it on three grounds.

The first was the assumption that z and $\theta(z)$ are independent of the size of the loan (a). This is obviously unrealistic and needs to be remedied. As pointed out by Chase, "there is, in effect, a constant component of the θ - distribution based on the borrower's prospective net worth from other sources, and a variable

component, deriving from the use of the proceeds of the loan in question. Since only the variable portion is affected by an increase in a , the rightward movement of the θ - distribution accompanying an increase in a is less than proportionate to the increase in a .¹⁵

The model can be made to behave in this manner by making the following assumptions:-

(8) Reinstate assumption (3) of the simple model in place of assumption (7) in Hodgman's model.

$$\text{i.e. } z = p(b+a) \dots\dots\dots(\text{II})$$

(9) There exists in the mind of the lender a probability distribution $\psi(\tilde{p})$ which expresses the lender's subjective expectations about the rate of return \tilde{p} ,¹⁶ and from which $\theta(z)$ is derived according to equation (X).¹⁷

$$\tilde{z} = \tilde{p}(b+a) \dots\dots\dots(\text{X})$$

This assumption presupposes that the lender's uncertainty about p and z originates from other factors having a common influence on both p and z . Hence, the assumption will be a reasonable approximation in the case of suppliers of rural credit, where the two unknown factors most likely to cause significant variations in both p and z are product prices and climatic conditions within the term of the loan.

15. Chase, op. cit., p. 323.

16. The comments previously made about distinguishing between z and \tilde{z} , also apply to p and \tilde{p} .

17. If the earlier comments are relevant, it will be necessary to substitute bk for b . The adjustment factor k , will not, of course, be known with certainty; but the degree of uncertainty surrounding k would be so small relative to that surrounding p that it could be ignored.

If the model is to be useful, at least in the sense that the effect of varying the parameters in the model can be tested, then it is also necessary to make an assumption about the nature of $\psi(\tilde{p})$. Before doing so however, another objection to Hodgman's model needs to be considered. This criticism relates to the way in which credit rationing in his model is conditional upon the borrower promising to repay an amount greater than or equal to the maximum amount the lender believes he could possibly repay. In other words, Hodgman's credit rationing depended upon the lender's subjective probability distribution having a finite upper bound.¹⁸ The possibility of this problem arising can obviously be overcome by specifying a distribution with no finite upper bound. Therefore the rectangular distribution assumed by Freimer and Gordon¹⁹ is unsatisfactory. Furthermore, on a priori grounds, it seemed more realistic to assume that a lender would consider one or a few values most likely to occur, and attach lower probabilities to values on each side of the modal values. Consequently it was assumed that \tilde{p} is normally distributed²⁰ with a mean, μ , and variance, σ^2 , since the normal distribution is not only a reasonable approximation in view of the conditions stipulated above,

18. Chase also doubted that expectations could differ to the extent that a borrower would consider it profitable to borrow an amount so large that the lender would be absolutely certain it would bankrupt him.

19. Freimer and Gordon, op. cit., p. 401.

20. The lender would most probably express his expectations in the form of a most likely value (e.g. μ); and a certain level of confidence (say 95%) that the true value p will be covered by a specified range (say $\mu \pm h$). In this case σ would equal $\frac{h}{1.96}$

but is also a convenient mathematical form to work with.

It follows that \bar{z} will be normally distributed with a mean, μ $(a+b)$, and a variance, $\sigma^2 (a+b)^2$. Therefore, as the size of the loan increases, not only will the lender's estimate of the borrower's ability to repay increase, but, at the same time, the lender will also become less confident about the final result. This reaction seems to be both plausible and intuitively reasonable.

The final criticism of Hodgman's paper related to his assumption that profit maximizing lenders would use $\frac{E(w)}{E(y)}$ as the criterion when allocating loanable funds. This assumption is undoubtedly the most contentious issue in his article. Chase objected to this assumption on the grounds that lenders are not indifferent to the prospect of bankrupt customers, because "banks thrive on depositors and on high class borrowers, neither is likely to be attracted to an institution whose loan customers have the habit of defaulting".²¹ Ryder based his model on the assumption "that the lender is motivated solely by the prospect of continued profitable relations with his customers".²² Miller felt that lenders would consider the absolute size of $E(y)$ as well as the ratio $\frac{E(w)}{E(y)}$, and proceeded to construct a model based on the assumption that banks are unwilling to make loans which might bankrupt a customer because of "a reluctance to incur the costs, both direct and indirect,

21. Chase, op. cit., p. 326

22. Ryder, op. cit., p. 473

associated with bankruptcy proceedings".²³ On the other hand, Freimer and Gordon based most of their analysis on the assumption that maximizing "the expected profit on the loan is a plausible decision criterion under the following conditions:

(1) the banker is able to borrow an infinite amount at a fixed rate of interest, and (2a) he is indifferent to risk, or (2b) the amount loaned to each borrower in relation to the banker's portfolio is small and the correlation in the outcomes of the loans are small".²⁴

In fact, two assumptions are at issue in this controversy. The first is the assumption that rational²⁵ lenders would only be concerned with expected values. This assumption presupposes the validity of condition (2a), or (2b) above. As all the available evidence suggests that most lenders are very concerned with risks, the second condition must be shown to hold if expected values are to be used in the model. In the Australian rural credit market, it is certainly true for most lenders that individual loans only make up an extremely small proportion of their total portfolio. The reasons for the degree of correlation in the outcomes of loans being small is somewhat more obscure. Although climatic conditions and movements in the price of an agricultural product will tend to increase the degree of correlation, this tendency will be mitigated considerably in the case of most institutional lenders, as their

23. Miller, op. cit., p. 481

24. Freimer and Gordon, op. cit., p. 400

25. In the profit maximizing sense.

loan portfolios not only cover a wide range of environments and agricultural products, but also frequently cover secondary industries as well. This observation may not be valid for certain specialized lenders, but will hold for most of the major lending institutions.

Given that a lender will use expected values, a second assumption has to be made about the relevant decision criterion to be used in making loans which will maximize his profits. Obviously Hodgman's method of using the expected loss as a measure of the dispersion of the distribution with which to weight the expected yield is not acceptable, as our lender is not concerned with the dispersion of the distribution per se. Furthermore, although Hodgman stated that his approach was meant to be "suggestive rather than definitive",²⁶ his use of $\frac{E(w)}{E(y)}$ as the decision criterion is inappropriate as it is undefined whenever a lender considers a loan proposition to be riskless (i.e. $E(y) = 0$).

On the other hand, simply using the expected value of the profit on the loan is, as Freimer and Gordon admit themselves, unrealistic. However, although their reasons differ, all of the authors cited seem to be in agreement that profits are positively related to the yield the lender can earn on his loanable funds,²⁷ and negatively related

26. Hodgman, op. cit., p. 264.

27. In private discussions with some responsible banking officials, this postulate was criticized on the grounds that the prime determinant of banks' profits is the volume of deposits they are able to attract. It was suggested that this fact not only accounts for the traditional reluctance of bankers to bankrupt customers along the lines suggested by Chase, but also causes bankers to base lending decisions mainly on their expectations about the potential of the borrower to be a future customer on the deposit side of the ledger. However the two criteria are not really incompatible, because the borrower who can offer a higher yield will not only be the borrower with a greater potential as a depositor, but will also become a potential depositor much quicker.

to the number of loans on which he has to foreclose. Therefore, it seemed reasonable to postulate that the decision criterion to be used should reconcile these two conflicting interests. Consequently, the following assumptions were made:-

(11) That the expected yield $E(i)$ is the appropriate factor to reflect the yield aspect of a loan, where $E(i)$ is defined in the same manner as yield in equation (III),

$$\begin{aligned} \text{i.e. } E(i) &= \frac{E(w) - a}{a} \\ &= \frac{\int_{-\infty}^s \tilde{z} \theta(\tilde{z}) d\tilde{z} + s \int_s^{\infty} \theta(\tilde{z}) d\tilde{z} - a}{a} \dots\dots\dots(XI) \end{aligned}$$

(12) That the expected loss per dollar loaned, $\frac{E(y)}{a}$ is the appropriate factor to reflect the risk of the borrower being bankrupt by the loan, hereafter referred to simply as the risk aspect of the loan.

Equation (IX) is not suitable for this purpose, because where $s > z \geq a$, the lender does not receive all the interest he was promised, and yet using equation (VIII) there is no loss ($y=0$). As interest foregone is an opportunity cost, it seems that it should be included as part of any loss, and hence it is necessary to reformulate the loss and risk functions by substituting equations (XII) and (XIII) for (VIII) and (IX) respectively.

$$y = (s-z) \quad (\text{for values of } z < s) \dots\dots\dots(XII)$$

$$E(y) = s \int_{-\infty}^s \theta(\tilde{z}) d\tilde{z} - \int_{-\infty}^s \tilde{z} \theta(\tilde{z}) d\tilde{z} \dots\dots\dots(XIII)$$

Therefore, $E(y)$ will be an increasing function of s , and also of a ; and thus the larger the loan, the greater the risk per dollar loaned.

(13) That the relevant decision criterion should consist of the expected yield, $E(i)$, weighted by the risk aspect of the loan, $\frac{E(y)}{a}$, in such a way that the resulting measure, hereafter termed the effective yield and denoted by j , should approximate to the expected yield $E(i)$, when the risk is negligible.

This was achieved by defining j as follows:-

$$j = \frac{E(i)}{1+c \frac{E(y)}{a}} \dots\dots\dots(XIV)$$

where c is a hypothetical lender characteristic reflecting the individual yield-risk preference of any given lender. Thus the fact that different lenders might have different subjective yield-risk preferences reflecting their respective beliefs about the relative influence of yield and bankrupt customers on profits can now be introduced into the model simply by varying c for different lenders.. Hence a lender who places a lot of importance on not bankrupting his customers will have a very high c value, while a low c value implies that the lender considers that the yield aspect of the loan has a much more important effect on profits.

Of course, no presumption is made that the above formulation is a realistic representation of actual lender behaviour; it merely provides a convenient framework of analysis which seems to describe how a rational lender might be expected to react.

The effective yield (j), can now be defined completely by substituting equations (XI) and (XIII) in equation (XIV) as follows:-

$$j = \frac{a \cdot E(i)}{a+cE(y)} \dots\dots\dots(XIV)$$

$$\begin{aligned}
&= \frac{E(w)-a}{c \cdot E(y)+a} \quad \text{from equation (XI)} \\
&= \frac{\int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} + s \int_s^{\infty} \theta(\bar{z}) d\bar{z} - a}{cs \int_{-\infty}^s \theta(\bar{z}) d\bar{z} - c \int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} + a} \quad \dots\dots\dots(XV)
\end{aligned}$$

before proceeding, one qualification needs to be noted. Hodgman assumed that $\theta(\bar{z})$ had a finite range, while if \bar{z} is normally distributed, the range is obviously infinite. Although it is desirable for \bar{z} to be unbounded in an upward direction, the lower bound must obviously be non-negative, as negative debt repayment is an illogical concept.²⁸ Therefore, it is necessary to place an upper restriction on the possible values of σ , such that the probability of \bar{z} being less than zero is negligible.²⁹ However, as all lenders would almost certainly refuse to extend credit if they considered that there was even a slight chance that they would be repaid neither the principal nor the interest, then the restriction on σ does not seem to be particularly serious.

Before proceeding further, it is again necessary to briefly consider the credit market as a whole along similar lines to those

28. The only possible case where negative values of z would make any sense is for an overdraft, or in fact any loan where the lender was prepared to advance additional funds to save the borrower from going bankrupt. However, as noted above, no rational lender would make a loan in circumstances where he considered there was any likelihood of the above situation occurring.

29. The significance of this point can be amply demonstrated by noting that if the above-mentioned probability is not negligible, then the model implies that the lender would still be facing some risk even when no loan is made.

used in the simple model, where it was established that all lenders would charge a common rate of interest under conditions of perfect knowledge. Unfortunately, it is not as easy to predict how the rural credit market will behave when uncertainty is introduced into the analysis. One problem that arises is that whereas the borrower is still trying to minimize the cost of credit r , the lender is now trying to maximize the effective yield j , and j no longer necessarily equals r even if $c = 0$. Thus we really have the situation where there are two market "prices". (i.e. j is the "price" considered by the lender but r is the "price" considered by the borrower.) Unfortunately, to date no theory seems to have been developed to cope with this sort of situation, although it may well prove to be not uncommon in an uncertain world; and consequently an intuitive approach has been used in this study. Compounding the difficulties however, is the fact that different lenders will not only have different values of c (i.e. different yield-risk preferences) but also different expectations (i.e. different $\theta(\bar{z})$ about any given borrower.) Therefore, any given borrower will, in effect, be able to offer different prices (i.e. different values of j) to different lenders. In this sort of situation, one would still expect the market to reach an equilibrium position, in the sense that total supply equals total demand. Consequently, in a competitive market any given lender will extend credit to all comers on the same terms, (i.e. at an equilibrium value of j denoted j^*).

This assumes that a profit maximizing lender will always be

"fully loaned up". This assumption will be a reasonable approximation so long as the lender has the alternative of placing his funds in a riskless investment such as government securities which earn a rate of return in excess of the cost of his loanable funds. Furthermore, because there is no risk, the rate of return on such an investment will equal j , and consequently sets a lower bound on the values of j that the lender will accept from a borrower. However, although any one lender will make all loans at some constant equilibrium value of j equal to j^* , it does not follow that there will be a single value of j^* that is common to all lenders. In fact, realization of the equilibrium position will almost certainly depend on different lenders using different values of j^* . This result arises from the fact that differences in c values, and in expectations between lenders will produce differences in the degree to which lenders have to reduce j^* to expand the volume of their lending by one unit; and in combination with differences in the lenders' supplies of loanable funds will mean that some lenders will be able to become "fully loaned up" at a higher value of j^* than others. In spite of this, a particular change in market conditions should change the various values of j^* of the different lenders in the same direction when the market shifts to a new equilibrium position; and consequently, when shifts in the market equilibrium position are discussed in the results, only changes in one value of j^* are considered.

Having established that the value of j will be a constant

for any given lender, it is now possible to return to the single borrower, single lender model. For any one lender with given values for c and j^* , and with certain expectations about Z , as defined by values for μ , σ^2 , and b ; it will now be possible using equation (XV) to determine how much the borrower will have to promise to repay (s), to obtain a loan of given size (a). Unfortunately, it is not possible to solve equation (XV) directly for s given a , or vice versa. To arrive at the required solution involves either an iterative procedure, which would require the services of a computer, or an interpolative procedure. Because programming the computer was not warranted by the number of computations involved, it was decided to use the latter method, which involves solving equation (XV) for j , and then graphing j against s for various values of a . The values of s corresponding to each value of a for an assumed value of j^* can then be derived by interpolation.

The supply of credit curve implied by the model can now be derived by plotting the rate of interest against the size of the loan; where the relevant value of s for each value of a is derived as above. However, in deriving the supply of credit curve, it should be noted that the relevant rate of interest is the derivative of $(s-a)$ with respect to a , which is a "cost" in the marginal cost sense; and not, as assumed by Hodgman, $\frac{s-a}{a}$, which is a "cost" in the average cost sense.³⁰ Only the final expression for the marginal cost function

30. Hodgman, op. cit., p. 270.

$\frac{d(s-a)}{da}$ is presented in equation (XVI) below,³¹ as derivation proved to be quite lengthy and involved, and consequently has been relegated to appendix 6.

$$\begin{aligned} \frac{d(s-a)}{da} &= \frac{ds}{da} - 1 \\ &= \frac{(1+j) - (1+jc) [\mu \int_{-\infty}^{x_s} \phi(\tilde{x}) d\tilde{x} - \sigma \phi(x_s)]}{1 - (1+jc) \int_{-\infty}^{x_s} \phi(\tilde{x}) d\tilde{x}} - 1 \\ &= \frac{j - (1+jc) [(\mu-1) \int_{-\infty}^{x_s} \phi(\tilde{x}) d\tilde{x} - \sigma \phi(x_s)]}{1 - (1+jc) \int_{-\infty}^{x_s} \phi(\tilde{x}) d\tilde{x}} \dots\dots\dots(XVI) \end{aligned}$$

The results of specifying values for the parameters in the model led to some very interesting conclusions. Diagram 10 illustrates the nature of a typical supply of credit curve. The curve not only becomes asymptotic to the vertical (i.e. credit rationing will occur); but even more significantly, interest rates are constant and equal to the value of j^* for most values of a , and only start to increase when the lender has advanced over 90 per cent of the total amount he is prepared to lend. In other words, the curve closely resembles the results of the simple model, where ONLY

31 Where:- \tilde{x} is the standard normal variate = $\frac{\tilde{z} - \mu(a+b)}{\sigma(a+b)}$

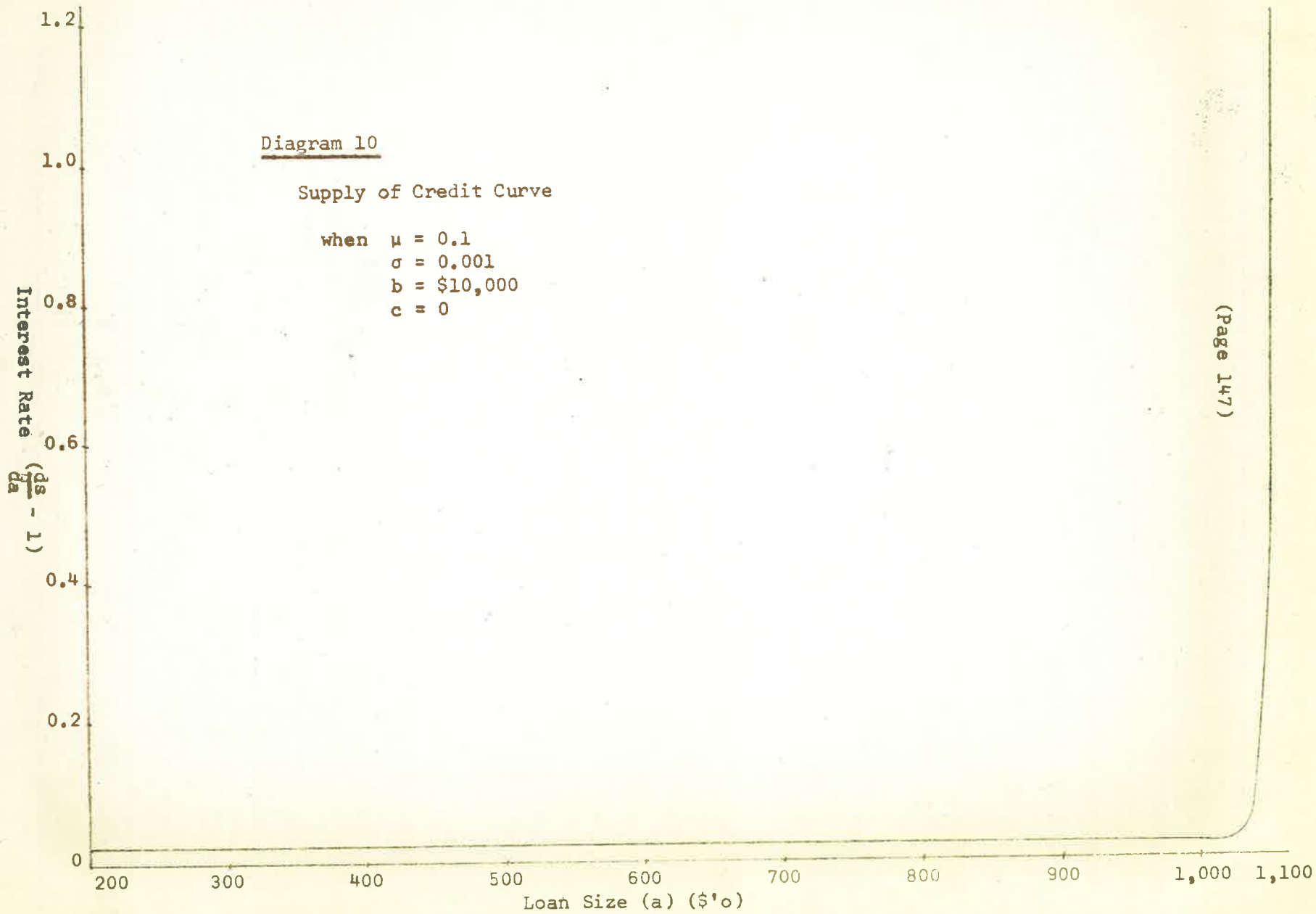
x_s is the value of \tilde{x} when $\tilde{z} = s$

$\phi(\tilde{x})$ is the standard normal distribution.

Diagram 10

Supply of Credit Curve

when $\mu = 0.1$
 $\sigma = 0.001$
 $b = \$10,000$
 $c = 0$



credit rationing occurred. Assuming a less liberal lender (i.e. a positive value for c) enhances the resemblance, but may in some cases be more than offset by greater uncertainty (i.e. higher values of σ^2) which increases the length of the "tail" of the curve (i.e. the end section where interest rates are greater than j^*). Thus, if there are no restrictions on the rate of interest charged, it will be theoretically possible for both interest rationing and credit rationing to occur, but in practice only the latter would be likely to occur.

The rest of this chapter, however, deals with the case where the interest rate (r) charged on the loan is fixed for some reason.³² This simplifies the analysis in two important respects. First, the average cost now equals the marginal cost, and both are constant; and secondly, it is possible to substitute $a(1+r)$ for s in equation (XV) which can now be rewritten thus:-

$$j = \frac{a \cdot r + \int_{-\infty}^{a(1+r)} z \theta(z) dz - a(1+r) \int_{-\infty}^{a(1+r)} \theta(z) dz}{a-c [\int_{-\infty}^{a(1+r)} z \theta(z) dz - a(1+r) \int_{-\infty}^{a(1+r)} \theta(z) dz]} \text{-----(XVII)}$$

In this situation, the lender will obviously not be able to extend credit to all borrowers on equal terms,³³ as in any given situation, j will be a function of a only. However, there will almost certainly still be some minimum level of the effective yield

32. In the Australian rural credit market, this is by far the most common form of loan anyhow.

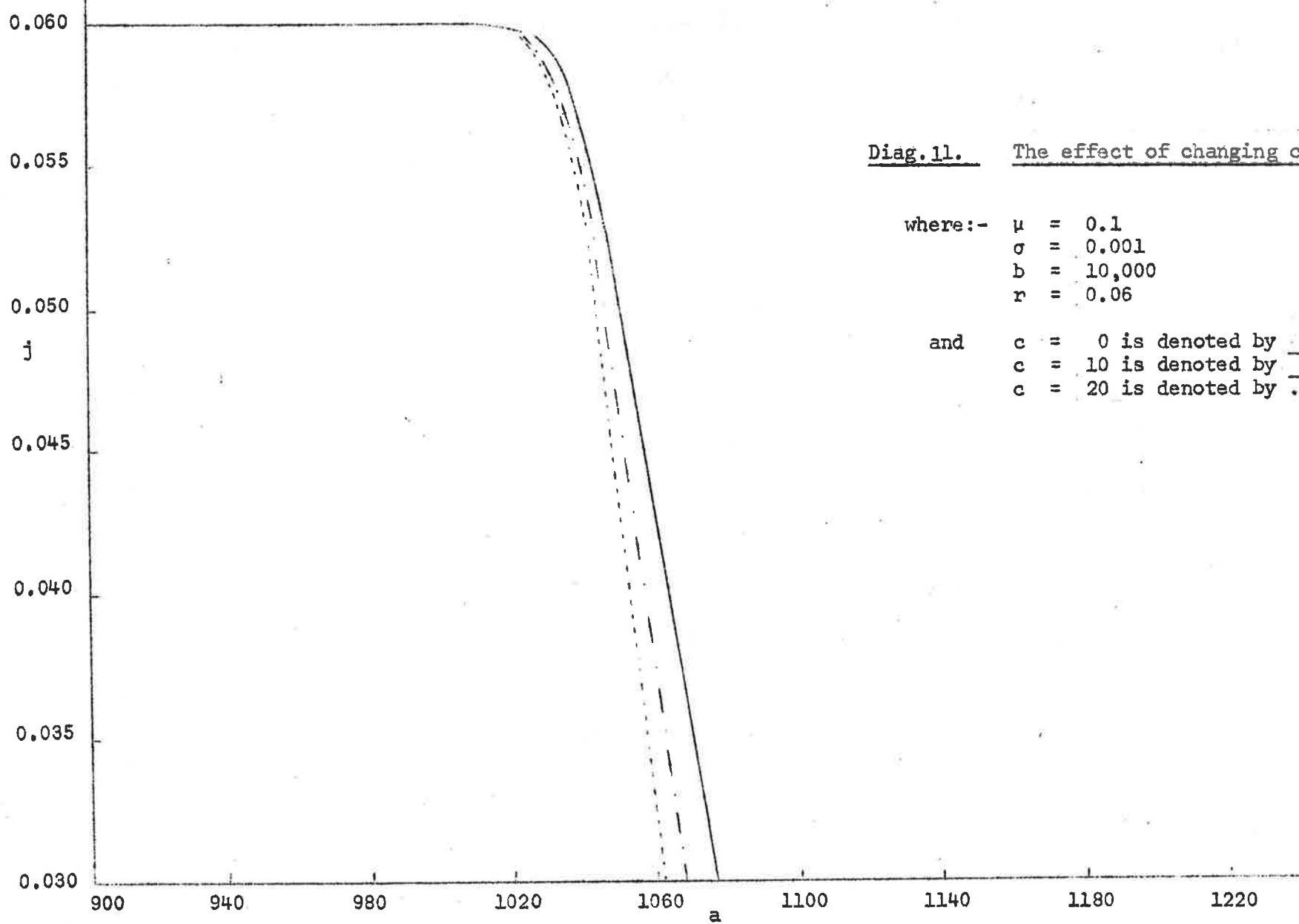
33. The only possible exception to this would be if all borrowers were prepared to borrow more than the lender was prepared to lend.

(j) that the lender will be prepared to accept (denoted by $j^\#$); as the lender will at least need to receive a certain positive rate of return on his loanable funds to cover the fixed costs involved in lending. Thus there will still be some finite limit to the amount the lender is willing to lend to any given borrower. This limit, denoted a_q , will be the point of credit rationing, and will be the value of a that sets j equal to $j^\#$ in equation (XVII). In the next section, the way in which the point of credit rationing varies as the parameters μ , σ^2 , b , c , r and $j^\#$ are changed is examined.

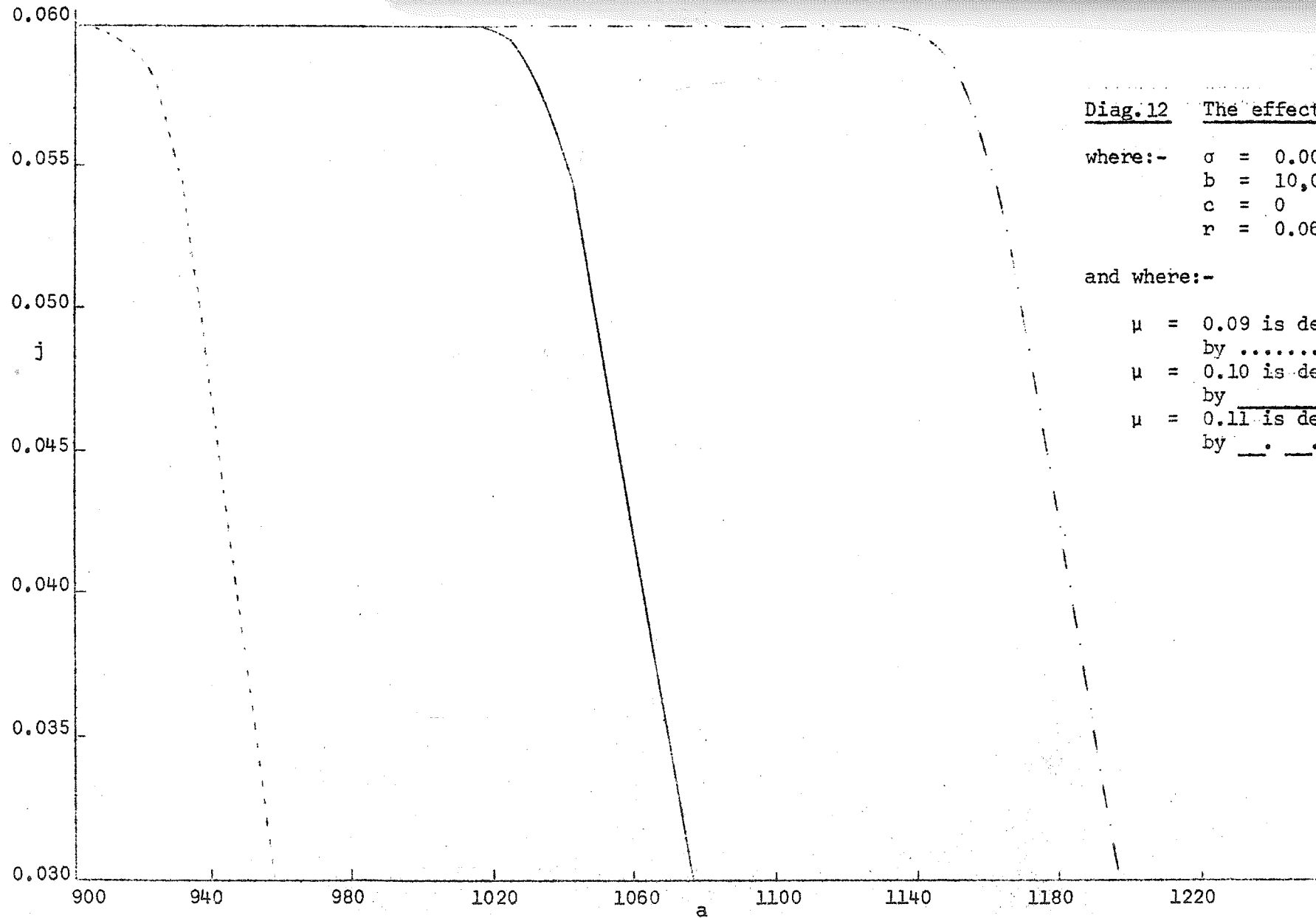
Results and Discussion

The results of applying the modified model to a few hypothetical loan situations are presented in diagrams 11 to 15. Each graph is derived by using specific values for μ , σ , b , c and r in equation (XVII); and then plotting the values of j calculated from this equation against the corresponding values of a .

All of the graphs seem to conform to the same general shape, which for the sake of convenience, can be divided into three sections. Starting from the Y-axis, the first section, which covers most of the range of a , consists of a horizontal straight line with j equalling the relevant value of r . The third, or final section, consists of a negatively sloped straight line, while the middle section consists of a curve joining the two straight lines. Obviously, only the second and third sections of the curve will be relevant to the question of credit rationing if $j^\#$ is less than r . In this case, the value of a_q , the point of credit rationing in a given situation, can be obtained from the appropriate graph by reading off the value



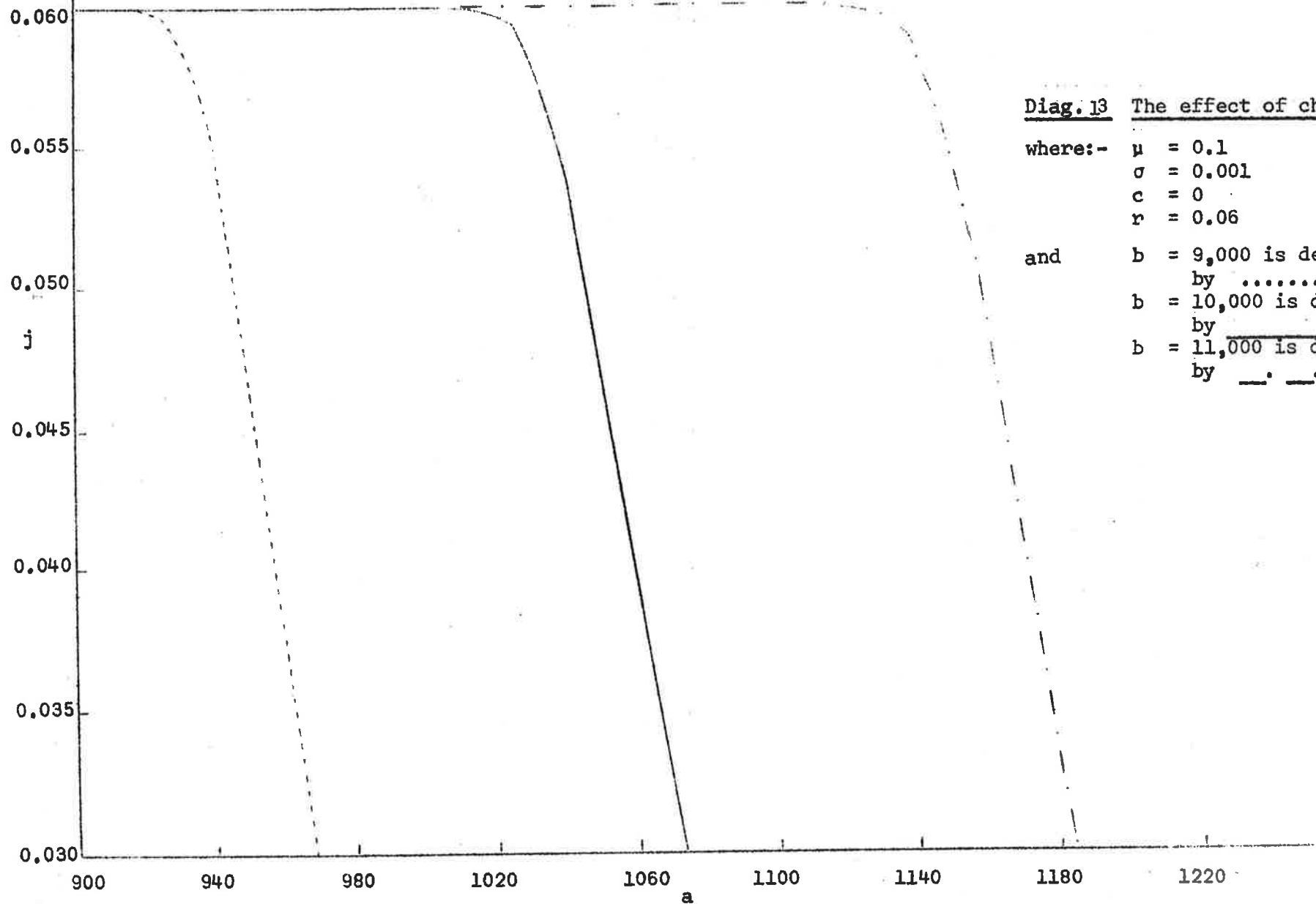
Diag. 11. The effect of changing c



Diag.12 The effect of changing μ

where:- $\sigma = 0.001$
 $b = 10,000$
 $c = 0$
 $r = 0.06$

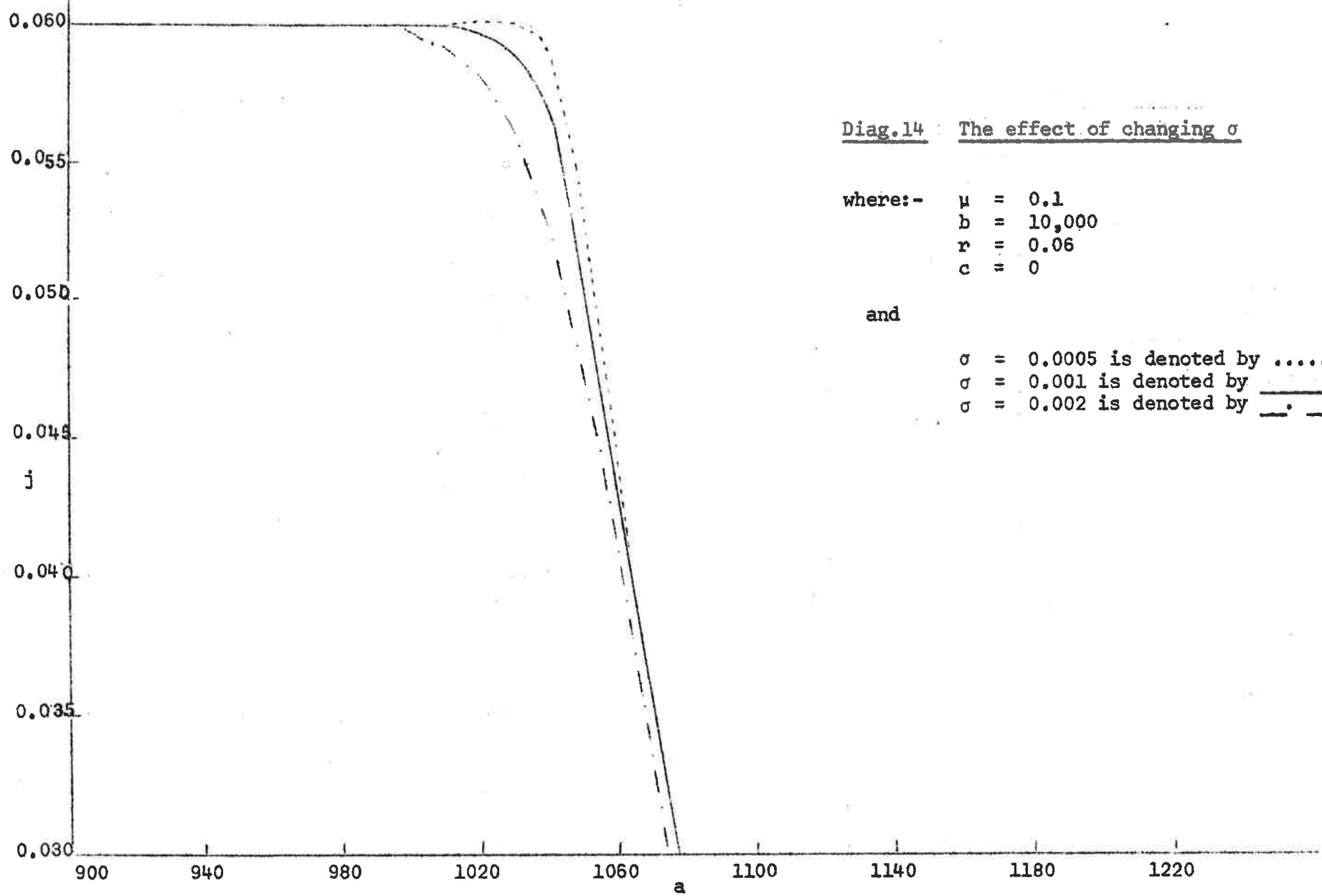
and where:-
 $\mu = 0.09$ is denoted
 by
 $\mu = 0.10$ is denoted
 by
 $\mu = 0.11$ is denoted
 by



Diag. 13 The effect of changing b

where:- $\mu = 0.1$
 $\sigma = 0.001$
 $c = 0$
 $r = 0.06$

and $b = 9,000$ is denoted
 by
 $b = 10,000$ is denoted
 by _____
 $b = 11,000$ is denoted
 by - . - . - .



Diag.14 : The effect of changing σ

where:- $\mu = 0.1$
 $b = 10,000$
 $r = 0.06$
 $c = 0$

and

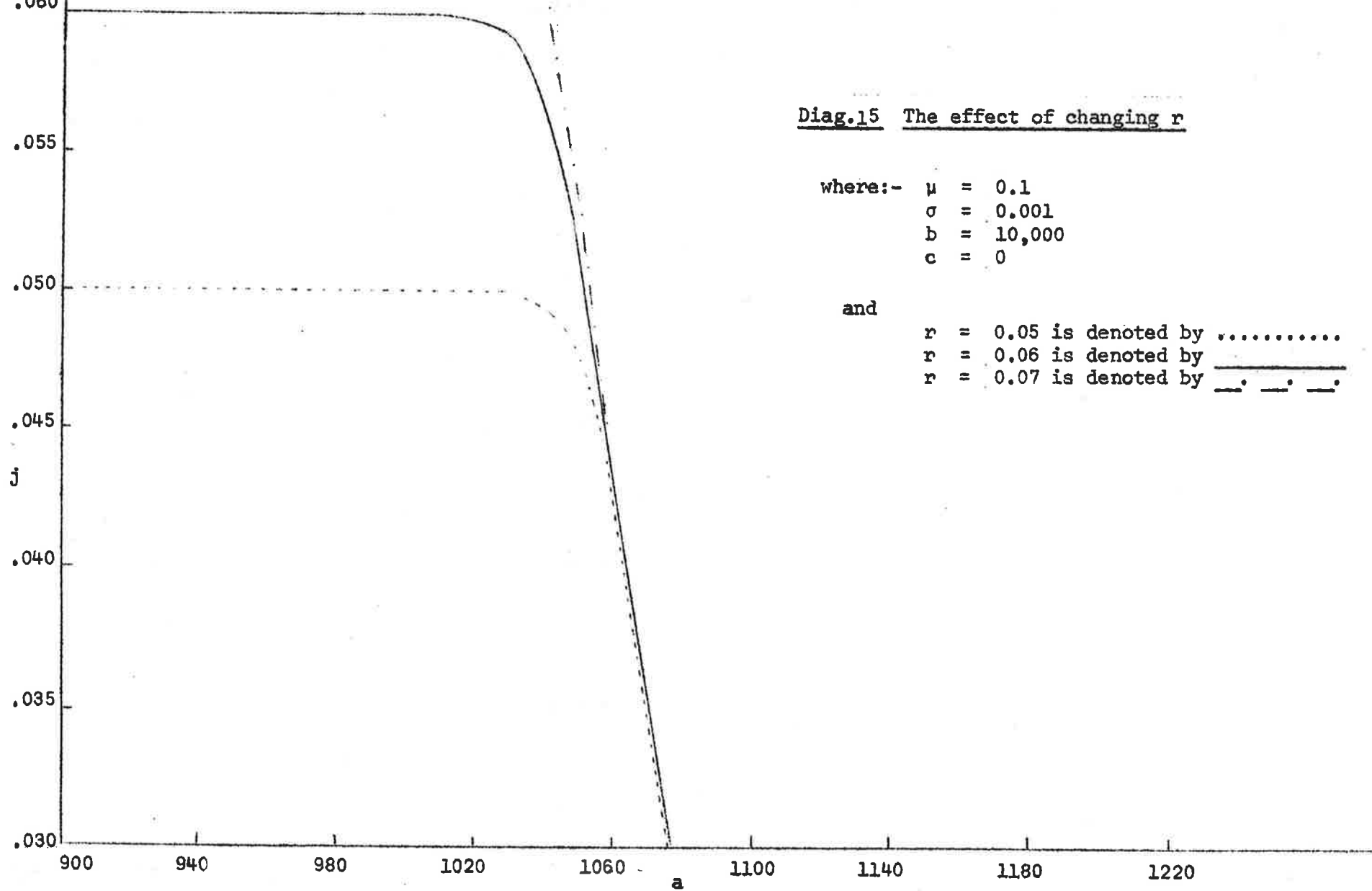
$\sigma = 0.0005$ is denoted by
 $\sigma = 0.001$ is denoted by _____
 $\sigma = 0.002$ is denoted by -.-.-.-.-

Diag.15 The effect of changing r

where:- $\mu = 0.1$
 $\sigma = 0.001$
 $b = 10,000$
 $c = 0$

and

$r = 0.05$ is denoted by
 $r = 0.06$ is denoted by _____
 $r = 0.07$ is denoted by __. __. __.



of a corresponding to the value of j equal to $j^\#$. If $j^\#$ equals r , a_q will be the value of a at the point on the graph where the first section joins the second.³⁴

Although time did not permit the effect of changing the values of the various parameters in the model to be fully explored, the following discussion outlines what seem to be the most important results. In interpreting the results, one of two points of view can be taken. The first is that lenders already place significant emphasis on the borrower's ability to repay when allocating loanable funds, while the second is that lenders are more concerned with the value of securities the borrower can pledge as collateral. If the first is the correct view, then the results of the modified model are probably directly applicable in one or more of the ways indicated below. However, if the second holds, then the results of the model can still be used as a basis for comparison with the manner in which the rural credit market operates at present. The choice between the two points of view is left up to the reader, as it was not possible in this study to resolve this question. Some apparent implications of the results are also discussed briefly, and a few possible avenues for further investigation are suggested. For the sake of simplicity, the following discussion is orientated mainly towards lending by the trading banks, as they are the single most important suppliers of

³⁴ $j^\#$ is only likely to equal r if the total demand for credit by credit-worthy borrowers at going rates of interest exceeds the total supply of loanable funds.

credit to the farm sector in Australia.

The way in which a_q changes as $j\#$ changes is obvious from the graphs. The fact that values of a_q are not very sensitive to changes in $j\#$ could have important policy implications. For example, one would expect an increase in the supply of loanable funds to decrease $j\#$, as to extend additional credit, lenders must be willing to accept less favourable terms (i.e. lower $j\#$). As the Reserve Bank influences the supply of these loanable funds in various ways, the model suggests either that such measures will be ineffective, or that small changes in the supply of loanable funds will cause large changes in the value of $j\#$. However, the former is more likely, particularly when an attempt was being made to increase the supply of credit to farmers, since lenders would tend to channel funds into riskless investments such as government securities rather than making loans yielding a lower value of $j\#$ than the rate of return on such investments. This tendency could be offset if the demand for credit at the going rates of interest also increased, as this would tend to raise values of $j\#$.

From diagram 11, it can be seen that virtually the only effect of increasing c will be to reduce the value of a_q . Thus, as would be expected, a lender with a high yield-risk preference (i.e. low c value), would be prepared to lend a greater amount to any given borrower than a lender concerned more with avoiding risk. In diagrams 12 and 13, the direct, almost proportional relationships between μ and a_q , and b and a_q respectively, are clearly demonstrated. As can be seen in diagram 14, changing σ does not have a very

significant effect, the main change being in the length and position of the middle section of the graph. Hence, for most values of $j\#$, changes in σ will cause only relatively small changes in a_q .

The first important point arising from these results is that the maximum amount of credit that a borrower will be able to obtain is only slightly more than the amount which the lender believes he is most likely to be able to repay if he did not borrow AT ALL. Thus in contrast to Hodgman's model, only small differences in the expectations of lenders and borrowers will be necessary for credit rationing to occur. Secondly, the results allow a closer examination of the claims that methods of allocating loanable funds based on the borrower's ability to repay will result in a more efficient allocation of credit than the more traditional methods, based mainly on the value of securities a borrower can offer as collateral for the loan. Contrary to what might be expected, the amount that can be borrowed if the former method is used will not depend solely on the economic efficiency of the borrower's operations, or expectations thereof (i.e. μ and σ). However, whereas the amount that can be borrowed under the latter method will depend only on the value of assets OWNED by the producer, under the former method it will be determined by the value of assets CONTROLLED by the producer AND by his economic efficiency. Furthermore, the former method would appear to have at least one other very important advantage apart from the ability to cope with uncertainty, over the latter method where very little potential, if any, seems to exist for varying the point of credit rationing (a_q) by varying the terms

and conditions attaching to the loan. The former method is much more flexible in this regard, although not completely so. To illustrate, one characteristic of a loan that can be varied is the number of years until maturity. Obviously, the amount to be repaid in any one year is inversely related to the term of the loan in years. Thus, at first sight, it would seem that the value of a_q is directly proportional to the length of the loan. However, as the term of the loan is increased, the lender's uncertainty will also increase, and as a result he will increase σ and possibly also revise μ in a downward direction. These reactions by the lender will tend to offset the increases in a_q gained by lengthening the loan; and, although one can only guess, a point will probably be reached beyond which increases in the term of the loan will no longer be effective in increasing a_q , and thus decreasing the incidence of credit rationing.

Lending decisions based on expectations about ability to repay may, however, have a serious drawback at the macro-economic level. Under boom conditions, lenders are likely to revise their expectations (i.e. μ) in an upward direction, and vice versa in a depression. If this proves to be the case, the action of those lenders who allocate loanable funds on the basis of the borrower's ability to repay, would tend to reinforce any fluctuations in the level of economic activity by increasing the supply of credit in an up-swing, and decreasing it in the downswing. Finally, the effect of changing r is demonstrated

in diagram 15. From this diagram, it appears that changes in the rate of interest may not only influence the demand for credit, but may also have a marginal influence on supply. However, if the demand for credit does change with the interest rate, it will alter $j\#$, and thus tend to offset any direct effect of interest rate on the supply of credit.

APPENDIX 1

Because the flow of funds results in chapter 3 were derived from a sub-sample of only 26 farmers, it is possible that these results were biased. Although it is not possible to directly test for bias, any bias is unlikely to be serious if there are no significant differences between the sub-sample of 26 farmers and the total sample of 59 farmers with respect to important farm and personal characteristics. Therefore the following five null hypotheses were tested using t - tests.

(1) That no significant difference exists between the mean age of farmers in the sub-sample and the mean age of farmers in the full sample.

Mean age (sub-sample) = 53.42 years;

Mean age (full sample) = 52.81 years.

$$|t| = \frac{0.61}{3.08} = 0.198$$

$$P |t| > 0.198 = 0.8 - 0.9$$

(2) That no significant difference exists between the mean level of formal education of farmers in the sub-sample and the mean level of formal education of farmers in the full sample.

Mean education (sub-sample) = 1.89

Mean education (full sample) = 2.34

$$|t| = \frac{0.45}{0.32} = 1.41$$

$$P |t| > 1.41 = 0.1 - 0.2$$

(3) That no significant difference exists between the mean family size of farmers in the sub-sample and the mean family size of farmers in the full sample.

$$\text{Mean family size (sub-sample)} = 5.19$$

$$\text{Mean family size (full sample)} = 4.69$$

$$|t| = \frac{0.50}{0.57} = 0.875$$

$$P |t| > 0.875 = 0.3 - 0.4$$

(4) That no significant difference exists between the mean farm acreage of farmers in the sub-sample and the mean farm acreage of farmers in the full sample.

$$\text{Mean farm acreage (sub-sample)} = 1321;$$

$$\text{Mean farm acreage (full sample)} = 1484.$$

$$|t| = \frac{163}{233} = 0.70$$

$$P |t| > 0.70 = 0.4 - 0.5$$

(5) That no significant difference exists between the mean amount borrowed by farmers in the sub-sample and the mean amount borrowed by farmers in the full sample.

$$\text{Mean amount borrowed (sub-sample)} = 5437$$

$$\text{Mean amount borrowed (full sample)} = 6760$$

$$|t| = \frac{1323}{2618} = 0.51$$

$$P |t| > 0.51 = 0.6 - 0.7$$

Therefore it was not possible to reject any of the null hypotheses postulated above, and consequently it must be concluded

that no significant difference exists between the sub-sample and the full sample with respect to the five characteristics tested above.

APPENDIX 2

The following are complete definitions of the items in tables 1A, 1B, 3A and 3B.

I Tables 1A and 3A

- (1) Sale of Produce:- The sum of the cash receipts from the sale of wheat, barley, oats, dairy produce, eggs, skins, small seed and other farm produce.
- (2) Livestock Profits:- The amount, if any, by which cash receipts from the sale of livestock exceeds cash payments for the purchase of livestock other than breeding stock.
- (3) Miscellaneous Receipts:- The sum of cash receipts from the provision of agistment, renting or sale of farm assets, and insurance proceeds for the loss of farm assets or produce.
- (4) Farm Cash Receipts:- The sum of items (1), (2) and (3) above.
- (5) Contracts, etc:- The sum of cash receipts from the provisions of services such as ploughing, harvesting, spraying, shearing, etc., to other farmers on a contract basis.
- (6) Wages:- The sum of all salaries and wages received by any member of the farm family from any off-farm occupation.
- (7) Interest and Dividends:- The sum of cash inflows received as interest on bank accounts, fixed deposits, government bonds, debenture stock, etc; and as dividends on shares held by any member of the farm family.
- (8) Commissions, Government grants, etc:- The sum of cash

receipts in the form of bounties, subsidies, drought relief, etc., plus income from commissions, discounts, rebates, sundry credits and bad debts recovered.

(9) Other:- Miscellaneous cash receipts not identified on income tax returns.

(10) Off Farm Income:- The sum of items (5) to (9) above.

(11) Loan Proceeds:- The sum of loans from each source of credit. (N.B. flows in the opposite direction (i.e. debt repayment) applying to different lenders or different borrowers have NOT been netted out).

(12) Redemption of Financial Assets:- The sum of cash receipts from the sale of shares, bonds and other financial assets; from the withdrawal of fixed deposits, and from the net annual decrease (if any), in the balance of all bank accounts owned by members of the farm family.

(13) Private Loans Repaid:- The sum of cash receipts from the repayment of private loans made by the farmer.

(14) Capital Injections:- The sum of cash receipts from gifts, prizes, inheritances, and new partnership capital.

(15) Miscellaneous:- The sum of cash receipts from the sale of non-farm physical assets, from tax rebates, and from life assurance endowments.

(16) Other Cash Receipts:- The sum of items (12) to (15) above.

II Tables 1B and 3B

- (1) Farm Cash Operating Expenses:- The sum of cash payments for the purchase of all goods and services which are incurred annually in operating the farm (i.e. all purchases of goods and services for the farm which are not included in Farm Investments).
- (2) Land Investments:- The sum of all cash payments for the purchase of farm land.
- (3) Improvements:- The sum of all cash payments for the purchase, or complete replacement (but not repair), of farm buildings and other structures, fences, gates, roads, dams, watering tanks and troughs, windmills, feeding facilities etc., plus all cash costs associated with soil conservation and pasture improvement.
- (4) Plant and Machinery Investment:- The sum of all cash payments for the purchase of new and second-hand farm plant and machinery, net of any trade-in allowance on, or cash receipts for, any old plant disposed of, plus half the cost of private automobiles.
- (5) Livestock Investment:- The sum of all cash payments for the purchase of breeding stock, plus the amount, if any, by which cash payments for the purchase of other livestock exceeds cash receipts from the sale of livestock.
- (6) Farm Investment:- The sum of items (2) to (5) above.
- (7) Interest:- The sum of all cash payments for interest on debt outstanding to all lenders.

(8) Principal Repayment:- The sum of repayments of principal to each type of lender. (N.B. flows in the opposite direction applying to different lenders or borrowers have NOT been netted out.)

(9) Debt Repayment:- The sum of items (7) and (8) above.

(10) Family Living Expenses:- The sum of all cash expenditure on food, clothing and drapery, housing, household supplies and equipment (including consumer durables), half the cost of private automobiles (as opposed to exclusively farm vehicles such as trucks etc.), entertainment services, life assurance premiums, gifts etc; plus any error terms.

(11) Physical Assets (Non-Farm Investment):- The sum of cash expenditure on non-farm real estate and other productive physical assets.

(12) Financial Assets (Non-Farm Investment):- The sum of cash payments in the form of private loans and for the purchase of shares, bonds etc.

(13) Non-Farm Investment:- The sum of items (11) and (12) above.

(14) Increase in Financial Assets:- The sum of cash disbursements for the placement of fixed deposits, plus the net annual increase (if any), in the balance of all bank accounts owned by any member of the family.

(15) Tax Payments:- The sum of cash disbursements to meet income tax, probate and other forms of tax obligations.

167.

(16) Other Cash Payments:- The sum of miscellaneous cash disbursements, (dominated by profits remitted to individuals outside the agricultural sector).

APPENDIX 3

The following table sets out the terms and conditions applying to loans from the sources of credit enumerated in this study.

Lender and type of Loan	Rate of Interest	Length of Loan (years)	Repayment Conditions	Usual Security Required
(1) <u>Trading Banks</u> (a) Overdrafts	5 $\frac{1}{4}$ -6 $\frac{1}{4}$ %	Variable	Nominally repayable on demand, but lender usually only requires annual reductions of principal	1st mortgage on land
	6-7%			2nd mortgage on land
	(b) Term Loans	7%	3-10 years	"Credit Foncier" (i.e. fixed sum paid half-yearly; includes principal and interest)
(c) Provident Fund Loans	7%	3 years	Interest half-yearly Principal any time before 3 years	1st mortgage on land
(2) <u>Savings Bank of S.A.</u> (N.B. Limit \$30,000)	5 $\frac{1}{4}$ %	20-30 years	"Credit foncier"	1st mortgage on land
(3) <u>State Bank of S.A.</u> (a) Overdrafts	As for other trading banks			
	5 $\frac{1}{4}$ %	15 years	"Credit foncier"	1st mortgage on land

Lender and type of Loan	Rate of Interest	Length of Loan (years)	Repayment Conditions	Usual Security Required
(4) <u>Commonwealth Development Bank</u> (a) Development Loans (b) Machinery Loans (farmer has to pay deposit on machine)	No survey farmers involved. Loans only made to farmers who can't get satisfactory credit elsewhere. 8-9%	Up to 3 years	Interest and principal in $\frac{1}{2}$ year instalments	Machinery purchased with loan
(5) <u>Pastoral Finance Companies</u>	$6\frac{3}{4}\%$	Usually 1 year	Principal repaid yearly	Stock mortgage or lien on wool check
(6) <u>Insurance and Trustee Cos.</u> (a) Loans on Life Assurance Policies (b) Trust Fund Loans	7% $6\frac{1}{2}$ - 7%	Indefinite 3-10 years	Interest $\frac{1}{2}$ yearly Principal any time Interest $\frac{1}{2}$ yearly and regular principal repayments	Life Assurance Policy 1st mortgage on land

Lender and type of Loan	Rate of Interest	Length of Loan (years)	Repayment Conditions	Usual Security Required
(7) <u>Department of Lands</u> (only available on land under an agreement to purchase plan)	4%	64 years	"Credit foncier"	1st mortgage on land
(8) <u>Trade Credit</u>	Variable, often 0%	1-12 months	All principal and interest at end of term	Goods purchased
(9) <u>Hire Purchase</u>	10-15% or more	1-4 years	Variable	Goods purchased
(10) <u>Private Individuals</u> (including estates)	Variable usually 4-6%	Usually 3-5 years Often renewable at end of term	Interest $\frac{1}{2}$ yearly or yearly. Principal any time before end of term	Usually 1st mortgage on land.
(11) <u>Relatives</u>	0-8% mainly 5%	Variable	Variable	Variable

APPENDIX 4

The values of assets owned and controlled by the farmer on the 30th June, 1964, were derived in the following manner.

- (1) Land and Fixed Improvements All land was valued on an improved basis, and included the capital investment in improved pastures, fences, watering points, buildings and other structures, as well as the farm house. Prices per acre for the different classes of land on the farm were estimated by the farmer in the light of recent sales of similar land in the survey area.
- (2) Plant and Machinery All plant and machinery was valued at replacement cost (i.e. the cost of purchasing an equivalent piece of plant or machinery of the SAME AGE and CONDITION). Values were estimated by the farmer in conjunction with the author, who attended several farm clearance auctions in the district so as to be familiar with the ruling prices for second-hand plant and machinery. Only half of the value of private automobiles was included in the value of plant and machinery, the other half being allocated to non-farm assets.
- (3) Livestock Most of the prices used to value the different classes of livestock were based on the average prices paid at the Adelaide market during 1964, as recorded in table 76 of the South Australian Statistical Register, 1963-4.¹ The values

1. Commonwealth Bureau of Census and Statistics, op. cit., p. 75.

actually used are set out below, and were applied to the stock on hand on the 30th June, 1964.

Sheep

Rams	Price paid by farmer
Other mature sheep	\$8 per head
Lambs (i.e. less than one year old)	\$7 per head

Dairy Cattle

Bulls	\$140 per head
Milking cows	\$120 per head
Other dairy stock	\$40 per head

Beef Cattle

Bulls	\$140 per head
Other mature stock	\$100 per head
Calves (i.e. less than one year old)	\$40 per head

Pigs

Boars	\$60 per head
Sows	\$60 per head
Other pigs	\$20 per head

Other Stock

Farmers estimate of value

(4) Financial Assets This category included money held in bank accounts and invested in financial securities such as shares, bonds, etc., In most cases, documentary proof of value was produced, but occasionally the farmer's estimate of value had to be used.

(5) Other Assets Valued by the farmer.

APPENDIX 5

Details of the partial budgets used to calculate the likely rate of return on an increase in the scale of farm operations involving the purchase of an additional 200 acres of land are described below. The budgets were constructed for three hypothetical farms of 800 acres, 1600 acres and 2600 acres in size, but were based on data from three survey farms of approximately the same size. It was assumed that the additional 200 acres of land would be used to proportionally extend the scale of the cropping and sheep enterprises.

The following assumptions were made about the amount of additional capital involved in extending the scale of operations.

Land and fixed improvements (including fences and watering points.)

200 acres at \$72.50 per acre (improved value) \$14,500

Livestock

3 rams at \$40 per head = \$120

120 sheep at \$8 per head = \$960

60 lambs at \$7 per head = \$420 \$ 1,500

Plant and Machinery

With an increase in farm size of 200 acres, the area cropped will increase by less than 100 acres. According to Catt,¹ the

1. C.C. Catt, "Machinery Costs in Cropping Cereals", Journal of Agriculture of South Australia, Vol. LXIX(March, 1966), pp. 270-276.

extra time required for each of the crucial operations of seeding and harvesting would range from ten hours with a large complement of plant and machinery to twenty four hours with the smallest likely plant combination. Hence each of these two crucial operations would only take one to two days longer than previously, an increase which would normally be of no significance. Furthermore, most of the survey farms appeared to have, if anything, excess machinery capacity, and consequently it seems unlikely that extra plant and machinery would be justified for an increase in farm size of 200 acres. However, because it could not be positively established that additional plant and machinery would be unnecessary, all rates of return were calculated twice, once with the assumption that the cost of increasing machinery capacity would be \$4,000. Therefore total additional capital equals \$20,000 if extra plant and machinery is necessary, and \$16,000 otherwise.

To calculate the additional gross revenue for each farm, the average gross revenue for the previous three years from the sheep and cropping enterprises (X), was multiplied by the ratio of additional acreage (200), to the existing acreage (Y) used for these enterprises.

$$\text{i.e. Additional gross revenue} = X \left(\frac{200}{Y} \right)$$

With the exception of depreciation, the additional expenses were also calculated from the average expenses for the previous three years by the same method. The following expenses, however, were classed as fixed costs and therefore not included in the calculations.

(i) Labour:- with the exception of paid shearing and crutching labour which were included in livestock expenses, it seemed unlikely that extra paid labour would be required. The input of family labour would increase, but as its opportunity cost would almost certainly be zero, it was not included in the calculations.

(ii) Administration expenses.

(iii) Rent:- not included as the additional land was assumed to be freehold.

Estimates of the additional depreciation expense were derived by assuming that the extra depreciable improvements would have a value of \$2,000, and be subject to a five per cent annual depreciation rate. Thus with no additional plant and machinery, depreciation would increase by \$100. Where extra plant and machinery was assumed, it was depreciated at 10 per cent per annum, thus increasing depreciation by a further \$400.

Annual rates of return were then calculated by expressing the ratio of additional net income to additional capital as a percentage; where additional net income equalled the increase in gross revenue less the increase in expenses, including depreciation. Application of the methods outlined above produced the following results:-

Annual Rate of Return on an Increase in the Scale of
Farm Operations Involving the Purchase of an Additional 200 acres

	800 acre farm	1600 acre farm	2600 acre farm
Without extra plant and machinery	16.1%	18.2%	18.8%
With extra plant and machinery	10.9%	12.6%	13.1%

APPENDIX 6

The marginal cost function (equation XVI) was derived from equation XV as follows:-

$$\begin{aligned}
 j &= \frac{\int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} + s \int_s^{\infty} \theta(\bar{z}) d\bar{z} - a}{cs \int_{-\infty}^s \theta(\bar{z}) d\bar{z} - c \int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} + a} \dots\dots\dots (XV) \\
 &= \frac{s - a + \int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} - s \int_{-\infty}^s \theta(\bar{z}) d\bar{z}}{a - c [\int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} - s \int_{-\infty}^s \theta(\bar{z}) d\bar{z}]}
 \end{aligned}$$

If $\pi = 0$, then rearranging gives:-

$$\pi = s - a(1+j) + (1+jc) [\int_{-\infty}^s \bar{z} \theta(\bar{z}) d\bar{z} - s \int_{-\infty}^s \theta(\bar{z}) d\bar{z}]$$

But \bar{z} is distributed normally with a mean $\mu(a+b)$, and variance $\sigma^2 (a+b)^2$. Hence the standard normal variate, $\bar{x} = \frac{\bar{z} - \mu(a+b)}{\sigma(a+b)}$

Let $\phi(\bar{x})$ designate the standard normal distribution, and $\phi(x_s)$ the value of $\phi(\bar{x})$ when $\bar{z} = s$; and $F(x_s) = \int_{-\infty}^{x_s} \phi(\bar{x}) d\bar{x}$.

$$\text{Therefore } \pi = s - a(1+j) + (1+jc) [\mu(a+b) F(x_s) - \sigma(a+b) \phi(x_s) - sF(x_s)]$$

$$= s - a(1+j) - (1+jc) [\sigma(a+b) \phi(x_s) + x_s \sigma(a+b) F(x_s)]$$

$$\text{Now } \frac{\partial F(x_s)}{\partial s} = \frac{\phi(x_s)}{\sigma(a+b)} \quad ; \quad \frac{\partial \phi(x_s)}{\partial s} = \frac{-x_s \phi(x_s)}{\sigma(a+b)}$$

$$\frac{\partial F(x_s)}{\partial a} = \frac{-s \phi(x_s)}{\sigma(a+b)^2} \quad ; \quad \frac{\partial \phi(x_s)}{\partial a} = \frac{s x_s \phi(x_s)}{\sigma(a+b)^2}$$

$$\text{Therefore } \frac{\partial \pi}{\partial s} = 1 - (1+jc) \left[\sigma(a+b) \frac{-x_s \phi(x_s)}{\sigma(a+b)} + x_s \sigma(a+b) \frac{\phi(x_s)}{\sigma(a+b)} + F(x_s) \right]$$

$$= 1 - (1+jc) [-x_s \phi(x_s) + x_s \phi(x_s) + F(x_s)]$$

$$= 1 - (1+jc) F(x_s)$$

$$\begin{aligned}
\text{and } \frac{\partial \pi}{\partial a} &= -(1+j) - (1+jc) \left[\frac{\sigma(a+b) s x_s \phi(x_s) + \sigma \phi(x_s) + x_s \sigma(a+b)}{\sigma(a+b)^2} \right. \\
&\quad \left. \left(\frac{-s \phi(x_s)}{\sigma(a+b)^2} - \mu F(x_s) \right) \right] \\
&= -(1+j) - (1+jc) \left[\phi(x_s) \left(\frac{s x_s}{(a+b)} + \sigma - \frac{s x_s}{(a+b)} \right) - \mu F(x_s) \right] \\
&= -(1+j) - (1+jc) [\sigma \phi(x_s) - \mu F(x_s)]
\end{aligned}$$

$$\begin{aligned}
\text{Now marginal cost} &= \frac{d(s-a)}{da} \\
&= \frac{ds}{da} = 1 \\
&= \frac{\partial \pi / \partial a}{\partial \pi / \partial s} = 1 \quad (\text{since } \pi = 0) \\
&= \frac{(1+j) + (1+jc) [\sigma \phi(x_s) - \mu F(x_s)]}{1 - (1+jc) F(x_s)} = 1 \\
&= \frac{j - (1+jc) [(\mu-1) F(x_s) - \sigma \phi(x_s)]}{1 - (1+jc) F(x_s)} \\
&= \frac{j - (1+jc) [(\mu-1) \int_{-\infty}^{x_s} \phi(\bar{x}) d\bar{x} - \sigma \phi(x_s)]}{1 - (1+jc) \int_{-\infty}^{x_s} \phi(\bar{x}) d\bar{x}} \quad \dots \text{(XVI)}
\end{aligned}$$

SELECTED BIBLIOGRAPHY

- Baily, A.P. A Comparative Survey of Economic Conditions in Two Pastoral Areas of South Australia, with Particular Reference to the Provision of Credit. Canberra : Bureau of Agricultural Economics, 1952.
- Baker, C.B. "Research Orientation and their Implications for Agricultural Economists". Paper presented at the Conference of the Australian Agricultural Economics Society, Armidale, Feb., 1967 (mimeo).
- Baker, C.B., and Irwin, G.D. Effects of Borrowing from Commercial Lenders on Farm Organisation. University of Illinois Agricultural Experimental Station Bulletin 671. Urbana, Illinois : University of Illinois, 1961.
- Bivens, G.E., et. al. Use of Credit by Farm Families in Southern Iowa and Northern Missouri. Agricultural and Home Economics Experiment Station, Iowa State University Special Report No. 35, Ames, Iowa : Iowa State University, 1963.
- Bollman, F.H. "Capital Expenditure on Australian Dairy Farms", Quarterly Review of Agricultural Economics, Vol. XI, No. 1 (Jan. 1958), pp. 35-43.
- Brien, J.P., Wrigley, J.F., and Jardine, R. "A Study of Some Personal and Social Factors in Relation to Farmer Performance", Review of Marketing and Agricultural Economics, Vol. XXXIII, No. 3. (Sept. 1965), pp. 126ff.
- Bureau of Agricultural Economics. The Australian Sheep Industry Survey, 1963-4. Canberra : Government Printer, 1967.
- Callaghan, B. "Development Loans - Principle and Practice", Paper presented at the Conference of the Australian Agricultural Economics Society, Perth, Feb., 1965 (mimeo).
- Campbell, K.O. "Current Agricultural Development and its Implications as Regards the Utilization of Resources", Economic Record, Vol. XXXII (May, 1956), pp. 119-134.
- Catt, A.J.C. "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, Vol. LXXVII (Aug. 1963), pp. 505-510.
- Catt, C.C. "Machinery Costs in Cropping Cereals," Journal of Agriculture of South Australia, Vol. LXIX (March, 1966), pp. 270-276.

- Chase, S.B. "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, Vol. LXXV (May, 1961), pp. 319-327.
- Commonwealth of Australia. Report of the Committee of Economic Enquiry, Vol. I, May, 1965.
- Commonwealth Bureau of Census and Statistics. South Australia Statistical Register, 1963-4 Part V (a) - Primary Production, Sections i, ii. Adelaide : Government Printer, 1966.
- Coombs, H.C. "Rural Credit Developments in Australia", Australian Journal of Agricultural Economics, Vol. III (July, 1959), p p. 57-69.
- Crawford, J.G. "Australian Agricultural Policy" Joseph Fisher Lecture. Adelaide : Hassell Press, 1952.
- Dickins, Dorothy. Factors Related to the Use of Credit Resources by Farm Families. Mississippi Agricultural Experiment Station Bulletin 658, Mississippi : Mississippi State University, 1963.
- Dowsett, C.P. "Some Thoughts on the Farm Credit Supply", Australian Journal of Agricultural Economics, Vol. VIII (June, 1964), pp. 1-10.
- Druce, P.C. "Credit Policy for Rural Development", Review of Marketing and Agricultural Economics, Vol. XXIV (Dec. 1956), pp. 181 ff.
- Edwards, G.W. "Indebtedness in the Dried Vine Fruits Industry", Quarterly Review of Agricultural Economics, Vol. XIX (April, 1966), pp. 97-107.
- Freimer, Marshall and Gordon, Myron J. "Why Bankers Ration Credit" Quarterly Journal of Economics, Vol. LXXIX (Aug. 1965), pp. 397-416.
- Gordon, Myron J., and Shillinglaw, Gordon. Accounting; A Management Approach. 3rd. ed. ; Homewood, Illinois : Richard D. Irwin Inc., 1964.
- Great Britain. Committee on the Working of the Monetary System Report. London : Her Majesty's Stationery Office, 1959.
- Gregory, R.H., and Shillinglaw, Gordon. "Analysis of the Sources and Uses of Funds", (unpublished mimeo).

- Gruen, F.H. "Long Term Trends in Prices, Costs, Incomes and Investment", Conference Proceedings, The Primary Industry Cost - Price Squeeze, Melbourne, 1962.
- _____
 "Wool Prices, Credit Restrictions and Development", Review of Marketing and Agricultural Economics, Vol. XXIV (June, 1956), pp. 61-73.
- _____
 "Capital Formation in Australian Agriculture", International Journal of Agrarian Affairs, Vol. XI (Jan. 1958), pp. 274-289.
- Gutman, G.O. "Investment and Production in Australian Agriculture", Review of Marketing and Agricultural Economics, Vol. XXIII (Dec. 1955), pp. 237-310.
- Harrison, A. "Some Features of Farm Business Structures", Journal of Agricultural Economics, Vol. XVI, No. 3(1965), pp. 330-347.
- Heady, E.O. Economics of Agricultural Production and Resource Use. New York : Prentice Hall, 1952.
- Heady, E.O., Back, W.B., and Peterson, G.A. Interdependence Between the Farm Business and the Farm Household with Implications on Economic Efficiency. Iowa State College Agricultural Experimental Station Research Bulletin 398, Ames, Iowa : Iowa State College, 1953.
- Heady, E.O., and Dillon, J.L. Agricultural Production Functions. Ames, Iowa : Iowa State University Press, 1961.
- Hefford, R.K. An Investigation into the Need for and Use of Rural Credit in Selected Areas in South Australia. Unpublished M.Ec. thesis, Barr Smith Library, University of Adelaide, 1961.
- Herr, William McD. "Capital Formation : Its Importance and Determinants", Australian Journal of Agricultural Economics, Vol. VIII (Dec. 1964), pp. 97 ff.
- Hesser, L.F., and Janssen, M.R. Capital Rationing Among Farmers. Purdue University Agricultural Experimental Station Research Bulletin. No. 703, Lafayette, Indiana : Purdue University, 1960.
- Hodgman, Donald R. "Credit Risk and Credit Rationing", Quarterly Journal of Economics, Vol. LXXIV (May, 1960), pp. 258-278.
- Holmes, A.S. Flow of Funds, Australia, 1953-4 to 1957-8. Reserve Bank of Australia Staff Paper (mimeo).

- Irwin, G.D., and Baker, C.B. Effects of Lender Decisions on Farm Financial Planning. University of Illinois Agricultural Experimental Station Bulletin 688, Urbana, Illinois : University of Illinois, 1962.
- Jarrett, F.G. "Pastoral Finance Houses and Rural Credit, 1949-50 to 1958-9", Australian Journal of Agricultural Economics, Vol. VI (Dec. 1962), pp. 62 ff.
- Jarrett, F.G., and Dillon, J.L. "Some Aspects of the Rural Credit Market", Australian Journal of Agricultural Economics, Vol. IX (Dec. 1965), pp. 152-168.
- Jarrett, F.G., Dillon, J.L., and Burley, H.T. "Forecasting Outstanding Advances of the Major Trading Banks and Pastoral Finance Companies", Australian Journal of Agricultural Economics, Vol. VII (Dec. 1963), pp. 160-171.
- Jarrett, F.G., and Penny, D.H. An Economic Survey of the Reclaimed Area of the Lower Murray. Adelaide : Griffen Press, 1960.
- Johnson, D. Gale. Forward Prices for Agriculture. Chicago : University of Chicago Press, 1947.
- Kalecki, Michal. Essays in the Theory of Economic Fluctuations. London : Irwin Ltd., 1939.
- Lewis, J.N. "Rural Credit Facilities", Conference Proceedings, The Primary Industry Cost - Price Squeeze, Melbourne, 1962.
- McDonald, Warren D. "The Role of the Development Bank in Rural Credit", Australian Journal of Agricultural Economics, Vol. IV (Dec. 1960), pp. 97-105.
- Mallyon, C.A. Principles and Practice of Farm Management Accounting. Sydney : Law Book Co., 1961.
- _____ "The Structure of Funds on Farming Properties - A Tentative Analysis", The Australian Accountant, Vol. XXXV (Aug. 1965), pp. 415-421.
- Miller, Merton H. "Further Comments", Quarterly Journal of Economics, Vol. LXXVI (Aug. 1962), pp. 480-488.
- Molnar, I. "Factors Influencing Recent Farm Improvements", Review of Marketing and Agricultural Economics, Vol. XXVII (1959), pp. 51-73.

- Mueller, A.G. "Flow of Funds Analysis in Farm Financial Management", Journal of Farm Economics, Vol. IIL (Aug. 1966), pp. 661-667.
- O'Neill, V.G.J., and Harris, S.F. "Some Aspects of the Sheep Industries Capital Account - A Case Study", Quarterly Review of Agricultural Economics, Vol. XVII (Jan. 1964), pp. 24 ff.
- Pearse, R.A. "An Empirical Micro-Study of Some Factors Influencing Farm Net Investment", Economic Record, Vol. XXXI (Nov. 1955), pp. 261-274.
- "Pressure Mounts for Long-Term Rural Finance", The Australian Financial Review, Dec. 13, 1965, p.1.
- Quilkey, J.J. "The Source and Use of Funds for the Fruit Industry", Proceedings of Banker's Residential Conference on Fruit in Victoria, Shepparton, Victoria, 1962.
- Reserve Bank of Australia. Australian Rural Credit Facilities. Sydney : Simmons Ltd., 1964.
- A Survey of the Physical and Financial Effects of Drought in Northern N.S.W. Sydney : Reserve Bank of Australia, 1966
- Rural Reconstruction Mission. Fifth Report - Rural Credit, Canberra : Government Printer, 1945.
- Ryder, H.E. "Credit Risk and Credit Rationing : Comment", Quarterly Journal of Economics, Vol. LXXVI (Aug. 1962), pp. 471-479.
- Saxon, E.A. "Changes in the Volume and Composition of Rural Capital", Quarterly Review of Agricultural Economics, Vol. XV (Oct. 1962), pp. 179-187.
- Schlaifer, Robert. Probability and Statistics for Business Decisions. Tokyo : McGraw - Hill, 1959.
- Schultz, T.W. "Capital Rationing, Uncertainty and Tenancy Reform", Journal of Political Economy, Vol. XLVIII (1949), pp. 309-324.
- Stephen, C.G. et. al. "A Soil Land Use and Erosion Survey of Part of County Victoria, S.A.". C.S.I.R.O. Bulletin, No. 188, 1945.
- Taplin, J.E. "Influence of Working Capital on Farm Organisation - How Appropriate is a Linear Programming Analysis", Australian Journal of Agricultural Economics, Vol. X (June, 1966), pp. 60-69.

- Tostlebe, A.S. Capital in Agriculture : Its Formation and Financing since 1870. Princeton, N.J. : Princeton University Press, 1957.
- Waring, E.J. "Rural Credit", Farm Policy, Vol. II (Dec. 1962), pp. 81-86.
- Williams, D.B., and Bollman, F.H. "Capital Expenditure on Queensland Dairy Farms", Quarterly Review of Agricultural Economics, Vol. IX (Oct. 1956), pp. 168-177.
- Williams, D.B., Parish, R., and Bollen, A.G. "Attitudes and Expectations of Wheat Growers in N.S.W.", Review of Marketing and Agricultural Economics, Vol. XXI (March, 1953), pp. 7-72.
- Wirth, M.E., and Brake, J.R. The Michigan Farm Credit Panel - Cash Flows and Use of Credit - 1961. Michigan State University Agricultural Experiment Station Research Report, East Lansing : Michigan State University, 1963.