

January 29, 1941

Dear Mr Lyle,

Thanks for your letter of January 27th with enclosed note. This I am returning herewith. I am glad you are using regression methods in costing, as it is only in this way that the introduction of arbitrary, and therefore often misleading, figures can be avoided in the costings of different Departments.

The difficulty of dealing with regression when the contributions to error of the ~~two~~ different variates are unknown has been discussed very widely, but not often very intelligently. It arises constantly when it is desired to interpret observed facts in terms of an elaborate system of theoretical concepts which may or may not accord with the facts; but I have not known it arise as a difficulty affecting practical procedure. Usually at least the problem is introduced with the scene painting.

For example, two economic variates may be observable by an economist, both with imperfect precision. As a theorist he is interested in the relationship between their <sup>true</sup> ~~two~~ values, and this he cannot estimate without bias in the absence of knowledge of their relative contributions to error; but, in practice, he wants

to estimate or predict B from the observed value of A, not from its true value, and this prediction is more accurately carried out using the regression of B on A as ordinarily calculated than it would be if the "true" economic law were applied.

I think this may be the same in industrial processes. A number of settings are under control, usually controlling the rate of flow of the product under treatment, of fuel to burners, etc, while the observables also include instrumental readings, e.g. of temperature and pressure, the variances and covariances of which are observable both with fixed and with varied settings. In respect of costing of individual operations, it is usually worth while to take a good deal of trouble in the timing of these under slightly varied conditions, but I cannot clearly see that the indeterminacy of the primary problem you discuss comes into this type of research.

The property you notice under the heading "Mutual regression" is new to me, and the discussion of your note eminently clear, though I am not at present clear as to its practical relevance.

Yours sincerely,