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AN ACADEMIC STUDY OF
SOME MONEY MARKET
AND OTHER STATISTICS

AN ACADEMIC STUDY
OF SOME MONEY
MARKET
AND OTHER STATISTICS

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SECOND EDITION

LONDON
P. S. KING & SON, LTD
ORCHARD HOUSE, 14 GREAT SMITH STREET
WESTMINSTER

—
1926

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PREFACE TO THE SECOND EDITION

A SECOND edition of this work has been published with the objects:—

- (1) Of correcting mistakes in certain of the tables that were pointed out by a Japanese correspondent, Mr. T. Nimagawa, of Kyoto Imperial University. These mistakes were made in the calculation of the "regression lines," from the correlation coefficients, in Tables 6, 10, 15, and 21.
- (2) Of incorporating certain additional work, of which Chapters VIII and IX have previously appeared in the *Bankers' Magazine*, to the Editor and Proprietors of which journal the writer wishes to express his thanks for permission to reproduce. He would like to have re-written these chapters to avoid a certain amount of repetition, but he was unable to do so.

Chapter VII, together with the charts in the pocket of the cover, have not been previously published. The writer thinks that the charts, on which are set out the prices of a number of commodities, relative to the general price level, for a period of seventy-four years, provide a new means of judging whether a particular price is likely to be too high or too low. This may be useful to those who have to buy or sell, or lend or borrow on, commodities.

INTRODUCTION TO THE FIRST EDITION

THE general object of the work described in the following pages was to discover facts connected with certain rates of interest and discount on the London Money Market, with the rates of exchange between London and two foreign centres, Paris and New York, with the relationships between the different rates, and with the prices of commodities.

Certain apparent relationships were found, and it was decided to examine in addition the rate of discount in Paris and the rates of interest on call money, and of discount in New York.

The more particular object of the work was to try and find some variation that would act as a guide to the future course of rates. Some success was obtained in this direction, for it was noticed that when the rate of discount in London was more than usual above the rate of interest on floating money, for the time of year, the floating rate showed a strong tendency to rise more (or to fall less, if it was a time of year when the rates usually fell) than usual, for the time of year. This relationship should chiefly be of use to those actively engaged in the Money Market, to whom it is probably already known, somewhat indefinitely, but it should also be of use to those, outside the Money Market, to whom movements in the floating rate are of interest, many of whom are certainly unaware of its existence.

Further than this, since the rate of interest given for the use of floating money is some guide to general trade conditions, the relationship may provide a means of measuring definitely, though partially, the probable future course of trade in general. As such, it may be a step towards turning the art of prophecy into an exact science. In making this suggestion we must not be taken as supposing that the future could ever be predicted with certainty. Cosmic upheavals, such as earthquakes, and political upheavals, such as wars, etc., may be quite unpredictable, but they only arrive occasionally, while many of the causes of the irregularities dealt with will be usually with us.

The period examined—1882 to 1913—consisted of years when the Money Markets of the world were unhampered by Government restrictions, and many

of the conclusions reached cannot, therefore, be applied directly to post-war years. In so far, however, as they depended on the free working of the law of supply and demand, and on secular variations in temperature throughout the year, causing harvests to be garnered at certain seasons, etc., they must be effective at the present time, though the apparent result may be different. The gathering of the harvest, for instance, indirectly causes a rise in the rate of discount in the autumn, and if in other years the rate of discount is fixed, so that it cannot move, the effect of the increased demand will be felt in some other way, in decreasing, perhaps, the amount of accommodation; in other words, if the shoe is not allowed to pinch in one place, it will pinch in another.

Looked at from a broad point of view, the work may be regarded as an attempt (a) to measure the effects of laws which have been arrived at either by the deductive method or by experience, (b) to increase our knowledge of economic laws by the inductive method, a method which, considering the amount of statistical material available, has obtained surprisingly few followers. The reasons for this seem to be that statistics and still more statistical methods are comparatively modern inventions, that the statistics available are, even yet, often incomplete, that much labour of a somewhat mechanical kind is involved, and that the method is not so attractive as the deductive. The ordinary practice of political economists has been to follow the deductive method, to arrive at a generalization, and then to expect facts to fit in with the laws arrived at. It is probably for this reason that they have been of less use to "practical" men than they otherwise would have been. "Practice and theory" have been found to disagree, to the detriment of both.

It would seem, too, that rules, sufficiently numerical, could never be "evolved," in some cases, by the deductive method. The prices of things, for instance, may depend quite definitely on the law of supply and demand, but what the "practical" man wishes to know is the variation in the price that may be expected to go with a definite variation in the supply. Such a desire could only be satisfied by an examination of the past, to see what had, in fact, occurred. An attempt to formulate such a law for wheat in England was, indeed, made about two centuries ago by Gregory King,¹ who suggested that while a deficiency in the supply of Wheat of one-tenth caused a rise in the price of three-tenths, a deficiency of two-tenths caused a rise of eight-tenths. The formulation of further laws of such a kind was one of the ultimate objects of the work described in these pages.

Some of the work has already been published in the pages of the *Bankers'*

¹ See *Journal of the Royal Statistical Society* for March, 1915, p. 296.

Magazine (for July and August, 1912, and for May, August, and September, 1921).

The proprietors of this magazine kindly gave permission for the articles referred to to be republished, and though advantage has only been taken of this permission as regards Chapter V, quotations, chiefly in the form of tables, have been freely made.

The thanks of the writer are due to Mr. W. S. Gosset, for much mathematical assistance, and particularly for the equation in Chapter V.

AN ACADEMIC STUDY OF SOME MONEY MARKET AND OTHER STATISTICS

CHAPTER I

MATERIAL AND METHODS USED

THE greater part of the data used in the following pages has been extracted from the *Economist*, from the first number of each month.

Different, and perhaps, from some points of view, more representative, data could have been obtained by averaging either daily or monthly figures, but time, etc., did not permit of this being done. After the greater part of the work had been completed, however, the weekly figures, from the *Economist*, were averaged monthly, but these have only been used to a small extent. A cursory examination would seem to show that they uphold the main conclusions arrived at from the monthly figures.

The data extracted, details of which are to be found in the Appendix, are as follows, all being for the years 1882-1913, unless otherwise stated.—

The rate of interest on floating money in London.

The rate of discount on 3 months Bank Bills in London.

The rate of discount on 6 months Bank Bills in London.

The rate of exchange between London and New York ; Telegraphic Transfers in and after July, 1886 ; before that date, "Short at interest."

The rate of exchange between London and Paris.

The "Market rate of discount" in Paris.

The rate of interest on Call Money in New York.

The rate of discount on "endorsed bills" in New York (for the years 1885-1910 only).

Sauerbeck's Prices of Commodities for 1850-1910 as quoted in the *Journals of the Royal Statistical Society*.

The methods adopted have been :—

(1) To average the monthly rates for each year.

(2) To average the yearly rates for each month of the year.

- (3) To determine the size of the variations in the rates, and the relationships between them according to the statistical methods associated chiefly with the names of Professors Karl Pearson and F. Y. Edgeworth (which are described in Professor A. L. Bowley's *The Elements of Statistics*).

Methods (1) and (2) are simple; by means of the former, the average rates of the years are determined, so that one year can be compared with another. Since, however, there are well-known secular variations in the rates, within the years, it was necessary also to determine the positions of the rates at different times within the year, i.e. to average each month of the thirty-two years separately, as in (2).

By means of (3) the size of the variations in the different rates was measured by determining the "probable error," and the relationships between the series of data, as such, were measured by means of the "correlation coefficient."

As regards the former, the "probable error" of a series is such that half the variations fall between it and the average, and half further away. It thus provides a definite measure of variation when such is necessary. As an example, the rates of discount in London and Paris, which are cited on a later page, may be taken, and it will be seen that whereas the average rate of discount on 3 months bank bills in London for the years 1882-1913 was 2.69 per cent., the probable error was .55 per cent., i.e. half the average annual rates fell between 2.14 per cent. and 3.24 per cent.; in the case of Paris the average market rate of discount for the same period was 2.49 per cent., while the probable error was .41 per cent., i.e. half the rates fell between 2.08 per cent. and 2.90 per cent. Not only, therefore, was the Paris rate lower, but the variation was less, being about two-thirds of that in London.

Coming now to the measurement of relationships, for which the correlation method has been used, this method consists in first plotting out on squared paper all the results to be considered. The scale of one variable is placed vertically and that of the other horizontally, and a mark is made for each case, according to its position on each scale. When all the cases to be examined have been plotted out a correlation coefficient is calculated, due weight being given to each individual according to its position on the chart. The correlation coefficients obtained vary between + 1.00, which indicates perfect positive correlation, such as would be given by correlating the diameters and circumferences of a number of circles, and - 1.00, which indicates perfect negative correlation, such as would be given by correlating the two portions of a number of cut packs of cards. It is obvious that in the former case the marks representing the individual cases will all lie along a diagonal formed by joining

two of the corners of the chart, while in the latter they will lie along the opposite diagonal. Where there is less complete correlation, the marks will be distributed generally about the diagonals, while if there is no correlation they will be distributed in no particular direction.

A sample correlation table is inserted in the Appendix. The method provides a means by which the relationship between two series of figures can be measured accurately and definitely; it enables the "Descriptive Statistician to present the inductive Scientist with a highly significant part of his data in a compact and instructive form,"¹ and with a conciseness that was impossible until the method had been invented.

It must be clearly understood, however, that the discovery of a correlation, perhaps a close one, between two series of data does not indicate that there is a connexion, in the nature of cause and effect, between the two series, for, leaving aside the fact that the apparent connexion may be the result of pure chance, they may be connected together through some common cause. It is necessary, therefore, to "take account of whatever extraneous knowledge may be available"² in order that an explanation of any apparent relationships found may be provided, and in order that the full value of their use may be realized.

To give an example of two variables to which the method of correlation may be applied with usefulness, one may instance the case of the weather and the crops, where "extraneous knowledge" suggests that the variations in the latter are largely connected with those in the former. Variations in both are so numerous that probably no generalizations have been arrived at by the deductive method. There are, no doubt, many empirical rules which have been formulated as the result of experience, such, for instance, as "a peck of March dust is worth a king's ransom," but they are so indefinite (not to mention the possibility of the units of measurement being old-fashioned) that they are of very little practical value.

An attempt has been made by Hooker³ to measure definitely, by means of the correlation method, the relationships between the weather and the resulting crops in the eastern part of England, with some success, showing for instance that the rainfall just before the sowing period correlates to the extent of $-.62$ with the resulting crop of wheat. Owing to incompleteness of data, it is probable that little practical use has been made of his work, but, where the connexion between the weather and the resulting crops is obviously so great and where it is of such importance, from a business point of view, to have as early an indication as possible of a coming crop, it would seem that further work in this direction cannot long be delayed.

¹ *A Treatise on Probability*, by J. M. Keynes, p. 329.

² *A Treatise on Probability*, by J. M. Keynes, p. 328.

³ See *Journal of Royal Statistical Society* for 1907, p. 1.

One may also, perhaps, draw attention to another series of data, published in the first number of the *Manchester Guardian Commercial*, and giving weekly rates of exchange between London and New York and London and Paris, together with the rate at which exchange can be purchased four weeks ahead.

It is suggested¹ that "while the reader can see for himself by a study of the tables that no precise generalization would be accurate, nevertheless, the market has been broadly right when it has taken a very decided view as measured by forward rates."

Now, such a statement may sum up the situation, but, to any one who wishes to make practical use of the "forward exchange" mechanism and is not sufficiently in touch with the market to know whether its view is "very decided" or not, it is far from being sufficient.

In order to discover, therefore, to what extent the variations in the forward rate were a guide to the movements of the exchange to four weeks ahead, the weekly forward rates, for New York and Paris, for the year 1921 and the first three months of 1922 were correlated with the differences between the spot rate at the time the forward rate was quoted and the spot rate four weeks ahead.

Coefficients of + .37 for the Paris rate and - .14 for the New York rate were obtained, showing that there is an appreciable connexion, in the direction expected, in the case of the Paris exchange but not in the case of the New York exchange. Whatever, therefore, may be its use as a general guide to the future, the actual distance of the forward rate (for four weeks ahead) over or under the spot rate, at any particular time, is but a poor guide to the spot rate of exchange exactly four weeks ahead in the case of Paris, and none at all in the case of New York.

¹ *Manchester Guardian Commercial*, p. 13.

CHAPTER II

RATES OF INTEREST AND DISCOUNT IN LONDON

THE figures to be examined in this chapter consist of the rates of interest on floating money and of discount on 3 and 6 months bank bills in London, extracted, as already stated, from the first number of the *Economist* for each month for the years 1882-1913.

The average annual rates are set out in the table on page 7.

The averages are also set out in Diagram 1, in the form of a curve, from which the relationships between the rates can be seen more easily. The rates vary between .40 per cent. and 3.79 per cent. for floating money, between .70 per cent. and 4.41 per cent. for discount on 3 months bank bills, and between .92 per cent. and 4.38 per cent. for discount on 6 months bank bills.

The rates move up and down together, and the correlation between the floating rate and the 3 months discount rate is +.93 and between the floating rate and the 6 months discount rate +.92.

The rates are generally high when trade is active, and it has been shown ¹ that the rate of discount ² in London correlates to the extent of +.90 with the value of the exports of the United Kingdom per head of the population, and to the extent of +.69 with the imports, both for the years 1878-1907. The rate of discount is thus connected closely with the state of the trade of the country.

It was also shown ¹ that the rises and falls in the rates of discount from year to year in the different centres correlate closely with the rises and falls in the exports and imports, not only for the United Kingdom, but also for France, Germany, and the United States of America, and it is interesting to note that the relationships are closer with the imports than with the exports. This might have been expected, for provision for payment has to be made by the buyer.

The average monthly rates are set out in the following table and in Diagram 2.

¹ Chapter IX.

² Approximately for the 3 months rate of discount.

TABLE I

Average annual rates in London for—

	Floating Money.	Discount on 3 months Bank Bills.	Discount on 6 months Bank Bills.
	%	%	%
1882	2·98	3·47	3·61
1883	2·69	3·00	3·20
1884	1·88	2·33	2·67
1885	1·54	2·20	2·49
1886	1·47	2·13	2·38
1887	1·86	2·47	2·62
1888	1·84	2·29	2·50
1889	2·08	2·66	2·86
1890	3·37	3·72	3·73
1891	1·90	2·58	2·96
1892	·96	1·55	2·08
1893	1·48	2·08	2·46
1894	·69	1·00	1·31
1895	·40	·73	·92
1896	1·03	1·35	1·38
1897	1·23	1·73	1·94
1898	1·78	2·56	2·65
1899	2·21	3·15	3·19
1900	2·58	3·72	3·84
1901	2·36	3·20	3·40
1902	2·32	2·90	3·17
1903	2·61	3·37	3·43
1904	1·90	2·62	2·82
1905	1·78	2·60	2·63
1906	2·82	3·83	3·69
1907	3·28	4·28	4·28
1908	2·03	2·33	2·63
1909	1·75	2·15	2·36
1910	2·75	3·16	3·22
1911	2·29	2·88	3·08
1912	2·97	3·53	3·62
1913	3·79	4·41	4·38
Average	2·08	2·69	2·86
P.E.	·52	·55	·53

TABLE II

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
Average floating rate per cent.	2.35	2.44	2.66	2.16	1.86	1.59	1.30	1.49	1.59	2.12	2.64	2.80
Average rate of discount on 3 months Bank Bills per cent. .	3.17	2.82	2.74	2.34	2.42	2.13	1.83	2.27	2.54	2.97	3.53	3.44
Average rate of discount on 6 months Bank Bills per cent. . . .	3.28	2.83	2.69	2.43	2.55	2.38	2.33	2.83	2.98	3.23	3.52	3.39

The rates are seen to have the same general trend ; they are highest at the beginning and towards the end of the year, and lowest in the summer. There are some interesting irregularities ; the floating rate rises from January to March, while, during this period, discount rates are falling. The floating rate descends regularly from March to July, and rises regularly to December, while the discount rates fall less to May and then fall regularly to July, rising to a maximum in November.

The rise in the floating rate to March is due, of course, to the collection of the taxes at the end of the financial year, after which it falls, owing to the smaller demand for accommodation by the bill-brokers. After July it rises, together with the discount rates, owing to the increased requirements of bill-brokers for financing the autumn crops.

Coming now to the differences between the floating and discount rates, it was noticed that although these rates moved roughly in the same direction, the distance between them was not always the same, and in order to examine the relationships between them, the differences between the floating rate and the two discount rates were determined, and the tables on the next pages set out the results.

It is seen that the differences between the floating rate and the 3 months discount rate vary between .30 per cent. and 1.14 per cent., while the 6 months differences lie between .35 per cent. and 1.26 per cent., the floating rate being, of course, in all cases the lower.

The "differences" are not appreciably greater when the rates are high, which is, perhaps, surprising (the correlation between the floating rate and the 3 months "difference" being slightly positive, at + .25, and the corresponding coefficients for the 6 months "difference" being slightly negative, at - .01), for it might have been supposed that the charge for risk, which must be included in the discount rate, would have been greater when floating rates were high.

TABLE III

Average annual difference between the rate of interest on floating money and the rate of discount on—

	3 months Bank Bills.	6 months Bank Bills.
1882 . . . . .	.49	.63
1883 . . . . .	.31	.51
1884 . . . . .	.45	.79
1885 . . . . .	.66	.95
1886 . . . . .	.66	.91
1887 . . . . .	.61	.76
1888 . . . . .	.45	.66
1889 . . . . .	.58	.78
1890 . . . . .	.35	.36
1891 . . . . .	.68	1.06
1892 . . . . .	.59	1.12
1893 . . . . .	.60	.98
1894 . . . . .	.31	.62
1895 . . . . .	.33	.52
1896 . . . . .	.32	.35
1897 . . . . .	.50	.71
1898 . . . . .	.78	.87
1899 . . . . .	.94	.98
1900	1.14	1.26
1901 . . . . .	.84	1.04
1902 . . . . .	.58	.85
1903 . . . . .	.76	.82
1904 . . . . .	.72	.92
1905 . . . . .	.82	.85
1906	1.01	.87
1907	1.00	1.00
1908 . . . . .	.30	.60
1909 . . . . .	.40	.61
1910 . . . . .	.41	.47
1911 . . . . .	.59	.79
1912 . . . . .	.56	.65
1913 . . . . .	.62	.59
Average . . . . .	.61	.78

The average monthly differences for the same years are set out in the following table :—

TABLE IV

Average monthly differences between the floating rate and—												
	Jan.	Feb.	Mar	Apr	May	June	July	Aug	Sept	Oct.	Nov.	Dec.
3 months rate of discount	·82	·38	·08	·18	·56	·54	·53	·78	·95	·85	·89	·66
6 months rate of discount	·93	·39	·03	·27	·69	·79	1·03	1·34	1·39	1·11	·88	·59

The "differences" are lowest in March and highest in September, while the high level of the whole of the autumn and of January is noticeable. These peculiarities are due to the greater demands of the bill-brokers in the autumn, relative to the amount of floating money available, and to the greater demand for floating money, relative to their requirements, in the early part of the year.

The "differences" between the floating and discount rates for individual months were next examined, and it was noticed that in years when the discount rate was more than usual, for the time of year, above the floating rate, the floating rate tended to rise more (or to fall less, if it was at a period of the year when the rate was falling) than usual.

To measure this relationship, the "differences" were correlated with the rises and falls in the floating rates, from the month named, to the average of the remaining 2 and 5 months of the currency of the bills, with the results set out in Table V (page 12).

There is seen to be a connexion of considerable size between the two sets of figures correlated for each month, indicating that when the rate of discount on 3 and 6 months bank bills is more than usual, for the time of year, above the floating rate, the floating rate tends to rise more than usual during the currency of the bill, or to fall less if it is a period of the year when the rate falls.

The relationship is particularly large in February, with both 3 and 6 months rates, while it is much smaller in May, with the 3 months rate, and in July, with the 6 months rate, than in other months.

It is interesting to note that the relationship is closer with the 6 months than with the 3 months "difference."

The average "differences," the average rise or fall in the floating rate from the month named to the average of the next 2 and 5 months, respectively,

TABLE V

Correlation coefficients between—		
	(1) The difference between the floating rate and the 3 months discount rate in the month named, and (2) The average rise or fall in the floating rate from the month named to the average of the next 2 months.	(1) The difference between the floating rate and the 6 months discount rate in the month named, and (2) The average rise or fall in the floating rate from the month named to the average of the next 5 months.*
January	+ .446	+ .698
February	+ .745	+ .774
March	+ .495	+ .728
April	+ .423	+ .538
May	+ .215	+ .418
June	+ .613	+ .660
July	+ .448	+ .260
August	+ .710	+ .558
September	+ .370	+ .453
October	+ .448	+ .676
November	+ .558	+ .725
December	+ .509	+ .655
Average	+ .515	+ .595

and the variation in the last named that may be expected to correspond to a variation of .1 per cent. in the "difference," are set out in Table V. :—

As an example, to explain the use of the table, the 6 months "difference" for February may be taken, and it is seen that the average "difference" for the thirty-two years was .39 per cent., while the average floating rate for the 5 months, March to July, was .52 per cent. below that for February. A variation in the "difference" of .1 per cent. corresponds to a greater or less fall than usual in the floating rate from February to the average of March-July of .10 per cent., so that if in any year the "difference" had been .49 per cent. a fall in the floating rate of .42 per cent. might have been expected, while with a "difference" of .29 per cent. the fall would have been .62 per cent.

Looking at the relationships in another way, and again taking the February 6 months "difference," the best prediction that could have been made of the future of the floating rate without the assistance of the relationships pointed out would have been to have taken the average fall of the period. On doing this, it is found that the average "difference" between the rate predicted and

TABLE VI

	Average "Diff" between the floating rate and the 3 months discount rate.	Average rise (+) or fall (-) in floating rate from month named to average of next 3 months.	Variation in rise or fall in floating rate, to average of next 2 months that may be expected to accompany a variation in "Diff" of 1 per cent.	Average "Diff" between floating rate and 6 months discount rate.	Average rise (+) or fall (-) in floating rate from month named to average of next 5 months.	Variation in rise or fall in floating rate from the month named to average of next 5 months that may be expected to accompany a variation in "Diff" of 1 per cent.
January .	·82	+ ·23	·07	·93	- ·18	·12
February .	·38	- ·00	·10	·39	- ·52	·10
March . .	·08	- ·60	·09	·03	- ·99	·11
April . .	·18	- ·43	·06	·27	- ·60	·08
May . . .	·56	- ·38	·04	·69	- ·23	·08
June . . .	·54	- ·18	·15	·79	+ ·23	·13
July . . .	·53	+ ·26	·05	1·03	+ ·84	·02
August . .	·78	+ ·38	·13	1·34	+ ·82	·08
September .	·95	+ ·80	·10	1·39	+ ·86	·08
October . .	·85	+ ·63	·09	1·11	+ ·44	·12
November .	·89	- ·09	·08	·88	- ·20	·09
December .	·64	- ·44	·09	·59	- ·54	·09

the actual rate is .70 per cent., while, if the relationship is used, the average difference between predicted and actual becomes .46 per cent., an advantage of .24 per cent., or of about a third of the .70 per cent.

The existence of the relationships pointed out are doubtless known in a general way, by "the Money Market," but as far as is known they have not been previously demonstrated. As has already been stated, the practical value of the relationships lies chiefly in the use to which they can be applied by dealers in "floating money"; their use should render "experience" more definite, and they have the advantage over general knowledge that exceptions to the rule can easily be discerned and examined. As a guide to future trade conditions they may also be useful.

Theoretically the relationships are interesting, and an attempt has been made to account for them. It was at first thought that they might have been due to a definite regulation of future rates by some authority, in accordance with the position at any particular time. This would not seem, however, to be a likely, or perhaps a possible, proceeding, and a further consideration was undertaken.

The business of discounting bills on the London Money Market is conducted

by the banks and bill-brokers, but it appears to be the latter to whom the most active part of the business appertains; it is they who, *vis-à-vis* the sellers of bills, perform the chief part of the operation of fixing the rates of discount. They buy bills at a discount, and in order to do this they borrow from the banks, chiefly floating money. It is thus their object, on the one hand, to buy bills at as high a rate of discount as possible, and, on the other hand, to borrow floating money as cheaply as possible.

When the supply of bills offering is larger than usual, then *ceteris paribus*, the rate of discount will be high; when the supply of floating money is larger than usual the floating rate will, *ceteris paribus*, be lower than usual; in either case the "difference" will be higher than usual. As, however, a larger offering of bills than usual will require a larger amount of "money" for financing them, the future supplies of floating money will be reduced, and the floating rate will rise more than usual—hence the relationships observed.

With this view of the situation, the question arises: Are the variations in the "differences" caused more by the variations in the floating rate or by those in the discount rate? And dealing with the 6 months rate, Table VII on page 15 sets out the correlations obtained between the "difference" and (a) the floating rate, (b) the rate of discount on 6 months bank bills.

The coefficients with the floating rate are seen to be much larger and more regular than those with the discount rate, indicating that the variations in the floating rate are generally a much more important factor in causing variations in the "difference" than are variations in the discount rate.

The floating rate tends to be low when the "difference" is high, in all months, the tendency being most marked in the first three months of the year, and being least marked in July.

The discount rates coefficients are generally negative in the early months of the year, the influence of the floating rates being probably overwhelming, while they tend to be positive in the later months, and particularly in July, August and September.

The next question that arises is: Does the "difference" correlate with the rises and falls in the discount rate? Table VIII sets out the coefficients obtained between the "differences" and the rises and falls in the 6 months rate of discount from the month named to the average of the next five months, the corresponding coefficients for the floating rate, already quoted, being set out for comparison.

In some months it is seen that a rise in the discount rate follows a high "difference," and in some they do not. From October to January, inclusive, and in June, the former is the position; in the remaining months it is the latter.

TABLE VII

Correlation coefficients between—

	(a) The difference between the floating rate and the rate of discount on 6 months Bank Bills and—	
	(b) The floating rate.	(b') 6 months discount rate.
January	— '53	— '15
February	— '77	— '34
March	— '62	— '22
April	— '31	+ '12
May	— '52	— '10
June	— '44	+ '03
July	— '10	+ '47
August	— '35	+ '23
September	— '30	+ '27
October	— '54	— '08
November	— '58	+ '08
December	— '45	+ '09

TABLE VIII

Correlation coefficients between—

	(a) The difference between the rate of interest on floating money, and the rate of discount on 6 months Bank Bills and—	
	(b) The rises or falls in the floating rate from month named to average of next 5 months.	(b') The rises and falls in the rate of discount on 6 months Bank Bills from the month named to average of next 5 months.
January	+ '70	+ '31
February	+ '77	— '05
March	+ '73	— '06
April	+ '54	— '23
May	+ '42	— '00
June	+ '66	+ '40
July	+ '26	— '35
August	+ '56	— '04
September	+ '45	+ '08
October	+ '68	+ '31
November	+ '73	+ '11
December	+ '66	+ '15

Generally speaking, the coefficients are not nearly so large as with the future floating rates, indicating that the "difference" is a less good guide to future discount rates.

The next question that arises is: At what period during the "next five months" do the rises and falls in the floating rate that have been shown to be connected with the "difference" occur?

An inspection seemed to show that it was chiefly in the first month. The "differences" were, therefore, correlated with the rises and falls in the floating rate to the next month, and the coefficients obtained are set out in the following table:—

TABLE IX

Correlation coefficients between—			
(a) The difference between the rate of interest on floating money, and the rate of discount on 6 months Bank Bills, and			
(b) The rises and falls in the floating rate from month named to next month.			
January	+ .22	July	+ .18
February	+ .86	August	+ .67
March	+ .63	September	+ .28
April	+ .52	October	+ .46
May	+ .41	November	+ .63
June	+ .62	December	+ .33

It is seen that the coefficients vary much more than those set out in Table VIII; August, November and February are again larger than their neighbours, February being particularly notable in this respect, while July is again low.

Calculating from these coefficients, the variations set out in Table X are those corresponding to a variation of .1 per cent. in the "difference."

It is seen that in most months the rises and falls to the next month, corresponding to a constant variation of .1 per cent. in the "difference," are much the same as the rises and falls to the average of the next five months, showing that whatever causes the floating rate to rise and fall operates almost entirely in the first month.

It has been suggested that the "cause" of the relationships set out is the withdrawal of the floating capital from the market owing to the financing of a larger quantity of bills than usual, owing to which the rate on floating money is increased. Such a cause would be largely automatic in its effect, being due to the natural working of the laws of supply and demand. In post-war years such a cause might have ceased to be operative, but an examina-

TABLE X

Rise or fall in the floating rate, above or below the average for the time of year, corresponding to a "difference" smaller or larger than the average by .1 per cent.

	(a) From the month named to the next month.	(b) From the month named to the average of the next 5 months.
January . . . . .	.04	.12
February . . . . .	.10	.10
March . . . . .	.09	.11
April . . . . .	.08	.08
May . . . . .	.06	.08
June . . . . .	.12	.13
July . . . . .	.01	.02
August . . . . .	.10	.08
September . . . . .	.05	.08
October . . . . .	.10	.12
November . . . . .	.08	.09
December . . . . .	.04	.09

tion of the data available would seem to show that it is still acting, though with so few years each month does not follow. Generally speaking, the rises and falls in the five months average follows the 1882-1913 relationships better than the rises and falls to the next month.

The 6 months "differences" and the rises and falls in the floating rate to the next month, and to the average of the next five months for the months of January, February, April and May, 1919-22, are set out in the following table:—

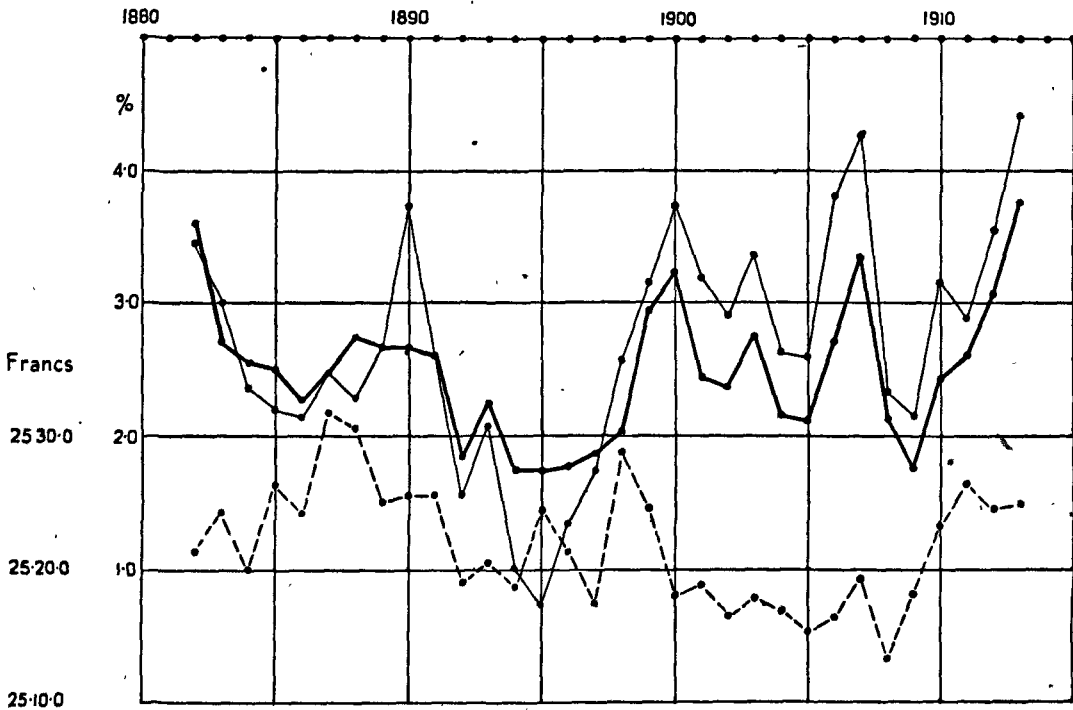
JANUARY.			FEBRUARY.				APRIL.				MAY.					
6 months "diff."			Rise in floating rate to		6 months "diff."		Rise in floating rate to		6 months "diff."		Rise in floating rate to		6 months "diff."		Rise in floating rate to	
			next month.	average of next 5 months.			next month.	average of next 5 months.			next month.	average of next 5 months.			next month.	average of next 5 months.
1920	2.10	.25	.73	1920	1.95	.63	.68	1920	2.63	1.25	1.60	1920	2.25	.75	.65	
1921	2.06	.13	.43	1921	1.82	.62	.42	1919	.87	.00	-.07	1921	1.56	.50	.20	
1919	.50	.13	-.15	1922	1.06	.25	-.30	1922	.07	-1.00	-1.79	1919	.85	-.00	-.07	
1922	.44	-.50	-.60	1919	.42	-.25	-.38	1921	-.41	-2.25	-2.05	1922	.25	-.25	-.31	

It is seen that the "difference" has again been a useful guide to the future course of the floating rates, but the rises and falls to the "next" month are not usually so great as those to "the average of the next five months."

Generally speaking, it would seem that the relationship between the "differences" and the variations in the rate of interest on floating money that have been pointed out are of general application. There seems to be no doubt about the fact, but the theory suggested to account for it may be fallacious.

DIAGRAM 3.

London rate of discount on 3 months bank bills _____
 French market rate of discount _____
 London-Paris Exchange - - - - -



CHAPTER III

THE LONDON-PARIS EXCHANGE

WE have now to examine the London-Paris exchange, its relationship with the rates of interest on floating money and of discount in London, and with the market rate of discount in Paris.

The table on page 21 sets out the annual average rate of exchange, the average rate of discount on 3 months bank bills in London, and the average market rate of discount in Paris, each being the average of the rates stated in the first number of the *Economist* at the beginning of each month.

It is seen that the rates of exchange were highest at the beginning of the period, though there is a high period during the last four years, while they were lowest during the first ten years of the present century. The average rate is 25.21.9 francs, which is almost exactly the par of exchange (which is 25.22 francs).

The average rate of discount on 3 months Bank Bills in London is 2.69 per cent., as compared with a market rate of 2.49 per cent. in Paris, while the variation as shown by the probable error is somewhat greater in London than in Paris. The rates are lowest in both Paris and London in the period 1891-99.

The relationship between the three series of figures may be more easily examined in Diagram 3, which sets them out in the form of a curve.

It is seen that the rates of discount move up and down roughly together, while the rate of exchange shows very little relationship to the other rates.

The correlation coefficients are as follows:—

Between the average annual London-Paris rate of exchange and

- | | |
|--|-------|
| (1) the average annual rate on floating money in London . . . | + .01 |
| (2) the average annual rate on 3 months Bank Bills, in London . . . | — .01 |
| (3) the average annual rate on 6 months Bank Bills, in London . . . | + .02 |
| (4) the average annual difference between the rates for floating money and of discount on 6 months Bank Bills, in London . . . | — .19 |
| (5) the average annual Paris Market rate | + .18 |

Between the average annual rate of discount on 3 months Bank Bills, in London and the average annual Paris Market rate + .82

It is seen that no appreciable connexion occurs between the rates

THE LONDON-PARIS EXCHANGE

21

TABLE XI

	London-Paris Exchange, 25 francs omitted in each case.	Rate of discount on 3 months Bank Bills in London.	Market rate of discount in Paris.
	Centimes.	%	%
1882	21·3	3·47	3·60
1883	24·3	3·00	2·70
1884	20·0	2·33	2·52
1885	26·3	2·20	2·50
1886	24·3	2·13	2·27
1887	31·8	2·47	2·47
1888	30·7	2·29	2·72
1889	25·0	2·66	2·65
1890	25·6	3·72	2·65
1891	25·8	2·58	2·60
1892	19·0	1·55	1·82
1893	20·7	2·08	2·24
1894	18·8	1·00	1·73
1895	24·3	·73	1·71
1896	21·3	1·35	1·76
1897	17·5	1·73	1·87
1898	28·8	2·56	2·01
1899	24·6	3·15	2·94
1900	18·0	3·72	3·21
1901	18·9	3·20	2·44
1902	16·5	2·90	2·37
1903	17·9	3·37	2·73
1904	17·0	2·62	2·17
1905	15·3	2·60	2·11
1906	16·5	3·83	2·70
1907	19·3	4·28	3·35
1908	13·2	2·33	2·11
1909	18·0	2·15	1·76
1910	23·2	3·16	2·41
1911	26·4	2·88	2·60
1912	24·5	3·53	3·05
1913	24·9	4·41	3·77
Average	21·9	2·69	2·49
P.E.	3·2	·55	·41

of interest and discount in London and the London-Paris exchange, while there is a slight tendency for the Market rate in Paris to be high when the rate of exchange is high. The rates of discount in the two centres vary together and a movement in London goes with a movement of about half the amount in Paris; in other words, if the London rate rise by .5 per cent., the Paris rate is likely to rise by .25 per cent.

The lack of connexion between the exchange and the rates of interest and discount is unexpected, for, according to the orthodox theory of exchanges, a high rate of exchange should go with low rate of interest and discount in London, and with a high rate of discount in Paris. In fact, there is a slight connexion in the expected direction with the Paris discount rate, but the size of it is very small.

We have next to examine the average monthly figures, and these are set out in the following table.

TABLE XII

Monthly averages for the 32 years of the rates for floating money and discount on 3 months Bank Bills in London, for the London-Paris rate of exchange, for the market rate of discount in Paris, and for the difference between the floating rate and the 3 months discount rate in London.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Floating rate, per cent.	2.35	2.44	2.66	2.16	1.86	1.59	1.30	1.49	1.59	2.12	2.64	2.80
3 months discount rate	3.17	2.82	2.74	2.34	2.42	2.13	1.83	2.27	2.54	2.97	3.53	3.44
London-Paris Ex., frs. 25 omitted	21.1	20.9	24.0	22.0	20.6	21.3	19.6	21.5	23.9	23.8	21.6	23.0
Market rate in Paris, per cent.	2.94	2.75	2.38	2.51	2.44	2.19	2.35	2.24	2.06	2.44	2.82	2.70
"Diff." between the floating rate and the 3 months dis. rate per cent. in London . . . . .	.82	.38	.08	.18	.56	.54	.53	.78	.95	.85	.89	.66

The numbers are too small for correlation, and the averages are set out in the form of a curve in Diagram 4.

The curves show that the Paris discount rate moves roughly in the same direction throughout the year as the London floating and discount rates. It does not fall as much as the floating rate in the summer, however, and it does not rise as much as the London discount rate in the autumn, thus maintaining the greater constancy peculiar to the Paris rates.

There are differences in the smaller irregularities, the London discount rate being highest in November, and falling gradually to the following July, and then rising fairly regularly to the next November, showing thus one festoon.

The London floating rate is highest in December, and has another maximum point in March, thus showing two festoons.

The Paris discount rate has minima in March, June, September, and December, thus showing four inverted festoons.

The exchange rate is much more irregular; it shows distinct maxima in March and September, and smaller maxima in June and December.

We now have to examine the relationships between the different rates for the same months of the different years, and the following table sets out the correlation coefficients between the London-Paris exchange rate, and (a) the rate of interest on floating money in London, (b) the rate of discount for 3 and 6 months Bank Bills in London, and (c) the market rate in Paris, all being for the years 1882-1913.

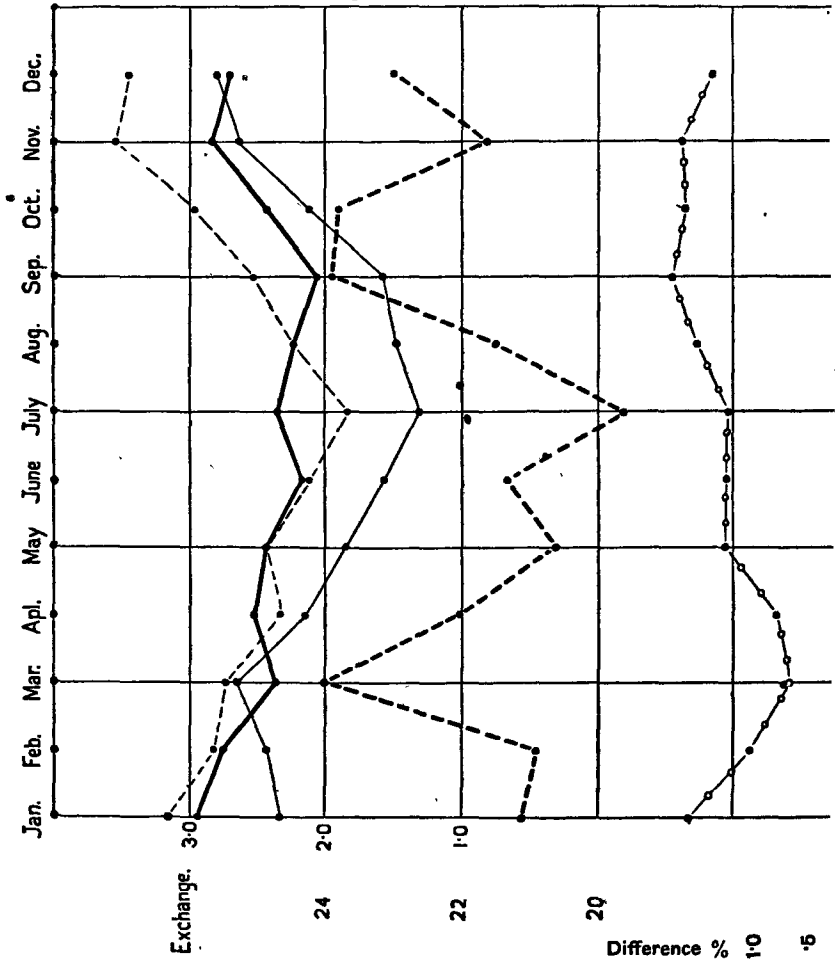
TABLE XIII

Correlation coefficients between the London-Paris Exchange and—				
	Floating rate in London.	3 months discount rate in London.	6 months discount rate in London.	Market rate of discount in Paris.
January . . .	+ .18	+ .08	+ .08	+ .06
February . . .	+ .21	+ .12	+ .10	+ .03
March . . .	+ .23	+ .19	+ .16	+ .09
April . . .	+ .19	+ .14	+ .13	+ .13
May . . .	— .02	+ .13	+ .17	— .08
June . . .	+ .32	+ .26	+ .21	— .11
July . . .	+ .01	+ .02	+ .06	+ .10
August . . .	+ .29	+ .37	+ .30	+ .14
September . . .	+ .18	+ .19	+ .14	+ .15
October . . .	+ .44	+ .35	+ .26	+ .30
November . . .	+ .34	+ .29	+ .25	+ .20
December . . .	+ .40	+ .40	+ .37	+ .31
Average . . .	.23	.21	.19	.14

Almost all the correlations are positive, showing that high rates of interest and discount both in London and Paris go with a high rate of exchange, but many of the coefficients are very small. As far as Paris is concerned,

DIAGRAM 4.

Average monthly rates for 1882-1913 : London floating rate — London 3 months discount
 Paris discount rate — London-Paris Exchange - - - -
 Difference between London floating rate and 3 months discount rate ○ ○ ○ ○



this supports the orthodox theory, according to which high rates of interest and discount should go with high exchange, when expressed in francs per £ sterling.

The relationships are, on the whole, closer with the floating rate in London, and they are largest in the autumn months of the year, August to December.

The relationships between the exchange rate and the London rates is of course in the direction that would not be expected, i.e. high exchange goes with high rates.

A further table is given, showing the correlation obtained between the rate of exchange and (a) the difference between the floating and discount rates in London, (b) the difference between the London 3 months discount rate and the Paris Market rate.

TABLE XIV

Correlation coefficients between the London-Paris rate of exchange and—			
	The "Diff." between the floating and 3 months discount rate in London.	The "Diff." between the floating and 6 months discount rate in London.	The "Diff." between the London 3 months discount rate and the Paris discount rate (+ = London rate relatively higher).
January	—·25	—·30	+·14
February	—·19	—·24	+·27
March	—·11	—·20	+·32
April	—·02	—·11	+·16
May	+·43	+·33	+·25
June	—·30	—·35	+·38
July	—·13	+·03	+·11
August	+·03	—·13	+·31
September	+·13	—·13	+·30
October	—·19	—·47	+·37
November	—·23	—·28	+·24
December	—·02	—·20	+·36

Generally speaking, the rate of exchange is high when the difference between the floating and discount rate in London is small, this being particularly marked in the period October-February, and in June, and with the 6 months difference, while in May there are high positive correlations.

As will be seen later, the Paris exchange agrees in these general relationships with the New York exchange, and the reason for their occurrence may be the same, a high exchange signifying that there is a smaller amount of business

than usual passing, and that the rate of discount is consequently lower than usual, relatively to the floating rate, as is shown by the "difference" being small.

The correlations with the differences between the rates of discount in the two centres are fairly large in many months, and are larger than those for the rates of discount themselves. They indicate that when the London discount rates are low relatively to Paris, then the rate of exchange also tends to be low. This is unexpected, and is probably due to the fact that when the Paris rate moves up and down, the London rate moves up and down to a greater extent; it has a greater range.

In three of the four quarterly "Paris" periods, namely March, June, and December, the coefficients are larger than their neighbours.

A final table, No. XV, is given on page 27, showing (1) the relationships between the Market rate of discount in Paris, and (a) the London floating rate; (b) 3 months discount rate; (2) the variation in the London 3 months rate that may be expected to accompany a variation of 1 per cent. in the Paris rate.

The rates in Paris and London are seen to be connected together; when they are high in Paris they are high in London. The discount rates in the two centres are more closely connected than is the Paris discount with the London floating rate, as might have been expected.

The connexion between the discount rates is fairly regular, but it is higher at the four quarterly periods, March, June, September, and December, than in other months.

The London rates vary more than the Paris rate, and, considering the discount rates only, a rise or fall in the Paris rate of 1 per cent. corresponds to a rise or fall in the London rate of about $1\frac{1}{2}$ per cent., the quarterly periods noted above generally showing a higher figure than the neighbouring months.

Can an explanation be provided for the various apparent connexions between the rate of exchange and the rates in London and Paris?

The salient facts about the Paris market seem to be (1) that France was a creditor nation, to this fact the Governor of the Bank of France, in his evidence before the Aldrich Commission, attributed their ability to have a lower bank rate than that in force at other centres; (2) that the Bank of France, which acts on very "conservative" lines, was able to control the trade of the market to a very great extent, so that the actual dealers in bills were directly affected by its decisions. There is no lending of floating money for the discount of bills in Paris, as in London, bills being rediscounted at the Bank of France, by the other Banks as a routine, and the Bank is therefore able to bring pressure to bear on the purchasers of bills much more easily than the Bank of England, which only rediscounts bills in times of stress. Also

TABLE XV

	Correlations between the Market rate of discount in Paris and—		1 per cent. variation in the Paris discount rate goes with a variation in—	
	The London floating rate.	The London 3 months discount rate.	The London floating rate of	The London 3 months discount rate of
January	+ .58	+ .36	% 1.1	% .7
February	+ .20	+ .45	.5	1.0
March	+ .44	+ .69	.8	1.2
April	+ .56	+ .67	1.0	1.1
May	+ .48	+ .68	.8	1.1
June	+ .52	+ .70	.9	1.2
July	+ .55	+ .61	1.0	1.1
August	+ .37	+ .62	.8	1.3
September	+ .59	+ .79	.9	1.4
October	+ .56	+ .71	1.2	1.5
November	+ .30	+ .53	.7	1.1
December	+ .74	+ .80	1.6	1.8

the Bank of France is not under the liability, like the Bank of England, to pay out gold on demand. It can therefore easily affect not only the rate at which business is done, but the amount of the business.

It would seem, therefore, that the failure of the London rates to be low when the exchange rate is high is due to the facts that the rate of discount tends to be high in both centres at the same time, and that when the rate is raised or reduced in Paris, the London rate rises or falls to a greater extent.

It is probably the conservatism of the French public reflected in the Bank of France (which is, of course, a national institution) that enables the rates to be kept lower in Paris than those in London, and in fact than those in all other centres. There is probably in each centre a "national" level for the rate of interest, which depends on the adventurousness of the investing public and on the supply of national capital.

If the foregoing be true, it will be apparent that the conditions of the French money market during the period considered were somewhat artificial, the variations of supply and demand were not fully reflected in the price of money, but were met by regulation of the supply and demand themselves (though it is possible that more natural conditions existed at the quarterly periods noted). Such a state of affairs could probably only exist in a creditor market,

and in one where conservatism was the ruling instinct. This may, therefore, make this analysis of the relationships of the London-Paris rate of exchange for a pre-war period less useful as a guide to the immediate future than it otherwise would be.

An interesting point that was noticed after the above work was completed was that, if the weekly figures for the period examined (1882-1913) be taken, it is to be noted that in the months December to March a movement in the Paris exchange is followed the next week by a movement, in the same direction, of the floating rate in London (178 cases to 138, the odds that this is not a chance occurrence being about 15 to 1), while for the period April to November a movement in the floating rate in London is followed the next week by a movement in the same direction of the rate of exchange on Paris (336 cases to 242, the odds that this is not a chance occurrence being about 800 to 1).

The market rate of discount in Paris is not now quoted in the English journals, and the exchange rate between London and Paris is too irregular to make the data of four years worthy of examination. As far as can be seen the three-monthly periodicity of the period 1882-1913 does not exist at the present time, showing, perhaps, that the forces of Nature, upon which the law of supply and demand is based, have become too great for even the Bank of France to control.

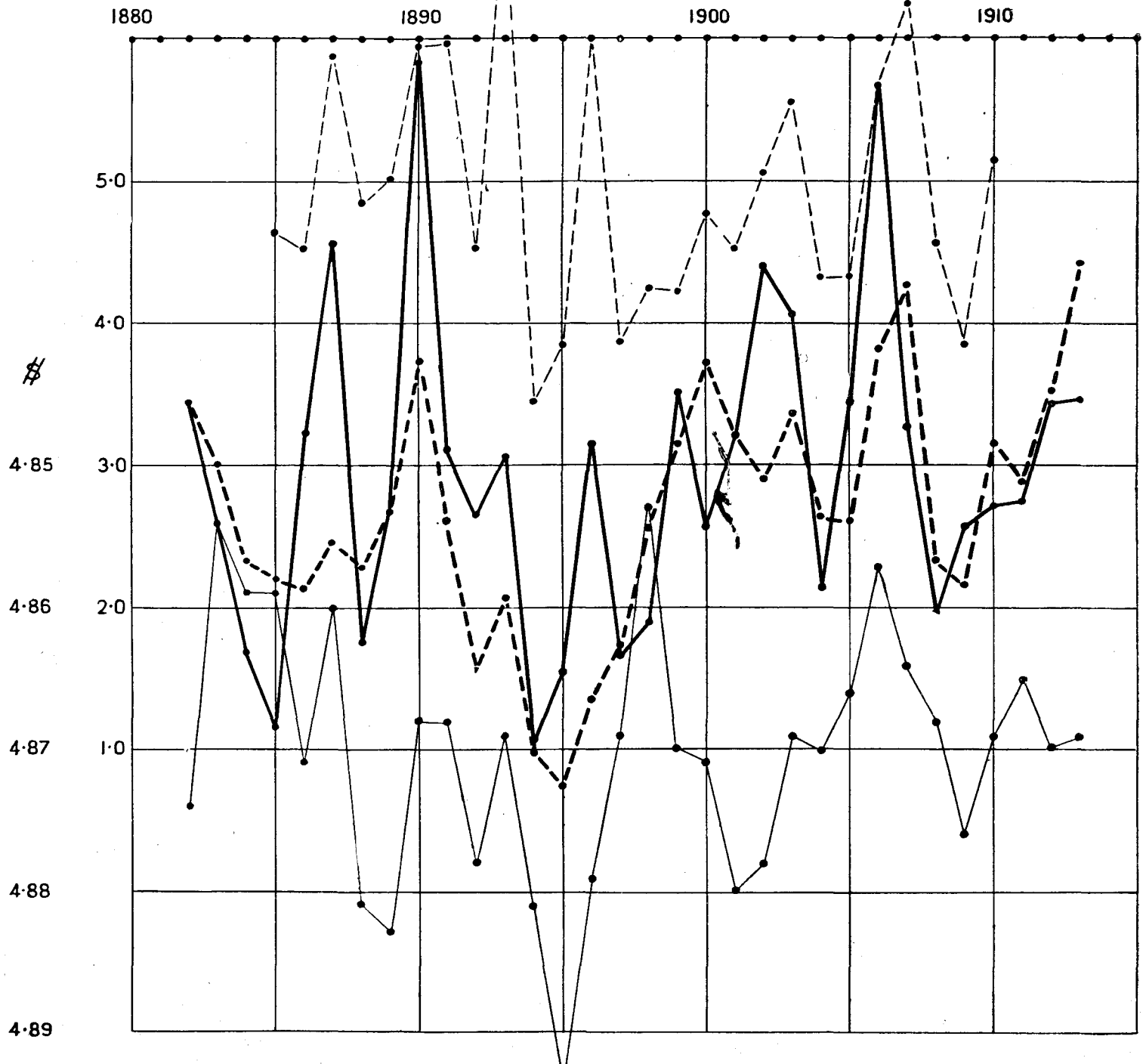
DIAGRAM 5.

Average Annual

London rate of discount on 3 months bank bills -----

New York " " " ----- New York call money rate _____

London-New York Exchange _____



CHAPTER IV

THE LONDON-NEW YORK EXCHANGE

THE London-New York exchange has been examined in the same way as the London-Paris exchange, and the facts discovered are stated in this chapter.

The table on page 30 sets out the average annual rate of exchange, the average rate of discount on 3 months Bank Bills in London, and the average rates of interest for call money and of discount on endorsed bills in New York (for the years 1885-1910). The figures are, as before, the averages of those quoted at the beginning of each month in the *Economist*; on and after July, 1886, the exchange is the "Telegraphic Transfer," before that date, "short at interest."

It is seen that the rates of exchange were lowest at the beginning of the period. The average rate is \$4.88-0, which is slightly in favour of London, par of exchange being \$4.86-5.

The rate of discount on 3 months Bank Bills in London is slightly lower than the rate of interest on call money in New York, and much lower than the rate of discount on endorsed bills. All the rates are low in the 1890-1900 decade.

The variation as shown by the probable error is almost the same for the two discount rates, and is appreciably greater for call money in New York.

The relationships may be more easily examined in Diagram 5 attached, which sets out the annual averages in four curves. It is seen that the rate of exchange tends to be high when the rate of discount in London is low, and that on the whole the rates of interest and discount move up and down together.

The correlation coefficients are as follows:—

Between the London-New York rate of exchange and the				
Rate of interest on floating money in London	.	.	.	—·42
Rate of Discount on 3 months Bank Bills	.	.	.	—·42
Rate of Interest on call money in New York	.	.	.	—·17
Rate of discount on endorsed bills in New York	.	.	.	—·37

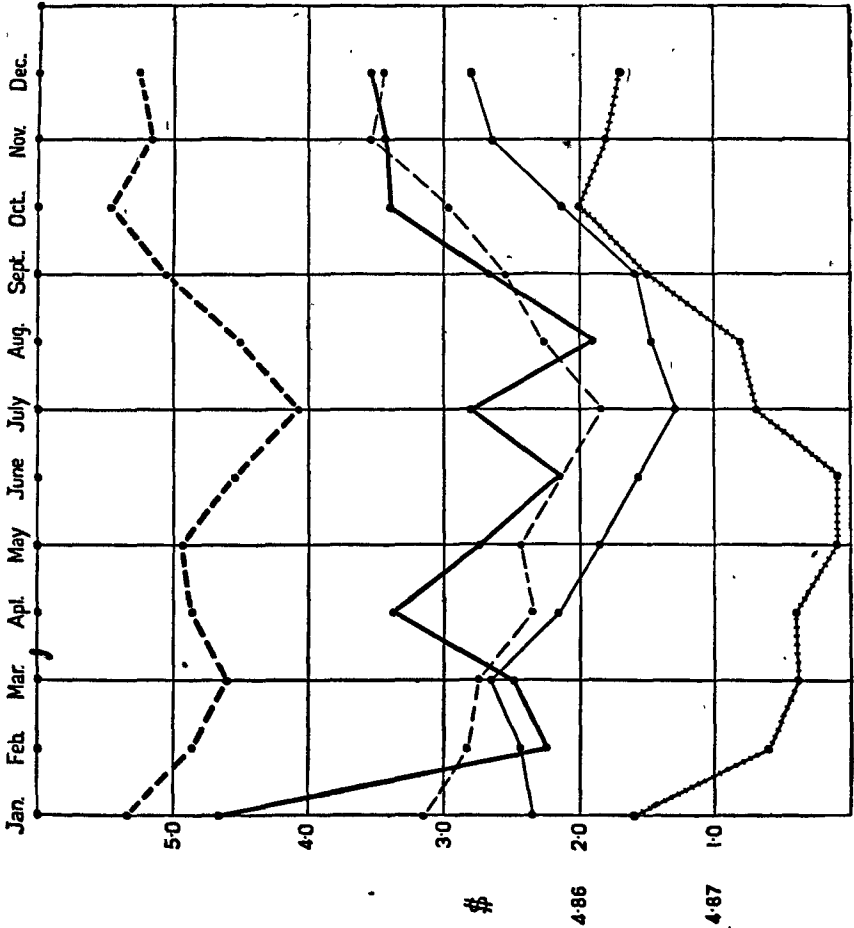
Between the 3 months rate of discount in London and rate of				
discount in New York	.	.	.	+·45

TABLE XVI

	London- New York Exchange \$4 omitted in each case.	Rate of discount on 3 months Bank Bills in London.	Rate of interest on call money in New York.	Rate of discount in New York on Endorsed Bills.
		%	%	%
1882	87.4	3.47	3.42	—
1883	85.4	3.00	2.58	—
1884	85.9	2.33	1.69	—
1885	85.9	2.20	1.17	4.63
1886	87.1	2.13	3.21	4.51
1887	86.0	2.47	4.58	5.88
1888	88.1	2.29	1.75	4.85
1889	88.3	2.66	2.67	5.00
1890	86.8	3.72	5.84	5.94
1891	86.8	2.58	3.10	5.98
1892	87.8	1.55	2.63	4.52
1893	86.9	2.08	3.04	6.93
1894	88.1	1.00	.98	3.44
1895	89.5	.73	1.56	3.86
1896	87.9	1.35	3.15	5.77
1897	86.9	1.73	1.67	3.86
1898	85.3	2.56	1.90	4.25
1899	87.0	3.15	3.50	4.22
1900	87.1	3.72	2.59	4.78
1901	88.0	3.20	3.19	4.53
1902	87.8	2.90	4.40	5.06
1903	86.9	3.37	4.08	5.52
1904	87.0	2.62	2.13	4.31
1905	86.6	2.60	3.42	4.32
1906	85.7	3.83	5.65	5.60
1907	86.4	4.28	3.29	6.22
1908	86.8	2.33	1.98	4.58
1909	87.6	2.15	2.58	3.85
1910	86.9	3.16	2.71	5.12
1911	86.5	2.88	2.74	—
1912	87.0	3.53	3.43	—
1913	86.9	4.41	3.46	—
Average	87.0	2.69	2.94	—
P.E. . . . .	.59	.55	.76	—
Average to compare with New York discount rate		2.55	2.95	4.91
P.E.	—	.58	.78	.57

DIAGRAM 6.

Average monthly rates 1882-1913:
 London Floating rate —————
 London 3 months discount - - - - -
 New York call money rate —————
 New York discount rate (1885-1910) - - - - -
 London-New York Exchange ······



The relationships are very different to those shown by the Paris rates ; a high rate of exchange (London-New York) goes with low rates in London, while there is a very small correlation between the rate of exchange and the rate of interest on call money in New York. The New York discount rate correlates negatively with the rate of exchange, which would not have been expected, and this is doubtless due to the fact that the London and New York discount rates show a fair-sized positive correlation. It is not nearly as large, however, as the correlation shown between the Paris and London discount rates.

We next have to examine the monthly averages, and these are set out in Table XVII and in Diagram 6.

All the curves show some similarity, the rates being highest at the beginning and towards the end of the year. The agreement between the rates of interest and discount in the two centres is not nearly so close, however, as that between the Paris and the London rate. The rate of exchange, on the other hand, shows more apparent connexion with the other rates than the Paris rate of exchange.

The movement of the call money rates in New York shows the least connexion with the movements of the other rates, and there are quarterly maxima at the beginning of January, April, July, and perhaps October.

The New York discount rate shows maxima in May and October, the beginning and end of a six-monthly period, which may show that they are connected with each other.

TABLE XVII

Averages of 1882-1913 (unless otherwise stated)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Floating rate, per cent. in London . . .	2.35	2.44	2.66	2.16	1.86	1.59	1.30	1.49	1.59	2.12	2.64	2.80
3 m. dis. rate per cent. in London . . .	3.17	2.82	2.74	2.34	2.42	2.13	1.83	2.27	2.54	2.97	3.53	3.44
London-New York Ex., \$4 omitted . . .	86.4	87.4	87.6	87.6	87.9	87.9	87.3	87.2	86.5	86.0	86.2	86.3
Call money rate in N. York, per cent. . .	4.63	2.24	2.48	3.39	2.72	2.12	2.80	1.86	2.68	3.40	3.44	3.51
Dis. rate in N. York per cent. for 1885-1901 .	5.32	4.88	4.60	4.87	4.93	4.55	4.08	4.50	5.07	5.46	5.17	5.25

The rate of exchange is at its minimum in October, when the New York discount rate is at its maximum.

We have now to examine the relationships between the different rates for the same months of the different years, and Table XVIII sets out the correlation coefficients between the London-New York exchange rate, and (a) the rate of interest on floating money, (b) 3 months discount and 6 months discount rates in London, (c) the call money and discount rates in New York, all except the last, which is for the years 1885-1910, being for the years 1882-1913.

Generally speaking the correlations are negative, showing that high rates of exchange go with low rates of interest and discount in both centres. This is in the expected direction as far as London is concerned, but is unexpected for the New York rate. The position is thus somewhat similar to that of Paris, only that, in the case of the New York exchange, it is London that gives orthodox connexions, while with the Paris exchange these were given by the foreign centre.

There are other dissimilarities; the correlation coefficients are somewhat

TABLE XVIII

Correlation coefficients between the London-New York rate of exchange and—					
	Floating rate in London.	3 months discount rate in London.	6 months discount rate in London.	Call money rate in New York.	Discount rate in New York.
January . . .	—·52	—·40	—·39	—·13	—·37
February . . .	—·19	—·17	—·15	—·02	—·17
March	—·21	—·28	—·16	—·27	—·21
April	—·20	—·37	—·31	—·34	—·04
May	—·39	—·44	—·44	—·05	—·03
June	—·13	—·14	—·14	—·25	—·05
July	—·06	—·07	—·15	—·36	—·55
August	+·16	+·04	—·15	—·10	—·32
September . .	+·20	+·08	·00	—·27	—·19
October	+·17	+·13	+·01	—·08	—·26
November . . .	—·06	—·14	—·24	—·03	—·35
December . . .	—·10	—·19	—·31	—·08	—·32
Average . . .	·20	·20	·20	·17	·24

smaller with the New York rates than with the Paris rates, while the New York coefficients tend to be often high when the London coefficients are low.

In the case of both London and New York, the rates for short money appear

to be less closely connected with the exchange rate than are the discount rates.

It is also to be noticed that for the months, of August, September and October the London rates tend to be positively correlated with the exchange rate, thus disagreeing with the rest of the year and with the annual average correlation.

A further table is given to show the correlations obtained between the rates of exchange and (a) the difference between the floating and discount rates for the years 1882-1913 in London, and (b) between the London 3 months discount rate and the New York discount rate for the years 1885-1910.

TABLE XIX

Correlation coefficients between the London-New York Exchange and—			
	The "Diff." between the floating rate in London and the 3 months discount rate in London.	The "Diff." between the floating rate in London and the 6 months discount rate in London.	"Diff." between the 3 months discount rate in London and the New York discount rate (+ = New York rate relatively higher).
January	+ .20	+ .39	— .04
February	+ .15	+ .21	— .16
March	+ .08	+ .19	— .38
April	— .48	— .33	— .34
May	— .07	+ .05	— .27
June	— .07	— .04	— .24
July	— .30	— .34	+ .48
August	— .46	— .54	+ .25
September	— .35	— .42	+ .23
October	— .23	— .47	+ .32
November	— .21	— .23	+ .04
December	— .20	— .29	+ .14
Average	— .23	— .29	— .24

Looking first at the correlations with the differences between the London floating and discount rates, it is seen that for the first three months of the year a high discount rate goes with a large "difference," while the reverse holds for the remainder of the year; the coefficients are largest for April and for the last six months of the year.

Coming now to the correlations for the differences between the discount rates at the two centres, it is seen that the year is divided clearly into two portions, the earlier part, when a low rate in New York relative to London

goes with a high exchange, and the latter, when the reverse obtains. *A priori*, one would have expected all the months to show positive correlations.

On considering together the relationships between the exchange and the London rates set out in the two previous tables, it is apparent that, as far as the London rates are concerned, the year divides itself into three parts:—

- (1) The first three months of the year, when high exchange rates go with low floating and discount rates, but with large "differences."
- (2) The months August, September, and October, when high exchange rates go with high floating and discount rate, and with small "differences."
- (3) The remaining six months, when high exchange rates go with low floating and discount rates, and with small differences.

To agree with these facts it will be apparent that in the first three months a variation in the rate of exchange must go with a larger variation in the discount rate than in the floating rate, and in the months August to October with a larger variation in the floating than in the discount rate.

On calculating the amount of variation in the floating and discount rates corresponding to a constant variation in the exchange rate which has been done for the three months "differences" only, the above is, of course, found to occur, as is shown in the table on page 36 for the typical months January, May, and September.

A final table, No. XXI, is given on page 37 showing the monthly relationships between the London floating and 3 months rate of discount and the rate of discount in New York, together with the variation in the London rates that goes with a constant variation in New York rate, for the years 1885-1910.

The discount rates in the two centres are seen to be closely connected, as are the London and Paris rates, but in the case of New York the relationship is peculiarly small in October, and is a little low in April and July, i.e. in three of the four quarterly maxima of the New York call money rate.

The movement in London corresponding to a variation in the New York discount rate of 1 per cent. is seen to be, on the average, .4 per cent., a movement in New York thus going with a movement of about half the size in London. This should be compared with the movement in the French discount rate, which is a little less than that of London.

What explanation can be provided to account for the relationships set out?

The general negative relationship between the exchange rate and the floating and discount rates in London would have been expected, but the negative relationship with the New York discount rate requires explanation.

TABLE XX

The floating rate and 3 months discount rate in London corresponding to different rates of exchange between London and New York—

	Rate of Exchange.	Calculated corresponding rates of interest on floating money in London.	Calculated corresponding 3 months discount rate in London.
January . . .	4.85.5	% 2.96	% 3.56
	6.0	2.78	3.43
	6.5	2.60	3.30
	7.0	2.42	3.17
	7.5	2.24	3.04
May	4.87.0	2.38	2.80
	.5	2.24	2.65
	8.0	2.10	2.50
	8.5	1.96	2.35
	9.0	1.82	2.20
September . . .	4.85.5	1.68	2.54
	6.0	1.74	2.57
	6.5	1.80	2.60
	7.0	1.86	2.63
	7.5	1.92	2.66

It would seem that it must be due to the fact that in the general movement of the rates at the two centres the influence of London is overwhelming, and the New York rate follows the London rate, giving like it a negative correlation. There is a slight indication that in the months of August, September, and October the movements in New York cause corresponding movements in London. This explanation is then similar, but in the opposite sense to that provided to account for the unexpected relationship between the London rates and the London-Paris exchange.

The power of London to "pull" the rates during the period examined was, perhaps, due partly to the fact that it was a creditor market, again similar to the London-Paris position, but in the opposite sense. There are, of course, great differences in the positions of Paris and New York relatively to London, the actual difference in distance naturally tending to make Paris have closer relationships. Economically speaking, also, London lies between Paris and New York, and perhaps partly on this account the London-New York exchange

TABLE XXI

	Correlation coefficients between the New York discount rate and—		1 per cent. variation in the New York discount rate goes with variations in—	
	The London floating rate.	The London 3 months discount rate.	The London floating rate of	The London 3 months discount rate of
January . . .	+ '58	+ '54	% '5	% '5
February . . .	+ '39	+ '28	'3	'5
March . . .	+ '31	+ '37	'4	'4
April . . .	+ '20	+ '20	'2	'3
May . . .	+ '23	+ '32	'3	'2
June . . .	+ '39	+ '40	'5	'4
July . . .	+ '29	+ '31	'3	'2
August . . .	+ '26	+ '33	'4	'3
September . . .	+ '51	+ '39	'2	'3
October . . .	+ '18	+ '09	'1	'2
November . . .	+ '43	+ '53	'6	'6
December . . .	+ '43	+ '54	'7	'5
Average . . .	'35	'36	'4	'4

correlates negatively with the London-Paris exchange for part of the year and positively for the remainder. From the point of view of its constitution, too, the London money market lies between Paris and New York. Paris is centralized, unfree, and carefully regulated. London is non-centralized, free, and subject very much to the movements caused by variations in supply and demand; while New York is (or at any rate was, during the period considered) non-centralized, free, and almost unregulated.

It is likely that some of these peculiarities are in large part due to the nature of the inhabitants of the countries in which these markets are situated. The French are thrifty, conservative, not adventurous, and willing to be "administered," and the rate of interest can, therefore, be usually maintained at a low rate if it be desired.

The British may be conservative, but they are much more adventurous and much more independent, and the rate of interest cannot therefore be regulated in the same way; while the Americans, with their comparatively new country and less tradition behind them, cannot help being still more adventurous and independent (this, perhaps, in a somewhat different sense to the

independence of the British), and their natural rate of interest is considerably higher.

Dealing with the "difference" relationships, which as a rule are negative, it may be remembered that in Chapter II it was suggested that a large "difference" was an indication of the fact that a larger amount of bills than usual were being offered for sale. Assuming that this be correct, it is to be expected that a larger amount of "exchange" than usual will be required, and the rate of exchange will therefore be lower than usual when the "difference" is high. An explanation is thus provided for the negative correlation between the "differences" and the exchange rates. In the early months of the year, when the correlation is positive for the London-New York exchange, the absorption of floating money, due to the collection of taxes during the first quarter of the year, affects the floating rate so much more than the discount that the correlation between the London-New York exchange and the "difference" becomes positive, the rates themselves obeying the orthodox connexion with the exchange, according to which high rate of exchange goes with low rates of interest and discount.

An examination of the movements of the weekly rate for the years already considered, which was made after the foregoing work was completed, shows that if the floating rate in London moves up or down, the London-New York exchange generally moves up or down in the same direction the following week, except in the months of February and July, and excluding these two months the movements in the same direction are 394 as against 203 in the opposite direction, the odds against this being a chance occurrence being about 1,400 to 1.

During the months of June to September, a movement of the exchange rate up or down is followed the next week on 151 occasions by a movement in the same direction of the London floating rate, as against 124 in the opposite direction, the odds against this being a chance distribution being about 4 to 1.

Both the above disagree with the orthodox theory according to which a rise in the exchange rate should be followed by a fall in the rate of interest, as indicated by the "floating rate."

On the other hand, a rise or fall in the "difference" in one week is followed by a fall or rise in the exchange the next week on 179 occasions during February to May, as against 141 in an opposite sense (odds 10 to 1 against it being chance), which accords with the theory advanced in these pages, while during June to August a rise or fall in the exchange in one week is followed by a

fall or rise in the " difference " the next week in 130 cases as against 91 cases in the opposite direction (odds against chance being 60 to 1), again agreeing with the theory advanced.

The results set out in this and the preceding chapter seem to be of theoretical interest, as showing that the orthodox theory of " foreign " exchanges, according to which high rates of exchange go with low rates of interest and discount, does not always obtain. In many cases the coefficients are small, but they may be of practical interest, as measuring definitely relationships which are probably already known by experience to those engaged in dealing with the business of exchange and bill-broking ; they may in fact be said to " crystallize experience." The method used has the advantages over " experience " that the more remote events are given as much weight as the more recent, and that exceptions to rule are more easily noticed. Further than this, the method can be applied more or less mechanically, so that more time can be spent on an examination of causes and effects, since less time is required for " learning by experience." Unfortunately, at the present time the actual relationships described do not seem to be directly applicable to post-war rates, but it is likely that the reasons causing them are still operative, though, perhaps, with different results, and that when free conditions again apply to the money markets of the world the knowledge may be directly applicable.

CHAPTER V

CALCULATION OF AN EQUATION FOR THE PREDICTION OF THE FUTURE FLOATING RATE FROM THE DIFFERENCE BETWEEN THE FLOATING RATE AND THE RATE OF DISCOUNT ON BANK BILLS, THE RATE OF EXCHANGE BETWEEN THE UNITED KINGDOM AND THE UNITED STATES OF AMERICA, AND THE RATE OF EXCHANGE BETWEEN THE UNITED KINGDOM AND FRANCE

In the earlier pages of this pamphlet it has been shown that the variations in the rises and falls in the floating rates for the coming five months can be foretold, to some extent, from the variation in the size of the difference between the floating rate and the rate of discount on Bank Bills. It has further been shown that the variations in the "difference" show connexions with the variations in the rates of exchange between the United Kingdom and the United States of America and France, while the variations in the two exchanges themselves also correlate with each other. To complete the series, the rises and falls in the future floating rates were correlated with the two exchanges, and it was found that in many months of the year fairly high relationships exist.

Now, it will be obvious on consideration that some of these relationships may be due to the existence of others. If, for instance, the "difference" correlates very highly with the future floating rate and also with the American exchange, it is likely that the exchange will show an appreciable correlation with the future floating rate, purely, perhaps, on account of the relationship of both with the "difference." Whether such a relationship is independent or not can be determined by applying the "multiple correlation" method. This method has been kindly applied for me to the month of January, for the six months rates, by Mr. W. S. Gosset, and he finds that the inclusion of the American exchange with the "difference" adds but little to the accuracy of the forecast of the future floating rate, but that the French exchange adds to it appreciably, and he suggests that the French exchange has an "effect" on the future floating rates separate from the "effect" connected with the "difference." The following table sets out the correlations between the different series:—

EQUATION FOR CALCULATING FUTURE FLOATING RATE 41

TABLE XXII

To show correlation coefficients between

(A)	and	(B)
The rises and falls in the rate of interest on floating money from January to the average of the next five months.		The differences between the floating rate and the rate of discount on 6 months Bank Bills . . + .70
Ditto.		The U.S.A.-U.K. exchange . . + .41
Ditto.		The U.K.-French exchange . . - .51
The differences between the floating rate and the rate of discount on 6 months Bank Bills.		The U.S.A.-U.K. exchange . . + .39
Ditto.		The U.K.-French exchange . . - .30
The U.S.A.-U.K. exchange.		The U.K.-French exchange . . - .11

Now, in the absence of any outside knowledge (including the relationships set out above), the only conclusion that can be drawn from the data of the years examined is that the rise in the floating rate from a January to the "next five months" will be the average rise of the years examined, namely .33 per cent., and the "probable error" of this prediction will be .58 per cent., i.e. over a number of cases half will fall nearer to the average (i.e. .33 per cent.) than .58 per cent. and half will be farther away. If, however, we make use of the "difference" relationship, the probable error of the prediction falls to .41 per cent. If the American exchange relationship be included it falls to .40 per cent., if the French exchange relationship be included to .36 per cent., and if both exchanges are included, to the same figure. The inclusion of the American exchange does not, therefore, appreciably improve the prediction, but the inclusion of the French exchange gives some improvement. On this account it is suggested that the effect of the French exchange on the future floating rate is independent of that of the "difference."

The equation for calculating the probable rise or fall in the floating rate for January to the average of the next five months is:—

$$R = 1.055 D - .0433 F,$$

where D is the "difference," above or below the average.

F is the French exchange above or below the average, expressed in centimes.

R is the rise in the floating rate, expressed in percentage.

If, therefore, in a certain January the "differences" were .4 per cent. above the average for all Januarys, and the French exchange were 5 centimes below the average for all Januarys, then the most probable rise in the floating

rate to the average of the next five months for the particular January taken would be :—

$$1.055 \times .4 + .0433 \times 5 \text{ above the average rise for Januarys, or}$$

$$.422 + .2165$$

or .64 per cent. above the average rise.

Equations could, of course, be worked out for the other months of the year and for the 3 months rates of discount ; enough has been done, however, to give an indication of the way in which the " multiple-correlation " method may be put to practical use. The actual equation given cannot be directly applied, of course, to post-war rates, and may be altogether inapplicable, as far as the rate of exchange is concerned. With currency stabilization and a return to normal conditions of supply and demand it is likely, however, that a similar equation could be calculated.

CHAPTER VI¹

ON VARIATIONS IN THE PRICES OF COMMODITIES

VARIATIONS in the prices of commodities affect every one, but, in ordinary times, they are usually small enough and they arrive sufficiently slowly to be left to the consideration of "economists." The variations during and since the war have been so great, however, that the subject has forced itself into general prominence.

Variation in prices is by no means a new phenomenon, for the rise in prices of some commodities during and after the Napoleonic Wars, the Civil War in America, and the Franco-Prussian War, were also sufficiently large to draw to themselves general attention. In modern times the more striking variations have been connected with wars, and, though it was fairly obvious before, it seems to be now generally accepted that such rises in prices are due to the increase in the amount of "money" available for spending, relative to the supply of commodities to be bought.

It must not be supposed, however, that variations in the price-level cannot take place during peace, for a great rise took place, in fact, in the middle of the nineteenth century, at the time of the gold discoveries in California and Australia, while a considerable fall took place during the last two decades of the same century, probably because, on the one hand, the supply of gold failed to meet the normal requirements (largely because Germany took to using gold as a basis for its currency), while, on the other, the supply of commodities increased faster than before, on account of improvements in manufacture and in the means of communication.

The price of things in general is usually said to depend on "supply and demand," but this "law" is subject to the proviso that the "demand" must be an actual demand, backed by money; the demand of Russia for locomotives at the present time, for instance, is only a potential, not an actual, demand, and, in the absence of any arrangement for the payment of their purchase price, is not likely to affect the price.

It might have been expected that the proper price for any particular commodity could have been fixed from a consideration of the supply of and the demand for it, but in addition to the difficulties of measuring these factors

¹ Republished from the *Bankers' Magazine* for September, 1921.

there is the difficulty, which is quite external to the particular commodity concerned of the variations in the general price-level, which certainly depend on the varying amounts of money spent and goods bought. This is, of course, an obvious conclusion, about which there can be no dispute. It is equally obvious, too, that if only a certain amount of money is available for spending, and if the quantity of goods for sale remains constant, the price level of the goods cannot be as high as it might be if the amount of money were doubled.

What is known as "The Quantity Theory of Money" proceeds a step further and suggests that rises in the price-level are due to increases in the amount of money available for spending, while detractors of the theory suggest that prices rise first and that then the amount of the money to be spent has to be increased. It would seem that the theory is correct, but it is very difficult to prove it, in practice, at any particular time. In the first place, the available statistics are inadequate; in the second place, it is very difficult to give an exact definition of the term "money," which may consist in normal times of a golden sovereign, of a bank-note, or of a credit given by a banker, and this last may depend not on an actual rise in prices, but on a rise that is expected to take place. In this way a prospective rise in prices may be the cause of an increase in the currency, and, in so far as this is true, the Quantity Theory may be a somewhat incorrect expression of the truth.

In dealing with individual commodities, a further difficulty arises which is not connected with the supply and demand relationship for the particular commodity concerned, namely, that if a greater proportion than before of the available money is spent on some commodities, there will be less available for spending on the remainder. The prices of some commodities may, therefore, rise, while others are falling for reasons quite unconnected with the supply and demand relationship, for one set of commodities alone. Although, therefore, it is very difficult theoretically, and in practice impossible, to calculate what the prices of commodities should be, it is comparatively easy to obtain and tabulate actual prices, to see, in fact, what the result of the division of "money" by "goods" has been, and it is proposed to set out and consider the prices of various commodities for the years 1850-1910, which were all years when prices in the United Kingdom were uncontrolled by the Government. The data examined consist of the "index-numbers" provided by Augustus Sauerbeck, which have been published in the *Journals of the Royal Statistical Society* for 1886 and subsequent years. These data consist of the average annual prices of 43 commodities for the whole period, of a 44th (nitrate of soda) from 1866, and of a 45th (petroleum) from 1873.

The average price for the years 1867-77 for each commodity separately is taken as the unit 100, and the prices of each individual year are taken as a percentage of this figure. The 45 percentages for each year are then added together to obtain the total index number for the year.

It is obvious that in order to provide a perfect index number the price of each article bought and sold ought to be included, but, owing to their number, this is impossible of performance, and we have to be content with a selection. The 45 articles selected have been chosen as being representative of things sold, and in order to give more weight to some articles which are of more importance than the others two separate quotations have been assigned to such commodities as wheat, beef, mutton, coal, and cotton, so that they have more weight in the total than, for example, butter. The 45 items are made up as follows:—

Vegetable food	8 numbers
Animal food	7 "
Sugar, tea and coffee	4 "
Minerals	7 "
Textiles	8 "
Sundry materials	11 "
—	
Total	45

The index numbers for the 61 years, from 1850, are set out in the following table:—

1850 = 77	1870 = 96	1890 = 72
1851 = 75	1871 = 100	1891 = 72
1852 = 78	1872 = 109	1892 = 68
1853 = 95	1873 = 111	1893 = 68
1854 = 102	1874 = 102	1894 = 63
1855 = 101	1875 = 96	1895 = 62
1856 = 101	1876 = 95	1896 = 61
1857 = 105	1877 = 94	1897 = 62
1858 = 91	1878 = 87	1898 = 64
1859 = 94	1879 = 83	1899 = 68
1860 = 99	1880 = 88	1900 = 75
1861 = 98	1881 = 85	1901 = 70
1862 = 101	1882 = 84	1902 = 69
1863 = 103	1883 = 82	1903 = 69
1864 = 105	1884 = 76	1904 = 70
1865 = 101	1885 = 72	1905 = 72
1866 = 102	1886 = 69	1906 = 77
1867 = 100	1887 = 68	1907 = 80
1868 = 99	1888 = 70	1908 = 73
1869 = 98	1889 = 72	1909 = 74
		1910 = 78

The diagram on the opposite page sets out the above in the form of a curve.

The highest figure reached is seen to be 111, in 1873, while the lowest is 61, in 1896—about half the maximum.

The average of the whole series is 84, the first half giving 96, and the second 72.

The average differences between the index number of two consecutive years is 4.0 in the first half and 2.6 in the second. A greater difference would, of course, be expected in the first half than in the second, because the price level is higher, but, allowing for this by dividing the differences by the price levels, we find that the difference becomes 4.2 per cent. for the first half and 3.6 per cent. for the second, showing that the variation in the price level from year to year has been, roughly, the same in both periods.

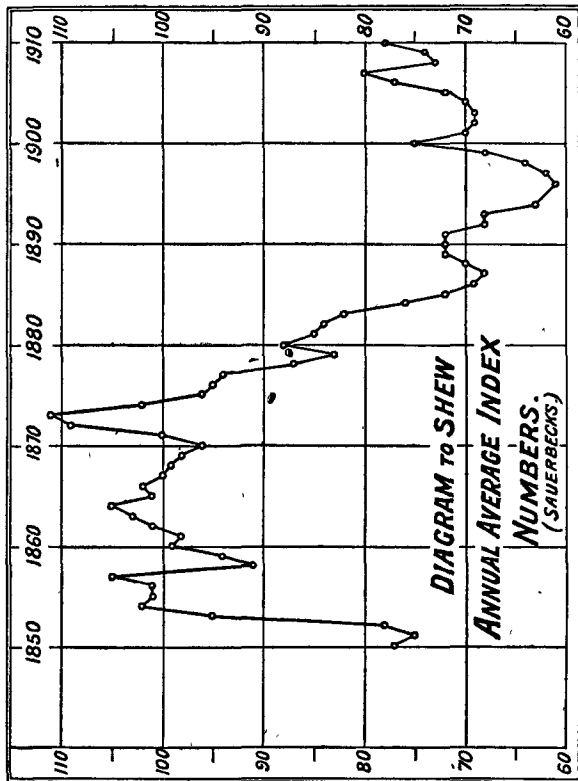
In so far as the index number is a good guide, this may be taken as the size of the variation in the price level, over the sixty years, that has been due to the variation in the proportion of money spent to goods sold, and it will be interesting to continue the same examination for the price level of the different groups of commodities, and for the individual commodities which go to make up the index number.

To take Sauerbeck's own grouping, according to the use to which the commodities are put, the following table sets out, for the two halves of the period taken, the average index number of the six groups of commodities.

Table to show average index number—

For the following groups.	1850-79.	1880-1909.
Vegetable food	95.9	66.7
Animal food	91.2	86.4
Sugar, tea and coffee	96.7	60.9
Minerals	95.8	78.6
Textiles	96.4	64.6
Sundry materials	99.7	71.5
Total index number for comparison . . .	96	72

The individual figures are, of course, closer to the average total figure in the first half than in the second, because this period contains the base years 1867-77, when each individual was brought to 100. It is seen that in the first half "animal food" is considerably lower than the other groups, showing that either a smaller proportion of the available money was spent on this kind of food, or that the supply of it was greater, relative to the demand, than



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it afterwards became. This is, in fact, the chief feature of the earlier period.

In the second period, the "sugar" group and "textiles" are well below the average, while "animal food" is well above it. In other words, the demand for "sugar, tea and coffee" relative to the supply has fallen off, while that for "animal food" has increased. What has happened? Has the supply altered, or the demand? It would not appear that the demand for sugar, tea and coffee has diminished (and, of course, in fact, it has increased enormously), and, if this be the case, then the supply must have increased very considerably, and this is what has happened.

With animal food there is no reason to suppose that the demand is less than it was; rather it would be expected to be greater, and the increase in the price level, relative to other commodities, is probably due to the relative fall in production of animal foodstuffs, and also to the fact that, as some other prices have fallen to a considerably greater extent, more money has been available for meat and has been spent on it. This may be taken as a result of the rise in the standard of living in the United Kingdom.

The textile group is in the same position as the sugar group, a greater supply and not a smaller demand probably accounts for the relatively reduced price.

Now we come to the year-to-year variations for the groups, and these, expressed as a percentage on the average index number, are set out in the following table for the two periods.

Table to show average year-to-year variations, expressed as a percentage on the average index number:—

For	1850-80.	1881-1910.
Vegetable food	8.4	5.0
Animal food	4.3	3.6
Sugar, tea and coffee	6.0	6.7
Minerals	7.6	7.1
Textiles	8.3	6.3
Sundry materials	4.4	3.3

It is seen that most of the groups have a greater variation than the total index number, as would be expected, for they are affected by variations in their own peculiar supply and demand relationship, in addition to those in the proportion of total money spent to total goods sold. It is interesting to note, however, that two of the groups (animal food and sundry materials) show a variation no greater than that of the total index number, seeming to show that either there have been no variations in the prices of these commodities, except those due to the variations in the general relation between money and

goods, or that there has been some compensatory influence, which has caused their variations to be in opposition to the general movement of prices.

In order to measure how close has been the connexion between the movements in the individual groups, the index numbers for the sixty years for each group have been correlated together and the results are set out in the following table.

Table to show correlation coefficients obtained between:—

	Animal Group.	Sugar, Tea and Coffee.	Mineral Group.	Textile Group.	Sundry Group.
Vegetable Group	+ .47	+ .78	+ .60	+ .60	+ .87
Animal Group	—	+ .40	+ .36	+ .37	+ .56
Sugar, etc.	—	—	+ .44	+ .69	+ .79
Minerals	—	—	—	+ .51	+ .67
Textiles	—	—	—	—	+ .74

It is seen that the size of the coefficients is very various; they are all positive, showing that there is a tendency for the prices of all groups to move together. The average of all the coefficients is + .59, and this may be taken as the value of the common factor that affects the prices of all groups about the mean of each.

We now come to individual commodities; the price level of these, together with their "year-to-year" variation, is set out in the table on page 50.

The table shows, in a striking way, what a great difference has occurred in the falls in the price level with different commodities, and also what a very large difference has occurred in the year-to-year variation.

To take the changes in price level first, the average fall in the total index number has been shown to be 24 points, from 96 to 72, between the first thirty years and the second. Now, certain commodities have fallen much more than this, cotton having fallen about 50 points, English wool 43, sugar about 40, silk 38, tallow 31, tea 49, and soda 38, while certain others have not only not fallen but have risen in price, namely, tin by two points and coal for export by three points.

These peculiarities have, of course, been caused by a change in the demand, relative to the supply. Which factor, the reduced demand or the increased supply, has been the more potent? For all the items that have been noted above as having fallen more than the average, it is almost certainly the increase in the supply that has been the effective factor, except, perhaps, in the case of silk, for which the demand may have fallen off more than sufficiently to counteract the cheaper cost of production.

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With the two items that have shown an increase in value, the chief factor has probably been that the supply has failed to meet the increased demand.

Table to show in descending order of average percentage variation :—

For	Average Index Numbers for		Average year to year variation.		Variation, expressed as a percentage on the Index Number	
	1850-79.	1880-1909.	1850-80.	1881-1910.	1850-80.	1881-1910.
Potatoes	92.3	66.3	16.9	10.3	18.3	15.5
Cotton A	109.7	57.1	22.0	7.0	20.2	12.3
Cotton B	107.9	59.4	21.4	6.6	19.8	11.1
Wool A	93.4	50.7	12.6	5.5	13.5	10.8
Jute	98.9	74.2	10.5	8.8	10.6	11.9
Sugar A	100.0	51.7	9.9	6.3	9.9	12.2
Tin	100.7	102.7	10.4	11.3	10.3	11.0
Iron Bars	92.0	71.5	11.3	6.3	12.3	8.8
Wheat A	95.6	57.4	11.5	5.2	12.0	9.1
Maize	99.6	68.9	10.4	7.0	10.4	10.2
Pig Iron	88.4	72.3	11.9	5.1	13.4	7.1
Copper	113.6	77.0	7.9	10.3	7.6	13.4
Wheat B	95.8	62.4	11.2	5.1	11.7	8.2
Sugar B	99.9	51.1	8.6	5.6	8.6	11.0
Flour	100.0	63.9	11.4	4.9	11.4	7.7
Hemp	92.2	77.4	9.0	6.8	9.8	8.8
Coal A	82.7	85.6	7.9	7.3	9.6	8.5
Linseed Oil	102.1	71.7	7.3	7.3	7.2	10.2
Coffee	87.2	85.6	6.9	8.5	7.9	9.9
Silk	92.7	54.8	8.8	4.5	9.5	8.2
Indigo	88.8	59.1	10.2	3.7	11.5	6.3
Flax	99.8	65.5	8.2	5.6	8.2	8.6
Lead	101.2	64.3	5.9	6.8	5.8	10.6
Coal B	88.3	79.4	8.0	5.7	9.1	7.2
Rice	99.9	70.6	9.1	5.0	9.1	7.1
Tallow	104.7	73.9	7.4	6.6	7.1	8.9
Wool B	100.1	75.0	7.3	6.0	7.3	8.0
Olive Oil	102.9	74.5	8.7	5.1	8.5	6.9
Pork	95.9	86.7	6.7	7.0	7.0	8.1
Hides	94.3	86.2	8.5	5.1	9.0	5.9
Palm Oil	99.8	70.9	7.4	6.7	7.4	9.5
Tea	99.3	50.0	8.0	3.1	8.1	6.2
Oats	92.3	70.6	6.9	4.5	7.5	6.4
Soda Nitrate	107.4	69.7	8.2	4.0	7.6	5.7
Mutton B	91.1	86.0	5.1	5.8	5.5	6.8
Barley	91.7	67.2	8.0	3.7	8.7	5.5
Bacon	91.8	86.1	6.1	4.8	6.6	5.6
Timber	107.4	78.8	7.8	3.6	7.3	4.6
Mutton A	91.5	92.4	5.2	5.3	5.7	5.6
Beef B	88.5	83.1	4.9	4.1	5.5	4.9
Leather	92.1	88.1	6.3	1.8	6.8	2.0
Butter	91.1	83.9	4.9	2.8	5.4	3.3
Beef A	88.0	84.5	3.9	3.6	4.4	4.3

Cotton A = "Fair Dhollerah"; Cotton B = "Middling American"; Wool A = "English Lincoln"; Wool B = "Merino"; Sugar A = average of "British West Indian" and "Best German"; Sugar B = "Java Floating Cargoes"; Wheat A = "English Gazette"; Wheat B = "American"; Coal A = "Average Export"; Coal B = "Best Wallsend, Hetton in London"; Mutton A = "Prime"; Mutton B = "Middling"; Beef A = "Prime"; Beef B = "Middling."

Coming now to the differences in the variation in price of the different commodities from year to year, this is surprisingly great, many of them having a variation of as much as 10 per cent. of their price.

At the one end of the scale we find the following items which vary from year to year, over both periods, more than 10 per cent. : Potatoes, cotton, English wool, jute, West Indian and German sugar, tin, iron bars, English wheat, maize, pig iron, and copper.

At the other end of the scale we have the following varying less than 7 per cent. : Oats, soda, mutton, barley, bacon, timber, beef, leather, and butter.

As has already been pointed out, in dealing with the variations in the group index number, part of this variation is due to the varying relation between the money spent and the volume of goods in general sold. This accounts for 4.2 per cent. in the first half period and 3.7 per cent. in the second. From this point of view, one of the most striking things is that certain commodities, namely, beef, butter, and leather, show no more variation than that due to this general cause alone, and, in fact, for the second period the variations in the price level of leather show a smaller variation than the general one. This can only be accounted for by the price of this commodity being somewhat conventionally fixed, as is, for instance, a tram fare.

Generally speaking, the prices of animal products vary little, and those of vegetable and mineral origin much. Comparing animal and vegetable products, this is probably because the vegetable crops are much more variable than the animal, and there seems to be no more reason why the demand should vary more with one than the other. With mineral products it is probably the variations in the demand which cause the chief year to year variations in the price level.

A comparison of the price level of potatoes, the product that shows most variation, with that of coal and iron bars, is interesting. On thirty occasions during the sixty years a rise or fall in the price has been followed in the next year by a fall or rise, showing that the high or low price has tended to produce an increase or a decrease in the production, which has reversed the price movement of the previous year.

The cases of iron bars and coal are very different ; in these cases a rise or fall has been followed in the succeeding year by a fall or rise, in only seventeen and fourteen occasions, respectively, showing that the variations in the price level have been much more continuous, i.e. have a greater "wave length," than those in the price of potatoes. This is due, of course, to the price of coal and iron bars being much more dependent on the rises in demand which are connected with the "trade cycle," and usually continue for several consecutive years, and with the subsequent falls that usually take place.

These peculiarities, are, perhaps, of little practical interest at present, but from a banking point of view a consideration of them might give an indication of the commodities upon which it was most safe to lend, either when they were actually in hand or when they were in a state of production.

To a central bureau of information, however, did such exist, the peculiarities should be of the greatest interest, for they would assist in forming an opinion as to whether one commodity or another was remaining too high in price, as compared with the general price level, and whether, therefore, it was desirable to embark fresh capital on its production, rather than on that of some other commodity which had got ahead of general prices. Such a point of view may be one for the far distant future, but the subject of the price level is of such vital importance to all business men and the amount of application of our knowledge has been so small that an active grappling with the subject may be anticipated and the "far distant future" may be, therefore, accelerated so that it is brought into the offing of time at an earlier date.

CHAPTER VII

CHANGES IN THE PRICE LEVEL OF INDIVIDUAL COMMODITIES¹

CHANGES in the general price level have been of almost daily interest during the last few years, on account of their size and of the rapidity with which they have sometimes come about. Since, however, the general price level is composed of the sum of the price levels of a number of individual commodities, there have, of course, been changes in these also, and it is to be noted that these have usually been greater than those of the general price level. These changes are of importance second only to those of the general price level, and it was thought that an examination of them would be of interest.

The method adopted has been to calculate each individual index number as a percentage of the total index number of the year, or group of years, taken. We are thus enabled to see at a glance whether an individual article has moved up or down when compared with the general price level. Sauerbeck's series of index numbers has been used, and it may be remembered that it deals with forty-five commodities, the average price of each of which, for the years 1868-77, is taken as 100.

The commodities taken may be divided into the six following groups :—

- (1) Vegetable foodstuffs.
- (2) Animal foodstuffs.
- (3) Sugar, tea and coffee.
- (4) Minerals.
- (5) Textiles.
- (6) Miscellaneous materials.

The years examined are :—

- (1) The five years 1892-6, these being the five years ending with the lowest price level of the last fifty years.
- (2) The five years 1909-13, the last five years before the war.
- (3) 1920, the year of the highest price level since the war.
- (4) 1922, the most recent complete year.

Beginning with the above six groups, the following table sets out the average

¹ First published in the *Bankers' Magazine*, for January, 1924.

price level of each expressed as a percentage of the total index number of the year.

	1892-6.	1909-13.	1920.	1922.
General Index No.	64.4	80.4	251.0	131.0
	Per cent.	Per cent.	Per cent.	Per cent.
Vegetable food	89.0	87.6	90.5	81.6
Animal food	124.1	116.9	104.8	140.5
Sugar, coffee, tea	102.5	69.8	79.0	62.6
Minerals	101.7	121.8	117.7	108.2
Textiles	85.4	92.6	104.3	102.2
Sundries	101.5	100.3	97.2	94.6

By far the most striking point about the table is the fall in the relative position of vegetable foodstuffs and the rise in that of animal foodstuffs. The greatest part of both these changes took place in or before the period 1892-6. The former was due to the increased supply caused by the opening up of new vegetable food-growing countries, together with the development of sea transport. The latter has also been largely due indirectly to the same cause, for with vegetable food cheaper there was more money available for the purchase of animal food, and, since the supply failed to keep pace with this additional demand, prices increased. This change in the relative price level of vegetable and animal produce accounts largely for the transfer of land in the United Kingdom from tillage to pasture.

The fall in the price level of the "Sugar, coffee, tea" group has been very great, again leaving more money to be spent on other commodities.

The changes in relative position have been surprisingly small in the remaining groups. Minerals have been as high as 121.8 per cent., but in 1920 the group stood at only 108.2 per cent. In the Textile group the percentage sank to 85 per cent. in 1892-6, but it has since been very near the general level.

Coming now to the prices of individual commodities, the following tables set out the percentage of each on the general index number for the same years as before, namely, the average of 1892-6, the average of 1909-13, 1920 and 1922. Attention is drawn to some of the interesting points in the notes to the tables.

Wheat and flour have ebbed and flowed; there was a great fall to 1892-6, a small rise to 1909-13, a fall to 1920 and a rise to 1922. On the whole period there has been a fall, from 1868-77, of about 25 per cent.

Barley has not fallen as much as wheat, but there has been a heavier fall

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VEGETABLE FOODSTUFFS

	1892-6.	1909-13.	1920.	1922
	Per cent.	Per cent	Per cent.	Per cent.
Wheat, English	73.0	76.0	59.0	67.2
Wheat, American	77.3	83.4	65.7	72.5
Flour	83.0	85.0	57.0	76.4
Barley	96.5	86.3	92.3	78.7
Oats	101.5	91.5	88.0	85.5
Maize	91.5	98.4	111.3	73.2
Potatoes	90.3	82.7	82.4	84.7
Rice	97.5	101.7	167.0	113.0

since 1892-6 and from 1920 to 1922. These have been connected with the reduction in the quantity and strength of the beer consumed.

Oats have fallen less than other home grown cereals. Maize has fallen, but the price was very high in 1920. Potatoes have fallen by about 20 per cent. over the whole period; this is probably due to the supply having exceeded the demand, on account of better methods of production. Rice, alone among vegetable foods, has improved its position; this is probably due chiefly to the increased demands of the rice-consuming countries of the East.

ANIMAL FOODSTUFFS

	1892-6.	1909-13.	1920.	1922.
	Per cent.	Per cent.	Per cent.	Per cent.
Beef, prime	123.5	113.0	84.5	114.6
Beef, middling	114.8	117.5	99.5	125.2
Mutton, prime	134.0	113.0	91.5	152.0
Mutton, middling	117.8	116.8	104.7	169.0
Pork	127.8	121.0	129.0	148.0
Bacon	125.8	118.7	129.0	149.7
Butter	124.5	118.7	95.7	123.8

There is a consistency about this table, only broken by the fact that in 1920 the prices of prime beef and mutton failed to maintain their relative price position.

Mutton has improved its position more than beef; pork and bacon have done best, taking the whole period.

Generally speaking, the position of all animal food producers ought to have been a happy one during the period under discussion; the price of

their produce has gone up, the cost of their production ought to have gone down.

SUGAR, COFFEE, TEA

	1892-6.	1909-13.	1920.	1922.
	Per cent.	Per cent.	Per cent.	Per cent.
Sugar, West Indian and German beet	79.5	59.0	104.7	47.4
Sugar, Java	78.0	55.8	104.3	41.2
Coffee	176.0	105.0	68.5	97.7
Tea	76.0	59.2	37.2	62.6

Sugar has descended; the demand has increased, but this increase has been more than met by the increased supply, chiefly from the Continent. It is to be noted, however, that the price level rose in 1920, owing, of course, to the temporary cessation of Continental supplies. Coffee appreciated in value up to 1892-6, during which period it had the highest position of all commodities. Generally speaking, it has since remained at the average level of commodities, except in 1920, when the demand from the Continent must have been smaller than usual.

Tea has descended to very low levels, and in 1920 was the lowest of all commodities; an appreciable rise has taken place to 1922. The general fall has been due to the production outrunning the market, while the special fall in 1920 was due to the cutting off of the Russian market.

MINERALS

	1892-6.	1909-13.	1920.	1922.
	Per cent.	Per cent.	Per cent.	Per cent.
Pig iron	98.0	107.4	131.3	113.0
Iron bars	95.0	104.0	136.5	103.8
Copper	90.7	104.0	51.7	64.1
Tin	109.3	211.5	114.7	117.8
Lead	79.3	95.3	77.7	94.0
Coal, home consumption .	119.4	108.2	57.7	119.0
Coal, export	123.8	122.0	254.0	147.5

Iron has gone up slightly in price level during the whole period, while it was higher than usual in 1920.

The behaviour of the price level of coal, which may be taken next, has

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been extraordinary; up to the war it had gone up by about 20 per cent., export coal having been always somewhat higher than that sold on the home market. In 1920, however, whereas home-consumed coal was at a price level only 57·7 of the general price level, export coal was at 254 per cent. This difference was due, of course, to Government restriction, and it brings out clearly (1) the great advantage obtained by home users of coal and (2) the high price charged to the "foreigner."

In 1922 the price level of export coal was still high, at 147·5 per cent., while coal for home consumption had risen to 119 per cent. This is the same relative position as in the period 1892-6, so that home consumers of coal are in the same position as during this period. Since, as noted above, the price of iron is relatively higher, the iron industry ought to be better off.

The movements in copper and tin price levels have been interesting. The former fell by about 10 per cent. for 1892-6, but rose to the general commodity level by 1909-13. In 1920 the level had fallen to 51·7 per cent., or to less than half its pre-war level; in 1922 the level rose to 64·1 per cent. This great reduction in the price level of copper was due, of course, to the disposal of stocks accumulated for war purposes.

The price of tin has pursued a somewhat similar course, in that there was a rise in its position from 1892-6 to 1909-13, but in this case the price level rose to such an extent that it was the highest relative to the base years of all commodities, namely, 211·5 per cent. It fell to about half this value in 1920, at about which position it has remained. The recent fall in the prices of both copper and tin have been due to failure of the demand, caused by the bad state of trade. The price level of lead has followed that of the other metals noted, but on a lower level. Production has in this case rather more than met the demand.

TEXTILES

	1892-6.	1909-13.	1920.	1922.
	Per cent.	Per cent.	Per cent.	Per cent.
Cotton, middling American	71·5	96·1	102·5	102·2
Cotton, Dhollerah . . .	69·7	102·7	81·0	90·0
Flax	95·0	96·7	197·0	145·8
Hemp	93·7	92·6	107·5	88·6
Jute	104·0	125·2	94·0	123·8
Wool, merino	91·5	108·0	143·5	137·6
Wool, English	82·7	65·8	44·2	37·4
Silk	74·5	56·7	67·0	103·1

For some unknown reason the price level of all textile materials fell from the base period to 1892-6, except that of jute. On the other hand, it rose from 1892-6 to 1909-13, English wool and silk being striking exceptions. Since then the striking features are that flax was very high in 1920 (largely owing to the cutting off of Russian supplies) and was still the highest textile in 1922. Jute and merino wool have appreciated and silk has recovered its position (which is surprising, in view of the present large production of silk substitutes). The price of English wool, on the other hand, has gone from bad to worse; in 1922 the price level was only at 37.4 per cent. of the general level. This fall in price is perhaps the most curious feature of the whole price list.

MISCELLANEOUS MATERIALS

	1892-6.	1909-13.	1920.	1922.
	Per cent.	Per cent.	Per cent.	Per cent.
Hides	109.7	138.8	102.5	87.0
Leather	126.8	124.8	131.5	133.0
Tallow	125.8	92.0	66.5	58.8
Palm oil	96.5	101.4	71.3	68.0
Olive oil	107.5	121.8	159.3	115.2
Linseed oil	98.8	126.3	108.3	97.0
Petroleum	60.6	68.6	81.0	93.4
Soda	83.2	75.6	65.4	102.2
Nitrate of soda	96.5	93.4	70.5	77.9
Indigo	101.0	51.0	79.6	97.7
Timber	111.1	104.5	133.6	109.1

Hides and leather, two animal products, have done well. At the present time hides are relatively low, so that the leather trade ought to be doing well.

Tallow, another animal product, started well, but it has fallen from its high estate in the 1922 figure.

Oils have appreciated on the whole, under the lead of olive oil. *Palm oil has been below the general oil level since the War, owing, no doubt, to the badness of trade.

Petroleum fell to 60.6 per cent. in 1892-6, since which time the price level has been rising.

Soda and nitrate have been below the average level for the whole period.

Indigo had a heavy fall, due to the manufacture of artificial dye stuffs, but it has appreciated in value since the period immediately before the War.

Timber has improved its position, relatively to commodities in general, over the whole period, by about 15 per cent.

The above notes draw attention to the more important points that arise from the tables. They are not intended to be in any way an exhaustive examination, and they have only been inserted to illustrate the method by which the relative position of different commodities may be compared at a glance. To take an example, the case of copper may be mentioned. This metal was at an average price, over the five years immediately before the War, of almost exactly £63 per ton. In 1922, the average price was the same figure. From this it might have appeared that the position of copper producers in 1922 was satisfactory. When, however, it is stated that the general index number stood at 80.4 during the period 1909-13 and at 131 in 1922, the "constancy" in the price of copper does not strike one in the same way.

CHAPTER VIII

CHANGES IN THE PRICE LEVEL OF INDIVIDUAL COMMODITIES

(continued)

IN the previous chapter the price levels of individual commodities as compared with the general price level were set out for the years 1892-6, 1920 and 1922. In the appendices to this chapter the same comparison is set out for each of the years 1850-1924.

The appendices are two in number, one showing the result of dividing the index number of each individual commodity for each year by the general index number of the year, while the other gives the same results in the form of a curve. For economy of printing, curves have been constructed only for 36 out of Sauerbeck's 45 commodities, the "secondary" items such as "middling beef" having been omitted.

Before dealing with the individual charts it is wished to make two general notes :—

(1) The variations in the price of anything with a constant general price level are due to variations in the supply and in the demand. On consideration, it will probably be agreed that it is often easy to say to which of these, variations in price are chiefly due. Potatoes are a very good example of this statement. On reference to the appendix it will be seen that the price of potatoes goes up and down from year to year differently to any other commodity. The reason of this is, of course, that the demand, depending as it does on the number of people to be fed, does not vary much from year to year. The supply, on the other hand, varies very much with the weather, etc. ; one year it is short and the price rises. The next year the price would almost certainly be lower, even if the area under potatoes was not increased, but it is almost certain to have been increased, with a resulting fall in the price. There is thus a tendency for the price being alternately above and below the average.

The variations in the price levels of the commodities coal and iron will be seen, on reference to the appendix, to follow a very different course, a rising price one year being followed more often than not by a further rise the following year and a falling price by a further fall. The reason for this phenomenon is that, with these commodities, it is the variations in the demand

that chiefly affect the price level from year to year. The mines and iron-works will be able to produce much the same amount from one year to another under standard conditions but the demand will vary with the "state of trade," from depression to boom.

This point of view of the possibility of variations in price depending more on variations in either supply or demand may be usefully kept in mind in examining the charts.

(2) The price of a commodity at any time depends on the relation between the supply and demand and also on the amount of currency that is in existence. By taking the percentage that the index number of each commodity is on the general index number, as is done in the appendices to this chapter, the effect of variations in the amount of the currency is removed and we are able to concentrate our attention on the variations that are due to the variations in the supply-demand relationship. These are what may be called the "natural" variations, those due to what have been called the "inexorable" laws. It is interesting to see how comparatively small are the variations in the price levels when these "natural" causes are allowed to operate in an unfettered manner.

The following table sets out for the whole of the seventy-four years and for the forty commodities mentioned in Appendix III the only occasions when an individual commodity has been below 60 per cent. of the general price level or above 150 per cent., or, in other words, if 100 per cent. be taken as 1s., the only occasions when commodities have been outside the limits of 7·2 pence and 18 pence. It is to be noticed that about half the cases occur in the years 1862-66, 1873, 1900 and in or after 1914, during which war effects may be said to have been operating.

The following notes, which are not intended to be exhaustive, have been made on the curves:—

The Vegetable Group of Foods shows a gradually lowering price level during the seventy-four years considered, the fall amounting to about 20 per cent. on the original price. The increase in the production of cereals, due, of course, to the opening up of new countries, has more than kept pace with the increase in the population of the world. It is to be noted, too, that the variations in the price level have become less, as would have been expected with the bringing into use of a greater number of areas.

The Animal Group of Foods has a very different history. The price level has risen instead of falling, and to the extent of about 50 per cent. of the price at the beginning of the period. This is surprising, since both Australia and Argentina may be said to have "arrived" as meat producers since 1850. The chief part of the rise took place between 1860 and 1885, and it has certainly

OCCASIONS DURING THE PERIOD 1850-1924 WHEN INDIVIDUAL COMMODITIES
 HAVE BEEN—

(a)		(b)	
less than 60 per cent. of the general price level.	Per cent.	more than 150 per cent. of the general price level.	Per cent.
Wheat, English 1920	59	Rice 1920	167
Flour 1918-20	50 to 57	Potatoes 1878	152
Sugar 1901-03	44 to 54	Mutton 1922	152
" 1906-08	47 to 59	Pork 1921	151
" 1912-14	45 to 58	Bacon 1921	156
" 1921-22	47 to 52	Coffee 1889-96	159 to 186
Tea 1901-03	55 to 59	Coal, Export 1900-01	159 to 179
" 1905-07	52 to 59	" 1919-21	180 to 254
" 1912-13	57 to 59	" 1923	156
" 1916	50	Pig iron 1873	153
" 1919-21	36 to 51	" 1921	153
Coffee 1917	57	Copper 1852	153
Coal, Home 1920	58	" 1854-5	151 to 152
Copper 1920-21	52 to 59	" 1888	154
Cotton 1854	59	" 1906	152
" 1898	58	Tin 1887-8	157 to 158
" 1899	59	" 1899	172
Wool, English 1900-03	46 to 54	" 1900-14	160 to 235
" 1908	59	" 1918	164
" 1918-23	28 to 55	" 1923-4	152 to 172
Silk 1909-19	40 to 59	Cotton 1862-66	169 to 292
Indigo 1904-07	53 to 57	Wool, Merino 1919	153
" 1910-13	45 to 55	" 1923-24	160 to 183
Petroleum 1882	57	Flax 1917-21	152 to 197
" 1892-4	47 to 59	Hemp 1918	177
Soda 1915	49	" 1921	154
" 1917-18	47 to 56	Jute 1906	161
Tallow 1921-22	52 to 59	" 1913-14	165 to 168
		Hides 1913-14	156 to 164
		Indigo 1915	170
		Timber 1917-19	154 to 173
		Linseed oil 1917	156
		Olive oil 1918-19	160 to 206
Total number of cases =	69		74
Cases occurring in years 1862-66, 1873, 1900 and 1914 to 1924) =	33		39

been due to a rise in the standard of living in meat-purchasing countries, leading to a consumption of a greater quantity of meat per head of the population.

The variation in price is fairly regular over the whole period, with the exception of the years 1914-24.

The "*Sundry Food*" Group curve is peculiar in that it is divided into three fairly distinct parts, that before the middle of the Nineties, that after about 1902, and the years between these two periods. Between the first division and the last the price level fell by about 50 per cent. ; this fall was certainly due to an increase in the supply of foods included in this group.

The *Mineral Group* curve shows no very decided tendency, though there was a very high period about 1873 and again for about twenty years after 1898.

The curve is somewhat peculiar and the festoons it forms suggest that the variations in the price level are more due to variations in the demand than to those in the supply.

The *Textile Group* shows more regularity than the groups already discussed, though there are two outstanding periods, 1860-70 and 1914-24, both being due to wars.

The "*Sundry Materials*" curve is peculiar for its steadiness, though at both ends of the period the steadiness was less marked, with the result that from the beginning to the end there is a fall of about 40 per cent.

The following notes have been made on the curves for individual commodities :—

American Wheat.—There has been a fall of from 30-50 per cent. over the whole period, which is fortunate for consumers. The curve is peculiar for the rapidity and size of the changes, e.g. a fall of about 40 per cent. between 1855 and 1859 and a rise of about 80 per cent. between 1864 and 1867. The variations are certainly due almost entirely to variations in the supply, and their size has become less with the efflux of time.

Oats.—Prices show a comparatively small change in level over the period ; the short distance variation is considerable.

• **Barley.**—The price level shows a fall of about 15 per cent. from about 1900, due, doubtless, to the reduction in the consumption of beer and whiskey that began at this date, and later, to the reduction in the strength of beer. The curve shows considerable irregularities.

Maize.—This curve shows no decided tendency ; the irregularities are, however, very great.

Rice.—Rice is peculiar among cereals in showing a rise in price, which amounts to about 20 per cent. It has taken place entirely during the present century. This rise may be the fundamental cause of the unrest in China. Supply has failed to keep pace with the demand. The curve shows great irregularities.

Potatoes.—The price level shows no particular tendency, but it shows a larger year to year variation than any other ; this is certainly due to variations in the supply.

Beef, Mutton, Bacon, Butter.—These curves have a great deal in common, e.g. all show a rise of about 50 per cent. from 1860 to 1880 and the level is then roughly constant till about 1900. With all except bacon there is then a fall to 1920 and a sharp rise and fall afterwards.

Mutton shows the greatest increase.

It would seem that up to about 1900 the demand, owing to the higher standard of living, had outrun the supply, but that about 1900 the supply began to catch up.

Tea, Sugar, give similar curves, the price of both commodities having about halved in the seventy-four years considered. In both cases this is, of course, due to the increase in the supply, on the one hand of Ceylon tea and on the other of beet sugar.

Coffee.—The variations in the price level of coffee are very great, e.g., the price more than doubled between 1882 and 1887, while it halved between 1895 and 1903 (incidentally arriving back at almost the point it started from in 1882) ; between 1912 and 1917 the price halved.

There seems to be no doubt that these variations are almost entirely due to variations in the supply and probably to its artificial regulation.

Coal.—The curves for home and export coal show the same general tendencies until 1914, after which date the price of coal for home use fell to a low level, while that exported rose to very great heights. The rise in price of export coal has been somewhat more marked all through the period.

The short period variations point to a connexion with the "trade cycle," and to their being caused by variations in the demand.

Compared with earlier years there should have been great prosperity in the coal trade during the period 1885-1914, while even after 1920 the price level of export coal has not fallen to anything like the level of the period 1850-80.

Pig Iron.—The curve is peculiar ; generally speaking there is a slight tendency for the price level to rise. The striking feature, however, is that for the greater part of the period the curve is regular and perhaps uninteresting, but on five occasions, for a very short time, the price has dashed up or down, showing that the supply-demand relationship was out of joint. These occasions were in 1854, 1873, 1899 and 1921, when the price rose for one or two years to a great height ; and in 1918, when it sank to a low level.

The variations are almost certainly due to variations in the demand.

From the point of view of the cost of "other" things in general and of

coal in particular, the pig iron industry ought to be in as flourishing a condition at present as during the greater part of the last seventy-four years.

Lead.—The price level has fallen by about 30 per cent. during the whole period, though the highest point actually occurs in the year 1924. Judging from the curve, one would expect a fall in the price.

Copper.—The price level fell by about 30 per cent. from 1850 to 1870, and then remained approximately constant till just before the War, after the beginning of which it fell again, this time by about 40 per cent. During the whole period, however, there were violent ups and downs. The long distance movements are probably due to the supply more than keeping pace with the demand, increasing though the latter has been. The movements of shorter wave-length are, however, due to variations in the demand, and it will be seen on reference to the curve that the rises are more short-lived than those of any other curve. The fact appears to be that generally speaking the supply of copper has more than kept pace with the demand during the seventy-four years considered, but that a sudden rise in the demand may find the market short of supplies.

Tin.—The price level shows great variation. Up to about 1895 there was not much change of level, but after this date there was a very great rise, which was followed towards the end of the War by a striking fall.

The supply of tin varies very little from year to year and the variations in price are certainly caused chiefly by those in the demand.

Cotton.—Great variation is shown; it is difficult to say what is the general trend, because the curve is so coloured by the high price during the American Civil War. There seems, however, to be a tendency for the price level to rise during recent years.

It seems unlikely that the demand for cotton clothes varies to anything like the same extent as the price of cotton; and the variations in the price level are therefore probably due chiefly to variations in the supply.

Flax is a fairly even curve till the War, when the cutting off of the supplies of Russian flax raised the price level. The smaller variations in price are also probably due to variations in the supply.

Silk fell by about 40 per cent. from 1850 to 1914; there was then a rise followed by a fall. These features are probably chiefly caused by variations in the demand, caused again by changes of fashion.

Wool, Merino; Wool, Crossbred.—These two curves are surprisingly different when it is remembered that the chief use of wool is to make clothes for comfort, and not for appearance. Since 1876-77 merino wool has shown an increase of 20-40 per cent., while crossbred wool shows a reduction of even a greater amount. No explanation can be given of this phenomenon; it

can only be suggested that since 1867-77 the increased standard of living has led to more people wearing clothes of better appearance.

Hemp, Jute.—Both of these commodities show increases in price level of about 20 per cent. over the whole period; both curves have curious points about them. Hemp seems to vary somewhat in the same way as potatoes, but with waves of longer length.

The price of jute between 1903 and 1913 is peculiar.

Hides, Leather.—Both show increases over the whole period of about 50 per cent. The curves are somewhat similar, the chief difference being that after the War there was a great fall in the price level of hides, with no corresponding fall in the price of leather. The leather industry should therefore be doing well at the present time. Variations in the demand are probably the chief factor in the changes in price.

Timber is a festoon of a curve, a high price level occurring almost at the beginning of the period and again almost at the end. Except on these two occasions the price level is very regular, showing that the supply is "there," waiting, at a price, for the demand.

Indigo.—A peculiar curve; the price level had fallen in 1913 to about a third of what it was in 1871; this was due, of course, to the manufacture of dyes from coal tar. The price level of 1913 rose by 300 per cent. by 1915 owing to the cutting off of the supply of German dyes and to the increased demand for the manufacture of explosives. By 1918, however, the price level had come down almost to its position of 1913.

Soda.—The price level has fallen owing to the increase in the supply. It looks as if the price should come down still further from the height of 1922.

Nitrate has fallen in price level by about 50 per cent. during the period. A rise from 1924 would seem to be deducible from the curve, if indeed, the low price level is not due to the increase in the supply caused by the manufacture of synthetic ammonia.

Tallow, Palm Oil have both fallen in price level by about 50 per cent. over the whole period. The levels of post-war years look unduly low.

Linseed Oil shows a general tendency to rise till the War. The short-distance variations of pre- and post-1900 are quite different in nature.

At the present time a rise seems indicated.

Olive Oil.—There is no particular general tendency; there was a phenomenal rise in 1916, the price level more than doubling by 1918. Since 1921 the price level has been very stable and at the pre-war level.

CHAPTER IX

THE BANKING PROBLEM FROM THE POINT OF VIEW OF A LAYMAN ¹

BEING THE APPLICATION OF THE STATISTICAL METHOD TO THE BANKING PROBLEM

THE size of the reserve of currency required by a banking system must always be a debatable point, for it varies with a multitude of causes, many of which are very nebulous, and no permanent and definite law can ever be laid down. The question has often been raised in England, but attention has been drawn away from it of late by the difficulties of American banking. It was considered sufficiently acute, however, for the London Chamber of Commerce to appoint a committee to investigate the subject, and this committee reported on July 26, 1909, that it recognized the desirability of strengthening the gold reserves of the country. There were several dissentients to the report, and the *Economist* criticized it "by challenging the first resolution" (i.e., the one quoted) and adding "surely the perfection of banking consists in the economy of gold." There is clearly, therefore, a great difference of opinion on the subject which seems to merit examination.

The arguments which might be urged on behalf of any change in the present arrangements seem to be two in number: (1) that a banking panic might arise in which the present reserves would be insufficient; (2) that the variations in the money rates are too frequent or too extreme.

In this paper the general position will first be stated, and this will be followed by an investigation of the two reasons quoted above which may be brought forward in favour of a change.

The General Position

It is only proposed to deal with the commercial banking institutions of the country, so that the Post Office and other savings banks will not be considered. It may, however, be remarked in passing that the proposed suggestions for selling "Consols" at Post Offices in small amounts would make for increased safety if it induced depositors to buy them, instead of depositing their money in the savings banks.

Banking, like most other businesses, is carried on with two objects: the profit of the capitalist, and the general good of the community. Both these

¹ First published in the *Bankers' Magazine* for July and August, 1912.

objects are furthered by the economy of the use of the currency metal, subject to the limitation that the stock must always be sufficient for the calls made on it. The way in which the currency is economized is by the use of paper money, which may be roughly divided for our present purpose into (a) bank notes, which are negotiable instruments; (b) cheques, etc., in which personal credit is a very important factor. These two classes of paper money are of very different importance in different countries, and it is difficult to make any exact comparison for two reasons: (1) that national habit in the use of different forms of currency is very different, and (2) that it is impossible to obtain exactly comparable figures for different countries, e.g., a Bank of England note must be paid in gold on presentation, while a Bank of France note can be paid in gold or silver at the option of the Bank.

We are not, of course, concerned here with the absolute amount of currency existing in any country, for the amount required will be different with different kinds of population (e.g., a rural population will probably require less currency than an urban) and with different amounts of trade. In countries using the same currency metal, the amount of the currency will tend to be what is required. Such countries may be compared to a number of lakes connected together so as to form one reservoir. They may be of widely different areas, but the level in each will be the same. Similarly, in a country where there is an excess of the currency, prices will tend to rise, exports will be checked, and the currency will be exported.

We have, therefore, only to consider the proportion between the different kinds of currency which exist, but here again we are without strictly comparable figures. Some idea of the differences which exist can, however, be obtained from the values of the note issues which are in circulation. These are set out for the three divisions of the United Kingdom and for France and Germany in the following table:—

TABLE TO SHOW NOTE ISSUE IN POUNDS PER HEAD OF THE POPULATION.¹

	England.	Scotland.	Ireland.
	£	£	£
Average 1878-1887	1·03	1·53	1·24
„ 1888-1897	·88	1·63	1·35
„ 1898-1907	·88	1·71	1·90
	Germany.		France.
	£		£
Average 1876-1885	·98	Average 1875	2·50
„ 1886-1895	1·10	„ 1885	2·94
„ 1896-1905	1·17	„ 1891	3·19
		„ 1897	3·79
		„ 1903	4·37
	France, 25·3 <i>f.</i> = £1.		Germany, 20·5 <i>m.</i> = £1.

¹ Figures from the Report of the Aldrich Commissioners, Document 578.

Large differences are seen to exist in the value of the note circulation (per head) of the different countries. The English rate is the lowest, while the French rate is by far the highest. -

It must not, however, be supposed that a large circulation of notes (e.g., as in France) is, on account of its size, a source of financial weakness. A population which is accustomed from long habit to the use of notes will probably not hoard gold in a panic any more than a population which uses a smaller proportion. Gold, too, is generally much safer in a bank, for when stolen and melted it cannot be distinguished from any other gold.

The Bank of England note is in an almost unassailable position. Clare, in the *Money Market Primer* (p. 23), says :—" So utterly improbable is the contingency of a 'run' on this " (i.e., the Issue Department of the Bank of England) " department as to be hardly worth serious consideration. It might, no doubt, occur in the event of a foreign invasion, and, as a matter of fact, did once happen in the last " (i.e., the eighteenth) " century, when the news reached London that the Highlanders, under the Pretender, had advanced as far as Derby. But apart from these exceptional circumstances, public confidence in the note has never been shaken, and in time of panic, even when every other promise to pay is discredited, the circulation, instead of falling off, invariably increases."

Any doubt about the Bank of England note need therefore only be considered when the general credit of the British Government is in jeopardy.

Confing now more to the details of the general position, we have to consider first the Bank of England, comparing it with the National Banks of France and Germany, and then to investigate the Joint Stock Banks.

THE BANK OF ENGLAND, COMPARED WITH THE BANKS OF FRANCE AND GERMANY

In each of the three countries, the United Kingdom, France and Germany, there is a national bank which exercises control over the general financial situation of the country, and is the possessor of the chief stock of gold.

• All these countries are on a gold basis, though, as will be pointed out later, England is the only country which pays freely in gold whenever required. In spite of restriction, however, gold tends to flow from countries which have payments to make, and all the national banks adopt the same method of guarding their stock of gold, in that they will raise their rate of discount in case of need.

• In France and Germany, where the outside banking establishments (and trade in general) are more under the control of the central institution, other means may also be adopted. The Bank of France may exercise its option of

paying in silver, while the Bank of Germany may in other ways prevent its customers withdrawing gold for export.

In addition to this, both these banks keep a stock of foreign bills in their portfolios, which they can use for the purpose of influencing the exchange.

In England, the raising of the Bank rate has very little direct effect. It influences the rates on many loans and that allowed on deposits by the banks, but the market rate may not follow it closely and the Bank has then to make its wishes felt by borrowing money in the open market, or by selling Consols.

It is easier, therefore, for the Banks of France and Germany to guard their stock of gold, but the Bank of England can probably exert a greater magnetic force for attracting gold from other countries in case of need. Lord Avebury replied to the Aldrich Commissioners,¹ "a sufficient bank rate always brings gold," while the Directors of the Bank of England say,¹ "experience seems to prove that the raising of the bank rate to a sufficient level never fails to attract gold, provided the higher rate is kept effective"; also, "the bank rate is more effective now than in 1866 because of the more rapid means of communication between financial countries"; also, "in 1907 the Bank drew gold from twenty-four countries (including British Colonies)."

Coming now to the actual liabilities and reserves of the banks, and considering first the Bank of England, the following table sets out the proportion between the "reserve" and "liabilities" on deposit arranged in ten-yearly periods, (with a final three-yearly period) and obtained from the weekly statements.

TABLE TO SHOW PROPORTION BETWEEN THE "RESERVE" AND THE "LIABILITIES ON DEPOSIT" AT THE BANK OF ENGLAND.

Average 1878-1887	.	.	.	.	.	.	.	43.8
„ 1888-1897	.	.	.	.	.	.	.	48.7
„ 1898-1907	.	.	.	.	.	.	.	45.9
„ 1908-1910	.	.	.	.	.	.	.	49.7

It will be remembered that the "reserve" consists of a small amount of bullion in the Banking Department and of a large amount of notes, which are backed to the extent of about 80 per cent. by gold in the Issue Department.

The liabilities consist of those on public and on private deposits, the latter being about three times the former. In making a comparison with foreign banks, these facts will have to be taken into consideration, and it remains to point out here that the position is distinctly stronger than it was. This fact would be much more apparent than it is, were it not for the abnormal period 1894-1896, when the "proportion" stood at about 60 per cent.

During the years dealt with, the average annual "proportion" has never

¹ Reports of the Aldrich Commissioners, Document 405.

fallen below 39 per cent., at which figure it stood in 1878 and 1882. The highest figures reached were in 1894, 1895 and 1896, when the "proportions" were 63 per cent., 61 per cent. and 57 per cent. respectively, while for the last three years it has been at a higher figure than for any of the previous ten years.

Taking individual monthly averages, the lowest was in December, 1898, when it was 32 per cent., but during the last thirteen years the "proportion" has only fallen below 40 per cent. in eleven months, and during the last three years not at all.

In addition to this raising of the "proportion," there seems to have been a greater constancy. This is shown in the following table, which sets out the "probable error" of the monthly averages about the yearly average. The "probable error" is merely the measurement of the variation, a "probable error" of (e.g.) 2.0 meaning that half the monthly averages are nearer to the annual average than 2.0 per cent. and half further away.

TABLE TO SHOW THE "PROBABLE ERROR" OF THE MONTHLY AVERAGE "PROPORTION" AT THE BANK OF ENGLAND ABOUT THE YEARLY AVERAGE.

1878 . . . 3.06	1889 . . . 1.60	1900 . . . 2.98
1879 . . . 4.15	1890 . . . 3.02	1901 . . . 2.48
1880 . . . 1.91	1891 . . . 2.40	1902 . . . 2.52
1881 . . . 2.68	1892 . . . 2.13	1903 . . . 2.10
1882 . . . 1.80	1893 . . . 2.21	1904 . . . 2.76
1883 . . . 2.57	1894 . . . 3.83	1905 . . . 3.43
1884 . . . 2.60	1895 . . . 2.74	1906 . . . 2.52
1885 . . . 2.88	1896 . . . 2.70	1907 . . . 2.00
1886 . . . 2.02	1897 . . . 1.72	1908 . . . 1.84
1887 . . . 2.34	1898 . . . 2.28	1909 . . . 1.72
1888 . . . 1.72	1899 . . . 2.25	1910 . . . 1.55

It is seen that there has been a slight reduction in the variation during the last few years. It is not possible, of course, to be certain whether this is a coincidence, or whether it is an indication of a change in policy.

The greatest variation occurred in 1879 when the probable error was 4.15 (i.e., in half the months the monthly average was nearer to the yearly average than 4.15 per cent., and in the other half further away) while the lowest was in 1910, when it was 1.55 per cent.

The general conclusion, therefore, would seem to be that a distinct effort has been made in the direction of raising the proportion and possibly of keeping it more constant.

In order to compare the position of the Bank of England with that of the Banks of France and Germany, as regards the ratio of their supply of gold

to their liabilities, the following tables have been elaborated from the weekly statements of the Banks published in the *Economist* :—

TABLE TO SHOW THE NOTES IN CIRCULATION, THE PRIVATE DEPOSITS, AND THE GOLD IN THE (ALL FIGURES IN MILLION POUNDS)—

	Bank of England.			Bank of France.			Bank of Germany.		
	Notes in Circulation.	"Other" Deposits.	Gold.	Notes in Circulation.	Private Deposits.	Gold.	Notes in Circulation.	Current Accounts.	Gold.
	£	£	£	£	£	£	£	£	£
1880	27	26	28	92	16	—	37	9	28
1885	25	27	23	114	15	44	36	12	29
1890	25	28	22	122	16	50	50	18	40
1895	26	41	39	141	29	82	55	25	51
1900	29	41	33	161	20	84	57	25	41
1905	29	42	35	176	23	114	67	29	49
1910	28	42	37	208	25	136	79	32	53

TABLE TO SHOW PROPORTION BETWEEN LIABILITIES (ON NOTES AND DEPOSITS) AND GOLD.

	Bank of England	Bank of France.	Bank of Germany.
	%	%	%
1880	53	—	61
1885	45	34	60
1890	42	39	59
1895	58	50	64
1900	48	46	49
1905	49	57	51
1910	53	59	48 ¹

It will be noted that the liabilities on Government deposits are not considered in these tables, since they do not involve the same risk in times of panic as liabilities on private deposit.

The chief points of interest are—

(1) That the Bank of England proportion is comparatively constant over the whole period.

(2) That the Bank of France has very much strengthened its position.

¹ If allowance is made for the £6,000,000 "war hoard" at Spandau, then the German proportion between "liabilities" and gold rises to 53 per cent.

- (3) That the Bank of Germany is less strong than it was.
 (4) That all these Banks have now much the same proportion between their gold and their "active" liabilities.

THE JOINT STOCK BANKS

As already mentioned, the banks (other than the national banks) in France and Germany are very different to those in the United Kingdom. It is not possible to go into details, but some questions of the Aldrich Commissioners, with Sir Felix Schuster's replies,¹ point out the difference.

Question.—"We found both in Germany and in France the question of the amount of the reserves in specie or in bank was regarded as of little importance by the Bankers. They depend on the Reichsbank or the Bank of France for rediscount in time of need."

Answer.—"Both in France and Germany banks are much more dependent on the central institution than we are. There is practically no banking system in our sense of the word in France, nor is there in Germany."

Question.—"Have you an idea of the amount of cash, gold and silver, in the banks of England?"

Answer.—"No, it is a figure you cannot arrive at because it is not published. Silver we can eliminate. . . ."

"I believe the Mint made a census this last June of the amount of gold held by the banks in England who have been asked to supply the figures and have done so voluntarily, and I believe that amount, exclusive of the Bank of England, is £35 million, but I have not seen any official statement to that effect."

The position of the joint stock banks in the United Kingdom would seem, therefore, to be much stronger than that of similar institutions in France or Germany.

Coming now more particularly to the banks of the United Kingdom, these consist of the Joint Stock and the Private Banks. The latter constitute a small and constantly diminishing group as compared with the joint stock banks, and the joint stock banks will be mainly considered.

The figures showing the position of the joint stock banks of the three divisions of the United Kingdom for the years 1880, 1885, 1890, 1895, 1900, 1905 and 1910 are set out in the following tables (page 74).

The figures are obtained from the half-yearly banking supplements issued by the *Economist*, and it must be remembered that they are taken from the balance-sheets of the banks. They are, therefore, only statements at a particular date, and are subject to the influence of "window dressing." This makes

¹ Reports of the Aldrich Commission, Document 405.

the table of less value than it would otherwise be, but it probably does not alter very much its comparative value :—

Year.	Number of Banks considered.	Number of Branches.	Paid-up Capital.	Reserve and Undivided Profits. ¹	Deposit and Current Accounts.	Advances and Discounts.	Cash in hand and Money at short call.
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ENGLISH AND WELSH JOINT STOCK BANKS PUBLISHING BALANCE-SHEETS.

			Million £	Million £	Million £	Million £	Million £
1880 .	84	1,270	29	16	211	168	51
1885 .	109	1,556	38	23	296	231	67
1890 .	99	2,057	39	25	356	265	79
1895 .	99	2,666	44	25	439	302	106
1900 .	82	3,824	46	31	572	387	136
1905 .	61	4,447	48	34	613	393	170
1910 .	46	5,103	48	34	707	453	201

SCOTTISH JOINT STOCK BANKS PUBLISHING BALANCE-SHEETS.

1880 .	10	876	9	5	76	59	14
1885 .	10	934	9	6	83	63	14
1890 .	10	974	9	6	89	59	22
1895 .	10	1,008	9	6	93	61	22
1900 .	11	1,077	9	7	104	70	26
1905 .	11	1,151	9	8	102	70	24
1910 .	9	1,219	9	8	107	69	26

IRISH JOINT STOCK BANKS PUBLISHING BALANCE-SHEETS.

1880 .	5	271	3	1	17	16	4
1885 .	8	312	4	2	24	22	5
1890 .	9	456	7	3	39	29	9
1895 .	9	493	7	3	44	31	11
1900 .	9	559	7	4	48	37	10
1905 .	9	613	7	4	53	42	10
1910 .	9	693	7	4	62	45	13

In all the years, except 1880 in England and 1880 and 1885 in Ireland, practically the whole (over 90 per cent.) of the joint stock banking capital is included in the tables.

It is seen, in the first place, how much larger the banking capital of England is than that of the other two divisions of the Kingdom, being about five times as large as that of Scotland and seven times as large as that of Ireland.

The number of banks has remained stationary in Scotland and Ireland but has now been reduced to about half what it was in England in 1880. The

¹ Reserve only, in and after 1895.

number of branches, on the other hand, has increased enormously in all the countries, but there has been a much smaller increase in Scotland than in the other two countries.

Taking the other columns in order, the paid-up capital has remained constant in Scotland and Ireland but has increased by about 30 per cent. in England (i.e., from £29 million to £48 million) but part of this has been due to the absorption of private banks. The only figures to hand for these are those for 1895 and onwards. In 1895 the paid-up capital and reserve of the private banks was £12 million, in 1900 £7 million, in 1905 £4.5 million and in 1910 £3.5 million, while in Scotland and Ireland there do not appear to have been any private banks during the period under discussion.

The reserves (together with the undivided profits) have about doubled themselves in England and Scotland between 1880 and 1910 and have increased at about the same rate in Ireland between 1890 and 1910. The deposit and current accounts have doubled themselves in England between 1890 and 1910, have increased during the same period in Scotland by 20 per cent., and in Ireland by about 50 per cent.

The discounts and advances have increased in England (between 1890 and 1910) by about 70 per cent., in Scotland by about 20 per cent., and in Ireland by about 50 per cent.

It is unfortunate for our present purpose that the banks do not separate the cash in hand from "money at short call." It can only be said that they do not,¹ and that we therefore have to deal with the two items together. In England the amount so held has increased by about 150 per cent., in Scotland by about 10 per cent., and in Ireland by about 30 per cent. between 1890 and 1910.

It must be pointed out that the Scottish banking system differs in some important particulars from that of the other parts of the United Kingdom, one of the chief differences from the point of view under discussion being that notes, which are very popular in Scotland, are largely used as till money. This enables gold to be economized at the branches, and as long as the popularity of the note continues (and it seems to be very much ingrained, for since 1765 the note has never varied from par)² it is questionable how far this is a source of weakness.

In both Ireland and Scotland there is a large issue of notes by the banks, part of which is "authorized" (i.e., is not backed by gold and should therefore be added to their liabilities), and part of which is backed by 75 per cent. of gold, and the amount of gold so "earmarked" should be subtracted from the cash in hand.

¹ With very few exceptions.

² Macleod: *Theory and Practice of Banking*, Vol. II, p. 208.

In England the note issue of the joint stock banks is so small that it may be disregarded.

The figures for all three divisions of the United Kingdom are set out in the following table.

TABLE TO SHOW NOTE ISSUES OF BANKS (OTHER THAN THE BANK OF ENGLAND) IN ENGLAND, SCOTLAND, AND IRELAND (IN MILLION POUNDS).

	England.		Scotland.		Ireland.	
	Authorized.	Actual.	Authorized (approx)	Actual.	Authorized.	Actual.
1880	6.0	3.5	3.1	5.5	6.4	5.7
1885	5.6	2.9	3.0	5.7	6.4	6.1
1890	4.8	2.4	3.0	6.3	6.4	6.8
1895	4.2	1.8	2.9	7.0	6.4	6.4
1900	2.7	1.3	2.9	8.0	6.4	6.8
1905	1.7	.6	2.8	7.5	6.4	6.4
1909	1.2	.3	2.7	7.1	6.4	6.9

We must now attempt to estimate the comparative capacity of the banks to meet a "panic," and this is best shown by the proportion between the "cash in hand and money at short call," and the liabilities on deposit, and on notes issued.

The following table sets out this proportion, notes up to the authorized issue together with one-quarter of the excess issue being added to the liabilities on deposit, and three-quarters of the excess note issue being subtracted from the "cash in hand and money at short call." ¹

TABLE TO SHOW CASH IN HAND AND MONEY AT SHORT CALL PER £100 OF LIABILITIES ON DEPOSITS AND NOTES ISSUED.

	England.	Scotland.	Ireland.
1880	23.7	15.0	17.4
1885	22.4	13.8	16.7
1890	22.0	21.6	19.6
1895	24.0	19.6	22.0
1900	23.7	20.4	18.2
1905	27.7	18.9	17.0
1910	28.4	20.8	18.9

¹ This will not be strictly correct if all the banks do not issue their minimum amount.

The proportion is seen to be considerably higher in England than in the other divisions of the United Kingdom, and is now distinctly higher than formerly. In Scotland and Ireland the proportion is much lower, and was very low in 1880 and 1885. This was no doubt due, in Scotland, to the troublous times through which Scottish banking had been passing, and in Ireland to the non-inclusion of the largest bank in these years.

The increase in England is probably due to the force of public opinion, which seems to have left Scotland and Ireland untouched.

It will, no doubt, be pointed out that the figures are not exactly comparable, because the Scotch and Irish liabilities include those on the notes issued. This is, of course, quite true, but on paper it would certainly seem that the Scottish and Irish position should be strengthened. In Ireland the necessity is probably less great than in Scotland, because the trade of the country is different to that of England and Scotland, in that it does not participate to nearly the same extent in the fluctuations due to the short trade cycles.

In connexion with the relative strengths of the banks, it is desired to draw attention to two further points:—

(1) *The proportion between loans and deposits.*

This proportion is set out in the following table:—

TABLE TO SHOW AMOUNT OF DEPOSITS PER £100 OF LOANS.

	England.	Scotland.	Ireland.
	£	£	£
1880	126	129	108
1885	128	132	102
1890	134	152	138
1895	145	154	142
1900	148	145	130
1905	156	146	128
1910	156	154	138

In all cases the proportion has increased, though since 1890 the increase has been slight.¹ From our present point of view, therefore, the position is slightly less strong than it was before, for those customers who have both loans and deposits are less in the hands of the banks than they were. Such figures can, of course, only be used with great caution, but they have been used in another place as pointing to increased strength, as in fact they may, from other points of view.

¹ 1890 was the first year to include the Bank of Ireland figures.

(2) *The reduction in the number of banks.*

The joint stock system lends itself very well, as pointed out by Adam Smith, to the business of banking—at any rate in an old established country—for caution and trustworthiness are the main qualities required for success. The increase in size of the banks, and the absorption of the smaller by the larger among them, has probably added considerably to the strength of the banking position on account of the greater uniformity and supervision which have accrued.

Having stated the position, it remains to consider the two reasons which may be urged in favour of making some alteration in the amount of reserves held.

I. The Necessity for Increasing the Reserves for use in Time of Panic.

A banking crisis occurs primarily through fear on the part of depositors that they will not be able to obtain, on application, the currency to which they are entitled, or, on the part of note-holders, that the notes will depreciate in value. Such a state of affairs may be caused by any event, such as a declaration of war, the repudiation of a state debt, or by mismanagement (fraudulent or otherwise) on the part of a large financial concern suddenly coming to light, all of which may bring about a sudden fall in prices of stocks and commodities.

Since the passing of the Bank Act in 1844 there have been at least three such crises: in 1847, 1857 and 1866; and each of these was brought about by over-speculation on the part of banks or other financial companies, chiefly in the East Indian trade and in railway building (both in this country and in the U.S.A.). In each of these crises the reserve in the Bank of England sank to such a low level that application had to be made to the Government of the day for permission to suspend the Bank Act in order that a further issue of bank notes might be made against securities. The knowledge that such permission had been given was in all cases sufficient to allay the panic, and on one occasion only was the law broken.

These crises are chiefly of historical interest, for very different methods prevail both in the leading financial companies and at the Bank of England, as a result largely of the experience obtained.

As an instance of this, it may be mentioned that between August 29, 1846, and January 1, 1847, the reserve at the Bank was allowed to fall from £9,500,000 to £6,500,000 without any raising of the Bank rate from 3 per cent. As regards the 1866 crisis, Lord Avebury, in reply to the Aldrich Commissioners, says: "I remember 1866 well. The Bank Act was not so well understood then as it is now, and I think the rate should have been raised sooner." On two more recent occasions—in 1878, when the City of Glasgow Bank failed, and

in 1890, when the house of Baring got into difficulties—there has been great financial strain. In 1878 the reserve stood at about £8,500,000 (28 per cent.) at the time of the smash, and a rise in the Bank rate from 5 per cent. to 6 per cent. caused an increase of about £3,500,000 (and to a percentage of 39). In 1890 the reserve was at £13,000,000 (41 per cent. at the time of the difficulty), and fell directly afterwards to £10,500,000 (31 per cent.), though it recovered almost immediately to £16,500,000 (45 per cent.), but it was thought necessary at the time to secure £3,000,000 in gold from France and Russia.

Comparing past events with the present situation, therefore, it would seem that the present position is satisfactory. Panics have become less frequent than formerly, and the position in the United Kingdom is considerably stronger than it was. It is also probably much stronger than that of France and Germany, though it is less strong relatively. Anything else could not be expected, for France and Germany have only firmly fixed themselves on a gold basis in comparatively recent times.

Looking to the future, the difficulty is that no definite rule short of the conduct of all transactions on a cash basis can be laid down.

Any sudden accretion of strength is to be deprecated, for it would probably lead to greater rashness on the part of financial concerns, since they might indulge in greater risks on the strength of the greater reserves.

As causes of a panic we have, as already mentioned, to consider two classes of events:—

- (1) Those of a political character, such as a war.
- (2) Those due to over-speculation (or over-trading, which is much the same thing), accompanied by fraud, or due to a genuine miscalculation of future events.

(1) The beginning of a great war would certainly cause much commotion, and might cause a panic. There is this to be said, however, that the prices of commodities would probably rise, so that there should be no fear of a panic on this account.

It would probably be different with securities, and, at any rate, with Government securities, in which banks are chiefly interested. Giffen suggested that Consols might fall 15 per cent. in the event of a great war. Those banks, therefore, which had their assets in bills and loans which are repayable at their face value rather than in securities would probably be in a stronger position.

Of course, in the event of an unsuccessful war, and possibly of an invasion, a panic might occur; but such an event, if allowed to go on unchecked, would probably involve the chief banking systems of the world, and, at any rate, the increases in the gold reserves suggested would be of as much use as building a sand castle to stop the tide.

The actual financing of the war is not here considered, since that depends purely on the capacity to raise loans, and on the power of buying and selling goods.

(2) Over-speculation has been the cause of nearly all the panics which have occurred in England—and probably of those in nearly all other countries. It may have been accompanied by fraud (as in the case of the Glasgow Bank smash), by such absence of judgment as to amount almost to the same thing, or—since all business consists largely of speculation—by a genuine and legitimate miscalculation of the course of future events.

No rule, of course, can ever be laid down to prevent fraud or carelessness, without hampering trade, and the true remedy seems to lie in publicity. It would therefore be advantageous to compel all banking institutions to issue periodical statements more frequently and with fuller particulars than at present (as has often been suggested), not so much with the idea of increasing the average reserves held as of forcing the weaker into line with the stronger institutions. These returns should, if possible, deal with the average figures over periods and not with those at a particular date, so that the effects of "window-dressing" would be apparent. It is at the other end of the scale, apart from the world of politics and personalities, that some advance may be expected, for variations in prices are largely the result of very commonplace causes, though these may be none the less difficult to measure. In attempting to advance, however, direct experiment is out of the question, and we have usually to be content with indirect figures. In dealing with these, the correlation method, which has been brought forward and popularized by Professors Karl Pearson, Edgeworth and Bowley, and by Dr. Yule and Mr. Hooker, is of great value—for with the use of it one can measure definitely the closeness of the relationship between two sets of figures, and can calculate how much of the one figure corresponds to how much of the other.

The method consists of plotting the two series of figures on squared paper, the calculation of the correlation co-efficient from the diagram obtained being comparatively simple.¹ One obtains figures varying between -1.00 and $+1.00$, the former indicating that the two sets of figures are as closely connected as possible (perhaps through some intermediate cause) in the negative sense (e.g., as for instance the length and diameters of a number of pieces of wire each drawn out from the same weight of metal), the latter the same thing in the positive sense (e.g., the diameter and circumference of a number of circles). Any intermediate figures may be obtained, $.00$ showing an absence of relationship.

This method provides us with a means of approaching economic problems

¹ See e.g. Professor Bowley's *Elements of Statistics*.

inductively and not deductively, for if two series of figures appear to be closely related to each other sufficiently often there is a strong probability that the same relationship will occur again and again—i.e., that there must be a connexion between the figures as cause and effect, or that there must be a common cause.

The following are examples of the use of the method in this direction. The increases and decreases in the average market rates for money in London, Paris, Berlin, and New York¹ have been correlated with the increases and decreases in the exports and imports per head of the population from year to year of the United Kingdom, France, Germany and the U.S.A. respectively, and the following co-efficients have been obtained:—

TABLE TO SHOW THE CORRELATION CO-EFFICIENTS BETWEEN INCREASES AND DECREASES IN THE

	Exports of				Imports of			
	United Kingdom	France.	Germany.	U.S.A.	United Kingdom.	France.	Germany.	U.S.A.
* and the increases and decreases in the average rates for money in—								
London . . .	+ .46				+ .51			
Paris . . .		+ .48				+ .50		
Berlin . . .			+ .26				+ .56	
New York . .				— .08				+ .29

Now, there are not very many cases here, so that one cannot use the inductive method of argument with great certainty, but there are sufficient to enable one to suggest very strongly that the variations in the rate for money are connected in some way with the variations in trade—when imports and exports increase, the rate for money increases. Every one will probably say that this is well known—but there is a further point which may not be so well known, and that is that the variations in the money rate vary more closely with the variations in the imports than with those of the exports. This is probably due to payments having to be arranged in the country to which the goods are coming.

¹ Obtained weekly from the first page of the *Economist*—54 years for the U.K., 30 years for France, 28 years for Germany, and 24 for the U.S.A., all ending 1908.

Even if the correlation method provided no new discoveries it would be very valuable on account of the exactness with which one can measure relationships. Such relationships may be generally known but they are so often masked by the fact that people are nearly always more influenced by the nearer rather than by the more remote event. Also any such knowledge is only obtained by years of study, the fruit of which is largely lost on the retirement of the individual from active service. Correlations require a great deal of care for their correct interpretation, but much of the routine work can be done on a system, and more attention could be given to other matters by the intellect at the head of affairs.

From the point of view of this paper, the object of the correlation method would be to secure a relationship from which an indication as to the course of future events could be obtained. We have very few indications of such a kind at present, because very little work has been done on the subject. The following is, however, a very striking instance.

J. P. Norton¹ has shown that the variations in the reserves of the New York bank correlate with the variations in the loans by the banks to the extent of +.49, with the loans of a week later +.62, with the loans of two weeks later +.87, with the loans of three weeks later +.96, and with loans of four weeks later +.91.

Now, perfect correlation, as already mentioned, would give a correlation co-efficient of +1.00, so that the relationship between the reserves of the banks and the loans of three weeks later is almost as close as it could be, and anyone requiring to know the loans of three weeks later could calculate them with practical certainty from the reserves.

In another case, R. H. Hooker (*Royal Statistical Society's Journal*, 1901, p. 491) has shown that for the years 1876-95 the variations in the bankers' clearing correlate to the extent of +.92 with the variations in the marriage rate of a year later, while the variations in the marriage rate correlate to the extent of +.90 with the exports of half a year earlier. It therefore seemed probable that the bankers' clearing could be used as a means of predicting the variations in the marriage rate, and in the other figures which vary in the same way, e.g., the London market rate.

With this object the increases and decreases (per head of the population) in the London Bankers' Clearing House returns have been correlated with the increases and decreases of the following year in the London Market rate, Sauerbeck's general index number and his index numbers for coal and iron. The results are set out in the following table:—

¹ In *Statistical Studies in the New York Money Market*. Macmillan, 1902.

TABLE TO SHOW CORRELATION CO-EFFICIENTS BETWEEN THE RISES AND FALLS IN THE BANKERS' CLEARING HOUSE RETURNS PER HEAD OF THE POPULATION AND THE RISES AND FALLS IN THE AVERAGE ANNUAL

London Market rate for money of a year later	+ .51
Sauerbeck's index number of a year later	+ .47
Index number for coal of a year later	+ .56
Index number for iron of a year later	+ .52

These co-efficients would lead one to the conclusion that about 25 per cent. of the variations in the market rate and the index numbers are connected with variations in the Bankers' Clearing House returns of the year before, i.e., four independent correlations of + .5 would account for all the variations in, e.g., the market rate. From these co-efficients the "regression" lines can be calculated, and as an example the money rate may be taken.

Over the years considered, the average rise per year in the bankers' clearing per head of the population has been £.39, while averaging all the rises and falls there has been an average fall in the market rate of .005 per cent. Calculating from the correlation co-efficient, an increase of £1 per head of the bankers' clearing is found to correspond to an increase of .503 per cent. in the money market rate of the year after. Predicting from these figures for all the years, and comparing the result so obtained with the actual market rate, there is found to be a probable error of .503 per cent. (i.e., half the differences¹ will be less than this and half greater), as compared with a probable error of .78 per cent., which is what would have been obtained if the average rate had been predicted each year.

It may perhaps be thought that this is a very short way towards the desired object, and this is of course true. It is probable, however, that further work concentrated on particular points would make it possible to obtain much closer predictions.

II. The Variations in the Rate for Money

The rate for credit—or as it is commonly called, for money—depends of course on the relative supply and demand, and with perfect knowledge and trustworthiness should not be affected by the amount of gold held. Practically, it is found that some gold is required, and it is necessary to increase it whenever the credit in circulation increases. This happens in times of active trade, and since the supply of gold is a much more definite object than the demand for credit, public attention is focused much more strongly on the former than on the latter.

¹ Between the prediction and the actual.

The control of the gold supply is in the hands of the Directors of the Bank of England, who vary the Bank rate and cause money to be cheaper or dearer as the situation may require. In former times the market rate followed the Bank rate very closely, for the general money market was nearly always in the hands of the Bank. At present, however, on account of the increase in the number of "outside" institutions, this is not the case, and the only direct effect of an increase in the Bank rate is to increase the rate demanded by the banks on most loans and the rate they give to depositors. The Bank of England, therefore, has sometimes to obtain control of the situation by borrowing money in the open market, or perhaps by selling securities whereby the floating stock of money is diminished and the required effect is produced.

Now, the rate for money is subject to two kinds of secular variation, one extended over several years—over what is generally known as the "short trade cycle"—and the other within the year itself.

As regards the former, Beveridge writes (in *Unemployment*, p. 41): The fluctuation in industrial activity is not limited to particular trades, it represents alternate expansion and contraction in the general demand for labour, and is only one aspect of a still more general ebb and flow dominating the economic life of the nation." As is well known, the rate is low in times of bad trade and high in times of good trade. It might be possible to reduce these variations to some extent by accumulating gold when the rate is low, so that it would be there for use when trade became more active. It would, however, be extremely difficult to know when to begin the accumulation and when to begin the dissipation (particularly as the length of a "cycle" cannot yet be predicted), and it would seem to be distinctly wrong in principle to do anything in this direction, for the differences in trade between the good and bad times would be accentuated. At present the low rates in the bad times are an encouragement, while the high rates in times of activity discourage excessive speculation.

There is no doubt, of course, that great fluctuations in the rate for money are a disadvantage to trade in general, as pointed out by Sir R. H. Inglis Palgrave (in *The Bank Rate and the Money Market*, p. 195). "There can be no doubt that to the borrower, and every man of business practically must at times be a borrower, this high range of fluctuation has been a very serious disadvantage."

It will be useful, however, to show what the fluctuation in the market rate has been in London as compared with the other centres, and this is shown in the following table:—

TABLE TO SHOW AVERAGE ANNUAL MARKET RATES AND THE PROBABLE ERROR ABOUT THE AVERAGE IN—

	London, 1878-1908	Paris, 1878-1909	Berlin, 1878-1908	London, 1884-1908.	New York, 1884-1908.
Average rate	2.63	2.48	3.04	2.58	2.93
Probable error . . . .	.56	.34	.52	.59	.70

It is seen that the average rate has been slightly lower in Paris than in London and somewhat higher in Berlin and in New York. The variation from year to year is also lower in Paris, while there is practically no difference between London and Berlin. New York shows more variation.

It must be pointed out that the variations in the stock of gold in reserve have comparatively little to do with these figures, for, as already pointed out, it is the variations in trade which have to be chiefly considered.

England has by far the largest external trade and almost certainly the largest internal trade, and it is conducted with much greater freedom than in France and Germany, where the Banks of Paris and Berlin can to some extent prevent excessive trading by refusing to grant accommodation. Though English trade may therefore be handicapped by greater variations in the rates for money, it is not likely that any of those involved would wish for a change to the French or German systems, which would probably also conduce to the removal of the financial centre of the world from London.

There is, however, one change which has been suggested, which might be useful as a means of preventing rises in the market rate when the withdrawals of gold, which cause them, are due to foreign demands, and that is that a stock of foreign bills should be kept by the English banks.

This is suggested by Sir R. H. Inglis Palgrave in *The Bank Rate and the Money Market*. "The English banker or bill broker has, as a rule, little knowledge of, or experience in, transactions in foreign bills. Hence there are very few, it might almost be said there are hardly any, foreign bills held in England; while the reverse of this is the case on the money markets of the continent of Europe, where English bills are very generally held, and form a most useful reserve to those who hold them, in the case of demands arising from an adverse rate of exchange."

The same change was advocated by Lord Swaythling in his interview with the Aldrich Commissioners.¹ "Why not imitate Germany, etc., and hold a portfolio of foreign bills . . . and hold them . . . until the danger occurs

¹ Document 405, p. 94.

of losing inconvenient sums of gold?" [This] "I have for many years urged upon the Bank of England; but they have always been opposed to it—at least not opposed to it, because in theory they approve of it—but in practice they are very difficult to move."

It would seem that the change suggested might tend to the reduction of many of the smaller fluctuations in the market rate.

With regard to the variations in the money rates within the year, it is well known that the rate is highest in the Autumn, that it is usually rather high till about April, and that in the middle of the year it is much lower.

The average monthly rates for London, Paris and Berlin are set out in the following table, together with the probable error:—

TABLE TO SHOW THE AVERAGE MONTHLY MARKET RATE FROM 1878 TO 1908 IN

	London.	Paris.	Berlin.
January	3·20	2·86	3·64
February	2·72	2·68	2·65
March	2·72	2·40	2·56
April	2·28	2·49	2·81
May	2·42	2·46	2·65
June	2·04	2·15	2·66
July	1·77	2·37	2·91
August	2·22	2·27	2·58
September	2·58	2·07	2·91
October	2·88	2·44	3·56
November	3·37	2·87	3·62
December	3·31	2·70	3·78
Average	2·63	2·48	3·03
Probable error (measuring the monthly fluctuation)	·33	·17	·31

The variation is seen to be somewhat greater in London, but it shows much the same movement in all three countries. It is due to a large extent to the accommodation required for the gathering in of the harvests, and it would seem that the accumulation of gold in the summer by any particular market might reduce somewhat the variation in the rates from month to month in that market. The average rate would probably not be affected—only the variation.

Conclusions

Two reasons may be brought forward for increasing the stock of gold held as a banking reserve in the United Kingdom.

- (1) That a panic might arise in which the present reserves would be insufficient.
- (2) That the variation in the money rates should be reduced.

Comparing the United Kingdom with France and Germany, the national banks have much the same proportion of gold to liabilities (leaving out the liabilities on deposit to their respective Governments).

The general position in the United Kingdom is, however, probably much stronger than that in the other countries, for the joint stock banks have a considerable stock of gold and are more independent of the central institution than in France and Germany.

Comparing the present position with the past, in the United Kingdom the Bank of England has increased its proportion of reserve to liabilities, and the proportion now seems to be less subject to fluctuation.

The joint stock banks also seem to have strengthened their position to a considerable extent, but the Scotch and Irish banks hold a much smaller proportion of "cash in hand and money at short call" to their liabilities than the English banks.

This is due to a great extent to the existence of their liabilities on note issues. Such liabilities may require less backing with gold than those on deposit accounts, and differences in the nature of the trade in the different countries may justify the different ratios, but on paper the position in Scotland and Ireland may require strengthening to some extent.

Panics are caused by a sudden fall in the prices of stocks or commodities, which may be brought about by a political event, such as the declaration of a war, or the repudiation of a State debt, or by over-speculation suddenly coming to light.

It is impossible to guard against the effects of all possible political events, such, for instance, as a war between two Great Powers, which might involve the repudiation of both their national debts. It can only be said that the United Kingdom would probably be in at least as good a position as France and Germany for meeting such an event, and that the increases in the gold reserves suggested would be of very little use.

Panics in England have nearly always been caused by over-speculation accompanied by fraud, by bad management, or by a legitimate miscalculation of the trend of future prices, etc.

Fraud cannot be prevented without imposing undue restrictions on trade, and the true remedy for the prevention of panics due to such a cause seems to be the periodical and frequent publication of statements of liabilities, etc., with the idea not so much of causing the stronger banks to make any change as of forcing the smaller institutions to come into line with the larger.

All trade involves speculation, and a panic may therefore be caused by a perfectly legitimate miscalculation of the course of future prices, etc. Any method therefore by which future prices, etc., can be more accurately predicted will tend to less trouble on this score, and in this connexion the correlation method brought forward by Professor Karl Pearson and others may be of great use. By this method it is possible to calculate the closeness of the relationship between two sets of figures and to calculate how much of the one corresponds to how much of the other. As an instance, it is pointed out that the increases and decreases in the amount cleared at the London Bankers' Clearing House (per head of the population) can be used to predict to some extent the market rate for money, Sauerbeck's index numbers and the prices of coal and iron of a year afterwards. The prediction is at present not very close, but it can probably be improved.

As regards the money rates, it is pointed out that the market rate for money varies (a) from year to year, being higher in times of good trade and lower in times of depression; (b) within the year, being highest in the autumn and lowest in the summer.

The average rates for the years 1878-1908 in London, Paris, Berlin and for 1884 to 1908 in New York are given, and Paris is shown to have the lowest rate. London and Berlin are much the same, and New York is the highest. The variation in Paris is also the lowest, while London and Berlin are again almost the same. It is pointed out that the rates do not depend so much on the stock of gold kept as on the differences in trade in the different countries and on the fact that in Berlin and Paris gold is sometimes difficult to obtain for export. Any change in the system in use in England is to be deprecated, because extreme money rates tend to either encourage trade in times of slackness or to discourage it in times of speculation.

Within the year it is shown that the variation is the greatest in London, and it is suggested that the extremes might perhaps be reduced by keeping the rate higher in the summer, so as to cause the accumulation of gold for dissipation in the autumn.

It is also suggested that some of the smaller variations in the money rates might be obviated by the Bank of England keeping a stock of foreign bills (as has been suggested by Lord Swaythling and Sir R. H. Inglis Palgrave) by the sale of which it could, in case of need, prevent the temporary withdrawal of gold.

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CHAPTER X

THE FORMATION OF A CENTRAL BUREAU OF INFORMATION ¹

MODERN industry, looked at either from a parochial, a national or an international point of view, seems to be singularly ill-equipped with information, and this is, perhaps, surprising when the large size of many business organizations is remembered. It is true that there are trade journals, often dealing adequately with individual branches of industry, but no attempt is made as a rule to examine the statistics provided, and nowhere are the statistics for industry as a whole considered. We have, of course, Government Departments such as the Board of Trade, but these are handicapped in many ways by being Government Departments, though in other ways they may be in an advantageous position on this account. On the one hand they are often empowered to compel returns to be made to them, and this is, of course, an advantage; but on the other hand they can only issue, as a rule plain, stereotyped statements of fact, and more than this is required. This latter difficulty is got over to some extent by the issue from time to time of papers by departmental officials, such as those by R. H. Hooker and J. C. Stamp, which are models of "trade research." Such research should, however, be permanent and continuous; and, further, it should be under the control of those who have to deal with actual commercial problems, who know what they are and are in a position to make use of the work done.

It might be held that work of this kind is a matter for the State, but in addition to the general undesirability of asking the State to increase the scope of its functions, no commercial organization is likely to make full use of a bureau such as is suggested unless it is, at any rate to some extent, under its own control.

Industry should "help itself" by forming a bureau. This might be undertaken by some such body as the Federation of British Industries, though it would seem to be preferable that it should be formed by one or by a combination of the big banks. The banks deal with the trade of the country as a whole and they are in a position to take a general view of it. They have almost endless information at their disposal from which material could

¹ First published in the *Bankers' Magazine* for March, 1922.

be provided for examination, and combined, they would have a more homogeneous point of view than, for instance, an alliance of organizations of different kinds, such as those which constitute the Federation of British Industries.

With a bureau under their own control it is to be hoped that the individual banks would feel themselves able to disclose to the bureau their "total" figures for different kinds of transactions, so that, for example, the total amount of money spent on foodstuffs at any time could be calculated. The staff of such a bureau would probably not be a nett addition to the staff of the banks, for the work proposed must be done to some extent at the present time by each bank. Duplication thus takes place and this would be avoided, for in place of several independent attempts to arrive at the same "statistic" or "fact," less total time would be concentrated on one attempt and with probably more accurate results. And there can only be one fact! A further concomitant advantage would be that such a bureau, if successful, would probably grow considerably, and as "brains" would certainly be required, some outlet would be provided for some of the intelligence which must exist in large quantities in the banks. Such intelligence is usually difficult to employ in large organizations, for obvious reasons, but the bureau would provide an almost unlimited field for it without "seniority" and other difficulties, for the officials of the bureau need have no executive authority.

The first object of the bureau would be to collect and arrange straightforward information after the manner of the Board of Trade, etc., but accelerating the returns as much as possible and checking them where necessary. Statistics would also be obtained for the chief industries of foreign countries, and it is most important that these should be considered as a whole for each trade, so that an international survey of each trade could be made. The second object would be to examine the statistics obtained by the comparatively new statistical methods discovered by Professor Karl Pearson and others, with a view to discovering relationships, in the nature of cause and effect, and to measure definitely the closeness of such relationships as are already known.

In attempting to discover new relationships by an examination of statistics, the bureau would be adopting, for economic science, the "inductive" method—that of arguing from the particular to the general. At a certain stage in the history of most sciences such a method is useful, and it is particularly applicable to economic and kindred sciences where the causes are so complicated as to baffle the "original" thinker. This method is not usually popular, for it involves doing a great deal of work without following any hypothesis. The work of R. H. Hooker on the connexion between the weather at different periods of the year and the resulting crops is a very good example of the nature and value of this method.

In attempting to measure the value of the "laws" which have been evolved by the deductive method, a method which has, up to the present, been that almost exclusively used in the science of political economy, the work would be complementary to that of the so-called "classical economists" who have evolved "general laws." By the use of the new method it would be possible to state definitely the value of many of the "laws" that have been laid down and we shall be spared the intellectual ignominy of reaching the conclusion frequently that theory and practice do not agree and that one must therefore be wrong.

It is almost superfluous to name the many questions that the business world as a whole requires answering. Many concern the future, and such questions can only be answered by finding out from the statistics of the past what are the relationships that have obtained. The administration of an individual concern cannot have much opportunity as a rule for correctly measuring either the details of the past or those of the world at large and it has usually quite enough to do to concern itself with its own local affairs. And yet the general course of trade in, for instance, the U.S.A., and the probable effect of variations in, for instance, the price level and in the prices of stocks and shares, may cause a complete eclipse of a business, however well managed it may be.

Without a knowledge of the figures from the banks, etc., that could be placed at the disposal of the bureau, it is impossible to state what results would be likely to be obtained. Even without such data, however, results have been obtained, and have been published in recent numbers of this magazine [i.e. *The Bankers Magazine*], which indicate that the results are likely to be extremely valuable from a practical point of view.

APPENDIX I

RATES OF INTEREST ON FLOATING MONEY, AND OF DISCOUNT ON BANK BILLS IN LONDON, AND RATES OF EXCHANGE BETWEEN LONDON AND PARIS AND LONDON AND NEW YORK, FOR INDIVIDUAL MONTHS.

	January.					February.					March.				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
1882	3.5	4.1	4.1	84.5	20.0	5.5	5.5	5.3	90.0	16.0	4.5	4.3	4.0	89.5	27.5
1883	3.0	3.4	3.5	84.3	22.0	3.5	3.3	3.3	86.3	19.0	2.8	2.6	2.6	84.0	21.5
1884	2.0	2.4	2.6	84.8	18.5	1.5	2.8	3.0	88.0	16.0	3.3	3.4	3.5	89.8	24.0
1885	4.0	4.1	3.6	83.8	32.5	3.8	3.5	3.4	85.0	33.0	3.8	3.5	3.1	85.0	37.5
1886	1.5	2.8	3.0	88.8	22.5	.8	1.5	1.9	89.0	17.5	1.0	1.6	1.9	89.1	17.5
1887	2.5	3.4	3.3	85.0	34.5	2.0	2.9	2.9	88.5	36.0	3.3	3.1	3.0	88.0	40.0
1888	1.5	2.0	2.1	86.5	32.0	1.0	1.3	1.9	86.0	24.5	2.0	1.9	2.0	88.3	30.0
1889	2.0	3.1	3.1	89.0	31.0	1.5	2.0	2.3	89.0	27.5	2.5	2.8	2.6	89.5	34.0
1890	4.0	4.3	4.0	84.8	23.8	5.5	4.5	4.0	83.5	30.0	3.0	3.1	3.1	86.0	27.5
1891	3.0	3.8	3.8	84.5	21.3	4.0	2.0	2.4	87.8	21.3	2.0	2.5	2.8	89.0	25.0
1892	1.5	2.8	2.8	85.0	18.9	1.3	2.0	2.4	87.0	17.5	1.5	2.0	2.3	88.0	25.0
1893	.5	1.3	1.8	88.0	14.5	.8	1.4	1.8	87.5	10.0	2.5	1.5	1.8	87.8	20.0
1894	1.0	1.6	2.1	86.3	17.5	1.5	2.1	2.4	87.8	20.0	1.5	1.3	1.5	88.8	18.8
1895	.3	.6	.9	89.0	18.8	.5	.9	1.1	89.5	21.3	.8	1.4	1.4	89.5	25.0
1896	.5	1.1	1.4	89.8	25.0	.5	.9	1.0	88.8	23.8	.5	.8	.9	88.3	23.8
1897	2.5	3.0	3.2	87.0	23.8	1.0	1.8	1.8	87.3	21.3	1.5	1.6	1.6	87.5	20.0
1898	1.5	2.9	2.4	84.8	23.8	2.3	2.6	2.6	85.0	25.0	2.8	2.9	2.6	85.0	30.0
1899	2.0	2.6	2.6	85.3	23.8	1.0	1.9	2.1	86.0	18.8	1.5	2.1	2.1	86.5	22.5
1900	3.5	4.8	4.5	88.6	28.8	2.0	3.6	3.8	88.3	21.3	3.5	3.6	3.6	87.0	20.0
1901	3.0	4.4	4.4	87.0	10.0	3.0	3.8	3.8	88.6	18.8	4.0	3.9	3.8	88.8	22.5
1902	1.5	3.1	3.1	87.4	16.3	2.3	2.8	2.8	87.5	13.8	2.8	2.6	2.6	88.1	17.5
1903	2.0	3.5	3.5	87.5	16.3	3.5	3.6	3.6	87.5	16.3	3.8	3.5	3.4	87.4	17.5
1904	2.5	3.3	3.3	84.6	16.5	1.8	2.9	2.9	85.9	17.5	2.0	3.1	3.1	87.1	17.5
1905	1.8	2.9	2.6	87.6	16.3	2.0	2.5	2.5	88.4	15.0	2.8	2.4	2.1	87.1	21.5
1906	2.0	3.7	3.4	86.0	7.5	4.0	3.8	3.4	87.9	14.5	3.3	3.4	3.0	86.4	15.0
1907	3.0	4.9	4.4	85.4	25.0	3.5	4.6	4.1	85.3	23.0	4.0	4.7	4.4	85.4	29.0
1908	5.0	5.0	4.6	85.9	15.5	3.0	3.8	3.4	87.5	15.5	3.3	3.0	3.0	86.9	18.5
1909	1.8	2.1	2.3	87.5	12.0	2.0	2.3	2.3	87.8	18.5	2.5	2.1	2.0	88.0	23.5
1910	2.5	3.3	3.2	87.3	18.0	2.3	2.5	2.5	86.8	18.3	1.8	2.5	2.8	87.4	18.3
1911	3.3	3.5	3.5	85.6	28.8	3.0	3.4	3.1	86.6	30.0	3.3	2.6	2.4	86.6	29.5
1912	3.0	3.4	3.4	86.9	22.0	3.8	3.4	3.0	88.0	25.5	3.3	3.3	2.9	87.5	24.0
1913	3.8	4.6	4.1	86.1	18.5	4.8	4.8	4.3	88.0	22.3	4.8	4.8	4.3	88.3	24.5
1914	3.5	4.8	4.1	—	—	1.0	1.8	1.9	—	—	2.0	2.4	2.3	—	—

A = rate of interest on floating money for first Friday of month in London, ex *Economist*.

B = rate of discount on 3 months Bank Bills for first Friday of month in London, ex *Economist*.

C = rate of discount on 6 months Bank Bills for first Friday of month in London, ex *Economist*.

D = rate of exchange between London and New York, ex first monthly number of *Economist*, 4 dollars omitted in each case: "Short at interest" up to and including July, 1886; afterwards "cable rate."

E = rate of exchange between London and Paris, ex first monthly number of *Economist*, 25 francs omitted in each case: "short exchange" up to and including June, 1889; afterwards "cheque rate."

APPENDIX I (contd.)

	April.					May.					June.				
	A.	B.	C.	D.	E.	A.	B.	C.	D.	E.	A.	B.	C.	D.	E.
1882	2.3	2.4	2.6	88.5	27.5	2.5	2.8	2.9	89.8	21.0	1.8	2.3	2.5	89.5	15.0
1883	2.5	2.6	2.6	84.5	23.5	2.5	3.0	3.3	85.3	21.0	3.5	3.5	3.6	88.5	29.0
1884	2.0	2.0	2.3	89.5	21.5	1.0	1.3	1.9	89.5	17.0	1.5	2.0	2.4	86.3	20.0
1885	2.0	2.8	2.6	87.5	35.5	.5	2.5	2.9	88.8	35.0	.5	1.0	1.4	88.0	20.0
1886	1.0	1.5	1.9	87.9	16.0	1.8	2.5	2.5	88.6	13.0	1.0	1.5	1.8	89.1	26.5
1887	2.0	1.5	1.5	87.5	31.5	.5	1.0	1.5	88.3	24.5	.5	.9	1.4	86.8	20.0
1888	1.3	1.4	1.8	87.5	24.5	1.5	1.9	2.0	88.8	28.0	1.0	1.6	1.9	89.0	28.5
1889	3.0	1.8	2.0	89.5	25.0	1.3	1.8	2.0	89.3	24.0	.8	1.4	2.0	89.3	18.0
1890	2.0	2.0	2.4	87.7	22.5	1.6	2.0	2.4	87.5	16.3	.8	2.4	2.8	87.0	15.0
1891	2.5	2.3	2.5	88.8	20.0	2.5	3.8	3.8	89.3	28.8	2.5	3.1	3.1	88.8	32.5
1892	.8	1.1	1.5	88.5	18.8	.5	1.0	1.5	88.3	18.8	.5	.9	1.5	88.5	18.8
1893	1.0	1.4	1.6	88.0	15.0	2.0	2.8	2.8	89.0	20.0	2.5	2.5	2.8	90.0	28.8
1894	1.3	1.1	1.3	88.8	20.0	1.0	1.3	1.5	89.3	22.5	.5	.7	1.1	89.0	20.0
1895	.5	.8	1.0	90.0	26.3	.5	.8	.9	89.5	23.8	.3	.6	.9	88.6	23.8
1896	.8	.6	.8	89.0	21.3	.5	1.0	1.0	89.3	17.5	.5	.8	.8	88.8	18.8
1897	1.3	1.3	1.3	87.8	16.3	.5	1.0	1.3	88.3	12.5	.5	.9	1.3	87.5	11.3
1898	2.5	2.9	2.9	84.3	31.3	2.5	3.8	3.6	84.5	32.5	1.3	1.8	2.0	86.3	30.0
1899	1.8	2.4	2.4	86.3	23.8	1.3	2.2	2.3	88.0	21.3	1.5	2.4	2.5	88.8	22.5
1900	3.0	3.8	3.8	87.3	21.3	3.5	4.0	4.0	88.9	18.8	1.5	2.7	2.9	87.6	18.8
1901	3.8	3.8	3.8	89.0	20.0	3.0	3.5	3.5	88.8	17.5	1.5	3.0	3.3	89.3	20.0
1902	2.5	2.6	2.6	88.3	18.8	2.5	2.8	2.8	88.5	20.0	2.5	2.7	2.8	87.9	25.0
1903	3.3	3.4	3.4	87.5	18.8	3.5	3.4	3.4	88.3	18.8	2.3	3.1	3.1	88.5	20.0
1904	2.5	2.6	2.8	87.8	14.0	1.0	2.1	2.4	87.1	11.0	1.5	2.1	2.2	87.6	14.5
1905	1.0	2.0	2.1	86.0	18.0	2.0	2.3	2.4	86.9	15.5	1.0	2.1	2.1	85.0	18.0
1906	2.0	2.9	2.9	85.4	11.5	3.5	3.8	3.8	84.4	15.5	3.0	3.4	3.4	85.6	19.5
1907	3.0	4.4	4.4	85.5	28.0	2.0	3.0	3.0	86.3	18.0	3.0	3.6	3.8	87.3	18.0
1908	2.5	2.4	2.5	86.8	13.5	2.6	2.6	2.8	87.3	13.0	1.0	1.3	1.8	87.3	11.5
1909	1.8	1.6	1.6	87.8	17.5	.8	1.3	1.5	87.5	15.3	1.5	1.8	2.1	88.1	18.8
1910	3.8	3.7	3.5	88.1	23.0	3.0	3.4	3.3	87.0	24.5	3.5	3.3	3.3	87.3	27.0
1911	2.8	2.4	2.4	86.3	30.0	1.8	2.3	2.3	86.8	30.3	1.8	2.1	2.5	86.5	29.0
1912	3.3	3.4	3.3	87.3	23.0	2.8	3.0	3.0	87.1	23.0	2.5	2.8	3.3	87.5	24.0
1913	4.0	4.3	4.1	87.8	25.3	3.3	3.9	3.9	86.8	20.3	3.5	4.1	4.5	87.1	23.0
1914	1.8	1.8	1.9	—	—	2.0	2.5	2.8	—	—	2.5	2.7	3.1	—	—

APPENDIX III

SAUERBECK'S INDEX NUMBERS FOR INDIVIDUAL COMMODITIES
AND GROUPS, EXPRESSED AS PERCENTAGES OF HIS GENERAL
INDEX NUMBERS FOR EACH YEAR AS PUBLISHED IN THE JOURNAL
OF THE ROYAL STATISTICAL SOCIETY AND THE 'STATIST':

Calculations made on Slide Rule.

	Vegetable food group.	Animal food group.	Sundry food group.	Minerals group.	Textiles group.	Sundry Materials group.	Wheat, American.	Wheat, English.	Flour.	Oats.
1850 . .	96	87	114	100	101	104	96	96	104	82
1 . .	97	91	114	101	100	105	95	95	104	96
2 . .	103	89	96	103	100	108	96	96	109	94
3 . .	105	86	92	110	92	106	102	102	119	85
4 . .	118	85	83	113	86	107	131	131	138	105
5 . .	119	86	88	108	83	108	136	136	147	105
6 . .	108	87	97	109	88	108	126	126	134	96
7 . .	100	85	114	103	88	113	98	98	106	92
8 . .	96	91	107	105	92	112	89	89	96	103
9 . .	91	91	109	104	94	114	85	85	95	95
1860 . .	100	92	108	98	91	112	99	99	105	95
1 . .	104	93	98	93	94	111	104	104	115	93
2 . .	97	85	98	90	123	105	101	101	101	86
3 . .	85	83	96	91	145	98	80	80	87	80
4 . .	75	85	101	91	155	93	71	71	79	73
5 . .	83	96	96	90	133	96	75	75	84	83
6 . .	93	94	92	88	127	97	89	89	96	92
7 . .	115	89	94	87	110	100	118	118	126	100
8 . .	114	89	97	86	108	103	118	118	118	109
9 . .	93	98	100	92	112	102	91	91	89	102
1870 . .	92	102	99	93	110	103	90	90	93	92
1 . .	94	100	100	93	103	105	100	104	96	97
2 . .	93	93	96	116	105	99	96	96	94	82
3 . .	96	98	97	127	93	96	102	97	94	88
4 . .	103	101	103	114	92	94	100	100	100	100
5 . .	97	113	104	105	92	96	90	86	91	115
6 . .	97	114	103	95	90	100	91	90	94	107
7 . .	106	108	110	90	90	100	104	111	104	106
8 . .	109	116	103	85	90	101	99	98	96	108
9 . .	105	114	105	88	89	103	104	97	94	101
1880 . .	101	115	100	90	92	101	104	92	97	101
1 . .	99	119	99	91	91	101	110	98	103	99
2 . .	100	124	91	94	88	101	104	99	104	100
3 . .	100	126	94	93	86	103	98	93	95	100
4 . .	93	128	83	90	90	107	86	86	86	103
5 . .	95	122	87	92	90	106	86	84	88	110

APPENDIX III

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APPENDIX III (contd.)

	Vegetable food group.	Animal food group.	Sundry food group.	Minerals group.	Textiles group.	Sundry Materials group.	Wheat, American.	Wheat, English.	Flour.	Oats.
1886 . .	94	126	87	97	91	100	90	83	89	106
7 . .	96	116	99	103	96	99	90	88	90	93
8 . .	96	117	93	112	91	96	94	83	93	92
9 . .	90	120	104	104	97	95	88	76	88	96
1890 . .	90	114	99	111	92	96	88	82	88	100
1 . .	104	113	99	106	82	96	99	94	100	107
2 . .	97	124	103	104	84	99	87	82	90	112
3 . .	87	125	110	100	87	100	74	71	79	106
4 . .	87	127	103	102	84	102	67	65	76	105
5 . .	87	126	100	100	84	105	74	68	81	90
6 . .	87	120	97	103	89	103	85	79	89	94
7 . .	97	127	84	107	82	100	100	89	105	105
8 . .	105	120	80	109	80	99	103	97	113	111
9 . .	88	116	78	135	85	96	79	69	85	96
1900 . .	83	114	72	144	88	92	75	65	80	91
1 . .	89	122	66	127	86	102	77	70	83	102
2 . .	91	126	59	119	89	103	78	75	81	113
3 . .	90	122	64	119	96	100	80	71	86	96
4 . .	90	119	71	118	101	96	86	74	89	90
5 . .	88	121	72	121	100	95	85	76	86	93
6 . .	81	116	60	131	104	96	75	68	75	91
7 . .	86	110	60	134	96	98	80	70	79	90
8 . .	96	122	66	122	85	100	92	81	95	95
9 . .	96	120	68	116	88	103	100	92	102	99
1910 . .	83	123	69	114	94	104	83	74	86	86
1 . .	88	113	76	116	95	101	79	73	79	90
2 . .	92	113	73	129	89	97	80	75	82	98
3 . .	81	116	64	131	99	98	77	68	78	86
4 . .	88	118	68	117	95	103	85	75	86	95
5 . .	100	117	65	117	85	101	99	92	98	109
6 . .	98	112	63	116	95	100	89	79	84	94
7 . .	101	110	64	98	110	100	85	79	73	114
8 . .	88	108	68	100	116	105	73	70	53	99
9 . .	87	104	71	107	111	106	65	65	50	98
1920 . .	91	104	79	118	104	97	66	59	57	88
1 . .	92	141	54	117	90	94	85	86	90	85
2 . .	82	141	63	109	102	95	73	67	76	86
3 . .	76	126	78	120	109	91	65	60	67	80
4 . .	86	114	76	114	122	87	67	65	68	76

APPENDIX III (contd.)

	Barley.	Maize.	Rice.	Po- tatoes.	Beef, prime.	Mutton, prime.	Bacon.	Pork.	Butter.	Tea.	Sugar.	Coffee.
1850 . .	78	112	111	95	79	88	86	103	86	121	130	90
1 . .	85	115	107	80	84	94	92	103	93	117	134	79
2 . .	94	114	116	99	81	90	94	94	90	92	112	78
3 . .	90	114	113	121	80	91	90	92	84	99	101	72
4 . .	90	130	120	101	83	84	89	92	80	93	85	69
5 . .	88	131	129	80	84	83	91	91	84	83	103	65
6 . .	104	107	99	72	80	83	95	95	91	82	121	68
7 . .	103	109	97	94	77	82	91	95	89	103	141	74
8 . .	98	111	83	93	88	89	88	93	103	108	114	77
9 . .	90	101	91	82	86	90	85	96	98	128	106	84
1860 . .	95	109	103	95	86	90	93	105	91	127	105	87
1 . .	94	116	107	101	85	89	97	106	92	106	98	84
2 . .	89	94	104	102	77	83	87	99	89	115	86	92
3 . .	85	87	107	75	78	84	83	89	84	108	89	96
4 . .	73	85	91	61	81	83	84	90	83	97	108	92
5 . .	75	91	106	72	89	101	92	105	92	106	95	89
6 . .	94	96	118	71	88	95	97	102	88	106	90	83
7 . .	103	126	117	111	88	87	84	87	93	106	94	79
8 . .	111	121	111	108	86	92	90	88	102	119	96	73
9 . .	103	97	97	75	95	94	105	108	94	111	105	77
1870 . .	93	96	99	80	99	96	104	113	103	108	103	75
1 . .	92	101	98	68	102	100	85	98	104	99	109	81
2 . .	88	82	92	110	92	97	89	88	87	92	102	92
3 . .	94	83	86	124	99	102	98	94	88	92	91	113
4 . .	113	115	98	88	103	96	106	102	105	99	95	127
5 . .	102	110	86	94	114	118	113	115	105	102	94	128
6 . .	95	87	95	121	111	120	115	119	114	95	99	124
7 . .	109	89	106	118	111	116	108	104	109	86	113	126
8 . .	119	89	115	152	120	124	115	110	113	91	101	122
9 . .	105	88	116	134	112	123	117	111	104	99	104	117
1880 . .	97	90	104	126	112	119	117	121	114	89	101	110
1 . .	96	100	98	86	112	128	121	123	115	78	108	99
2 . .	95	113	88	96	122	136	119	117	119	70	104	81
3 . .	100	104	99	110	127	142	118	115	120	73	103	94
4 . .	104	103	101	84	129	134	125	121	126	82	74	96
5 . .	107	99	97	89	122	124	128	121	124	89	82	90
6 . .	99	94	96	100	120	142	132	126	116	93	73	106
7 . .	96	96	100	107	107	122	121	122	121	78	77	166

APPENDIX III

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APPENDIX III (contd.)

	Barley.	Maize.	Rice.	Po- tatoes.	Beef, prime.	Mutton, prime.	Bacon	Pork.	Butter ^{no}	Tea.	Sugar.	Coffee.
1888 . .	102	103	102	99	116	132	117	110	114	71	82	137
9 . .	92	85	100	96	111	139	124	115	114	70	96	159
1890 . .	102	85	100	83	111	131	117	113	111	71	75	171
1 . .	100	119	110	110	111	117	118	104	118	78	79	164
2 . .	99	99	113	88	118	124	135	135	127	75	85	166
3 . .	97	90	91	83	119	124	135	141	125	78	91	181
4 . .	100	97	92	95	127	138	127	135	124	75	76	186
5 . .	90	97	89	110	129	149	118	114	119	76	69	185
6 . .	97	76	102	77	125	138	112	110	128	76	75	164
7 . .	97	73	108	98	129	140	129	137	121	73	63	139
8 . .	109	86	113	109	122	131	122	136	119	72	63	122
9 . .	97	81	106	88	122	127	102	113	121	74	65	110
1900 . .	85	83	97	89	115	125	108	113	109	65	61	99
1 . .	93	97	94	96	119	123	122	134	120	57	54	96
2 . .	96	112	90	86	134	126	123	134	119	55	44	93
3 . .	86	97	104	104	117	133	118	123	116	59	52	91
4 . .	81	94	94	110	116	134	110	107	117	61	63	103
5 . .	86	99	93	78	111	131	122	122	120	56	65	103
6 . .	81	88	95	74	104	124	114	122	114	52	47	95
7 . .	80	94	103	94	104	119	106	109	108	59	49	84
8 . .	90	113	104	95	121	126	115	114	125	63	59	85
9 . .	93	115	96	76	119	112	130	126	130	64	61	91
1910 . .	76	94	92	80	118	118	130	134	117	62	65	92
1 . .	88	98	103	93	109	109	112	110	112	63	65	116
2 . .	93	100	119	87	112	111	109	113	115	59	58	120
3 . .	82	86	97	79	109	117	122	124	112	57	45	104
4 . .	82	106	107	72	113	120	120	111	113	62	59	95
5 . .	89	119	122	74	113	110	117	128	105	64	62	73
6 . .	97	120	123	96	102	109	109	124	113	50	74	62
7 . .	95	127	144	91	101	104	114	121	99	67	69	57
8 . .	79	126	136	64	91	91	128	129	103	71	66	67
9 . .	94	117	125	83	89	88	125	120	98	51	75	85
1920 . .	92	111	167	82	84	92	129	129	96	37	105	69
1 . .	90	76	119	109	126	134	156	151	129	36	52	77
2 . .	79	73	113	85	115	152	149	148	124	63	47	98
3 . .	67	86	115	67	104	141	119	133	116	78	81	86
4 . .	86	88	120	115	100	127	103	97	122	69	67	104

APPENDIX III
APPENDIX III (contd.)

	Coal, export.	Coal, home.	Pig iron.	Iron bars.	Lead.	Copper	Tin.	Cotton	Flax.	Silk.	Wool, merino	Wool, English.
1850 . .	81	100	83	92	113	135	96	101	113	108	103	73
1 . .	80	97	77	89	112	139	104	81	128	104	105	84
2 . .	77	96	83	98	112	153	104	76	126	100	118	87
3 . .	68	105	95	118	123	148	114	67	105	82	100	85
4 . .	77	105	113	119	115	151	109	59	117	68	84	77
5 . .	78	99	102	102	114	152	109	62	105	68	91	65
6 . .	76	83	104	107	121	143	126	69	91	95	108	80
7 . .	72	80	95	95	112	144	122	82	71	99	106	99
8 . .	82	90	87	94	120	144	123	84	106	91	119	76
9 . .	80	89	80	87	107	139	136	80	115	97	119	100
1860 . .	73	94	79	80	109	128	126	70	105	101	117	103.
1 . .	75	93	73	75	102	121	115	97	102	89	106	101
2 . .	71	81	77	75	100	115	110	190	116	90	103	103
3 . .	70	80	79	83	98	112	111	250	109	88	102	111
4 . .	72	87	79	95	97	113	94	292	105	91	105	132
5 . .	76	90	78	93	97	110	84	209	107	116	106	129
6 . .	80	87	86	86	98	106	77	169	113	120	111	117
7 . .	83	91	78	82	96	95	83	121	102	117	101	95
8 . .	81	85	78	78	95	94	91	118	108	110	93	89
9 . .	79	86	80	84	96	94	122	137	107	115	81	94
1870 . .	80	88	82	93	94	91	124	115	106	127	82	89
1 . .	79	87	85	92	89	92	128	95	92	117	100	108
2 . .	117	106	136	122	91	114	127	107	95	104	114	119
3 . .	150	131	153	137	105	101	114	90	87	86	106	112
4 . .	135	112	125	122	107	103	91	87	90	73	111	103
5 . .	111	114	99	105	115	113	83	85	104	71	109	104
6 . .	92	100	90	93	113	106	74	73	105	96	99	93
7 . .	86	97	84	87	106	97	69	75	100	93	100	82
8 . .	87	94	81	78	93	95	67	76	97	83	107	87
9 . .	84	99	83	84	89	93	83	84	88	83	106	76
1880 . .	82	80	90	93	91	96	96	88	90	74	117	88
1 . .	85	91	84	82	87	98	105	84	82	80	108	74
2 . .	87	92	85	91	85	105	115	88	76	81	110	68
3 . .	92	100	84	85	77	103	109	78	79	83	109	62
4 . .	98	99	80	82	72	95	103	88	84	83	112	67
5 . .	100	104	84	82	79	79	115	86	102	76	102	69
6 . .	99	106	84	81	94	77	135	83	109	87	102	74
7 . .	99	107	90	82	93	87	157	91	100	93	106	80

APPENDIX III (contd.)

	Coal, export.	Coal, home.	Pig iron.	Iron bars.	Lead.	Copper.	Tin.	Cotton	Flax	Silk.	Wool, merino.	Wool, English.
1888 . .	96	107	83	84	97	154	158	89	87	82	103	76
9 . .	114	111	96	106	88	95	124	92	83	82	114	78
1890 . .	140	119	100	107	90	100	125	93	78	85	106	78
1 . .	135	119	95	95	85	95	121	72	79	79	97	68
2 . .	129	124	90	97	77	88	131	68	84	78	90	65
3 . .	118	130	90	90	71	87	119	75	103	80	88	77
4 . .	134	119	99	94	75	84	103	67	110	68	87	81
5 . .	121	110	103	95	84	92	97	69	92	69	92	98
6 . .	117	112	112	100	92	103	94	79	92	76	102	95
7 . .	116	116	107	103	100	105	95	69	89	73	95	79
8 . .	124	119	106	105	102	108	108	58	81	72	100	69
9 . .	127	124	135	130	110	146	172	59	75	84	122	62
1900 . .	179	143	134	145	112	129	171	81	92	76	101	53
1 . .	159	130	112	113	89	126	160	76	117	66	89	50
2 . .	142	122	115	107	80	103	167	78	107	70	104	46
3 . .	136	109	110	110	83	112	175	97	104	86	113	54
4 . .	127	106	106	106	86	113	173	104	113	77	110	73
5 . .	117	97	111	110	97	129	189	79	99	76	117	88
6 . .	113	98	112	114	110	152	224	86	96	78	113	88
7 . .	127	113	115	114	119	145	205	91	85	83	110	78
8 . .	140	112	112	112	93	110	174	88	77	63	104	59
9 . .	122	108	110	107	89	107	174	95	87	57	118	62
1910 . .	121	100	105	101	83	98	190	114	99	58	115	65
1 . .	114	101	98	96	88	94	228	98	108	59	104	64
2 . .	120	117	112	105	105	114	235	85	97	54	101	62
3 . .	132	115	113	111	109	107	224	92	94	56	104	74
4 . .	128	114	99	100	112	93	169	84	89	55	106	75
5 . .	126	130	98	118	108	90	145	60	124	40	96	82
6 . .	145	92	100	122	117	113	127	74	127	52	117	74
7 . .	124	72	82	95	90	95	130	104	161	54	125	61
8 . .	128	80	79	89	82	80	164	129	153	58	115	49
9 . .	180	100	106	114	70	60	119	106	152	55	153	55
1920 . .	254	58	131	136	78	52	115	103	197	67	143	44
1 . .	180	95	153	150	76	59	105	67	159	74	91	28
2 . .	147	119	113	104	94	64	117	102	146	96	137	37
3 . .	156	114	130	112	108	68	152	131	139	82	160	47
4 . .	135	90	103	109	126	60	172	131	172	74	183	69

APPENDIX III (contd.)

	Hemp.	Jute.	Hides	Leather	Timber.	Indigo.	Soda.	Nitrate.	Tallow	Palm Oil	Linseed Oil.	Olive Oil.
1850 . .	105	109	69	77	120	95	—	135	107	100	117	112
1 . . .	125	91	85	83	134	69	—	136	112	96	123	107
2 . . .	109	108	78	76	160	87	—	135	112	95	109	123
3 . . .	109	122	75	81	140	71	—	136	122	100	96	135
4 . . .	142	93	80	82	140	62	—	119	142	121	110	108
5 . . .	117	99	91	83	135	72	—	127	112	112	122	107
6 . . .	100	94	116	90	124	78	—	124	118	107	109	103
7 . . .	81	86	129	114	104	86	—	139	124	110	112	107
8 . . .	80	93	122	104	108	99	—	133	130	110	107	101
9 . . .	73	89	128	104	117	86	—	123	134	122	97	104
1860 . .	70	85	122	109	120	91	—	106	127	119	96	117
1 . . .	71	94	108	96	119	121	—	98	123	117	103	116
2 . . .	78	109	97	90	116	99	—	99	105	109	117	111
3 . . .	84	138	84	88	110	84	—	101	95	92	121	107
4 . . .	83	128	80	84	108	76	—	107	89	83	109	109
5 . . .	80	102	79	87	108	89	—	101	99	94	111	101
6 . . .	101	114	78	89	99	92	—	87	100	106	112	112
7 . . .	110	103	79	88	96	102	103	86	99	105	118	124
8 . . .	113	102	88	92	98	116	93	97	104	104	107	133
9 . . .	110	102	86	93	103	121	84	114	105	107	103	106
1870 . .	118	122	91	95	107	115	89	121	103	104	107	106
1 . . .	105	124	96	94	89	124	125	116	101	97	107	98
2 . . .	99	99	103	100	86	86	139	105	95	92	100	88
3 . . .	91	86	108	103	100	83	98	99	87	87	95	78
4 . . .	90	93	113	107	111	95	90	86	90	90	92	82
5 . . .	89	91	114	113	103	82	86	92	106	96	89	90
6 . . .	91	92	98	111	105	96	92	87	106	102	87	97
7 . . .	86	98	108	106	107	80	83	107	100	110	98	104
8 . . .	79	104	108	106	100	87	88	123	97	112	98	113
9 . . .	81	105	111	110	90	104	89	129	99	105	108	111
1880 . .	77	113	119	110	101	114	91	126	98	93	102	93
1 . . .	101	115	118	112	105	109	84	123	105	97	100	90
2 . . .	107	94	119	112	108	107	82	113	128	107	89	88
3 . . .	112	92	122	115	107	105	88	98	126	128	83	88
4 . . .	113	94	132	124	108	109	94	90	124	121	91	105
5 . . .	114	88	132	131	112	100	83	104	106	107	102	108
6 . . .	107	88	123	136	110	100	77	103	91	89	100	110
7 . . .	119	94	130	138	103	97	80	100	90	82	96	100

APPENDIX III (contd.)

	Hemp.	Jute.	Hides.	Leather	Timber.	Indigo.	Soda.	Nitrate.	Tallow	Palm Oil.	Linseed Oil.	Olive Oil.
1888 . .	116	100	104	124	106	94	74	102	102	80	90	103
9 . .	135	110	97	117	117	86	77	95	100	89	96	97
1890 . .	114	97	97	113	110	82	92	85	99	96	102	114
1 . .	100	95	92	113	103	92	97	88	104	93	97	119
2 . .	99	116	93	119	109	91	106	93	118	90	94	106
3 . .	94	100	96	119	105	112	91	97	128	106	102	106
4 . .	94	105	102	124	111	110	73	105	130	100	103	111
5 . .	90	94	136	136	111	95	68	95	128	95	103	116
6 . .	90	105	126	138	121	87	76	94	126	92	92	99
7 . .	86	94	121	136	124	89	90	89	108	91	86	100
8 . .	105	91	128	131	122	75	92	86	108	92	92	100
9 . .	128	97	125	124	115	71	90	81	82	94	99	97
1900 . .	115	100	120	116	113	64	89	76	81	95	126	96
1 . .	117	96	120	124	114	67	102	92	89	96	132	109
2 . .	131	93	126	126	114	65	102	102	104	103	126	99
3 . .	116	103	132	126	119	65	102	102	94	104	97	96
4 . .	122	106	134	125	109	57	100	104	84	102	77	92
5 . .	122	135	132	117	108	56	98	110	82	96	88	100
6 . .	121	161	134	122	108	53	91	104	88	101	92	101
7 . .	106	139	131	121	106	56	88	100	96	106	94	107
8 . .	92	112	123	125	107	63	90	103	93	97	103	118
9 . .	91	92	135	126	104	61	89	99	92	100	111	135
1910 . .	87	100	136	123	105	55	85	90	101	115	149	121
1 . .	85	134	133	124	104	51	78	89	93	110	156	125
2 . .	95	131	134	119	105	45	68	94	86	100	125	113
3 . .	105	165	156	132	106	45	61	96	89	106	92	117
4 . .	105	168	164	139	109	94	61	92	82	99	96	119
5 . .	120	103	138	134	124	170	49	83	75	82	90	96
6 . .	119	120	128	118	149	135	63	94	77	84	99	88
7 . .	139	118	129	114	154	81	56	102	79	68	107	137
8 . .	177	108	114	98	173	65	47	101	95	60	113	27
9 . .	128	128	125	108	158	61	62	86	95	86	125	7
1920 . .	108	94	103	132	133	80	65	70	67	71	108	
1 . .	154	94	79	132	129	102	98	87	52	61	75	
2 . .	89	124	87	133	109	98	102	78	59	68	c	
3 . .	90	106	88	123	122	80	87	74	63	72	I	
4 . .	115	120	86	117	109	60	80	70	68	74		

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RESTORATION OF THE WORLD'S CURRENCIES

By R. A. LEHFELDT, D.Sc., Professor of Economics in the University of the Witwatersrand, Johannesburg; Author of "Gold Prices and the Witwatersrand." Demy, 8vo. 160 pp. Cloth, 6s.

Times Literary Supplement: "It preserves a studious impartiality, and is marked throughout by wide reading and observation, as by sound and careful thought and reasoning."

RUSSIAN CURRENCY AND BANKING, 1914-1924

By S. S. KATZENELLENBAUM, Professor of Economics in the First State University of Moscow, Member of the Board of Directors of the State Bank of the Union of Soviet Socialist Republics. Demy 8vo. 198 pp. Cloth, 9s.

18. Publishing this treatise in English a double aim is kept in view. On the one hand, it is desired to make the British public best with the changes that have taken place in the last few years in the currency and credit system in Russia, on the other, to make known to those interested in theoretical problems the views of the author regarding the laws governing the issue of paper currency.

1st News: "He has treated his subject with a scientific mind, and deserves, therefore, the attention of all interested in the economic experiment of history of which Russia has been and is the scene."

P. S. KING & SON, LTD.

1 CHARD HOUSE, GREAT SMITH STREET, S.W.1

APPENDIX IV: CHART 4

Sauerbeck's index number for MINERALS as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

General index number for 1924 = 139
 Minerals group " " = 158

Average of 1867-77 = 100 in both cases

%

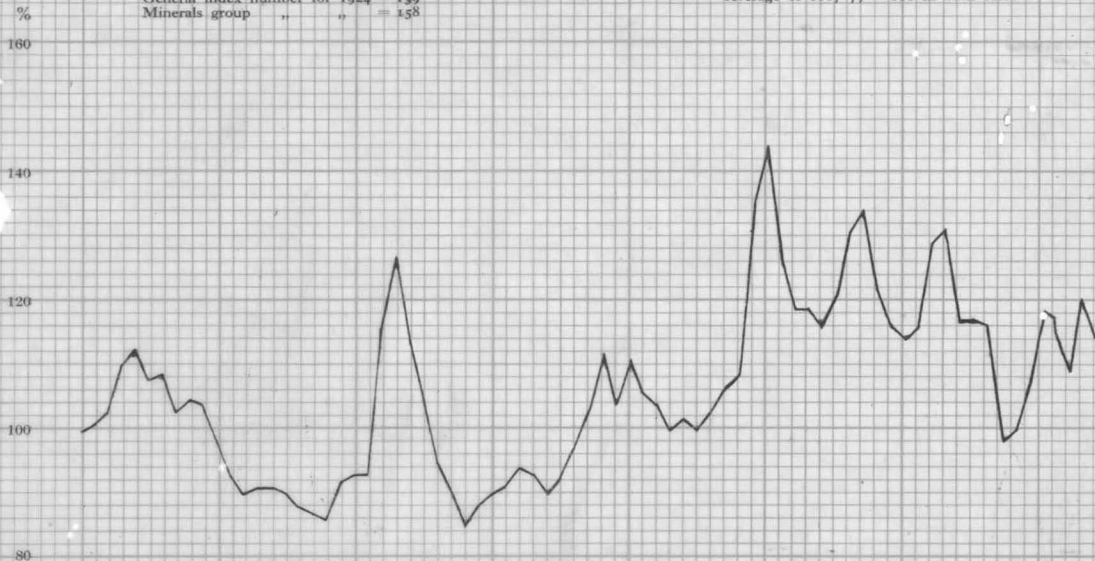
160

140

120

100

80



APPENDIX IV: CHART 5

Sauerbeck's index number for SUNNY MARYLAND'S as % of his general index number

Sauerbeck's index number for TEXTILES as % of his general index number

1850
1850

'60

'70

'80

'90

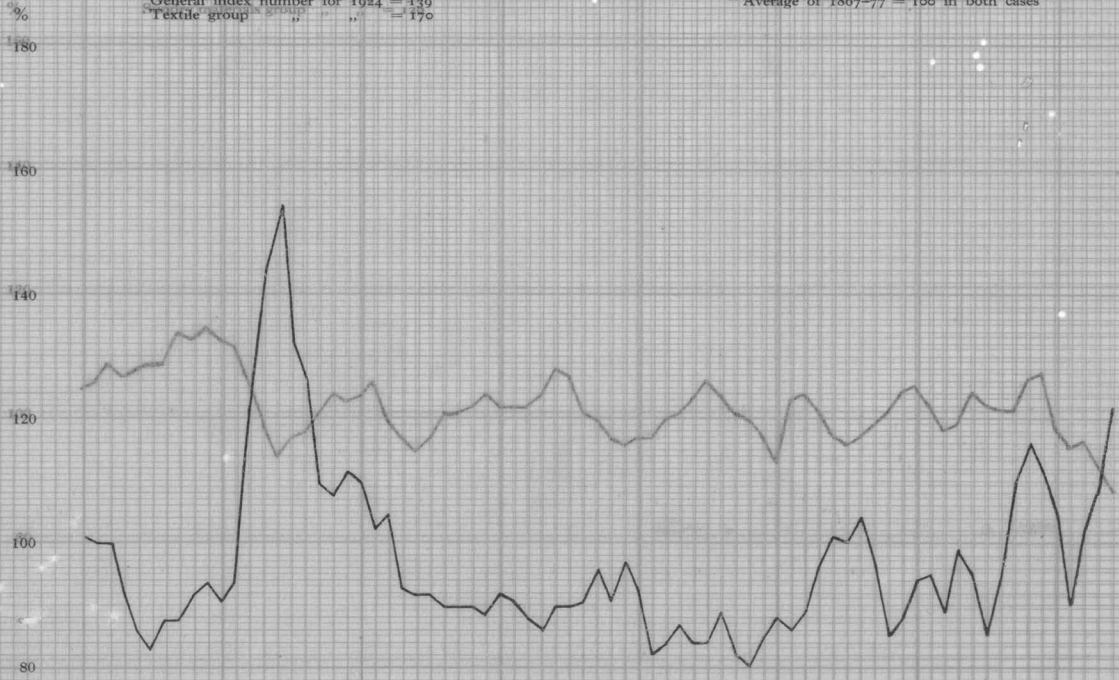
1900

'10

'20

General index number for 1924 = 139
 Textile group " " = 170

Average of 1867-77 = 100 in both cases



APPENDIX IV : CHART 6

Sauerbeck's index number for **SUNDRY MATERIALS** as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

General index number for 1924 = 139
 Sundry materials group " " = 120

Average of 1867-77 = 100 in both cases.

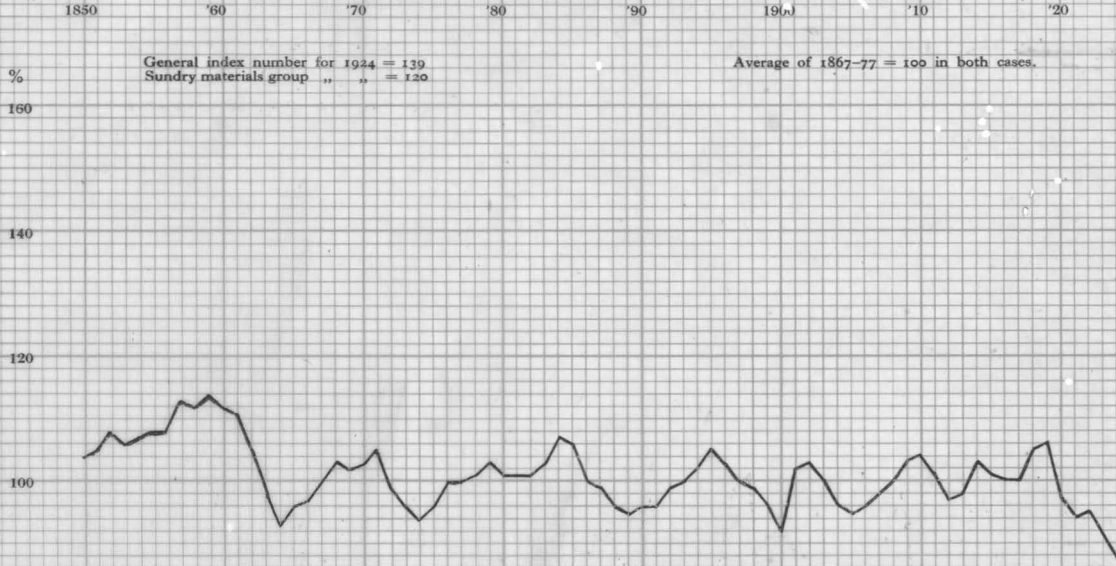
%

160

140

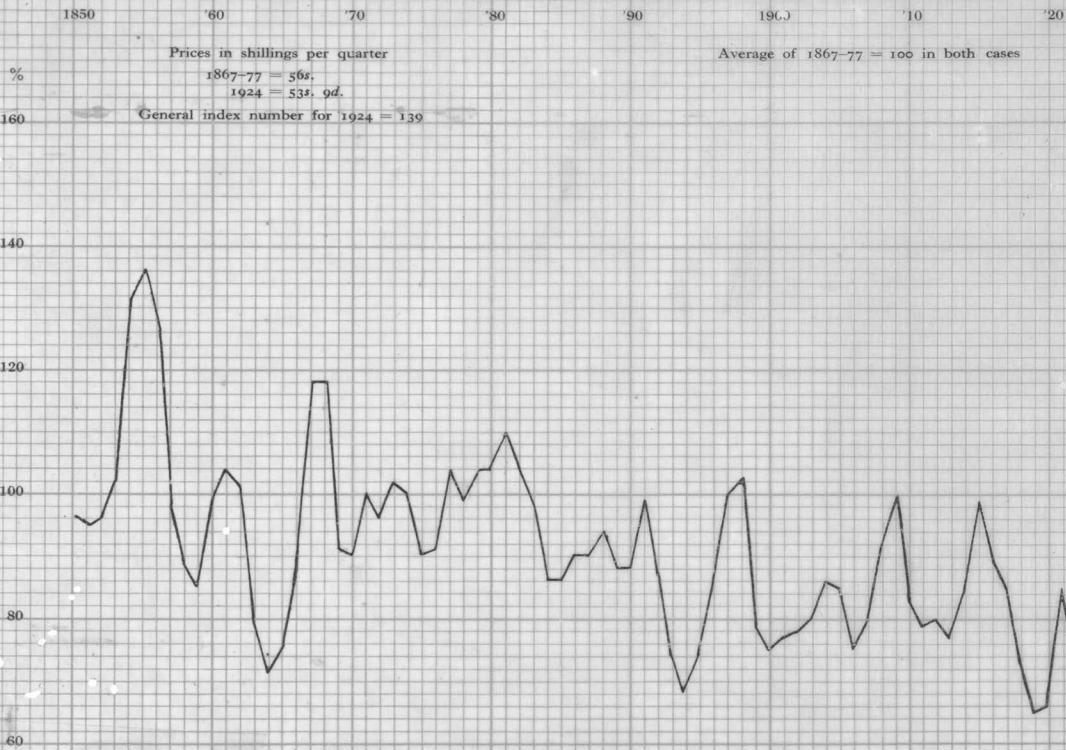
120

80



APPENDIX IV: CHART 7

Sauerbeck's index number for AMERICAN WHEAT as % of his general index number



APPENDIX IV: CHART 8

Sauerbeck's index number for OATS as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = English Gazette in shillings per quarter

Average of 1867-77 = 100 in both cases

%

1867-77 = 26s.

1924 = 27s. 2d.

General index number for 1924 = 139

160

140

120

100

80

60

1850

1855

1860

1865

1870

1875

1880

1885

1890

1895

1900

1905

1910

1915

1920

1925

1930

1935

1940

1945

1950

1955

1960

1965

1970

1975

1980

1985

1990

1995

2000

2005

2010

2015

2020

2025

2030

2035

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2045

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2095

2100

2105

2110

2115

2120

2125

2130

2135

2140

2145

2150

2155

2160

2165

2170

2175

2180

2185

2190

2195

2200

2205

2210

2215

2220

2225

2230

2235

2240

2245

2250

2255

2260

2265

2270

2275

2280

2285

2290

2295

2300

2305

2310

2315

2320

2325

2330

2335

2340

2345

2350

2355

2360

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2370

2375

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2385

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2505

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2575

2580

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2590

2595

2600

2605

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2620

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2635

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2645

2650

2655

2660

2665

2670

2675

2680

2685

2690

2695

2700

2705

2710

2715

2720

2725

2730

2735

2740

2745

2750

2755

2760

2765

2770

2775

2780

2785

2790

2795

2800

2805

2810

2815

2820

2825

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2850

2855

2860

2865

2870

2875

2880

2885

2890

2895

2900

2905

2910

2915

2920

2925

2930

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2950

2955

2960

2965

2970

2975

2980

2985

2990

2995

3000

3005

3010

3015

3020

3025

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3055

3060

3065

3070

3075

3080

3085

3090

3095

3100

3105

3110

3115

3120

3125

3130

3135

3140

3145

3150

3155

3160

3165

3170

3175

3180

3185

3190

3195

3200

3205

3210

3215

3220

3225

3230

3235

3240

3245

3250

3255

3260

3265

3270

3275

3280

3285

3290

3295

3300

3305

3310

3315

3320

3325

3330

3335

3340

3345

3350

3355

3360

3365

3370

3375

3380

3385

3390

3395

3400

3405

3410

3415

3420

3425

3430

3435

3440

3445

3450

3455

3460

3465

3470

3475

3480

3485

3490

3495

3500

3505

3510

3515

3520

3525

3530

APPENDIX IV: CHART 9

Sauerbeck's index number for BARLEY as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

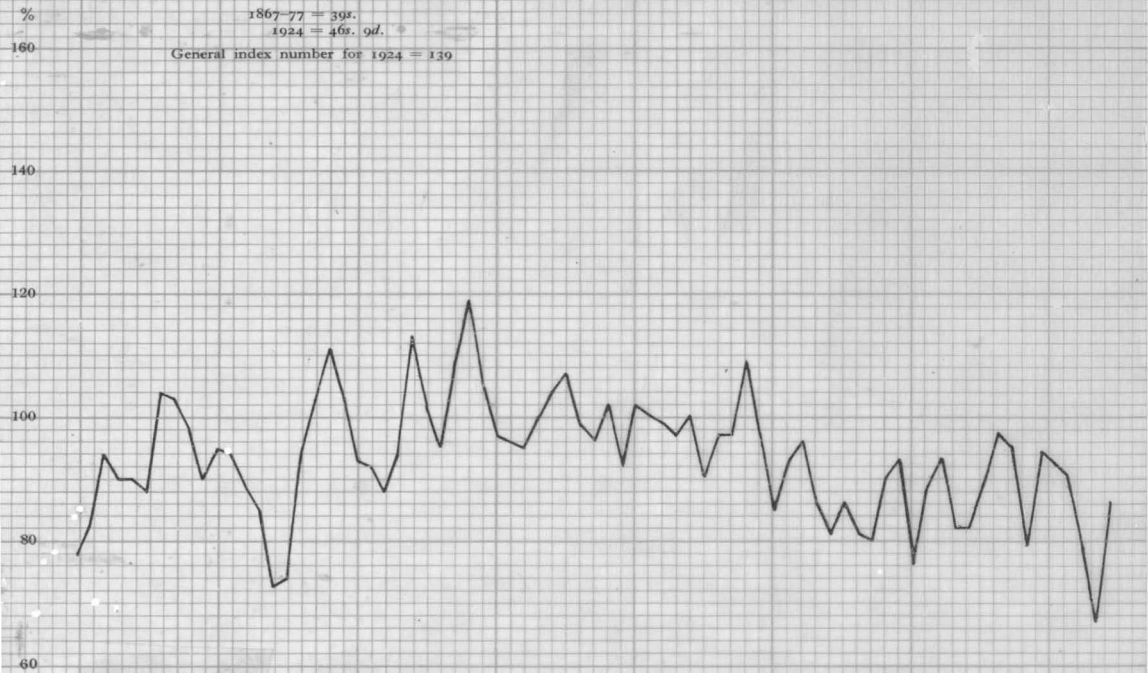
Prices taken = *English Gazette* prices in shillings per quarter

Average of 1867-77 = 100 in both cases

1867-77 = 39s.

1924 = 46s. 9d.

General index number for 1924 = 139



APPENDIX IV : CHART 10

Sauerbeck's index number for MAIZE as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = American Mixed (La Plata for 1924) in shillings per quarter

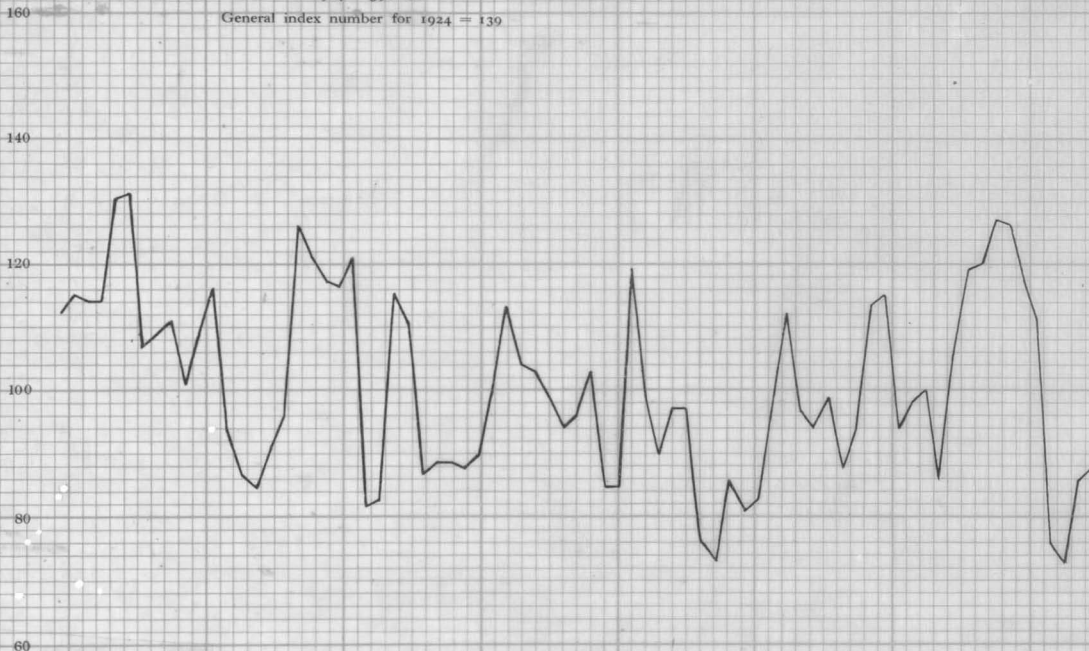
Average of 1867-77 = 100 in both cases

%

1867-77 = 32s. 6d.

1924 = 39s. 8d.

General index number for 1924 = 139



APPENDIX IV : CHART 11

Sauerbeck's index number for RICE as $\frac{9}{10}$ of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices taken = those of Rangoon cargoes to arrive in shillings per cwt.

Average of 1867-77 = 100 in both cases

1867-77 = 100.

1924 = 165. 0d.

General index number for 1924 = 139

%

180

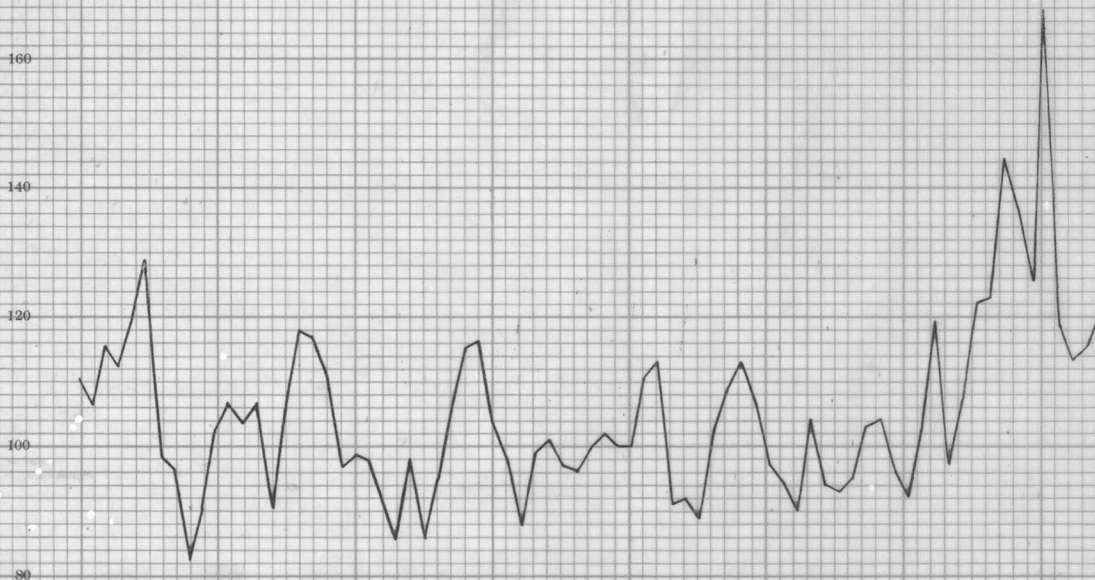
160

140

120

100

80



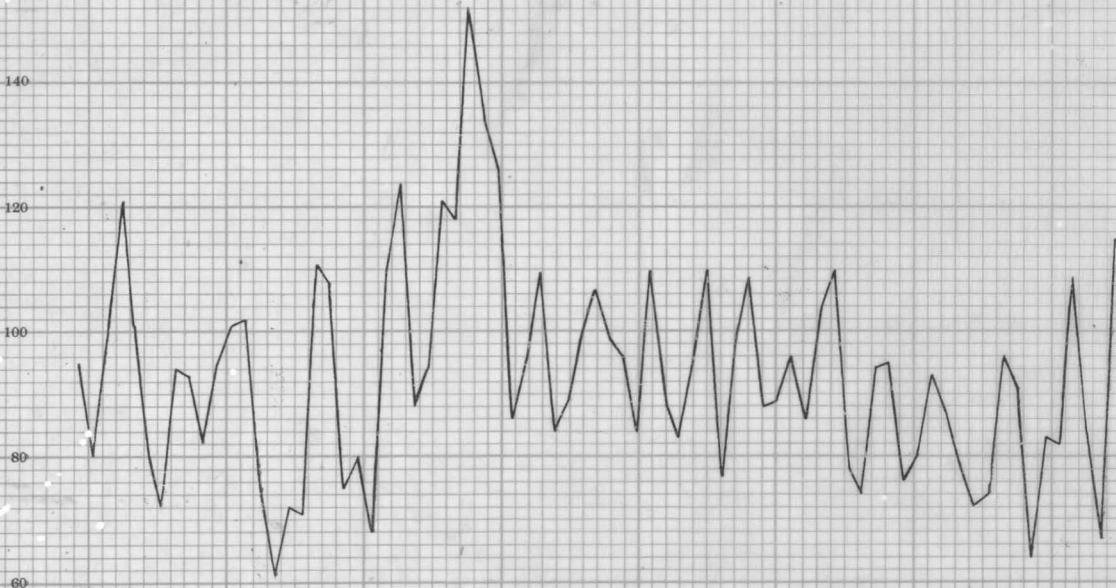
Sauerbeck's index number for POTATOES as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = those of Good English in shillings per ton.

Average of 1867-77 = 100 in both cases

%
1867-77 = 117s.
1924 = 186s.
General index number for 1924 = 139



APPENDIX IV: CHART 13

Sauerbeck's index number for BEEF as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

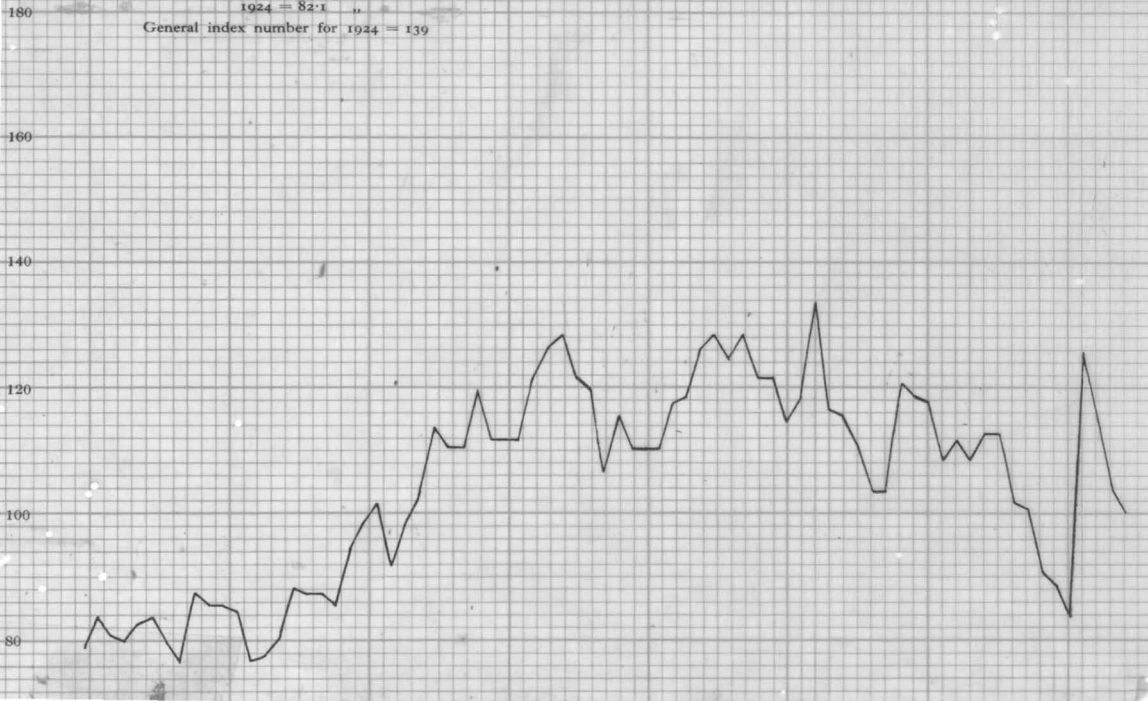
% Prices taken = those of prime beef in pence per 8 lbs.

Average of 1867-77 = 100 in both cases

1867-77 = 59 pence

1924 = 82.1 "

General index number for 1924 = 139



APPENDIX IV: CHART 14

Sauerbeck's index number for MUTTON as % of his general index number

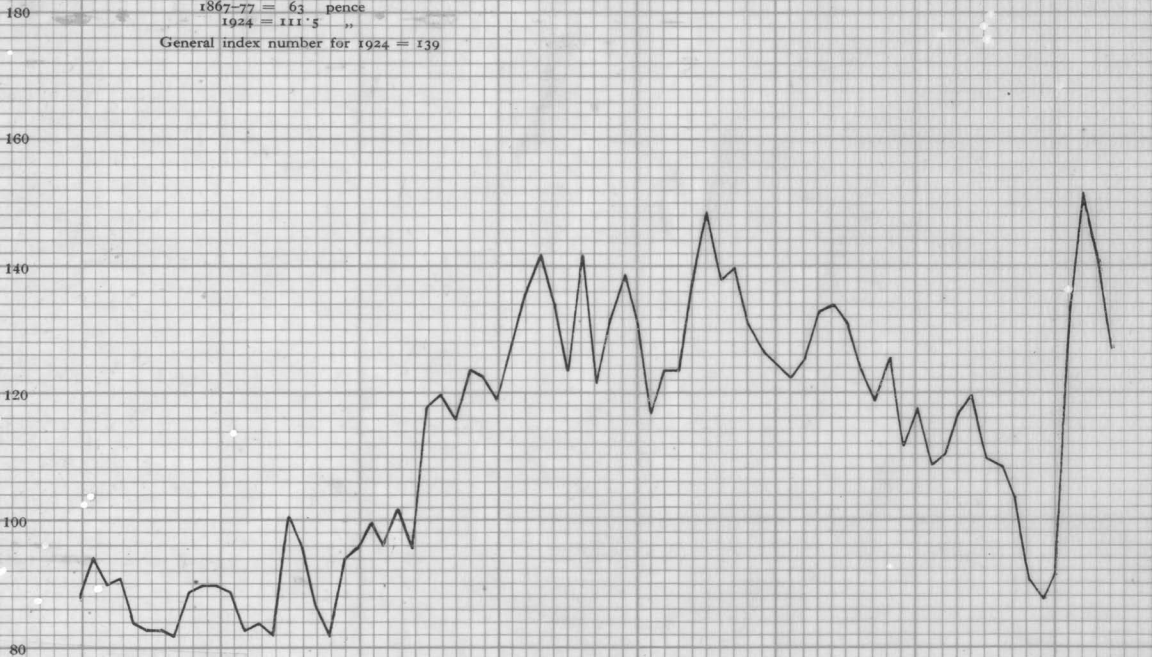
1850 '60 '70 '80 '90 '1900 '10 '20

% Prices taken = those of prime mutton in pence per 8 lbs.

Average of 1867-77 = 100 in both cases

1867-77 = 63 pence
1924 = 111.5 "

General index number for 1924 = 139



APPENDIX IV: CHART 15

Sauerbeck's index number for BACON as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices taken = those for Waterford bacon in shillings per cwt.

Average of 1867-77 = 100 in both cases

1867-77 = 74s.

1924 = 106s.

General index number for 1924 = 139

%

180

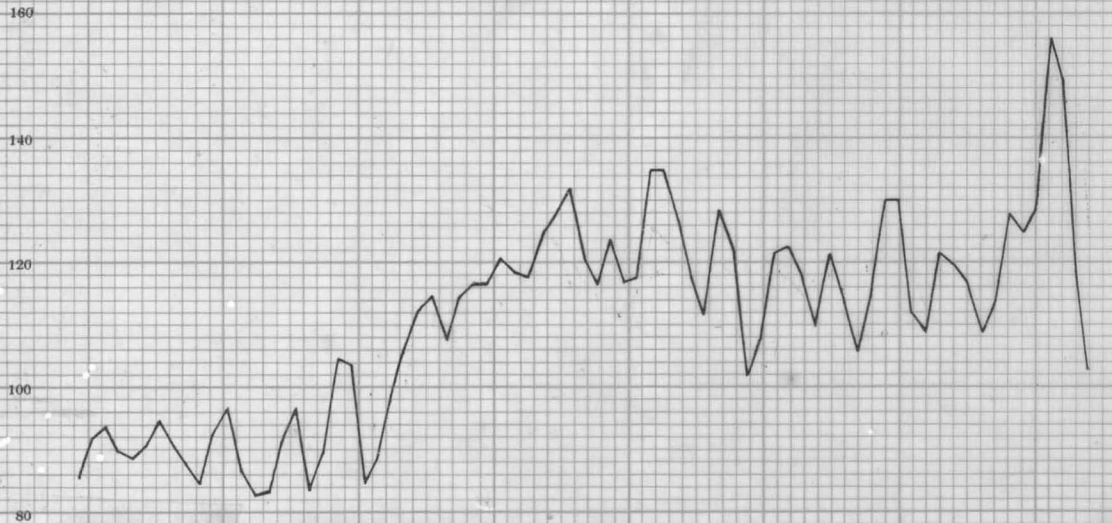
160

140

120

100

80



APPENDIX IV : CHART 16-

Sauerbeck's index number for BUTTER as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

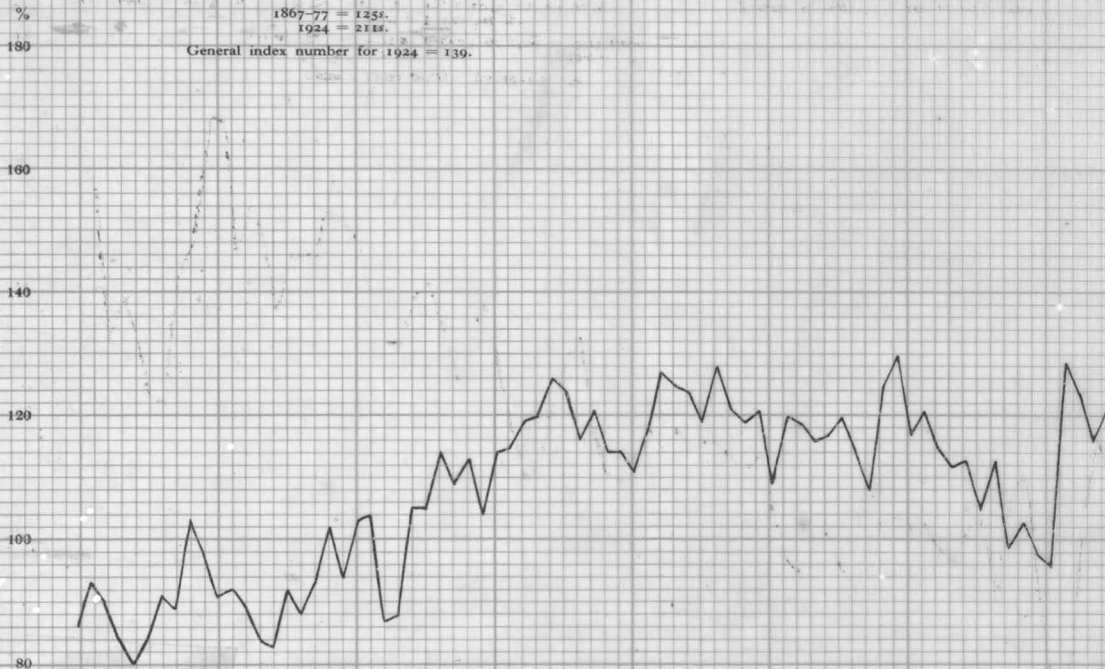
Prices taken = those of Friesland, fine to finest, in shillings per cwt.

Average of 1867-77 = 100 in both cases

1867-77 = 125s.

1924 = 211s.

General index number for 1924 = 139.



APPENDIX IV : CHART 17

Sauerbeck's index number for TEA as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

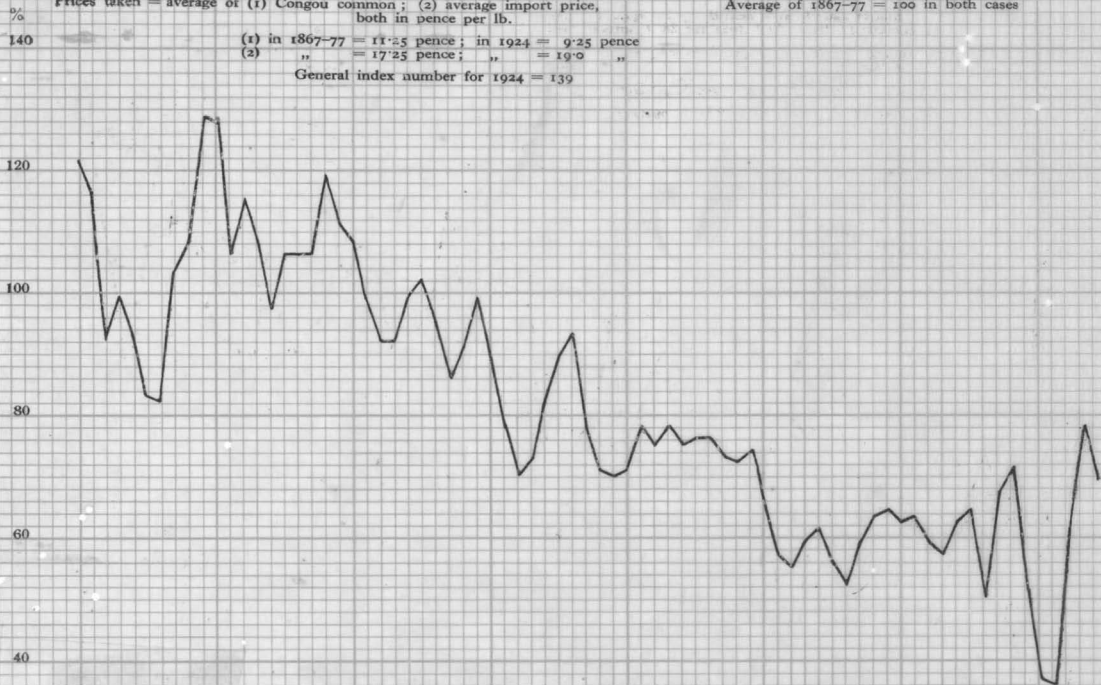
Prices taken = average of (1) Congou common ; (2) average import price,
both in pence per lb.

Average of 1867-77 = 100 in both cases

(1) in 1867-77 = 11.25 pence ; in 1924 = 9.25 pence

(2) " = 17.25 pence ; " = 19.0 "

General index number for 1924 = 139



APPENDIX IV: CHART 18

Sauerbeck's index number for SUGAR as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

%

140

120

100

80

60

40

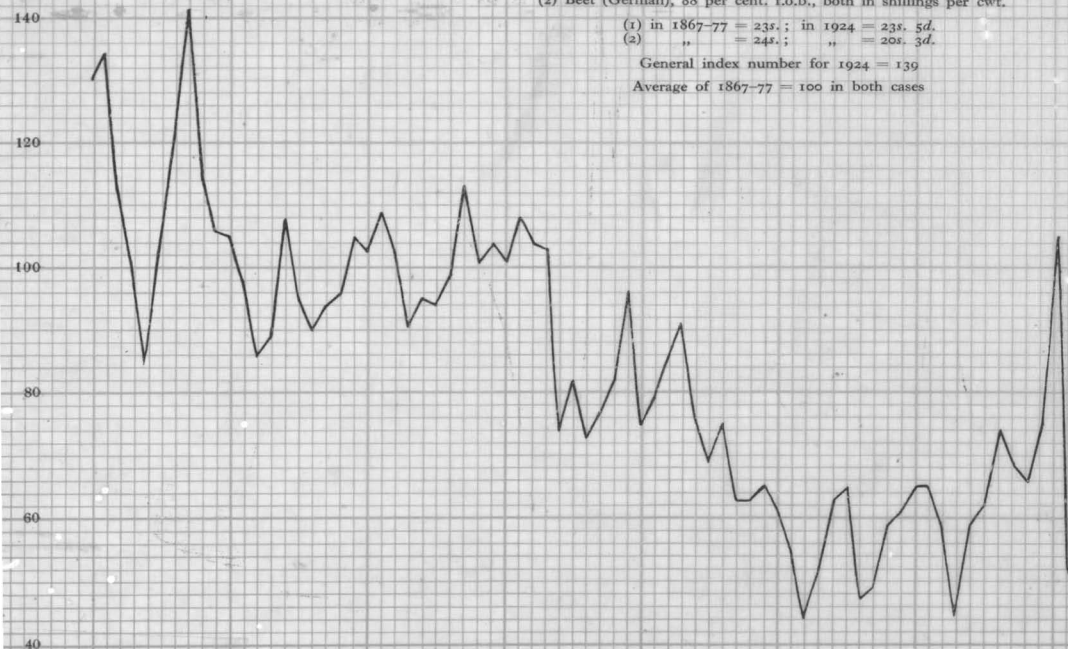
Prices taken = average of (1) British West Indian refining or White Javas;
 (2) Beet (German), 88 per cent. f.o.b., both in shillings per cwt.

(1) in 1867-77 = 23s.; in 1924 = 23s. 5d.

(2) " = 24s.; " = 20s. 3d.

General index number for 1924 = 139

Average of 1867-77 = 100 in both cases



APPENDIX IV :

CHART 19

Sauerbeck's index number for COFFEE as

% of his general index number

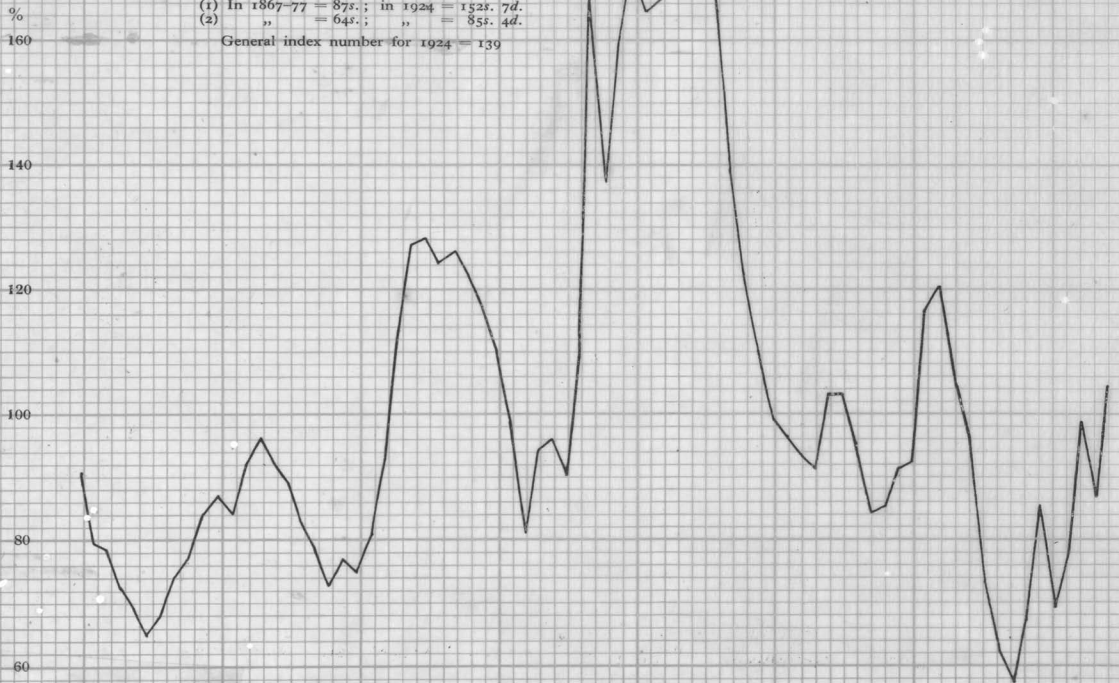
1850 '60 '70 '80 '90 1900 '10 '20

Price taken = average price of (1) Ceylon (or East India) Plantation
Low Middling; (2) Rio Good, both in shillings per cwt.

(1) In 1867-77 = 87s. ; in 1924 = 152s. 7d.
(2) " = 64s. ; " = 85s. 4d.

General index number for 1924 = 139

Average of 1867-77 = 100 in both cases



APPENDIX IV : CHART 26

Sauerbeck's index number for EXPORT COAL as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = average export price in shillings per ton
 1867-77 = 12s. 6d.
 1924 = 23s. 5d.
 General index number for 1924 = 139

Average of 1867-77 = 100 in both cases



APPENDIX IV: CHART 21

Sauerbeck's index number for HOME GOAL as % of his general index number

1850

'60

'70

'80

'90

1900

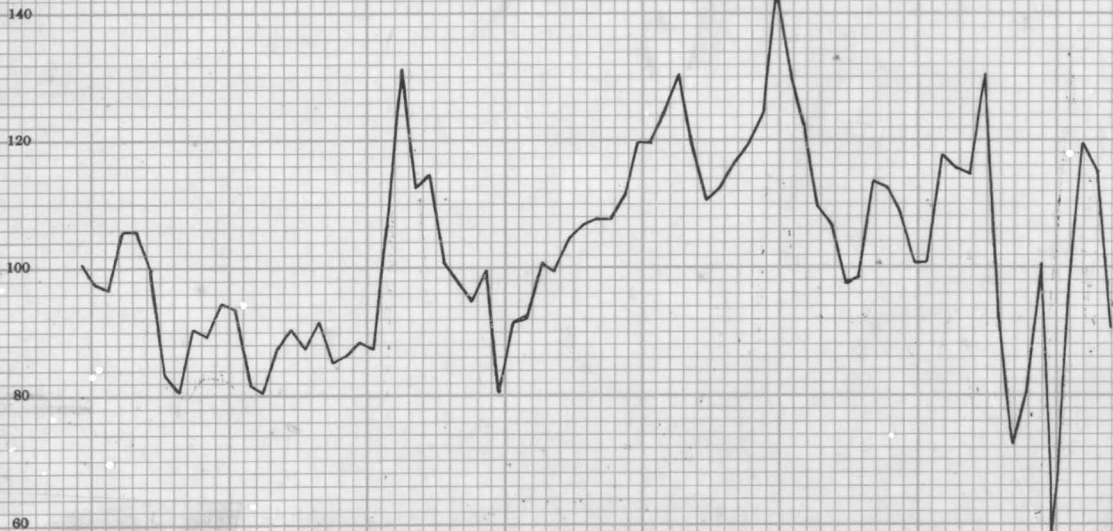
'10

'20

Prices taken = those of (1) Wallsend (Hetton) or Best Yorkshire House in
London; (2) Newcastle Steam; both in shillings per ton;

Average of 1867-77 = 100 in both cases

%
160
(1) 1867-77 = 22s.; 1924 = 27s. 6d.
(2) " = 12s. 6d.; " = 22s. 1d.
General index number for 1924 = 139



APPENDIX IV: CHART 22

Sauerbeck's index number for PIG IRON as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

% Prices taken = average of (1) Scottish Pig; (2) Cleveland (Middlesbrough) Pig;
both in shillings per ton.

Average of 1867-77 = 100 in both cases

180

(1) 1867-77 = 69s.; 1924 = 96s. 8d.

(2) " = 60s.; " = 88s. 2d.

General index number for 1924 = 139

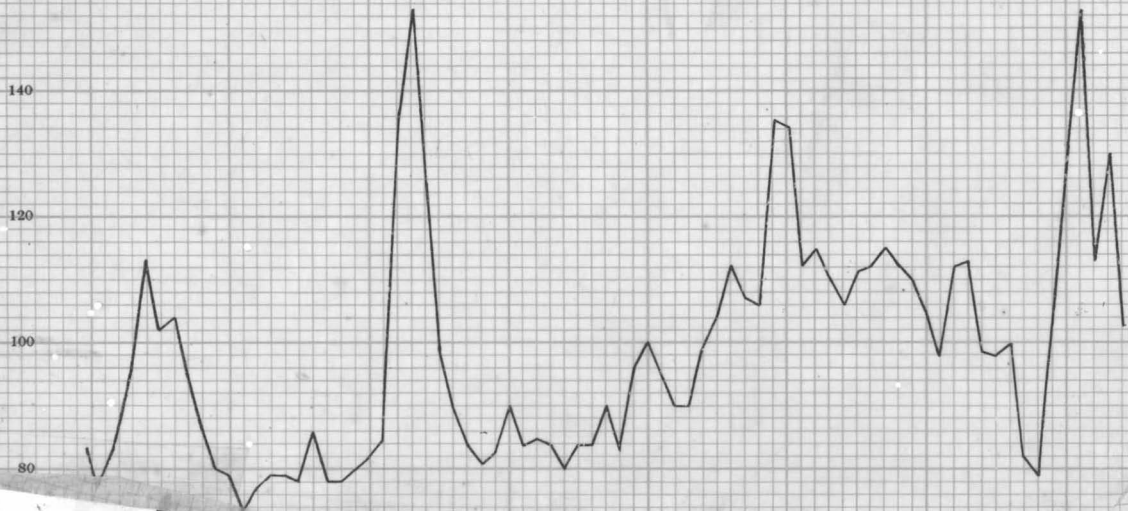
160

140

120

100

80



Sauerbeck's index number for LEAD as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices taken = those of English Pig in £ per ton

Average of 1867-77 = 100 in both cases

1867-77 = £20.5
1924 = £35.8

General index number for 1924 = 139

%

160

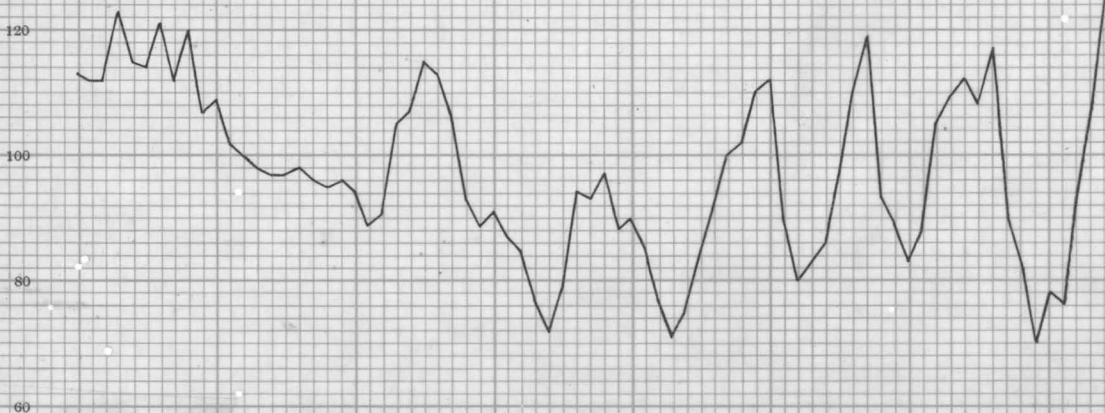
140

120

100

80

60



Sauerbeck's index number for COPPER as % of his general index number

1850

'60

'70

'80

90

1900

'10

'20

Prices taken = average of (1) Standard ; (2) English tough cake ;
both in £ per ton.

Average of 1867-77 = 100 in both cases

(1) 1867-77 = £75 ; 1924 = £63.2
(2) " = £81 ; " = £67.4

General index number for 1924 = 139

%

160

140

120

100

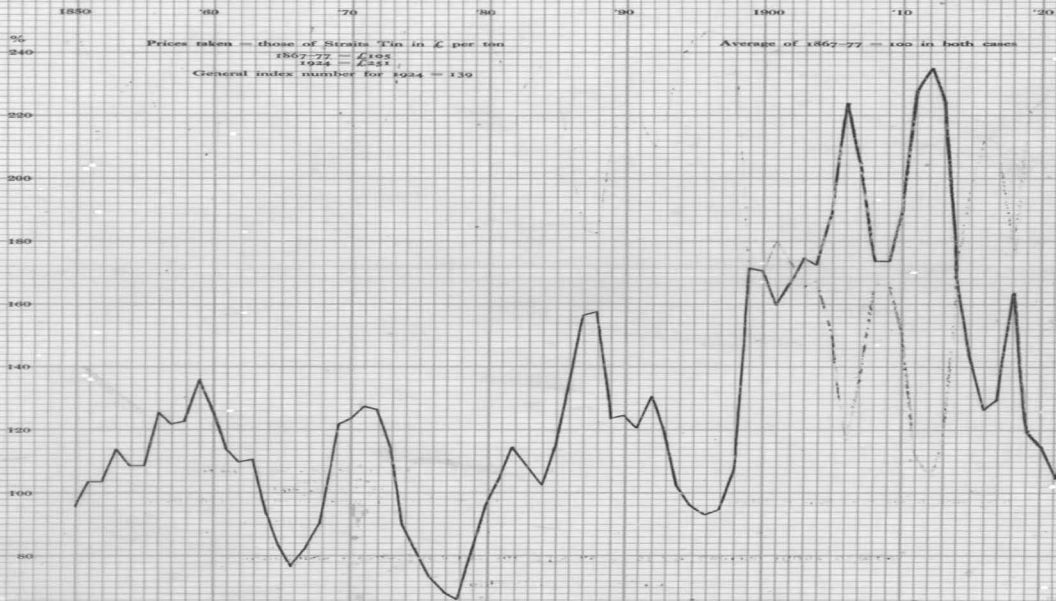
80

60

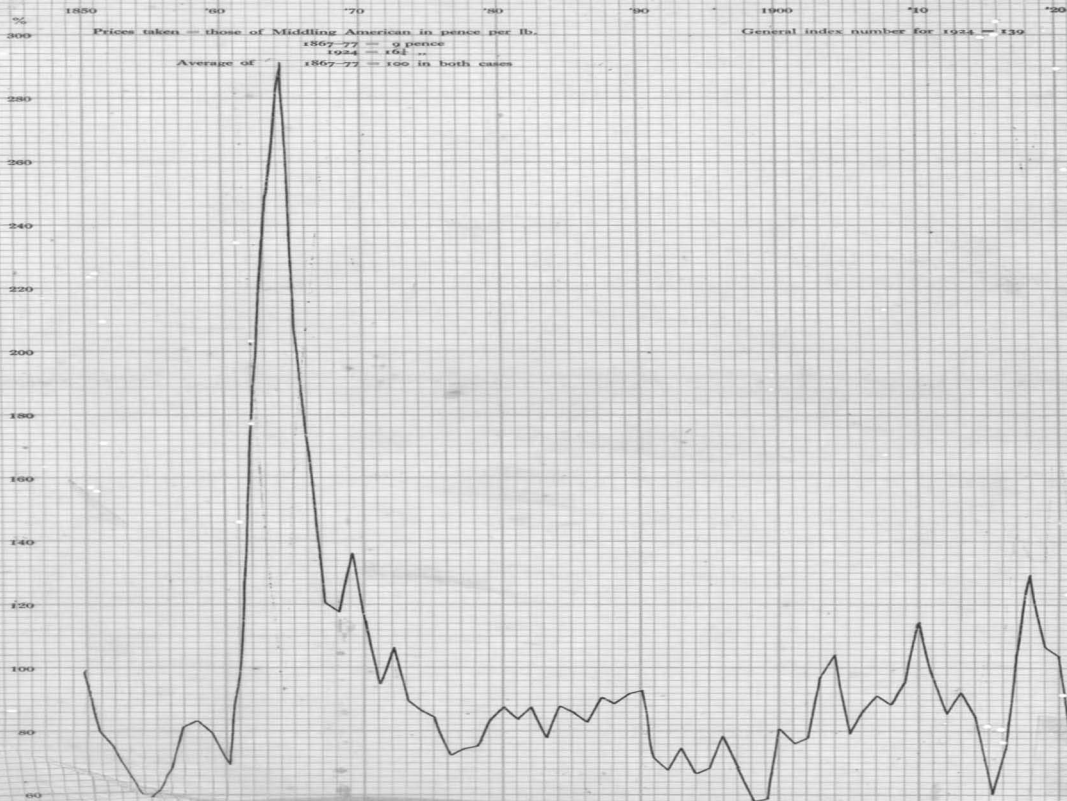


APPENDIX IV: CHART 25

Sauerbeck's index number for TIN as % of his general index number



Sauerbeck's index number for MIDDLING COTTON as % of his general index number



Sauerbeck's index number for FLAX as % of his general index numbe

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = average of (1) Petrograd (Livonian from 1921); (2) Russian average import; both in £ per ton

Average of 1867-77 = 100 in both cases

(1) 1867-77 = £46; 1924 = £120

(2) " = £48; " = £104 10s.

General index number for 1924 = 139

%

180

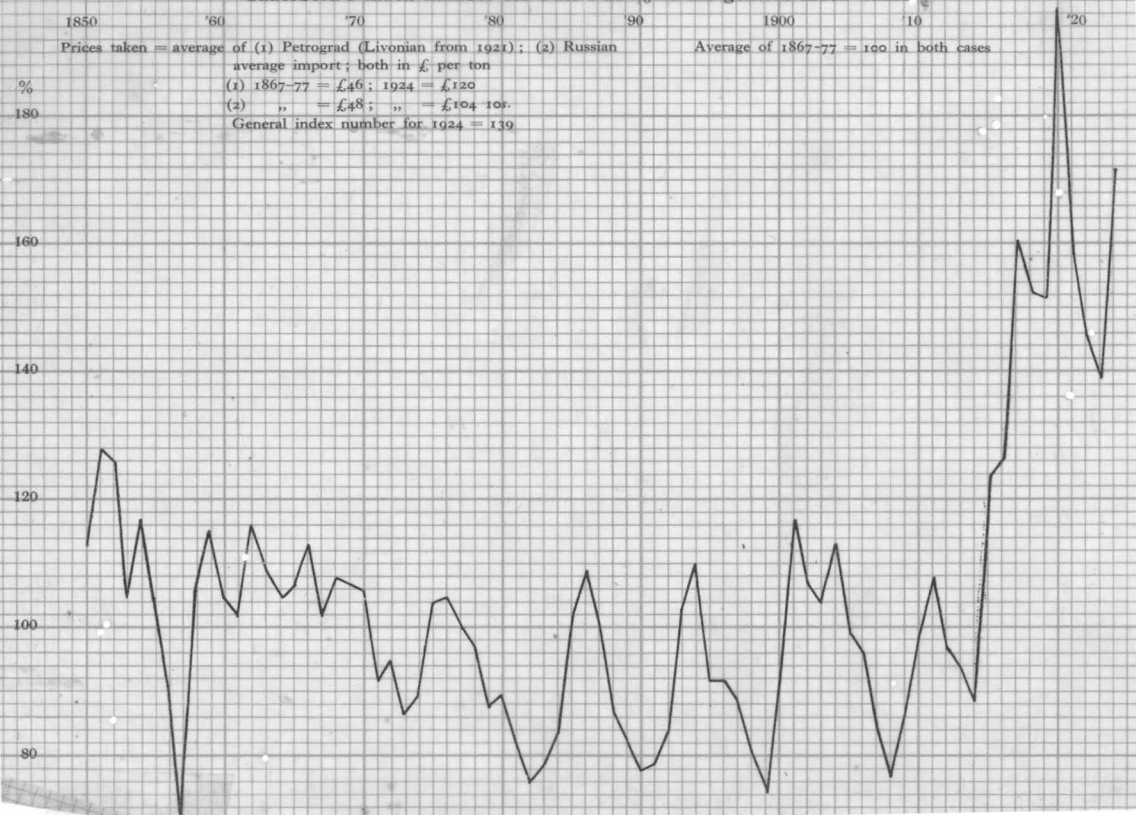
160

140

120

100

80



Sauerbeck's index number for SILK as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices taken = those of Tsatlee (common style since 1921) in shillings per pound

Average of 1867-77 = 100 in both cases

1867-77 = 23s.

1924 = 23s. 6d.

General index number for 1924 = 139

%

140

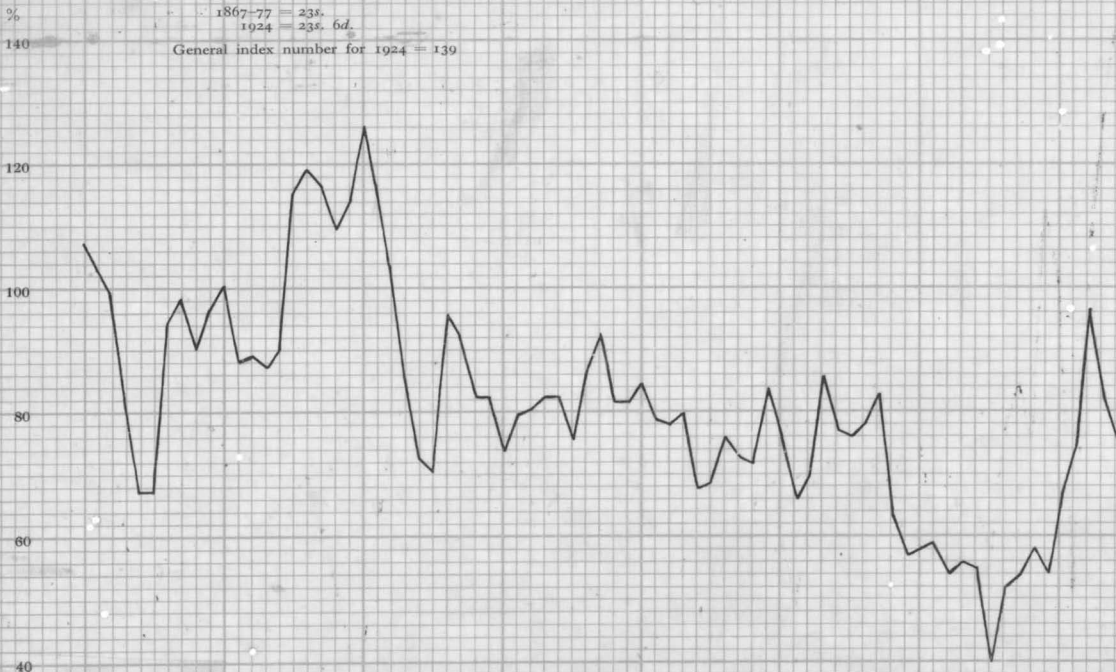
120

100

80

60

40



Sauerbeck's index number for MERINO WOOL as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices taken = average of (1) Merino Port Philip Average Fleeces; (2) Merino Adelaide Greasy Average; both in pence per pound

Average of 1867-77 = 100 in both cases

(1) 1867-77 = 21½; 1924 = 53½
 (2) " = 9½; " = 25½

General index number for 1924 = 139

%

180

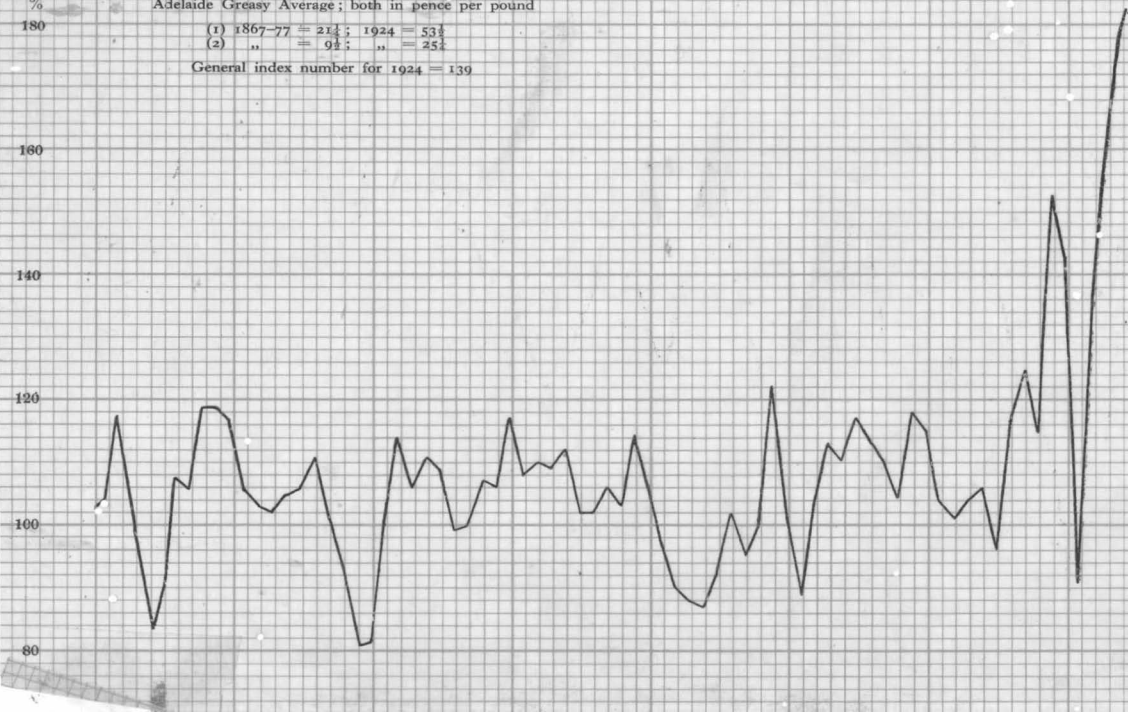
160

140

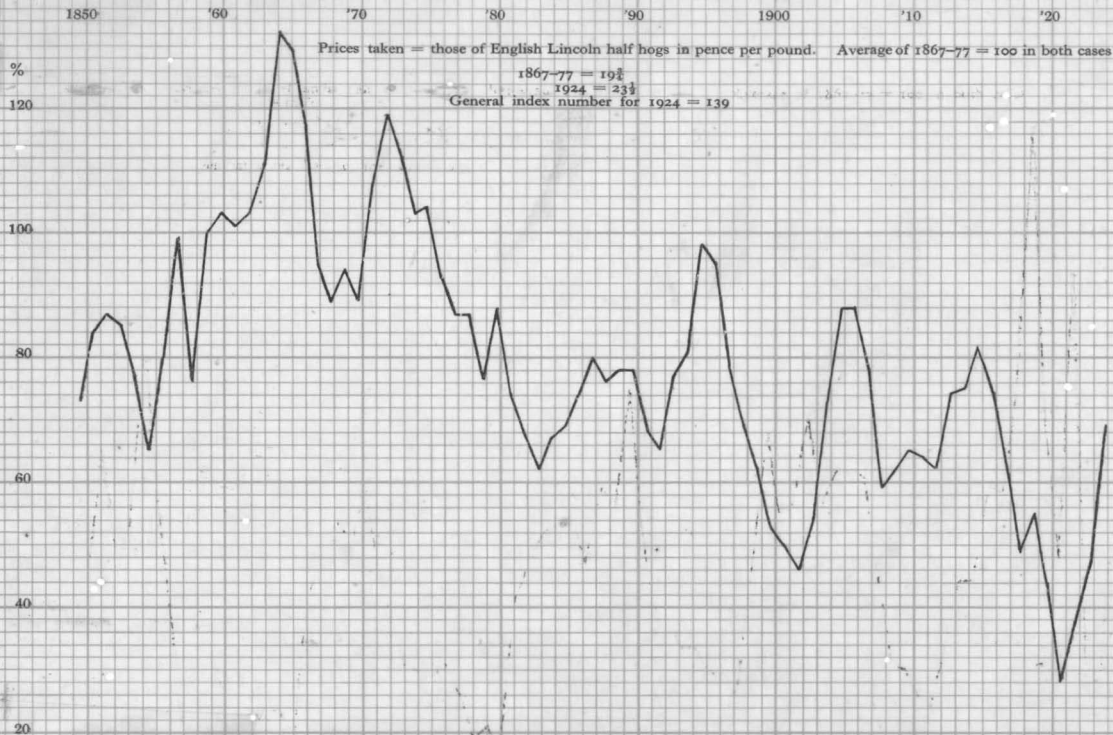
120

100

80



Sauerbeck's index number for ENGLISH WOOL as % of his general index number



Sauerbeck's index number for HEMP as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

%

180

Prices taken = average of (1) Manila Fair Roping; (2) Petrograd Clean;
both in £ per ton

Average of 1867-77 = 100 in both cases

(1) 1867-77 = £43; 1924 = £44
(2) " = £35; " = £81

General index number for 1924 = 139

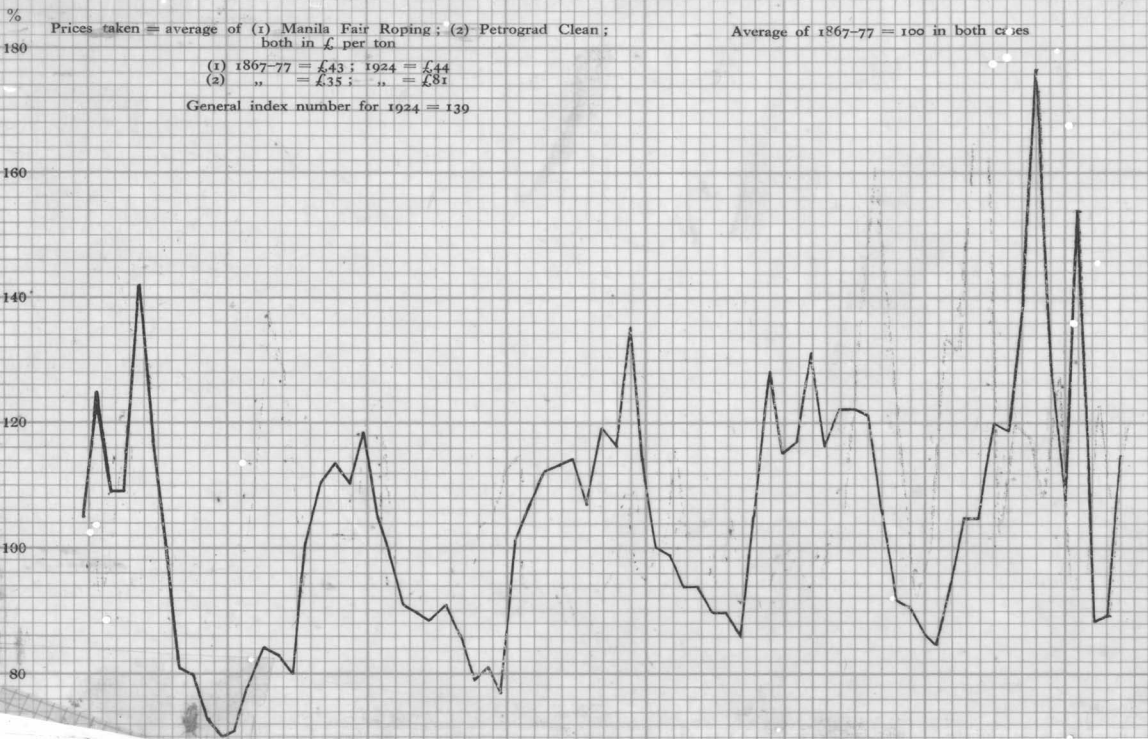
160

140

120

100

80



APPENDIX IV : CHART 32

Sauerbeck's index number for JUTE as % of his general index number

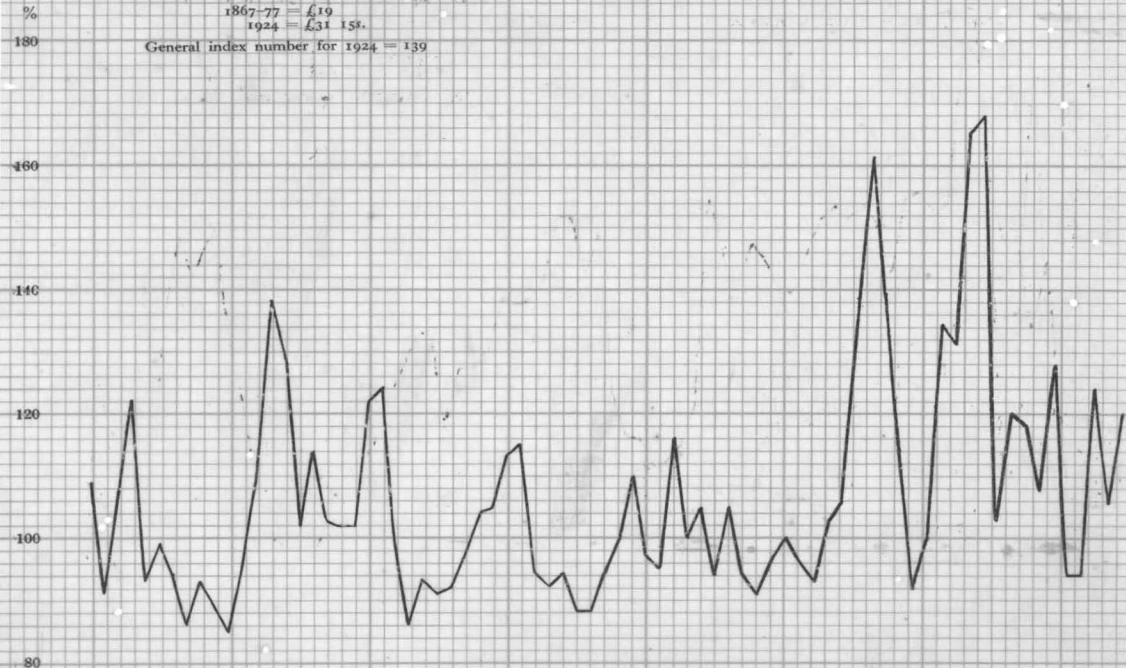
1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = those of good medium in £. per ton

Average of 1867-77 = 100 in both cases

1867-77 = £19
1924 = £31 15s.

General index number for 1924 = 139



APPENDIX IV : CHART 33

Sauerbeck's index number for HIDES as % of his general index number

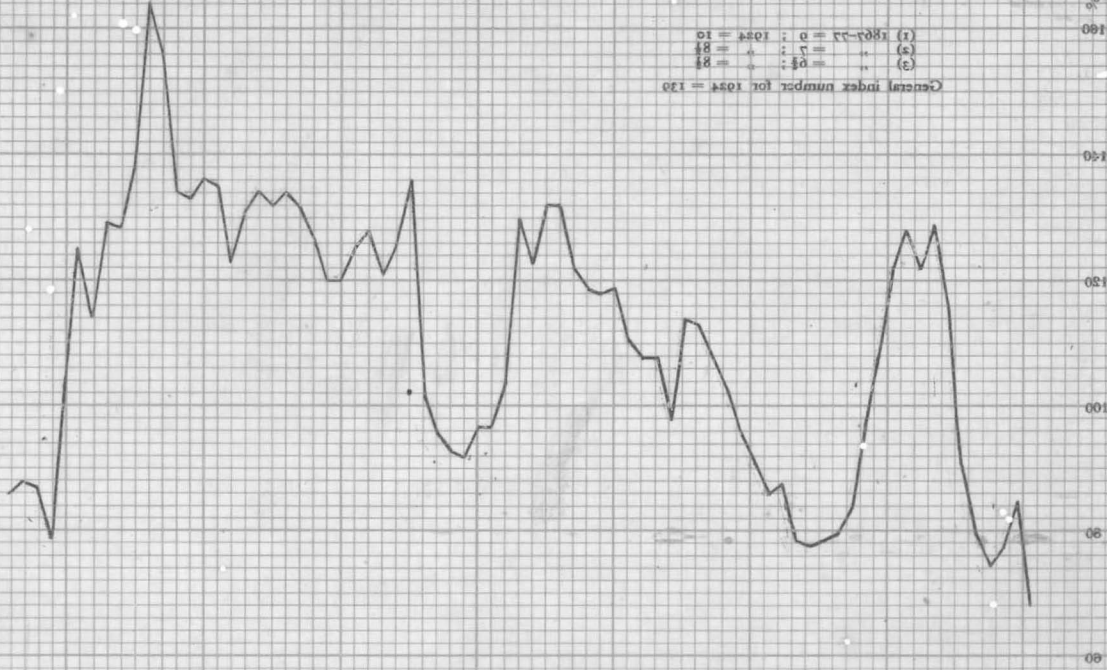
1880 '60 '70 '80 '90 1900 1910 1920

Average of 1867-77 = 100 in both cases

Prices taken = average of (1) River Plate dry ; (2) River Plate salted
(3) Average import price; all in pence per pound

(1) 1867-77 = 9 ; 1924 = 10
(2) " " = 7 ; " = 8½
(3) " " = 6½ ; " = 8½

General index number for 1924 = 130



APPENDIX IV : CHART 34

Sauerbeck's index number for LEATHER as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

% Prices taken = average of (1) Dressing Hides ; (2) Average import price ;
both in pence per pound

Average of 1867-77 = 100 in both cases

(1) 1867-77 = 16 ; 1924 = 22½
(2) " = 18½ ; " = 34

General index number for 1924 = 139

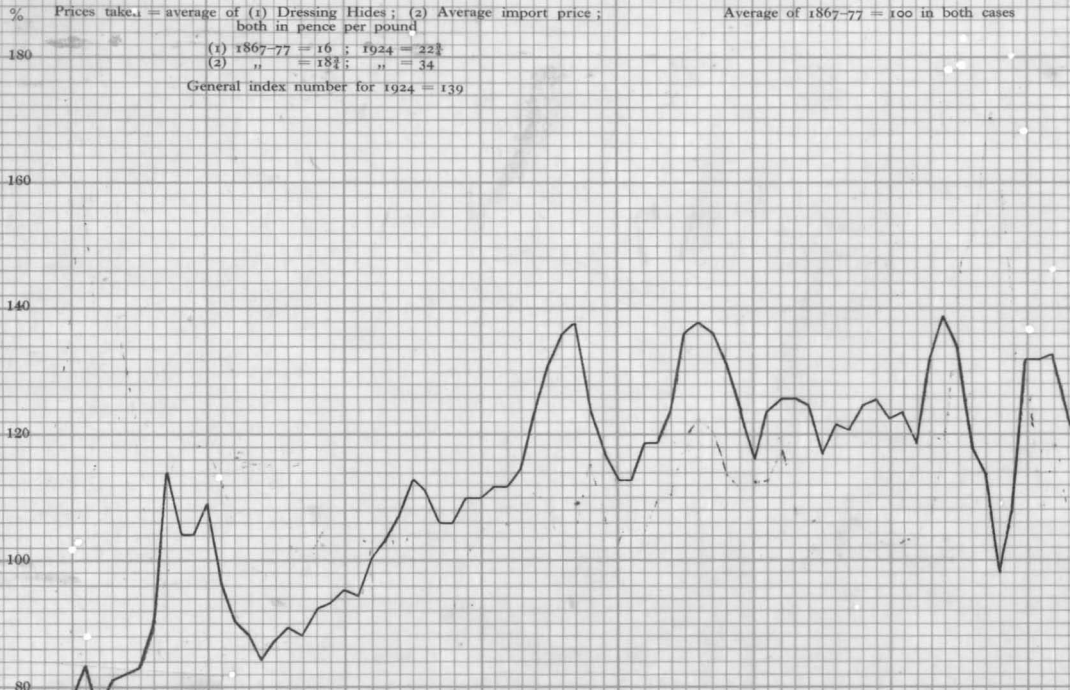
180

140

100

80

80



APPENDIX IV: CHART 35

Sauerbeck's index number for TIMBER as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = average of (1) Hewn average import price; (2) Sawn or Split

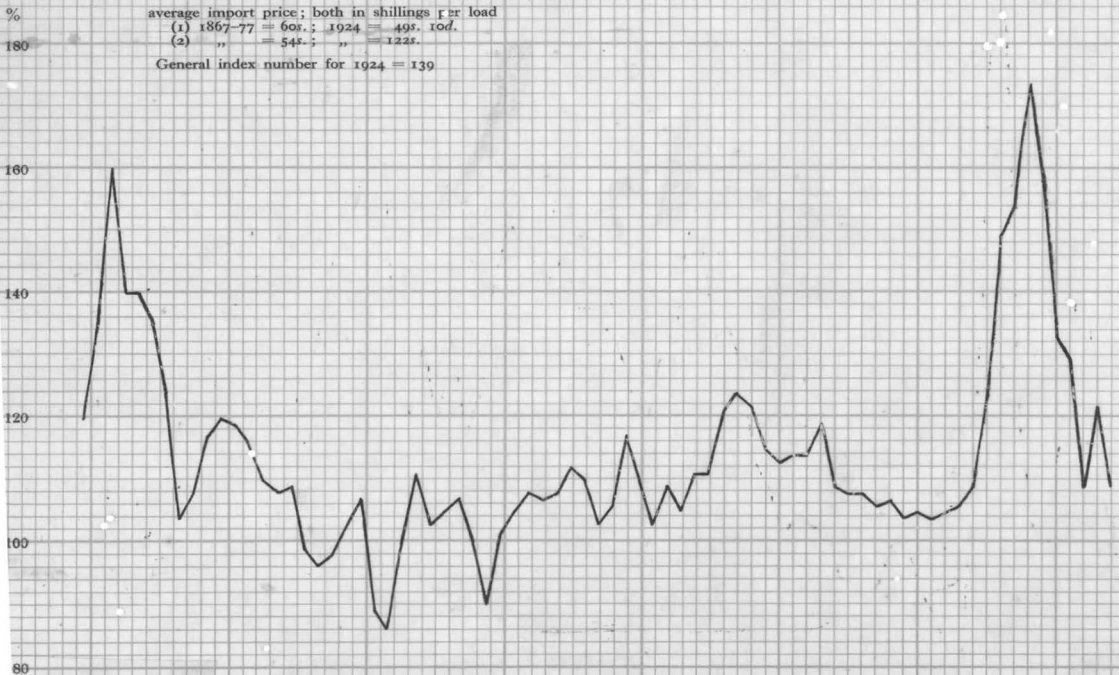
Average of 1867-77 = 100 in both cases

average import price; both in shillings per load

(1) 1867-77 = 60s.; 1924 = 49s. 10d.

(2) " = 54s.; " = 122s.

General index number for 1924 = 139



APPENDIX IV: CHART 36

Sauerbeck's index number for INDIGO as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken. = those for Bengal Good Consuming, in shillings per pound

Average of 1867-77 = 100 in both cases

1867-77 = 7s. 3d.

1924 = 6s. 0½d.

General index number for 1924 = 139

%

140

120

100

80

60

40



APPENDIX IV: CHART 37

Sauerbeck's index number for SODA as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices taken = those for Soda Crystals, in shillings per ton

Average of 1867-77 = 100 in both cases

1867-77 = 92s.

1924 = 101s. 9d.

General index number for 1924 = 139

%

140

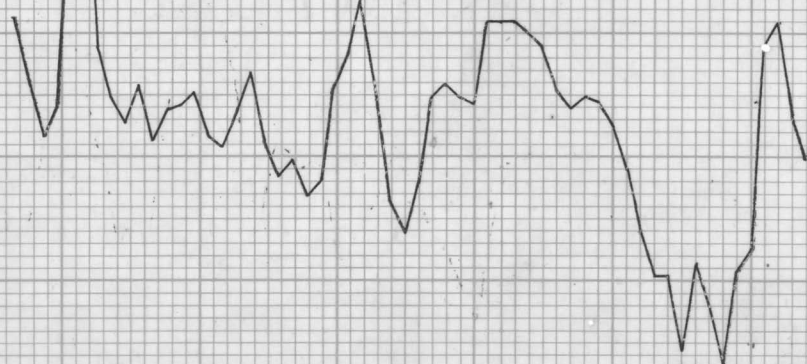
120

100

80

60

40



APPENDIX IV: CHART 38.

Sauerbeck's index number for NITRATE OF SODA as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

Prices in shillings per cwt.

1867-77 = 14s.

1924 = 13s. 7d.

Average of 1867-77 = 100 in both cases

%

160

General index number for 1924 = 139

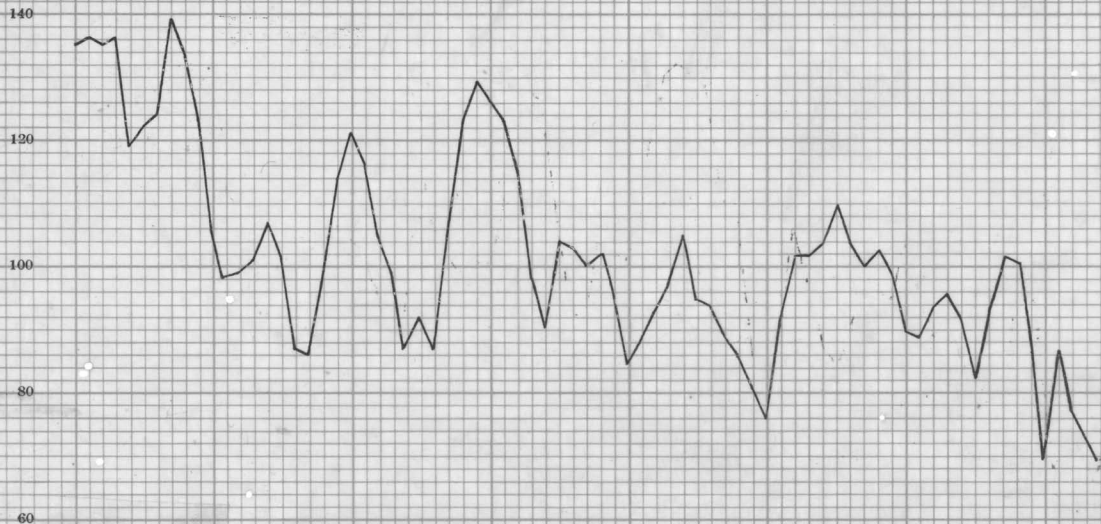
140

120

100

80

60



Sauerbeck's index number for TALLOW as % of his general index number

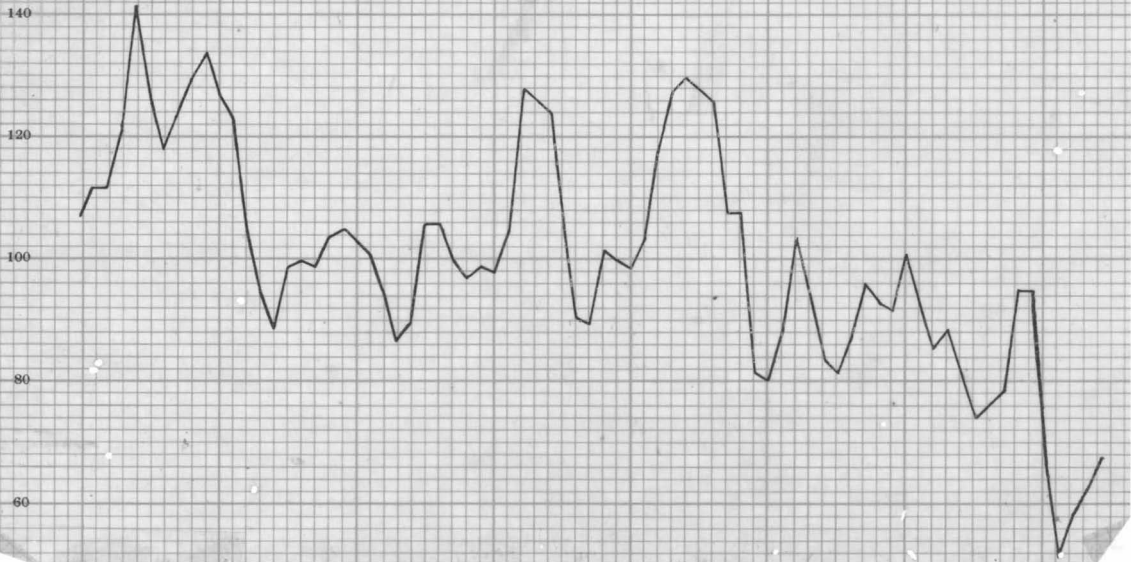
1850 '30 '70 '80 '90 1900 '10 '20

Prices = those for "Town," in shillings per cwt.

Average of 1867-77 = 100 in both cases

%
160
140
120
100
80
60

1867-77 = 45s.
1924 = 42s. 5d.
General index number for 1924 = 139



APPENDIX IV: CHART 4c

Sauerbeck's index number for PALM OIL as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices in £ per ton

1867-77 = £39

1924 = £40 4s.

Average of 1867-77 = 100 in both cases

General index number for 1924 = 139

%
160

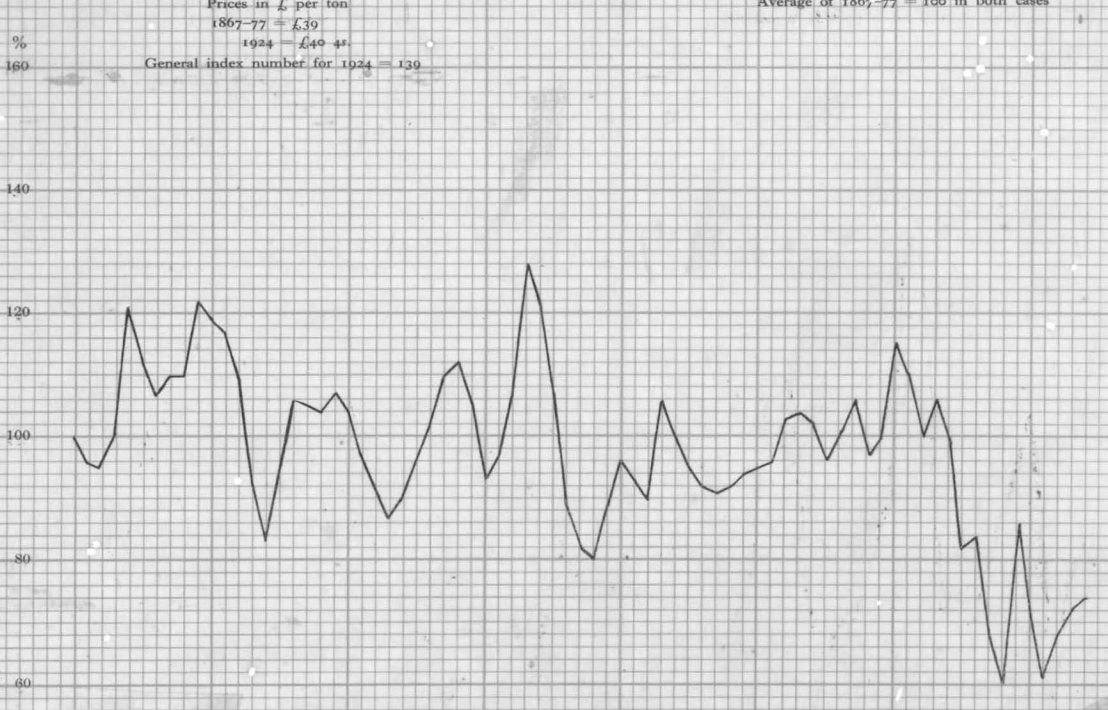
140

120

100

80

60



Sauerbeck's index number for LINSEED OIL as % of his general index number

1850 '60 '70 '80 '90 1900 '10 '20

Prices in £ per ton

1867-77 = £30

1924 = £12 12s.

Average of 1867-77 = 100 in both cases

General index number for 1924 = 139

%

130

140

150

120

100

80



APPENDIX IV: CHART 42

Sauerbeck's index number for OLIVE OIL as % of his general index number



APPEND

: CH2

index number for ANIMA

OOD as

of his ge. etc.

'70

'80

'90

1900

'10

er for 1924 = 139
" = 158

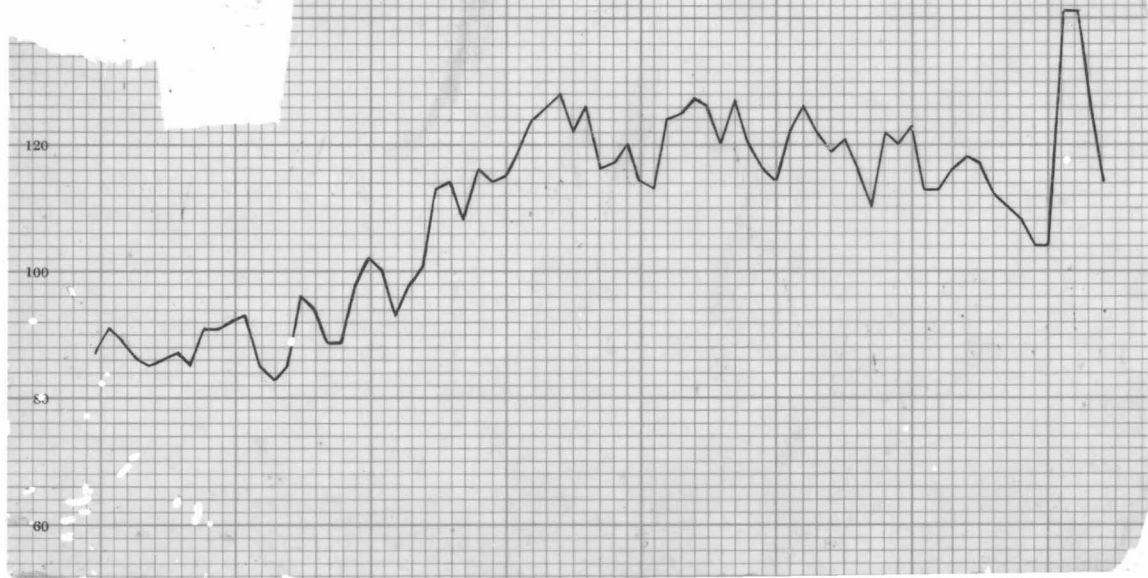
Average of 1867-77 = 100 in both cases

120

100

80

60



APPENDIX IV: CHART 3

Sauerbeck's index number for **SUNDRY FOOD** as % of his general index number

1850

'60

'70

'80

'90

1900

'10

'20

General index number for 1924 = 139
 Sundry food group " " = 105

Average of 1867-77 = 100 in both cases

%

140

120

100

80

60

40

