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Volume Author/Editor: Oskar Morgenstern

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Chapter Author: Oskar Morgenstern

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CHAPTER IX

THE BEHAVIOR OF LONG-TERM INTEREST RATES

Section 1. The Significance of Long-Term Interest Rates

(1) In this chapter an attempt is made to discover how long-term interest rates in our four countries are related, and to find out whether and how these relationships influence capital movements, stock prices, etc., thus contributing to the international dependence of the various business cycles. We shall also investigate to some extent the highly significant connections between the long-term and short-term rates in each country and compare these relationships with each other. This will involve making use of the results obtained in Chapters III and IV concerning the international behavior of short-term rates.

The long-term rate has played a fundamental role in business cycle theories; it is therefore obvious that we should look to those theories for guidance and shall want to examine them, in their turn, in the light of our own material. The interrelation of the various types of interest rates is itself a problem, far beyond the scope of the present investigation. Nevertheless we hope to make a small contribution to its elucidation, if only by presenting the material collected for this chapter and analyzed for our own purposes. Data about long-term interest rates are unfortunately not easily obtained for long periods and for several countries.

(2) It was difficult to choose a proper, representative short-term rate for each country and to determine whether it underwent important functional changes (cf. the discussion on pp. 76 ff.). It is far more difficult to find suitable long-term interest rates. Although business cycle theory until very recently has run in terms of "the" rate of interest—at best distinguishing only between a short-term and a long-term rate—economists have become increasingly aware of the artificiality of this approach. This becomes particularly clear in respect to long-term rates. The various short-term rates are so closely related to each other that no great mistake is made in picking any one, as long as only the direction of the movements and the specific cycles are important. When the absolute stand in

various countries is to be compared, the matter of the proper choice assumes greater significance.

While there also are always several simultaneous long-term rates, their interdependence is of a more complicated nature. The risk element comes much more to the fore than with short-term rates; this applies both to the varying length of long-term loans and to the different grades of bonds for each duration. Attempts to account separately for the pure "interest" and "risk" factors in the given market rate have been made, but they have encountered, as was to be expected, great difficulties. The information in this study as given by the market rate is *all* the information, considering our present tools of observation. We shall therefore in the following not be able to make this highly desirable distinction.

There is a great dearth of studies of long-term rates suitable for our purposes. Little has been done in particular regarding international comparisons or transmission of changes from one country to another.[1]

(3) The long-term rate has been of great importance in virtually all business cycle theories. It is therefore necessary to discuss the principal views in order to provide a proper framework for the subsequent measures. Many of these theories, notable as they are, e.g., that of K. Wicksell, bear no direct and obvious relation to preceding empirical investigations. They seem to have been abstracted from the general observation and experience available to the writers. It is clear that this can at best be only a preliminary view, to be tested by extensive empirical investigations upon which a theory may later be erected. The main point of theory is that the long-term rate (assuming that there is at least one representative rate) controls the allocation of investible funds and that the values of all durable goods move inversely with the rate through the process of capitalization. Thus a decline in the rate would drive up, or more strictly speaking be identical with, an increase of values of capital goods. Since other prices, notably labor and raw materials, would not be thus affected quickly, a gap for profit would appear

[1] The most important works are the following: Karin Kock, *A Study of Interest Rates*, London, 1929; Frederick R. Macaulay, *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, National Bureau of Economic Research, 1938; Winfield W. Riefler, *Money Rates and Money Markets in the United States*, New York, 1930; Carl Snyder, *Business Cycles and Business Measurements*, New York, 1927; Jan Tinbergen, *Business Cycles in the United Kingdom, 1870–1914*, Amsterdam, 1951.

that could be closed by increased production of capital goods. An expansion of economic activity would follow, until the difference between the profit expectation and the rate of interest has disappeared due to changes in relative prices.

Another observation is that the rates of interest move with the price level, but show a lag behind the business cycle (as for the evidence of the latter cf. pp. 95 ff. for short-term rates, and pages 451 ff. below for long-term rates). This has not been utilized in theories of the cycle to a like extent.

All theories seem to emphasize a delay in the adjustment of the long-term to the movements of the short-term rate. This is stressed particularly for the time before the lower turning point, when the short-term rate is very low but short-term capital is for a long while not transformed into long-term capital, in spite of a very favorable differential to the lender large enough to make up for the difference in type of commitment. The assertion will be amply tested (section 5). Clearly if there should be notable differences in that respect, around closely packed lower turning points of business cycles of different countries, this would account for subsequent differences in their expansions and for international shifts of funds. In other words the alternatives for short-term funds in A are long-term employment in A, or a short-term shift to B, or long-term use in B (taking only two countries), thus giving rise to capital exports. For all these possibilities there are thresholds of varying but unknown magnitude. Simple assumptions will run afoul of the facts; for example, we saw in section 3 of Chapter IV that even among the sensitive short-term rates unaccountably high permanent differences remained.

To this must be added the possibility of *lags*, which may work within a country or among various countries in the media mentioned above. The rates may be not only interdependent at a given moment of time, but in a complicated manner over periods of time. Domestic interdependence of rates has received increasing attention by theorists,[2] but it is safe to say that these investigations are far from concluded, especially in view of the paucity of empirical explorations. M. Kalecki[3] has made a statistical study of the relation between British long-term and short-term rates.

[2] Cf., e.g., J. Tinbergen, "The Explanation of Interest Rates," *Quarterly Journal of Economics*, Vol. LXI, 1947, p. 397 ff., and the literature discussed there. Also F. A. Lutz, "The Structure of Interest Rates," *Quarterly Journal of Economics*, Vol. LV, 1940.

[3] *Studies in Economic Dynamics*, London, 1943, Chap. II.

The functional relation is not stable, but varies from country to country and even within the same one (at least over longer periods), so that the frequent assertion that the long-term rate can always be understood as the result of a series of repeated borrowings and lendings at successive short-term rates, if ever valid, is only of restricted plausibility. It cannot be used in its present simple form for a general explanation of the relation of long-term and short-term rates to each other. However, should it hold, it would have to be extended to international relations too—at least for certain types of business.

It is also possible that, instead of comparing interest rates of different countries, the prospective borrower or investor watches the *differences* of rates in other countries, or, at least as plausibly, the rates of change of the various interest rates. All this leads to statistical complications of such magnitude that they cannot be resolved with ordinary computational devices; they are therefore not further considered at present.

(4) The question arises whether *the absolute differences* between long-term rates of various countries must also obey the law of the solidarity of money markets, which thus would become a law of the *solidarity of capital markets*. This would mean accepting the values of Tables 74 and 75 for the period of yearly interest shown there. It was very difficult, as the reader will recall, to accept the detailed argument—though not the general idea—of the solidarity hypothesis as far as short-term rates were concerned. It will be at least as difficult in the present case; but before passing judgment we shall consider the evidence which, to our knowledge, has never been assembled on a broad systematic basis. It will also be instructive to compare the behavior of these differences with those of the short-term rates. One would also have to see whether they conform to the data on capital exports as expressed by foreign capital issues (cf., however, Chapter X, section 4). In these questions the monetary standard plays a role. If the solidarity hypothesis can in theory be extended to the long-term rates, it will be necessary to limit it to the period of the gold standard. For other monetary standards other principles would have to be worked out, because *some* principles must prevail for intercommunicating economies. It would upset our beliefs if we assumed that the differences between long-term rates of different countries could be entirely arbitrary.

(5) We now turn finally to a seemingly trivial, but in fact quite fundamental, question: what is a long-term interest rate? It is

relatively easy to state what a short-term rate is and consequently no serious trouble was encountered in earlier chapters. There is a clear definition of the credit instruments and thus a good description of the economico-physical processes that are controlled by the credit operation. Some of these processes are quite specifically known. Not so with the long-term rate. Questions as to the nature of long-term rates were ably and extensively discussed by F. R. Macaulay, *op. cit.* There is, for example, the problem of how to deal with differences in maturity of bonds (these being taken as the chief credit instruments), because prices of bonds with longer maturity would necessarily show wider amplitudes in their fluctuations. In an international comparison apparent absolute differences might be misleading if they should be obtained for bonds of varying maturity.[4] Yield indexes over long periods embody similar difficulties even for one and the same country.

The main difficulty however lies in another direction not considered by Macaulay: when a short-term rate changes, this variation becomes quickly effective, e.g., for the call money rate, overnight. In other words within one day *all* credits governed by this rate are extended at the new rate. Changes in the discount rate will also affect *all* transactions within perhaps fifteen to thirty days, depending on the distribution of old and new credits, but as a rule almost all will have expired in a short time. So we may distinguish between the *market rate* and the *effective rate*,[5] i.e., the one governing going contracts. The market rate will only gradually become effective. But it is the market rate, at which *new* contracts are being concluded, that determines future operations. In the long-term capital market nothing has happened for all the borrowers under *existing* contracts,[6] when the long-term rate has increased; only the new *additional* credit operations are influenced. Yet the statistics show a rise of the market rate, without taking into account that its effectiveness is at first very limited and only gradually grows into the state of 100 per cent effectiveness. If one

[4] This will have to be remembered in evaluating some of our statistics, especially those of Tables 115 to 120.

[5] This must not be confused with I. Fisher's "real-rate," which compares an interest rate with the changes in the price level. Cf. his treatment in *The Theory of Interest*, New York, 1930.

[6] As far as their borrowing and lending is concerned; otherwise they are all affected indirectly through the intermediary channels and the price movements of the securities.

has monthly averages of short-term rates, the difference between the (statistical) market rate and the effective rate will not be very large. In the long-term market an indefinite period may elapse before the prevailing market rate is universally effective.[7] In fact such a state will never be reached in view of the length of most borrowing operations and subsequent changes of the market rate. In order to get true, meaningful information, the market rate, computed, for example, from bond yields, would have to be weighted for the amounts of credit outstanding and newly contracted. Consideration would also have to be given to refunding. The theoretically interesting operations are however the new flotations.

This applies to the *borrower*. The *creditor* is obviously in another position even vis-à-vis old contracts, since the price change of bonds—expressing the interest rate variation—produces a capital loss or gain, which may even be transferred (with inverse sign) to the debtor, depending on repurchase and callability of the bonds. If old bonds are sold the yield is for the purchaser an effective rate, but not for the debtor, who may calculate "cost," for example, on the old basis.

A further complication arises when the *real* rates are considered, i.e., when correction is made for the movement of price levels. Again the case is simple when short intervals are taken. Only when one is confronted, say, with sharp changes on the stock market, will there be much importance to this correction. But for long-term operations the movements of price levels become of prime significance. So the meaning of I. Fisher's fundamentally correct measure increases with the length of the period considered or with the extent of fluctuations of a relevant price index or with both. However its practical applicability is limited by the extent to which one has solved the preliminary problem of accounting for the quantitative distribution of market and effective rate and of old and new securities and their transfers within the period under study. We refer only in passing to the various lags which may be involved.

These remarks serve as a background for the observation that the situation becomes almost hopelessly complex when four countries are to be studied simultaneously. Yet all this information

[7] This "hysteresis," i.e., the gradual transmission of effects of changes, is an important feature of economic relationships. A dynamic theory when it once appears will have to take the matter fully into account. For discussion of price theory under this aspect cf. O. Morgenstern, *Wirtschaftsprognose*, *op. cit.*, pp. 65 ff.

would be required in a field where undoubtedly a high sensitivity to changes, rates of change, actual and expected, etc., prevails. Quite aside from the immense computational task, requiring electronic computers, there simply is no basic information available which permits the distinction to be made between market rates and effective rates. It will be a task for the future to devise techniques for collecting statistics which will enable us to gain proper insight into these conditions. Possibly some of the contradictions observed by various students in the behavior of interest rates and of their relations to prices are due to this type of lack of homogeneity of the material, because some fundamental concepts have not been applied to the measurements. We shall ourselves, in the study of the relationships between short-term and long-term rates (cf. section 4), note further discrepancies of a most disconcerting nature.

The difficulties in correlating the movements of the rates of interest with price levels may be due to the fact that the rate is a "real" quantity and prices are not; for example, the price level could just as well be double what it is even if the rate were the same. The *transition* from one price level to another, on the other hand, may very well set interest rates into motion until the final state is reached. A truly dynamic theory—which we lack in economics—would describe this transitory process in detail.

Section 2. The Statistics of Long-Term Interest Rates

(6) In order to economize space we shall merely state the sources and nature of the four long-term rates chosen for our countries without going into any discussion of their general background. The reader will be able to identify our series fully from the descriptions which follow.

The principles of selection are the same applied currently in this work: (a) the series should be representative for the activity which it describes or which is controlled by the underlying operation; (b) it should *in this sense* be internationally comparable; and (c) it should be available for as long a period as possible in order to conform with the time periods covered by series in related fields.

The greatest arbitrariness is in (a), while (b) follows almost automatically if a good domestic choice has been made. A good choice would be that in which the rate actually applies to large

scale operations;[8] thus yields of municipal bonds would not fall into this category, but yields of consols would. The international comparability of yields of government bonds is, while not obvious, not an unreasonable assumption. If differences of maturity prevail, this will affect amplitudes of fluctuations but not the cycle turning points, which are our primary concern. Maturity differences will also distort the absolute differences of various rates. These however do not enter significantly into our subsequent discussion. Cycle turning points in the difference will not be materially affected—if such cycles exist at all. Fundamentally the choice is restricted, if not wholly governed, by the third factor—availability. This finally had to settle the issue in each case.

In the following paragraphs we give the sources. Section 3 will then take up the usual cyclical analysis. Charts 53 to 56 show the series on a monthly basis. The period covered is variously 1870–1913 and from the close of World War I up to 1939. The characterization of the data by means of frequency distributions is omitted, because the graphs show clearly very long-range swings and thus make the computation of the distributions an even more doubtful affair than in time series having only short-run variations (cyclical or otherwise). Seasonal variations were only observed and therefore corrected for France and England.

(7) The long-term rates are:

United States. F. R. Macaulay[9] calculated the yields of American railroad bonds on a monthly basis from 1857 to 1936. The yields are based on monthly average prices, the average being the arithmetic mean of the monthly maxima and minima quotations. "Economic drift," i.e., secular and cyclical changes in the index induced by changes in the grades of the bonds, was eliminated from the index by means of Macaulay's "4.50 sigma index."[10]

The Standard Statistics Company computed yields of fifteen high-grade railroad bonds for the United States and these were used to complete the United States long-term interest rates to 1938.

Great Britain. Yields of 3 per cent consols are available on a

[8] A fundamental difference in the financing of securities before World War I between the United States and Europe was that in New York it was done largely by means of credit, while in Europe the proportion of savings was greater—as far as one can know.

[9] *The Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, National Bureau of Economic Research, 1938, p. A142.

[10] *Ibid.*, pp. 85 ff.

monthly basis from 1840 to 1852 in the *Annual Register*, and thereafter in the *Statistical Abstract of the United Kingdom*.

The nominal rate of interest was 3 per cent up to 1889. Beginning January 1, 1889, the nominal rate of interest was fixed at 2.75 per cent. In 1903 the rate was again lowered to 2.5 per cent, the first payment at the new rate being made April 5. The series has been made homogeneous.

France. The National Bureau of Economic Research computed the prices of 3 per cent perpetual rentes (per 100 francs share) from December 1873 to 1897 from *L'Economiste Français*. For the period 1898–1914 the prices were taken from Jean Déssirier, "Nouveaux Essais de Statistiques sur les Mouvements Boursiers," *Journal de la Société de Statistique de Paris*, February 1929. Déssirier first computed a monthly price index of stocks for the above-mentioned period. Thereafter the actual yield of the stocks for 1913 was computed. Starting from this yield and using the monthly index of security prices and earnings on the basis 1913 = 100, the net yield of the whole period was calculated.

The Bureau de Statistique Générale published security yields for the period 1919–1931 in *Indices Généraux du Mouvement Économique en France de 1901 à 1931*, pages 143–145, 160. The series was continued in successive issues of the *Bulletin de la Statistique de la France*. These yields were obtained directly from dividends and prices.

Germany. The Institut für Konjunkturforschung published an estimate of monthly bond yields for the period 1870–1913 in *Vierteljahrshefte zur Konjunkturforschung*[11] in 1934. No information is given regarding either the specific securities included or the methods of computation, but in view of the general reputation of the Institute the series was nevertheless accepted. The absolute level indicates that probably other than government bonds also were included.

The Statistisches Reichsamt calculated the prices of 6 per cent bonds for the period 1928–1932 in the *Konjunkturstatistisches Handbuch*, 1933 (page 134) and for 1933–1935 in successive issues of *Wirtschaft und Statistik*. These have been converted into yields by dividing the price into 6 per cent. The figures for 1925, 1926, and 1927 were computed by multiplying the gold mortgage bond yields (published by the Statistisches Reichsamt in successive

[11] *Sonderheft*, 36, pp. 98–99.

issues of *Wirtschaft und Statistik* since 1925)[12] for 1926 and 1927 by 0.900, which is the average monthly ratio of overlapping figures of gold mortgage bond yields and 6 per cent bond yields for January–June 1928.

Section 3. Cyclical Behavior of Long-Term Interest Rates

(8) Charts 53 to 56 show that the specific cycles of long-term interest rates we are able to mark off visually, in applying the standard definition, are not without elements of ambiguity. The cycles are sometimes clearly in evidence; at other times they might be considered part of a phase of a longer cycle. An instance is that of German bond yields, where there is a decline from the end of 1878 to the second half of 1889, a movement that is continued in spite of some interruptions to the middle of 1896, when a general upward movement begins. Similar conditions prevail in the other series.

Table 109 gives the *dates of the specific cycle turning points* and can be compared with Table 12 containing those of the short-term rates. In Table 110 we show the number and duration of the specific cycles for seasonally corrected data. The period covered is the same as for the short-term rates, February 1878–August 1913, 426 months. Averages were not computed for the period after World War I.

The number of full cycles is very small; for Great Britain five, France eight, Germany four, and the United States seven. Only France has the same number of cycles as for the short-term interest rate; in all other cases there are fewer cycles. This is not unexpected, but not without interest. If the rates of long and short maturities are interdependent, then their cycles ought to be. Thus observed differences must express this interdependence, which may be of a very complicated nature. German and British cycles are the longest, 91.2 and 71.4 months respectively, making the first more than twice as long as those for short-term rates, the second 50 per cent longer. The French cycles are virtually of the same length for both rates—49.2 and 47.5 months. The percentage shares

[12] A simple average of the yields of mortgage bonds with nominal interest rates of 5, 6, 7, 8, and 10 per cent was struck. Each of the groups is an average of ten bonds, except in 1926 when the 6 per cent group is an average of four bonds and in 1927 when the 10 per cent group is an average of eight bonds.

TABLE 109

Turning Points of Specific Cycles of Long-Term Interest Rates, Seasonally Corrected Data[a]

GREAT BRITAIN		FRANCE	
Peak	*Trough*	*Peak*	*Trough*
			Jan. 1877
Aug. 1870	Aug. 1871	Apr. 1877	Oct. 1880
Mar. 1874	Aug. 1876	Dec. 1883	Nov. 1886
Oct. 1878	Feb. 1883	Feb. 1887	Sept. 1892
Apr. 1885	Jan. 1888	Apr. 1893	Aug. 1894
May 1891	Nov. 1897	Oct. 1895	July 1897
Nov. 1901	June 1902	July 1900	June 1902
Mar. 1904	Sept. 1905	Feb. 1904	Oct. 1905
Aug. 1907	July 1908	Aug. 1907	Oct. 1909
		June 1913	Aug. 1913
Dec. 1920	Apr. 1923		
Mar. 1924	Nov. 1924		
June 1927	Dec. 1928	Oct. 1921	Aug. 1922
Dec. 1929	June 1931	June 1925	Apr. 1931
Dec. 1931	Oct. 1932	Jan. 1934	Jan. 1935
July 1933	Jan. 1935	May 1937	Dec. 1938

GERMANY		UNITED STATES	
Peak	*Trough*	*Peak*	*Trough*
	June 1872		Aug. 1873
May 1873	July 1874	Nov. 1873	Aug. 1876
Nov. 1875	July 1876	Apr. 1877	June 1881
Nov. 1878	Aug. 1889	Sept. 1883	July 1886
Aug. 1891	Mar. 1893	Oct. 1887	June 1889
Nov. 1893	Aug. 1896	Aug. 1891	July 1892
Sept. 1900	Apr. 1903	Aug. 1893	Aug. 1895
Apr. 1908	Apr. 1909	Aug. 1896	June 1899
		Sept. 1903	Feb. 1905
		Nov. 1907	Feb. 1909
		Dec. 1913	June 1914
	Mar. 1925		
Nov. 1925	Feb. 1927		Sept. 1922
Jan. 1930	July 1930	Oct. 1923	Dec. 1927
June 1932		Sept. 1929	May 1931
		June 1932	

Source of series: see Section 2.

[a] France and Britain.

TABLE 110

Number and Duration of Specific Cycles of Long-Term Interest Rates of Four Countries, Seasonally Corrected Data

Prewar, February 1878–August 1913, 426 months

	NUMBER OF:			AVERAGE DURATION OF[a]: (MONTHS)			AVERAGE PER CENT[b] DURATION OF SPECIFIC CYCLES	
	Expansions	*Contractions*	*Full cycles*[c]	*Expansions*	*Contractions*	*Full cycles*	*Expansions*	*Contractions*
Great Britain	5	6	5	31.6	33.2	71.4	48.8	51.2
France[d]	8	8	8	23.0	26.2	49.2	46.7	53.3
Germany	4	5	4	35.2	44.8	91.2	44.0	56.0
United States	7	7	7	25.3	22.1	47.4	53.4	46.6

[a] Durations of only complete cycles, expansions, and contractions are included in their respective columns.

[b] The percentages are calculated from a base equal to the average duration of expansions plus contractions. This sum is equal to the average duration of cycles only when the number of full cycles is the same as the number of expansions and contractions.

[c] Only complete cycles are counted; parts of cycles at both ends of a series are dropped. Cycles are measured from trough to trough. Similarly only complete expansions and contractions are counted in their respective columns.

[d] Cycles determined by French rentes.

of expansions and contractions are more evenly distributed than was the case for the short-term rates, where there was a clear and general case of longer duration of expansions than of contractions; they exceeded the latter up to 100 per cent. Now the opposite condition seems to prevail, except in the United States. All this is a reflection of the long swings in the rates referred to above. (It will be remembered that this relationship between expansions and contractions for short-term rates was exactly reversed for 1925–1938.) At any rate the interdependence cannot be the same for all countries in view of these differences—provided the data are satisfactory and the rates equally representative.

However the lack of definition of the pattern of behavior has also to be viewed in the light of the fact that specific cycles themselves are of a far more uncertain nature than those of the short-term rates.

(9) Taking next the covariation of the long-term rates with their respective reference cycles, we can be very brief and refer the reader to Table 111, in which the covariations are computed. As is

TABLE 111

Phase Comparison of Specific Cycles of Long-Term Interest Rates and Their Respective Reference Cycles, Prewar

February 1878–August 1913, 426 months

	SAME PHASE:			Different phase	SAME PHASE:			Different phase
	Expansions	Contractions	Total		Expansions	Contractions	Total	
	(MONTHS)				(PERCENTAGES)			
Great Britain	155	88	243	183	36.4	20.7	57.0	43.0
Germany	124	118	242	184	29.1	27.7	56.8	43.2
United States	114	79	193	233	26.8	18.5	45.3	54.7
France	128	145	273	153	30.0	34.0	64.1	35.9

to be expected, the results are indifferent, save for France where the highest total covariation is observed. There a significant 64.1 per cent obtains (as compared with 81.9 per cent covariation of French short-term rates and reference cycles). The British figure of 57.0 per cent may also be mentioned; it compares with 82.4 for the short-term rates. As a whole, the result is much worse than what was observed in Chapter III.

Relative to their respective reference cycles, the long-term series appear to be lagging, which means that business is turning up before the long-term rates rise. This would be in general conformity with expectations on the basis of the monetary and monetary over-investment theories. The United States rate did lag, although after World War I this became less evident. For France we have very long lags, and for Germany they were also conspicuous. These lags contribute to the poor correspondence shown in the phase correspondence percentages; if the lags were allowed for, the correspondence would be higher.

Further information will be obtained from Table 112 showing the concentration and dispersion of peaks and troughs.

(10) Whatever the covariation of cycles of long-term rates with their own reference cycles, more immediately relevant for our purposes is to discover their interrelation. It is possible that, while the correspondence with reference cycles is often bad, they may be in better harmony with each other. They would thus show that an international rhythm prevails, somewhat separated from the national one.

TABLE 112

Long-Term Interest Rates, Dispersion of Specific Cycle Turning Points, July 1878–September 1913

(422 months)

	Average peak[b]	Mean deviation (months)	Average mean deviation (months)	Percentage coinciding
	COINCIDING PEAKS[a]			
Four countries	Nov. 1907	2.75	2.75	77
Three European countries	Jan. 1901	5.67	4.6	105
	Nov. 1907	3.67		
	COINCIDING TROUGHS[a]			
	Average trough[b]	Mean deviation (months)	Average mean deviation (months)	Percentage coinciding
Four countries	Mar. 1909	6.25	6.25	0
Three European countries	May 1896	7.67	6.33	100
	Sept. 1902	4.33		
	Mar. 1909	7.00		
	Average mean deviation of coinciding peaks as per cent of corresponding average for troughs			
Four countries	44%			
Three European countries	74%			

[a] Coinciding turning points: within the range of turning points is no opposite turning point.

[b] Arithmetical mean of the coinciding turning points is computed. If the average falls exactly between two months, both are reported. If the average falls more closely into one month, only this month is reported.

The calculations for the period before World War I are summarized in Table 113; they correspond to those used earlier, and are to be compared with Tables 15 and 18. When all four countries are taken together, i.e., determining the number of months when the long-term rates are all either contracting or rising, 34.7 per cent are in the same phase. For the three European countries alone, the correspondence is closer. The pairwise correspondence is significant and varies within narrow limits only. The best obtains for Great Britain–Germany with 69.2 per cent of all months in the same phase; the poorest exists for the United States–Germany with 61.3 per cent. The range is thus very small, indeed smaller than it

TABLE 113

Phase Comparison of Specific Cycles of Prewar Long-Term Interest Rates for Groups of Countries, February 1878–August 1913, 426 Months

	SAME PHASE:			Different phase	SAME PHASE:			Different phase
	Expansions	Contractions	Total		Expansions	Contractions	Total	
	(MONTHS)				(PERCENTAGES)			
Four countries	84	64	148	278	19.7	15.0	34.7	65.3
Three European countries	108	95	203	223	25.4	22.3	47.7	52.3
Great Britain–France	128	143	271	155	30.0	33.6	63.6	36.4
Great Britain–Germany	149	146	295	131	35.0	34.3	69.2	30.8
France–Germany	114	167	281	145	26.8	39.2	66.0	34.0
United States–Great Britain	151	119	270	156	35.4	27.9	63.4	36.6
United States–France	133	144	277	149	31.2	33.8	65.0	35.0
United States–Germany	134	127	261	165	31.5	29.8	61.3	38.7

was for the short-term rates.[13] But on the other hand the pairwise covariation was in each corresponding case better for the latter than for the long-term rates.

While one should be very careful in interpreting these figures, it seems safe to state (again) that, though a mechanism exists to line up short-term rates with each other (especially when there is trouble as expressed by rising rates), either this mechanism does not also link the long-term rates to the same degree or these are relatively independent of the short rates. This is a question of major significance and will be investigated in section 4. We may also say that the mechanism consists of two parts; one linking short-term, and another linking long-term markets. While each part shows a plausible connection, the relation of the two parts to each other remains obscure at the present juncture.

All these measurements have been made only for the period before World War I, because of the difficulties of comparing the post-World-War-I cycles as such. The postwar parts of our present series will be analyzed for covariation in section 5 when determining the correlations for the whole series, i.e., freeing ourselves from the restrictions imposed by the specific cycle definition.

[13] This applies to their specific cycles; it will be recalled that we found also *short cycles* there, where the correspondence was better than here.

Section 4. Long-Term Interest Rate Differentials

(11) The formation of short-term differentials in Chapter IV was justified by assuming the classical mechanism, the working of which was later scrutinized in studying the series in conjunction with the exchange rates. The long-term differentials have a less immediate and direct foundation. Yet the practical operator in international finance has always compared long-term rates of his own country with those of other countries. When deciding upon the employment of funds, even when holding short-term capital, the investor not only had in mind the domestic and foreign short rates, but also the long rates. Long-term foreign investment through direct participation, or purchase of foreign bonds, government and private, were all obvious possibilities, and indeed common practice, before 1914. After World War I new elements entered the picture, but large-scale lending operations went on. However imperfect the investors' information may have been, they compared many interest rates (and thus differentials).

In the following we simply discuss the statistics and leave interpretation to a minimum. Charts 57 to 62 show the six series for prewar and post-World-War-I on which the specific cycles are marked off. The order in which the differences were formed is parallel to those of the short-term rates (cf. Charts 18 to 23) and we refer to the discussion on pages 125 ff. This will make it possible to compare the two corresponding differentials directly with each other[14] regarding cycles and absolute amounts. In respect to the latter, caution must be exercised, since the difficulties discussed in section 1 apply of finding long-term rates—especially over extended periods—that can really be taken as indicating the absolute level of long-term rates. If it is difficult to form an accurate idea about the rate structure within a country for any length of time, it is far more difficult to show what "international structure" exists.

(12) The long-term differentials will be investigated in a number of steps: the static properties as shown by: their frequency distributions; their cyclical characteristics; and the determination of their maximal and minimal differences.

The *frequency distributions* are shown in Table 114 and are arranged like those of the short-term series. They require thus

[14] Similarly they can be compared with the differentials of official discount rates of Chapter VIII, section 7.

TABLE 114

Frequency Distribution of Long-Term Rate Differentials for Six Countries

American Railroad Bond Yields over German Bond Yields, Seasonally Corrected
January 1876–July 1914

Class (*per cent*)	*Frequency*
−0.60 to −0.51	11
−0.50 to −0.41	18
−0.40 to −0.31	10
−0.30 to −0.21	10
−0.20 to −0.11	20
−0.10 to −0.01	114
0 to 0.09	115
0.10 to 0.19	47
0.20 to 0.29	41
0.30 to 0.39	15
0.40 to 0.49	6
0.50 to 0.59	10
0.60 to 0.69	5
0.70 to 0.79	2
0.80 to 0.89	8
0.90 to 0.99	29
1.00 to 1.09	2
Total	463
Arithmetic mean	0.11
Median	0.04
Standard deviation	0.33
Coefficient of variation	0.3

TABLE 114, continued

American Railroad Bond Yields over British Consol Yields
(seasonally unadjusted American bond yields with seasonally corrected British consol yields)

January 1876–July 1914

Class (*per cent*)	*Frequency*
0.20 to 0.29	14
0.30 to 0.39	11
0.40 to 0.49	15
0.50 to 0.59	13
0.60 to 0.69	67
0.70 to 0.79	100
0.80 to 0.89	61
0.90 to 0.99	53
1.00 to 1.09	18
1.10 to 1.19	21
1.20 to 1.29	31
1.30 to 1.39	3
1.40 to 1.49	3
1.50 to 1.59	5
1.60 to 1.69	9
1.70 to 1.79	1
1.80 to 1.89	4
1.90 to 1.99	14
2.00 to 2.09	18
2.10 to 2.19	2
Total	463
Arithmetic mean	0.96
Median	0.82
Standard deviation	0.44
Coefficient of variation	0.45

(*table continues*)

TABLE 114, continued

American Railroad Bond Yields over French Rente Yields
(French Rente yields seasonally corrected; American railroad bond yields seasonally uncorrected)

January 1876–July 1914

Class (*per cent*)	*Frequency*
−0.10 to −0.06	3
−0.05 to −0.01	3
0 to 0.04	18
0.05 to 0.09	14
0.10 to 0.14	14
0.15 to 0.19	16
0.20 to 0.24	32
0.25 to 0.29	14
0.30 to 0.34	13
0.35 to 0.39	18
0.40 to 0.44	38
0.45 to 0.49	38
0.50 to 0.54	26
0.55 to 0.59	42
0.60 to 0.64	40
0.65 to 0.69	30
0.70 to 0.74	32
0.75 to 0.79	16
0.80 to 0.84	5
0.85 to 0.89	5
0.90 to 0.94	9
0.95 to 0.99	6
1.00 to 1.04	12
1.05 to 1.09	7
1.10 to 1.14	9
1.15 to 1.19	3
Total	463
Arithmetic mean	0.51
Median	0.52
Standard deviation	0.29
Coefficient of variation	0.56

TABLE 114, continued

German Bond Yields over British Consol Yields
(seasonally corrected British consol yields;
seasonally uncorrected German bond yields)

January 1876–December 1913

Class (*per cent*)	*Frequency*
0.45 to 0.49	1
0.50 to 0.54	1
0.55 to 0.59	7
0.60 to 0.64	29
0.65 to 0.69	29
0.70 to 0.74	38
0.75 to 0.79	79
0.80 to 0.84	75
0.85 to 0.89	40
0.90 to 0.94	43
0.95 to 0.99	51
1.00 to 1.04	15
1.05 to 1.09	30
1.10 to 1.14	16
1.15 to 1.19	2
Total	456
Arithmetic mean	0.85
Median	0.83
Standard deviation	0.14
Coefficient of variation	0.17

(*table continues*)

TABLE 114, continued

French Rente Yields over British Consol Yields, Seasonally Corrected
January 1876–July 1914

Class (per cent)	*Frequency*
−0.20 to −0.11	1
−0.10 to −0.01	23
0 to 0.09	50
0.10 to 0.19	35
0.20 to 0.29	107
0.30 to 0.39	27
0.40 to 0.49	51
0.50 to 0.59	28
0.60 to 0.69	33
0.70 to 0.79	53
0.80 to 0.89	20
0.90 to 0.99	13
1.00 to 1.09	6
1.10 to 1.19	7
1.20 to 1.29	6
1.30 to 1.39	3
Total	463
Arithmetic mean	0.43
Median	0.36
Standard deviation	0.32
Coefficient of variation	0.75

TABLE 114, continued

German Bond Yields over French Rente Yields
(German bond yields seasonally uncorrected;
French Rente yields seasonally corrected)

January 1876–December 1913

Class (*per cent*)	*Frequency*
−0.35 to −0.31	1
−0.30 to −0.26	2
−0.25 to −0.21	2
−0.20 to −0.16	1
−0.15 to −0.11	4
−0.10 to −0.06	4
−0.05 to −0.01	15
0 to 0.04	30
0.05 to 0.09	24
0.10 to 0.14	14
0.15 to 0.19	10
0.20 to 0.24	10
0.25 to 0.29	8
0.30 to 0.34	6
0.35 to 0.39	18
0.40 to 0.44	30
0.45 to 0.49	41
0.50 to 0.54	61
0.55 to 0.59	57
0.60 to 0.64	44
0.65 to 0.69	46
0.70 to 0.74	23
0.75 to 0.79	4
0.80 to 0.84	1
Total	456
Arithmetic mean	0.42
Median	0.51
Standard deviation	0.27
Coefficient of variation	0.65

(*table continues*)

TABLE 114, continued

American Railroad Bond Yields over British Consol Yields
(seasonally unadjusted American bond yields with seasonally corrected British Consol yields)

January 1925–December 1938

Class (*per cent*)	*Frequency*
−0.60 to −0.41	10
−0.40 to −0.21	32
−0.20 to −0.01	35
0 to 0.19	17
0.20 to 0.39	26
0.40 to 0.59	14
0.60 to 0.79	16
0.80 to 0.99	10
1.00 to 1.19	6
1.20 to 1.39	2
Total	168
Arithmetic mean	0.16
Median	0.08
Standard deviation	0.47
Coefficient of variation	2.94

TABLE 114, continued

German Bond Yields over French Rente Yields
(German bond yields seasonally uncorrected;
French Rente yield seasonally corrected)

January 1925–March 1935
(omitting August, October, November, December 1931 and
January, February, March 1932)

Class (*per cent*)	*Frequency*
1.00 to 1.24	1
1.25 to 1.49	5
1.50 to 1.74	5
1.75 to 1.99	7
2.00 to 2.24	11
2.25 to 2.49	5
2.50 to 2.74	11
2.75 to 2.99	8
3.00 to 3.24	9
3.25 to 3.49	11
3.50 to 3.74	5
3.75 to 3.99	10
4.00 to 4.24	9
4.25 to 4.49	6
4.50 to 4.74	4
4.75 to 4.99	2
5.00 to 5.24	2
5.25 to 5.49	1
5.50 to 5.74	1
5.75 to 5.99	3
Total	116
Arithmetic mean	3.18
Median	3.14
Standard deviation	1.14
Coefficient of variation	0.36

(*table continues*)

TABLE 114, continued

American Railroad Bond Yields over German Bond Yields, Seasonally Corrected

January 1925–March 1935
(omitting August, October, November, December 1931 and January, February, March 1932)

Class (*per cent*)	*Frequency*
−5.20 to −5.01	1
−5.00 to −4.81	5
−4.80 to −4.61	5
−4.60 to −4.41	3
−4.40 to −4.21	4
−4.20 to −4.01	3
−4.00 to −3.81	1
−3.80 to −3.61	10
−3.60 to −3.41	33
−3.40 to −3.21	11
−3.20 to −3.01	16
−3.00 to −2.81	14
−2.80 to −2.61	4
−2.60 to −2.41	6
Total	116
Arithmetic mean	−3.40
Median	−3.44
Standard deviation	0.61
Coefficient of variation	0.18

TABLE 114, continued

French Rente Yields over British Consol Yields, Seasonally Corrected

January 1925–December 1938

Class (*per cent*)	*Frequency*
−1.40 to −1.21	2
−1.20 to −1.01	11
−1.00 to −0.81	11
−0.80 to −0.61	7
−0.60 to −0.41	5
−0.40 to −0.21	5
−0.20 to −0.01	5
0 to 0.19	10
0.20 to 0.39	4
0.40 to 0.59	11
0.60 to 0.79	14
0.80 to 0.99	22
1.00 to 1.19	21
1.20 to 1.39	12
1.40 to 1.59	8
1.60 to 1.79	8
1.80 to 1.99	6
2.00 to 2.19	3
2.20 to 2.39	2
2.40 to 2.59	1
Total	168
Arithmetic mean	0.55
Median	0.79
Standard deviation	1.03
Coefficient of variation	1.87

(*table continues*)

TABLE 114, continued

American Railroad Bond Yields over French Rente Yields
(French Rente yields seasonally corrected; American railroad bond yields seasonally uncorrected)

January 1925–December 1938

Class (*per cent*)	*Frequency*
−2.55 to −2.41	2
−2.40 to −2.26	0
−2.25 to −2.11	1
−2.10 to −1.96	8
−1.95 to −1.81	5
−1.80 to −1.66	3
−1.65 to −1.51	3
−1.50 to −1.36	2
−1.35 to −1.21	3
−1.20 to −1.06	10
−1.05 to −0.91	7
−0.90 to −0.76	10
−0.75 to −0.61	9
−0.60 to −0.46	10
−0.45 to −0.31	21
−0.30 to −0.16	12
−0.15 to −0.01	7
0 to 0.14	4
0.15 to 0.29	6
0.30 to 0.44	3
0.45 to 0.59	5
0.60 to 0.74	12
0.75 to 0.89	13
0.90 to 1.04	11
1.05 to 1.19	1
Total	168
Arithmetic mean	−0.37
Median	−0.37
Standard deviation	0.88
Coefficient of variation	2.38

only brief comment, since we shall discuss their means together with those of others below on pages 496 ff. The marked skewness which appears in some distributions could of course have been inverted by forming the opposite (and equivalent) differential. More important seems to be the appearance of bimodality in some, especially in the German–French pre-World-War-I differential, and the American–French and French–British postwar differential. This behavior cannot be explained on grounds of policy (as in the case of the official discount rates), since we are dealing with differences

TABLE 114, concluded

German Bond Yields over British Consol Yields
(seasonally corrected British consol yields;
seasonally uncorrected German bond yields)
January 1925–March 1935
(omitting August, October, November, December 1931
and January, February, March 1932)

Class (*per cent*)	*Frequency*
2.40 to 2.59	4
2.60 to 2.79	7
2.80 to 2.99	6
3.00 to 3.19	20
3.20 to 3.39	15
3.40 to 3.59	25
3.60 to 3.79	7
3.80 to 3.99	4
4.00 to 4.19	5
4.20 to 4.39	6
4.40 to 4.59	2
4.60 to 4.79	5
4.80 to 4.99	3
5.00 to 5.19	0
5.20 to 5.39	3
5.40 to 5.59	1
5.60 to 5.79	0
5.80 to 5.99	1
6.00 to 6.19	2
Total	116
Arithmetic mean	3.62
Median	3.45
Standard deviation	0.76
Coefficient of variation	0.21

of free market prices subject to a multitude of influences. Neither was bimodality found in short-term differentials. A characteristic, which they share with the short-term differentials though to a lesser extent, is the great spread of the coefficient of variation: from 0.17 to 0.75 for the prewar period, and 0.18 to 2.94 for the postwar period.

Instead of a further evaluation of the distributions we characterize the over-all properties by a tabulation in Table 115, corresponding with Table 26, showing in percentages how often some rates exceeded the others.

Taking the pre-World-War-I period first, Table 115 shows that the London long-term rate was always lower than any of the other

TABLE 115

Long-Term Interest Rate Differentials between Pairs of Countries Expressed as Percentage of the Total Period[a]

	Prewar[b]	*Postwar*[c]
London higher than Paris	5.2	27.4
Berlin higher than Paris	93.6	100.0
New York higher than Paris	98.7	32.7
New York higher than Berlin	60.5	0.0
New York higher than London	100.0	54.2
Berlin higher than London	100.0	100.0

[a] New York or Berlin rate is uncorrected for seasonal variation.

[b] January 1876 to July 1914, except in case of Berlin versus London and Berlin versus Paris where the period is January 1876 to December 1913.

[c] January 1925 to December 1938, except in Berlin versus London, New York versus Berlin, and Berlin versus Paris where the period is January 1925 to March 1935, except for August 1931 and October 1931 to March 1932 inclusive, for which the data are lacking.

three; for the short-term rates, that role, which London could not maintain in the postwar years, fell to Paris. Indeed the division in the mutual relation of London and Paris before 1914 is most interesting: *the picture is much more definite for the long-term than for the short-term rates*. The greater role of London as the prime *capital* market expresses itself in these figures again; Paris was always liquid in the *short* run, exhibiting apparently what would now be called a high liquidity preference. The widest difference, practically 100 per cent, exists both for short-term and long-term rates between New York and Paris; the former of course being the higher of the two. After World War I the German long-term rate was always higher than those of the other countries; this is hardly surprising. But the fact that such permanent differences are maintained for hundreds of months is, indeed, remarkable; the interaction of all these highly organized money and capital markets and the vast flows of funds back and forth was not strong enough to overcome fundamental institutional and risk differences.[15]

These indications are supplemented by the subsequent measurements of the maximal differences of long-term rates and their comparison with those of the short-term rates. Furthermore Tables

[15] In the above the assumption is necessarily made that the absolute levels of long-term rates of various countries can be compared with confidence, and that the accuracy of the data warrants the formation of these measures.

118 to 122 give a comprehensive survey of the relative position of all rates.

(13) *Cyclical characteristics.* The first question is: should one expect cycles, and what should be their properties? Theory gives us no guidance, except perhaps by implication. It was not too difficult to make a case for the short-term differentials, and indeed in addition to fairly-well-defined specific cycles, "short cycles" appeared also. These were rediscovered in the exchange rates, making the existence of a link between them plausible. What mechanisms can be thought of as either producing or regulating cycles among the long-term differentials?

If cycles appear, they must be due to lags, differences in amplitudes of cycles of constituent series, and the various combinations of these factors, but it is difficult now to indicate what forces would produce such regularities. At any rate a profound understanding of the interaction of long-term foreign investment would be required in order to comprehend the behavior of our series, i.e., it would be necessary to have information about the amount of differences in long-term rates that induces an investor to jump the hurdle of investing in foreign securities, about the different pulls exercised by simultaneously prevailing rates at home, and about the evaluation of the risk element. These things have never been explored systematically, and we shall have to approach the cycles in a simple, descriptive manner only.

It is seen from Charts 57 to 62 that there are indeed strong cycles. The specific cycles are based on the usual criteria, and their dates are given in Table 116. Just as in the underlying series of the long-term rates, wide swings appear to exist in addition. Several specific cycles are of uncertain character, though they fall within the definition. Some series have very pronounced cycles even before 1914. This is especially noteworthy for the Paris–London differential, formed for the two most highly developed capital and money markets of the time. This would seem to indicate that cycles are at least not incompatible with a high development. A strong rhythm is also found for the New York–London series after World War I, when these two capital markets would have to be considered as the most active and advanced. The international crises of 1893, 1896, 1901, 1907, and others stand out clearly. After World War I main turns occur in 1920, 1925, 1929, and especially in 1931, a turn which is often swallowed up in other economic series.

In all cases before 1914 there is a narrowing of fluctuations over

TABLE 116

Dates of Specific Cycle Turning Points of Long-Long Interest Rate Differentials, Pairs of Countries

AMERICAN–BRITISH		AMERICAN–GERMAN		BRITISH–GERMAN	
Peak	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
			July 1870		
	July 1873	Nov. 1871	July 1873	July 1870	June 1872
Oct. 1873	July 1876	Nov. 1873	Aug. 1876	May 1873	July 1874
Mar. 1877	June 1881	Mar. 1877	July 1881	Feb. 1879	Sept. 1881
Feb. 1883	Aug. 1886	July 1884	June 1886	Feb. 1883	Oct. 1886
Oct. 1887	June 1889	Oct. 1887	June 1889	Dec. 1887	Mar. 1889
Aug. 1891	July 1892	June 1891	Feb. 1892	Aug. 1891	July 1892
Aug. 1893	Aug. 1895	Aug. 1893	Apr. 1894	Nov. 1893	Mar. 1895
Aug. 1896	July 1901	Aug. 1896	Jan. 1901	Apr. 1899	Mar. 1904
Aug. 1903	Jan. 1905	Sept. 1903	Sept. 1905	Dec. 1905	Sept. 1907
Nov. 1907	Feb. 1909	Nov. 1907	Sept. 1908	June 1908	July 1912
July 1910	July 1912	July 1910	Sept. 1913		
May 1920	Nov. 1920				
Apr. 1923	Dec. 1927	Mar. 1925	Nov. 1925	Aug. 1925	Mar. 1925
July 1929	Sept. 1930	Feb. 1927	Dec. 1929	Jan. 1930	Apr. 1927
July 1932	Aug. 1937	July 1930	June 1932	July 1932	June 1930
Apr. 1938		Jan. 1934		Aug. 1934	Jan. 1934

AMERICAN–FRENCH		BRITISH–FRENCH		GERMAN–FRENCH	
Peak	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
	Mar. 1876		Jan. 1877		
Mar. 1877	July 1877	Sept. 1877	Aug. 1880	Jan. 1877	May 1877
Nov. 1878	Aug. 1881	Mar. 1884	Nov. 1886	Sept. 1879	June 1884
Mar. 1882	Mar. 1884	Feb. 1887	Sept. 1892	June 1886	Oct. 1886
Feb. 1885	Feb. 1887	Apr. 1893	Aug. 1894	Sept. 1892	Apr. 1893
Oct. 1887	June 1889	July 1896	Nov. 1901	Nov. 1893	Oct. 1895
Sept. 1891	Feb. 1892	June 1902	Mar. 1904	Jan. 1901	June 1903
Aug. 1893	Oct. 1895	Jan. 1907	Dec. 1907	Apr. 1906	Jan. 1907
Aug. 1896	July 1899	June 1908	July 1912	Apr. 1908	Apr. 1909
Sept. 1903	Aug. 1904			Oct. 1909	Aug. 1911
Nov. 1907	Feb. 1909			July 1912	
July 1910	Mar. 1913				
Aug. 1913					
May 1920	Jan. 1922		Dec. 1920		May 1925
Nov. 1922	June 1925	June 1925	Jan. 1930	Dec. 1925	July 1926
Jan. 1930	Oct. 1930	Mar. 1934	June 1935	Jan. 1930	Apr. 1931
July 1932	Jan. 1934	Aug. 1936	Dec. 1938	July 1932	Jan. 1934
May 1934	July 1936				
Dec. 1938					

TABLE 117

Number and Duration of Specific Cycles of Long–Long Interest Rate Differentials for Six Pairs of Countries

	NUMBER OF:			AVERAGE DURATION OF[a]: (*months*)			AVERAGE PER CENT[b] DURATION OF SPECIFIC CYCLES	
	Expansions	*Contractions*	*Full cycles*[c]	*Expansions*	*Contractions*	*Full cycles*	*Expansions*	*Contractions*
	Prewar, February 1878–August 1913, 426 months							
American–British	8	8	8	20.8	26.0	46.8	44.4	55.6
American–German	8	7	7	25.2	19.4	35.3	56.5	43.5
British–German	7	8	7	22.1	30.8	52.9	41.8	58.2
American–French	9	10	9	20.8	22.5	42.1	48.0	52.0
British–French	7	7	7	17.7	37.0	54.7	32.4	67.6
German–French	8	8	7	25.6	23.4	46.3	52.2	47.8
	Postwar, January 1925–December 1932, 96 months							
American–British	2	1	1	20.5	14.0	36.0	59.4	40.6
American–German	2	3	2	11.0	21.7	39.5	33.6	66.4
British–German	3	2	2	21.0	12.5	31.5	62.7	37.3
American–French	2	1	1	38.0	9.0	64.0	80.9	19.1
British–French	0	0	0	0	0	0	0	0
German–French	3	2	2	20.0	13.0	37.5	60.6	39.4

[a] Durations of only complete cycles, expansions, and contractions are included in their respective columns.

[b] The percentages are calculated from a base equal to the average duration of expansions plus contractions. This sum is equal to the average duration of cycles only when the number of cycles is the same as the number of expansions and contractions.

[c] Only complete cycles are counted; parts of cycles at both ends of a series are dropped. Cycles are measured from trough to trough. Similarly only complete expansions and contractions are counted in their respective columns.

time. The differences between the long-term rates became stabilized around lower means. The most noteworthy role in that respect is played by the series involving New York. (This evening out will become still more evident in Charts 63 and 64 above, where we turn to the absolute maxima of differentials.) After World War I all six series, without exception, assume fluctuations of vastly greater dimensions than they had before, thus again confirming observations made repeatedly about the profound changes that characterize the interwar period.

The cycles are enumerated in Table 117, where also their average duration is given. They should be compared with the cycles of the

underlying series, shown above in Table 110. The postwar data are added, but are of small value, because in only two cases could as many as three cycles be distinguished, and in three cases there were only two cycles. There are nine and eight cycles before 1914 for the American–French and American–British series and seven for each of the remaining pairs. Consequently their average durations differ far less from each other than those of the cycles of the long-term rates.

Table 117 should be compared with Table 69, where the numbers and durations of specific cycles of the short-term differentials and exchange rates are given. It is surprising that in each case there are more full cycles for the long-term than for the corresponding short-term differentials. This is certainly contrary to expectations, on the assumption that "variability," "flexibility," and "speed of reaction" would be much greater in the international money markets than in the capital markets and would show in these series. The conflict is only apparent and is resolved by the observation of the short cycles in short-term differentials, of which there is no evidence in the long-term differentials. This also illustrates how much depends on the underlying notions of appropriateness of measuring units.

(14) *Maximal and minimal differences.* Perhaps the most revealing condensed information is given in Charts 63 and 64 and Tables 118 and 119 showing the annual maximal and minimal differences between long-term interest rate differentials. The tables and charts are constructed parallel with Tables 30 and 31 and Charts 7 and 8 concerning short-term differentials. There we devoted a lengthy comment to these statistics; here we shall only give the data and make a few remarks. An extension of the following observations easily suggests itself but is left for the reader. He will in particular ask himself how one can safely speak of economic maturity or stagnation in view of the enormous change, and its direction, between the data for the prewar and post-World-War-I periods!

We are mainly interested in finding the general structural behavior of these series and in comparing it with the structure revealed in Chapter IV for the short-term interdependence. There it was found that the maxima showed, for the years before 1914, a clear downward trend, while the minima were, as necessary for algebraic reasons, free from any. After World War I this trend was reversed. In each case it was more marked for the averages, while the fluctuations were far greater for the annual ranges. The

TABLE 118

Absolute Maxima of Long-Term Interest Rate Differentials for Six Pairs of Countries[a]

(annual values)

Year	*Maxima maximorum* (*per cent*)	Countries	Months	*Minima maximorum* (*per cent*)	Countries	Months	Range (*per cent*)	Average (*per cent*)
Prewar:								
1876	2.05	NY–L	Jan. May	1.97	NY–L	Mar. July	0.08	2.01
1877	2.14	NY–L	Mar.	1.94	NY–L	July	0.20	2.03
1878	2.02	NY–L	Feb.	1.87	NY–L	Dec.	0.15	1.95
1879	1.80	NY–L	Jan. Apr.	1.60	NY–L	July Aug.	0.20	1.68
1880	1.58	NY–L	Jan.	1.16	NY–L	Dec.	0.42	1.42
1881	1.22	NY–L	Apr.	1.05	NY–L	June	0.17	1.14
1882	1.27	NY–L	Mar. Nov.	1.15	NY–L	July	0.12	1.22
1883	1.30	NY–L	Feb.	1.20	NY–L	July	0.10	1.25
1884	1.24	NY–L	June	1.12	NY–L	Apr.	0.12	1.19
1885	1.11	NY–L	Jan.	0.84	NY–L	Nov.	0.27	0.95
1886	0.79	B–L	Feb. June	0.72	NY–L B–L	Oct.	0.07	0.75
1887	0.93	NY–L	Oct.	0.76	P–L NY–L	Jan. Mar.	0.17	0.82
1888	0.83	NY–L	Jan.	0.65	NY–L	Aug. Dec.	0.18	0.72
1889	0.84	B–L	Nov.	0.77	B–L	Mar.	0.07	0.80
1890	0.97	NY–L	Dec.	0.79	B–L	Jan.	0.18	0.84
1891	1.03	NY–L	Aug.	0.91	NY–L	Feb.	0.12	0.96
1892	0.95	NY–L	Dec.	0.83	NY–L	July	0.12	0.87
1893	1.24	NY–L	Aug.	0.91	NY–L	Feb.	0.33	1.03
1894	0.95	NY–L	Jan.	0.85	NY–L B–L	Apr. May Oct. Apr.	0.10	0.88
1895	0.94	NY–L	Apr.	0.82	NY–L	Aug.	0.12	0.88
1896	1.26	NY–L	Aug.	0.94	NY–L	Feb.	0.32	1.04
1897	0.96	B–L	Nov.	0.88	B–L NY–L	Apr.	0.08	0.92
1898	0.97	B–L	Nov. Dec.	0.90	B–L	Apr.	0.07	0.94
1899	1.00	B–L	Jan. Feb. Mar. Apr.	0.85	B–L	Nov.	0.15	0.97

NY = New York
L = London
B = Berlin
P = Paris

(table continues)

TABLE 118, concluded

Year	*Maxima maximorum* (*per cent*)	*Countries*	*Months*	*Minima maximorum* (*per cent*)	*Countries*	*Months*	*Range* (*per cent*)	*Avera* (*per ce*
Prewar:								
1900	0.96	B–L	Apr.	0.87	B–L	Jan.	0.09	0.92
1901	0.86	B–L	Jan.	0.66	B–P	Nov.	0.20	0.73
1902	0.67	B–L	June	0.56	B–L	Mar.	0.11	0.60
						Apr.		
					B–P	Apr.		
1903	0.83	NY–L	Aug.	0.46	B–P	Mar.	0.37	0.71
					B–L			
1904	0.79	B–L	Oct.	0.63	NY–L	Mar.	0.16	0.73
1905	0.83	B–L	Dec.	0.74	B–L	Feb.	0.09	0.78
1906	0.82	B–L	Feb.	0.78	B–L	July	0.04	0.80
						Dec.		
1907	1.04	NY–L	Nov.	0.75	B–L	Mar.	0.29	0.83
1908	0.98	B–L	June	0.77	B–L	Dec.	0.21	0.90
1909	0.77	B–L	Oct.	0.67	B–L	Mar.	0.10	0.72
1910	0.82	NY–L	July	0.69	NY–P	Feb.	0.13	0.75
1911	0.74	NY–P	Jan.	0.67	NY–P	July	0.07	0.71
			Oct.			Aug.		
		NY–L	Mar.					
			Apr.					
1912	0.74	B–P	July	0.61	B–P	Sept.	0.13	0.67
					B–L			
1913	0.76	B–L	Aug.	0.63	B–L	Mar.	0.13	0.70
Postwar:								
1925	4.88	B–L	Aug.	4.18	B–L	Mar.	0.70	4.59
1926	4.43	B–NY	Jan.	3.01	B–NY	Dec.	1.42	3.43
1927	3.59	B–NY	Nov.	2.85	B–NY	Feb.	0.74	3.16
1928	3.59	B–NY	Apr.	3.43	B–NY	Aug.	0.16	3.54
			Nov.					
		B–P	June					
1929	4.59	B–P	Dec.	3.54	B–P	Feb.	1.05	4.06
1930	4.76	B–P	Jan.	4.20	B–P	Aug.	0.56	4.36
1931[b]	5.04	B–P	Sept.	3.75	B–P	Apr.	1.29	3.99
1932[c]	6.19	B–L	July	4.50	B–L	Dec.	1.69	5.49
1933	4.32	B–L	Sept.	3.34	B–L	Sept.	0.98	3.90
1934	3.73	B–L	Aug.	3.19	B–L	Jan.	0.54	3.51
1935[d]	3.54	B–L	Jan.	3.35	B–L	Mar.	0.19	3.47

[a] British and French series seasonally corrected; American, German series, seasonally uncorrected.

[b] Data lacking for August, October, November, and December.

[c] Data lacking for January, February, March.

[d] Data available for only first three months.

individual crises show clearly in both sets, although the yearly graphs cannot provide full detail.

The corresponding construction for the long-term differentials shows a similar development. The averages, too, exhibit a tendency toward stability at a level of about 0.75 per cent for the absolute maximum difference. The minimal difference is virtually zero for the last ten years before 1914. This was preceded by a period of sharp decline for the absolute maximum up to 1888; afterward minor ups and downs occur, holding it below 1 per cent except for 1893 and 1896, when very slight digressions occurred. Up to 1896 the absolute maximum is almost always due to New York–London, while for the short-term rates it was New York–Paris. After that year the relation begins to shift around, involving other capital markets too. The minima are from the outset of a more varying nature.

The extraordinary stability of all values at low levels from 1886 on for twenty-seven years is indeed a striking phenomenon that should be seen in its true significance. It is notable when compared with the development of these series after World War I and with the simultaneous behavior of the corresponding data for the short-term interest rates.[16] There the gradual narrowing of the gap between the maxima and minima was taken to express an increasing improvement of the organization and interaction of international money markets. It was also viewed as indicating an increase in flows of short-term funds. But it is the persistent difference in absolute amounts that deserves most attention: *before World War I the absolute maximum of the short-term differentials is always higher than that of the long-term.* The smallest difference between the two types of differentials is about 0.5 per cent. As a rule the difference is many times as large, especially in critical times. Similar differences prevail for the other two series. For the post-World-War-I period (Chart 63) the long-term interest differentials are considerably higher than those before 1914, and even *exceed* the short-term interest rate differentials.

(15) Chart 64, showing the annual *ranges*, need only be briefly referred to. It gives a picture compatible with that of the averages, but different from that of the short-term rates, where again a (weak) downward trend appeared. Furthermore the postwar situation, while it differs from that of the ten years preceding World War I,

[16] The great difference in scale of the graphs relating to short-term and long-term differentials must be observed.

TABLE 119
Minima of Long-Term Interest Rate Differentials for Six Pairs of Countries[a]
(annual values)

Year	*Maxima minimorum* (per cent)	Countries	Months	*Minima minimorum* (per cent)	Countries	Months	Range (per cent)	Average (per cent
Prewar:								
1876	0.32	P–B	Feb.	0.00	P–B	Sept.	0.32	0.15
1877	0.15	B–P	Jan.	0.01	P–B	Oct.	0.14	0.10
1878	0.38	B–P	Nov. Dec.	0.02	B–P	Mar.	0.36	0.26
1879	0.52	B–P	June	0.38	B–P	Feb.	0.14	0.46
1880	0.50	P–L	Apr.	0.18	NY–B	Dec.	0.32	0.41
1881	0.24	NY–B	Apr. Dec.	0.09	NY–B	June July	0.15	0.17
1882	0.28	NY–B	Mar.	0.18	B–P	Dec.	0.10	0.23
1883	0.24	B–P	Feb. Mar.	0.04	B–P	Nov. Dec.	0.20	0.13
1884	0.08	B–P	Dec.	0.01	P–B	July Aug.	0.07	0.04
1885	0.15	B–P	Feb.	0.00	B–P	Mar.	0.15	0.08
1886	0.06	NY–P B–NY	Feb.	0.00	NY–P NY–B	Aug. Sept. Oct.	0.06	0.02
1887	0.04	B–P	Oct.	0.00	NY–B B–P	Jan. Apr. July Aug. Sept.	0.04	0.01
1888	0.05	B–P	Mar.	0.00	B–P	Aug. Nov.	0.05	0.02
1889	0.07	B–NY	Oct. Nov.	0.01	B–NY	Jan.	0.06	0.02
1890	0.11	NY–B	Dec.	0.00	B–NY	Aug.	0.11	0.04
1891	0.21	NY–B	June	0.06	NY–B	Dec.	0.15	0.13
1892	0.08	NY–B	Oct. Dec.	0.01	NY–B	Feb.	0.07	0.05
1893	0.28	P–L	July	0.05	NY–B	Dec.	0.23	0.15
1894	0.11	NY–B	Sept.	0.00	NY–B	Apr.	0.11	0.05
1895	0.19	NY–B	Apr.	0.04	NY–B	Oct.	0.15	0.11
1896	0.36	NY–B	Aug.	0.10	NY–B	June	0.26	0.18
1897	0.13	B–NY	Dec.	0.00	B–NY	Apr.	0.13	0.05
1898	0.25	B–NY	Nov.	0.00	B–NY	Apr.	0.25	0.15
1899	0.22	NY–P	Dec.	0.09	NY–P	July	0.13	0.17
1900	0.22	P–L NY–P	Feb.	0.15	P–L	Dec.	0.07	0.20
1901	0.11	P–L	Jan. Feb.	0.00	P–L	July Nov.	0.11	0.04
1902	0.09	P–L	July Oct.	0.00	P–L	Apr.	0.09	0.06

NY = New York B = Berlin
L = London P = Paris

TABLE, 119, concluded

Year	*Maxima minimorum* (*per cent*)	Countries	Months	*Minima minimorum* (*per cent*)	Countries	Months	*Range* (*per cent*)	*Average* (*per cent*)
1903	0.07	B–NY	May	0.00	P–L	Mar.	0.07	0.03
1904	0.11	B–NY	Dec.	0.01	B–NY	Mar.	0.10	0.06
					NY–B	Apr.		
1905	0.12	B–NY	Jan.	0.08	B–NY	May	0.04	0.10
1906	0.11	B–NY	Jan.	0.06	B–NY	Mar.	0.05	0.07
						May		
						Aug.		
						Sept.		
						Dec.		
1907	0.13	P–L	Nov.	0.01	B–NY	Mar.	0.12	0.06
			Dec.			June		
1908	0.11	B–NY	Sept.	0.01	NY–B	Jan.	0.10	0.06
						Mar.		
					B–NY	Feb.		
1909	0.07	B–NY	Jan.	0.00	NY–B	Dec.	0.07	0.04
			Feb.					
1910	0.05	NY–B	Apr.	0.01	B–P	Jan.	0.04	0.03
		L–P	Nov.		NY–B	Jan.		
						Feb.		
					P–L	June		
						Aug.		
					L–P	Sept.		
						Oct.		
1911	0.05	L–P	Jan.	0.01	L–P	July	0.04	0.02
						Aug.		
					P–L	Nov.		
1912	0.03	B–NY	July	0.00	NY–B	Feb.	0.03	0.02
			Aug.			Mar.		
		P–L	Nov.			Apr.		
			Dec.		P–L	Mar.		
						Sept.		
1913	0.05	P–L	Jan.	0.01	P–L	Feb.	0.04	0.03
			Mar.		B–NY	Apr.		
		B–NY	Mar.		NY–B	May		
		L–P	Aug.			June		
Postwar:								
1925	0.17	NY–L	Feb.	0.02	NY–L	July	0.15	0.07
1926	0.31	L–NY	Dec.	0.12	L–NY	Feb.	0.19	0.22
1927	0.49	L–NY	Nov.	0.27	L–NY	Feb.	0.22	0.38
1928	0.14	P–NY	May	0.01	P–L	Oct.	0.13	0.07
1929	0.31	L–NY	Dec.	0.04	L–NY	July	0.27	0.12
1930	0.36	L–NY	Sept.	0.11	L–NY	Dec.	0.25	0.24
1931[b]	0.34	L–NY	Sept.	0.15	L–NY	June	0.19	0.26
1932[c]	0.52	P–L	Nov.	0.07	P–L	May	0.45	0.29
1933	0.49	P–NY	Aug.	0.08	P–NY	May	0.41	0.29
1934	0.55	P–NY	Jan.	0.02	NY–P	May	0.53	0.31
1935[d]	0.46	P–NY	Mar.	0.10	P–NY	Jan.	0.36	0.26

[a] British and French series seasonally corrected; American, German series, seasonally uncorrected.

[b] Data lacking for August, October, November, and December.

[c] Data lacking for January, February, March.

[d] Data available for only first three months.

TABLE 120

Phase Comparison, Prewar, Long–Long and Short–Short Differentials

December 1878–April 1910, 376 months

Pairs of countries	SAME PHASE: Expansions	SAME PHASE: Contractions	SAME PHASE: Total	Different phase	SAME PHASE: Expansions	SAME PHASE: Contractions	SAME PHASE: Total	Different phase
	(MONTHS)				(PERCENTAGES)			
New York–London	112	132	244	132	29.8	35.1	64.9	35.1
New York–Berlin	141	104	245	131	37.5	27.7	65.2	34.8
London–Berlin	74	107	181	195	19.7	28.5	48.1[a]	51.9
Berlin–Paris	130	119	249	127	34.6	31.6	66.2	33.8
London–Paris	79	150	229	147	21.0	39.9	60.9	39.1
New York–Paris	154	124	278	98	41.0	33.0	73.9[a]	26.1

[a] Percentages for expansion plus contraction do not add to total because of rounding.

has been observed before—back in the restless 1890's. But the ranges of the long-term maxima deviate after World War I profoundly from anything previously noted for them. Thus the picture given by the averages is confirmed in that respect.

How much the various capital markets have been pulled apart is seen from the increase in the postwar minima, both for averages and ranges; this too did not happen for the short-term rates. For algebraic reasons the minima for the prewar long-term rates are lower than those for the short-term rates.[17]

(16) Since there is an interest in observing the cyclical *covariation of the long-term differentials with those of the short-term rates,* we give the result in Table 120. In view of the already variously noted interdependence of the basic rates, it is noteworthy that the two differentials show a pairwise high correlation, except for the case of Berlin–Paris, where there is only a 48.1 per cent covariation. In all other cases it is high, especially for New York–Paris with 73.9 per cent.

It now appears that not only are there cycles in the long-term differentials but they even correspond well with those of the short-term differentials. For the explanation of the latter it was possible to use the idea of the monetary mechanism; there is no intuitive

[17] If it could be shown theoretically that a strict interdependence of long-term and short-term rates exists, then the validity of the solidarity principle for the short-term rates implies a similar principle for the long-term rates, with analogous limits (see the discussion above on "permissible limits," Chapter VII).

TABLE 121

Phase Comparison of Specific Cycles of Long-Term Interest Rate Differentials and Foreign Exchange Rates

Prewar[a]

Pairs of Countries[b]	SAME PHASE: Expansions	SAME PHASE: Contractions	SAME PHASE: Total	Different phase	SAME PHASE: Expansions	SAME PHASE: Contractions	SAME PHASE: Total	Different phase
	(MONTHS)				(PERCENTAGES)			
New York–London	47	20	67	183	18.8	8.0	26.8	73.2
Paris–New York	67	39	106	144	26.8	15.6	42.4	57.6
New York–Berlin	59	52	111	139	23.6	20.8	44.4	55.6
Berlin–London	61	79	140	110	24.4	31.6	56.0	44.0
Paris–London	44	69	113	137	17.6	27.6	45.2	54.8
Paris–Berlin	83	26	109	141	33.2	10.4	43.6	56.4

[a] September 1887 to July 1908, 250 months.
[b] With each pair A-B, the differential of A over B is compared with the exchange of B on A.

or other basis for the cycles in the new series. It might be established by a theory showing not only the systematic connection of the two rates but also explaining that this connection is so strong as to yield high cyclical covariation. In that respect we have already noted that it is very hard to conceive of a theory covering systematic connection of the two rates, and subsequent demonstration will make this even more clear. As to the strength of such connection, the noncyclical correlation is so much *weaker* than the one requiring the additional, preliminary measurement of cycles which, in this investigation, are essentially determined qualitatively, that we do not even exhibit the indifferent results of the sign correlations.

When a covariation between two series, based on qualitatively determined cycles, is stronger than when the direction of movement is considered month by month, an interesting situation is given. The cycle definition obliterates—as it ought to do—a good deal of information by stressing another particular aspect of the time series.

(17) Next the question arises whether the long-term differentials should be expected to vary with the *exchange rates* as do the short-term differentials. A test is made in the computations of Table 121 for a uniform period of 250 months before World War I. In Chapter VI we found that, while there was significant covariation of cycles in the two series in four out of six pairs in similar periods, it was

improved when the notion of short cycles was introduced. This could be attributed to the idea of a high speed of reaction between the two quantities and to the cycle-producing properties of the underlying mechanism.[18]

Whether the long-term differentials are also part of the same or a similar transferring mechanism is unknown. If the exchange rate cycles should correspond well with those of the long-term differentials, this would produce a motive for a search along the traditional lines. The evidence however must be negative, as Table 121 shows. There is slightly significant covariation only for London–Berlin while all others are decisively nonconforming. On the other hand there is no doubt that capital transfers, induced by long-term interest rate differences, must to a high extent go via the exchanges. But there are also the induced commodity movements, the great and indefinite delays in the transfer, indirect transfers, etc. Persistence of a differential is more likely to lead to a foreign capital movement than a mere momentary appearance which may, however, suffice in the short-term field of international finance to induce a transfer of funds. Our monthly averages are too short for the first and possibly too long for the latter phenomena. On the basis of all the evidence we would conclude that the exchange rate fluctuations are only very indirectly influenced by long-term flows of capital. These may well account for the type of persistence in behavior noted in Chapter V,[19] but they cannot be expected to conform well with the variations of the long-term interest rate differentials. Their value lies in broader comparisons which the investors make; their decisions are thereafter tied to exchange rates of different later periods, spread out possibly over many months, but not depending primarily on the *simultaneous* stand of the foreign exchanges.

Section 5. The Differentials of Long-Term and Short-Term Interest Rates

(18) The study of long-term interest rates has already led to a number of comparisons with the short-term rates of our four countries, but as yet we have barely scratched the surface. It is now necessary to dig deeper by investigating their relation more

[18] Although in even finer, noncyclical measurement the correlations reappeared, as was shown there.

[19] Cf. especially section 7.

systematically regarding both the static properties and the relative cyclical behavior. In the next section we propose to drop the cyclical aspect and instead shall be concerned with various correlation problems. Cumbersome though they may appear, these steps are essential, in order to learn something about one of the most fundamental economic relationships in the business cycle. It is hoped that the data may cause further theoretical researches, creating order out of the observations, when these have been expanded.

The cumbersome character of our approach comes of course from dealing with very long time series—broken in two parts by World War I—and four countries simultaneously. On the other hand we are obtaining a vastly increased amount of information that has been almost totally lacking. The detail into which the following goes is far from sufficient, but it would be entirely outside the scope of this work to do more.

It is reasonable prima facie to assume that the difference between "the" long-term and "the" short-term rate is of high significance during the cycle, although what is shown here is due to the actual choice of a particular long-term and a particular short-term rate. Other choices may be better,[20] or not be possible at all. Numerous writers have stated that at a business cycle trough the long-term rate tends to be higher than the short-term rate, thus pulling funds from the money to the capital market, which would help to expand the volume of new construction of capital goods. A considerable lag may develop before this movement of funds gets well under way. Indeed the conviction has been growing over the last twenty-five years that it is necessary to push the liquid short-term funds into long-term employment by public works, financed by borrowing. Earlier it was believed that an increase in liquidity through the open market operations of the central bank would suffice to overcome any stickiness. In no case however have any *quantitative* statements been made as to what constitutes a "normal" cyclical relationship between the short-term and long-term rates, or rather their representatives. Clearly since both fluctuate, sometimes in opposite direction, or at vastly varying speed when going in the same direction, an explanation of the structure of interest rates must allow for these phenomena, although at the beginning it will have to set out as a purely static theory. The material presented on

[20] Our tests in this direction have not revealed anything decisive. We therefore feel confident that the present material is not very restrictive.

pages 477 ff. in the preceding section is one part of the evidence. Now we propose to discuss the interdependence in each nation separately, and finally, in section 6, we shall consider all relations together.

(19) The treatment will be in three main stages: frequency distributions and survey of all interest rate averages (these two describe static phenomena); finally, the cyclical characteristics of the long-term and short-term differentials will be investigated.[21]

Frequency Distributions of Long-Term and Short-Term Differentials: in Table 122 there are four pairs, covering the prewar and postwar periods for each country; the fifth consists of a breakdown of the British prewar differentials into three parts, made in view of its general significance and to show the influence of conversions of consols upon the structure of the differentials. In each case the short-term rate is deducted from the long-term. The frequency with which the long-term rates have exceeded the short-term rates is shown in Table 123.

The noticeable shift in the New York and London case after World War I gives another idea of the structural changes already observed repeatedly. It demonstrates another of the difficulties confronting current attempts to theorize in this field. The data shown do not support the belief that the long-term rate is the market product of individual forecasts of short-term rates. It suffices to look at New York before 1914. In this connection the fundamental scientific principle must be recalled that an explanation is not a valid theory until it has been shown that it is the *only* possible interpretation of the facts.

The frequency distributions differ considerably for the same period and among periods even for the same country. Standard curves could be fitted to each of the prewar distributions, although the German shows clear bimodality for which there is no ready explication, this not being a series subject to policy manipulation.[22]

[21] In another publication the correlations of long-term and short-term rates will be investigated in somewhat more detail than is possible here. There, earlier work, e.g., by M. Kalecki, is studied and amplified. Our larger material will show that for different periods and different countries significantly different patterns are observed, making it very difficult to generalize. However it appears from our unpublished material that it is not unreasonable to conclude that the long-term rate is pushed up by the short-term rate, *provided the latter does not rise beyond a certain point*, where it begins to lose its influence upon the long-term rate.

[22] Cf. section 5 of Chapter VIII. The reasons customarily given for bimodality are likewise not very plausible in this case.

TABLE 122

Frequency Distribution of Long-Term–Short-Term Interest Rate Differentials, Prewar and Postwar, Seasonally Corrected Data

British Consol Yields over London Open Market Discount Rates

January 1876–July 1914

Class (*per cent*)	*Frequency*
−3.50 to −3.26	1
−3.25 to −3.01	0
−3.00 to −2.76	1
−2.75 to −2.51	0
−2.50 to −2.26	1
−2.25 to −2.01	2
−2.00 to −1.76	6
−1.75 to −1.51	16
−1.50 to −1.26	16
−1.25 to −1.01	19
−1.00 to −0.76	18
−0.75 to −0.51	19
−0.50 to −0.26	47
−0.25 to −0.01	44
0 to 0.24	41
0.25 to 0.49	40
0.50 to 0.74	38
0.75 to 0.99	34
1.00 to 1.24	32
1.25 to 1.49	36
1.50 to 1.74	25
1.75 to 1.99	15
2.00 to 2.24	11
2.25 to 2.49	1
Total	463
Arithmetic mean	0.11
Median	0.25
Standard deviation	1.03
Coefficient of variation	9.36

(*table continues*)

TABLE 122, continued

British Consol Yields over London Open Market Discount Rates
January 1925–December 1938

Class (per cent)	*Frequency*
−1.40 to −1.21	1
−1.20 to −1.01	2
−1.00 to −0.81	7
−0.80 to −0.61	2
−0.60 to −0.41	2
−0.40 to −0.21	3
−0.20 to −0.01	5
0 to 0.19	13
0.20 to 0.39	21
0.40 to 0.59	9
0.60 to 0.79	1
0.80 to 0.99	2
1.00 to 1.19	1
1.20 to 1.39	0
1.40 to 1.59	2
1.60 to 1.79	2
1.80 to 1.99	6
2.00 to 2.19	9
2.20 to 2.39	36
2.40 to 2.59	13
2.60 to 2.79	21
2.80 to 2.99	9
3.00 to 3.19	1
Total	168
Arithmetic mean	1.43
Median	2.11
Standard deviation	1.26
Coefficient of variation	0.88

TABLE 122, continued

American Railroad Bond Yields over American Commercial Paper Rates
January 1876–July 1914

Class (*per cent*)	*Frequency*
−8.00 to −7.76	1
−7.75 to −7.51	
−7.50 to −7.26	
−7.25 to −7.01	
−7.00 to −6.76	
−6.75 to −6.51	
−6.50 to −6.26	1
−6.25 to −6.01	
−6.00 to −5.76	
−5.75 to −5.51	
−5.50 to −5.26	
−5.25 to −5.01	1
−5.00 to −4.76	
−4.75 to −4.51	
−4.50 to −4.26	
−4.25 to −4.01	
−4.00 to −3.76	1
−3.75 to −3.51	
−3.50 to −3.26	1
−3.25 to −3.01	5
−3.00 to −2.76	7
−2.75 to −2.51	10
−2.50 to −2.26	15
−2.25 to −2.01	17
−2.00 to −1.76	38
−1.75 to −1.51	37
−1.50 to −1.26	43
−1.25 to −1.01	41
−1.00 to −0.76	57
−0.75 to −0.51	51
−0.50 to −0.26	47
−0.25 to −0.01	31
0 to 0.24	20
0.25 to 0.49	17
0.50 to 0.74	11
0.75 to 0.99	7
1.00 to 1.24	3
1.25 to 1.49	1
Total	463
Arithmetic mean	−1.02
Median	−0.94
Standard deviation	1.10
Coefficient of variation	1.07

(*table continues*)

TABLE 122, continued

American Railroad Bond Yields over American Commercial Paper Rates
(commercial paper rates seasonally corrected for 1925–1933 only)
January 1925–December 1938

Class (*per cent*)	*Frequency*
−2.00 to −1.76	1
−1.75 to −1.51	3
−1.50 to −1.26	3
−1.25 to −1.01	5
−1.00 to −0.76	4
−0.75 to −0.51	2
−0.50 to −0.26	4
−0.25 to −0.01	8
0 to 0.24	16
0.25 to 0.49	13
0.50 to 0.74	6
0.75 to 0.99	6
1.00 to 1.24	5
1.25 to 1.49	3
1.50 to 1.74	5
1.75 to 1.99	5
2.00 to 2.24	4
2.25 to 2.49	10
2.50 to 2.74	37
2.75 to 2.99	24
3.00 to 3.24	4
Total	168
Arithmetic mean	1.38
Median	1.75
Standard deviation	1.40
Coefficient of variation	1.02

TABLE 122, continued

German Bond Yields over Berlin Market Discount Rates
Seasonally Corrected Data

January 1876–December 1913

Class (*per cent*)	*Frequency*
−2.00 to −1.81	1
−1.80 to −1.61	6
−1.60 to −1.41	9
−1.40 to −1.21	5
−1.20 to −1.01	11
−1.00 to −0.81	7
−0.80 to −0.61	7
−0.60 to −0.41	20
−0.40 to −0.21	19
−0.20 to −0.01	28
0 to −0.19	32
0.20 to 0.39	44
0.40 to 0.59	34
0.60 to 0.79	26
0.80 to 0.99	31
1.00 to 1.19	45
1.20 to 1.39	36
1.40 to 1.59	28
1.60 to 1.79	33
1.80 to 1.99	26
2.00 to 2.19	6
2.20 to 2.39	2
Total	456
Arithmetic mean	0.57
Median	0.64
Standard deviation	0.93
Coefficient of variation	1.62

(*table continues*)

TABLE 122, continued

German Bond Yields over Berlin Market Discount Rates
(Berlin market discount rates seasonally corrected;
German bond yields uncorrected)

January 1925–March 1935
(omitting August, October, November, December of 1931 and
January, February, March of 1932)

Class (*per cent*)	*Frequency*
−0.75 to −0.51	1
−0.50 to −0.26	1
−0.25 to −0.01	3
0 to 0.24	5
0.25 to 0.49	9
0.50 to 0.74	6
0.75 to 0.99	7
1.00 to 1.24	4
1.25 to 1.49	6
1.50 to 1.74	5
1.75 to 1.99	6
2.00 to 2.24	8
2.25 to 2.49	7
2.50 to 2.74	10
2.75 to 2.99	12
3.00 to 3.24	5
3.25 to 3.49	3
3.50 to 3.74	4
3.75 to 3.99	6
4.00 to 4.24	0
4.25 to 4.49	3
4.50 to 4.74	2
4.75 to 4.99	0
5.00 to 5.24	3
Total	116
Arithmetic mean	2.07
Median	2.16
Standard deviation	1.36
Coefficient of variation	0.65

TABLE 122, continued

French Perpetual Rente Yields over Paris Open Market Discount Rates, Seasonally Corrected

January 1876–July 1914

Class (per cent)	*Frequency*
−1.40 to −1.21	1
−1.20 to −1.01	0
−1.00 to −0.81	3
−0.80 to −0.61	9
−0.60 to −0.41	6
−0.40 to −0.21	11
−0.20 to −0.01	14
0 to 0.19	26
0.20 to 0.39	37
0.40 to 0.59	49
0.60 to 0.79	43
0.80 to 0.99	57
1.00 to 1.19	50
1.20 to 1.39	59
1.40 to 1.59	42
1.60 to 1.79	19
1.80 to 1.99	10
2.00 to 2.19	3
2.20 to 2.39	6
2.40 to 2.59	11
2.60 to 2.79	4
2.80 to 2.99	3
Total	463
Arithmetic mean	0.90
Median	0.91
Standard deviation	0.72
Coefficient of variation	0.79

(*table continues*)

TABLE 122, continued

French Perpetual Rente Yields over Paris Market Discount Rates, Seasonally Corrected

January 1925–December 1938

Class (*per cent*)	*Frequency*
−2.20 to −2.01	1
−2.00 to −1.81	0
−1.80 to −1.61	0
−1.60 to −1.41	0
−1.40 to −1.21	0
−1.20 to −1.01	1
−1.00 to −0.81	3
−0.80 to −0.61	2
−0.60 to −0.41	1
−0.40 to −0.21	5
−0.20 to −0.01	8
0 to 0.19	7
0.20 to 0.39	7
0.40 to 0.59	12
0.60 to 0.79	5
0.80 to 0.99	8
1.00 to 1.19	9
1.20 to 1.39	13
1.40 to 1.59	7
1.60 to 1.79	18
1.80 to 1.99	14
2.00 to 2.19	8
2.20 to 2.39	13
2.40 to 2.59	7
2.60 to 2.79	7
2.80 to 2.99	3
3.00 to 3.19	7
3.20 to 3.39	1
3.40 to 3.59	1
Total	168

Arithmetic mean	1.34
Median	1.46
Standard deviation	1.06
Coefficient of variation	0.79

TABLE 122, continued

Excess of British Consol Yields over London Open Market Discount Rates

3 per cent January 1870 to February 1888		2¾ per cent March 1888 to March 1903	
Class (per cent)	*Frequency*	*Class (per cent)*	*Frequency*
−4.25 to −4.01	1	−3.50 to −3.26	1
−4.00 to −3.76		−3.25 to −3.01	
−3.75 to −3.51		−3.00 to −2.76	1
−3.50 to −3.26		−2.75 to −2.51	
−3.25 to −3.01	1	−2.50 to −2.26	
−3.00 to −2.76		−2.25 to −2.01	
−2.75 to −2.51	1	−2.00 to −1.76	3
−2.50 to −2.26	1	−1.75 to −1.51	2
−2.25 to −2.01	4	−1.50 to −1.26	3
−2.00 to −1.76		−1.25 to −1.01	16
−1.75 to −1.51	5	−1.00 to −0.76	18
−1.50 to −1.26	2	−0.75 to −0.51	7
−1.25 to −1.01	9	−0.50 to −0.26	9
−1.00 to −0.76	7	−0.25 to −0.01	10
−0.75 to −0.51	12	0 to 0.25	17
−0.50 to −0.26	13	0.26 to 0.50	13
−0.25 to −0.01	23	0.51 to 0.75	11
0 to 0.25	20	0.76 to 1.00	9
0.26 to 0.50	21	1.01 to 1.25	12
0.51 to 0.75	18	1.26 to 1.50	14
0.76 to 1.00	17	1.51 to 1.75	11
1.01 to 1.25	14	1.76 to 2.00	18
1.26 to 1.50	16	2.01 to 2.25	6
1.51 to 1.75	15	Total	181
1.76 to 2.00	10		
2.01 to 2.25	8		
Total	218		
Arithmetic mean	0.33	Arithmetic mean	0.31
Median	0.38	Median	0.33
Standard deviation	1.09	Standard deviation	1.14
Coefficient of variation	3.35	Coefficient of variation	3.64

(table continues)

TABLE 122, concluded

Excess of British Consol Yields over London Market Discount Rates

2½ per cent April 1903 to July 1914	
Class (per cent)	*Frequency*
−3.50 to −3.26	1
−3.25 to −3.01	
−3.00 to −2.76	3
−2.75 to −2.51	
−2.50 to −2.26	
−2.25 to −2.01	2
−2.00 to −1.76	2
−1.75 to −1.51	1
−1.50 to −1.26	8
−1.25 to −1.01	10
−1.00 to −0.76	10
−0.75 to −0.51	14
−0.50 to −0.26	15
−0.25 to −0.01	10
0 to 0.25	9
0.26 to 0.50	15
0.51 to 0.75	13
0.76 to 1.00	8
1.01 to 1.25	5
1.26 to 1.50	4
1.51 to 1.75	6
Total	136
Arithmetic mean	−0.19
Median	−0.20
Standard deviation	1.00
Coefficient of variation	5.32

The skewness of the distributions is now meaningful (regarding their direction), while it was arbitrary for the international differentials. Since the means will be collected in Table 124 together with others, we point only to the great difference in the coefficient of variation, which ranges from a low of 0.65 for Berlin, postwar, to 9.36 for prewar London (Table 122). The shift brought about by the war is greatest for New York and London, where there is indeed a radical change. The New York distribution has become clearly bimodal, while the London distribution even breaks totally apart.

This might be assumed to be due to the conversion of British consols in 1932; there is thus one kind of heterogeneity of the material. But it also applies to the very same consols before 1914 when

TABLE 123

Long-Term Rates Higher than Short-Term Rates[a]

	Prewar	*Postwar*
	(*per cent*)	(*per cent*)
New York	12.74	82.14
London	58.96	86.90
Paris	90.50	87.50
Berlin	75.22	95.69

[a] Seasonally corrected data, except for postwar German bond yields. Period covered: Prewar, January 1876–July 1914; postwar, Berlin, January 1925–July 1931, September 1931, April 1932–March 1935; others, January 1925–December 1938.

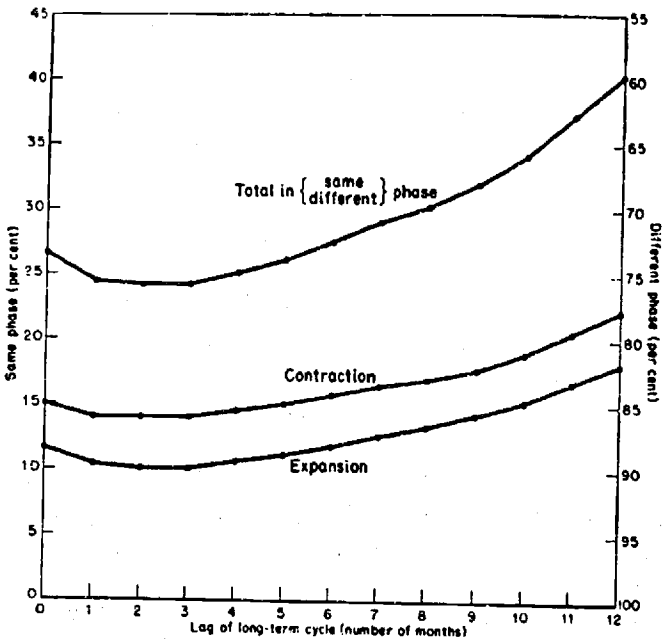
two conversions occurred in March 1888 and in April 1903. However the distribution for the entire period is free of bimodality. Yet in the distribution of Chart 66 breaking the entire period for London into these appropriate parts—thus making each homogeneous, as far as the factor of conversions is concerned—there appear two which are not of a highly regular type. So we see that the question of heterogeneity of the data is not easily settled.

In this connection the results of a further experiment may be mentioned. In view of the plausible hypothesis, mentioned repeatedly in the literature, that the long-term rate may move (perhaps with lag) in the same direction as the *difference* between the long-term and short-term rate, the following computations were made: for various periods before and after World War I (depending upon the longest complete specific cycles) for each of the four countries the phase covariation between the two series was determined first with no lag of the long-term rate behind the differential, then introducing a monthly lag from one up to twelve months. The two sample Charts 65 and 66 show the results for the United States and Great Britain (prewar). On the left ordinate is shown the percentage of months in the same phase, on the right ordinate the percentage of months in different phases, and on the horizontal axis the number of months lagged. The chart for Britain starts with almost 60 per cent of the months in the same phase. The introduction of a lag decreases the conformity to about 35 per cent, where it stabilizes. For the United States we start with an insignificant value of 26.5 per cent, which first drops, but after a four-month lag rises steadily to over 40 per cent—an improvement

CHART 65

Comparison of the Specific Cycles of Long–Short Interest Rate Differentials with the Specific Cycles of the Long-Term Rates, Prewar

United States. 1879–1913



Source: See the accompanying text.

of almost 100 per cent. France, prewar, is indifferent to lagging, Germany behaves somewhat like Great Britain, but other types also occur (not shown), e.g., the United States postwar starts with a 50 per cent correspondence with zero lag. This drops to below 40 per cent for a five-month and six-month lag, and then rises again the greater the lag becomes.

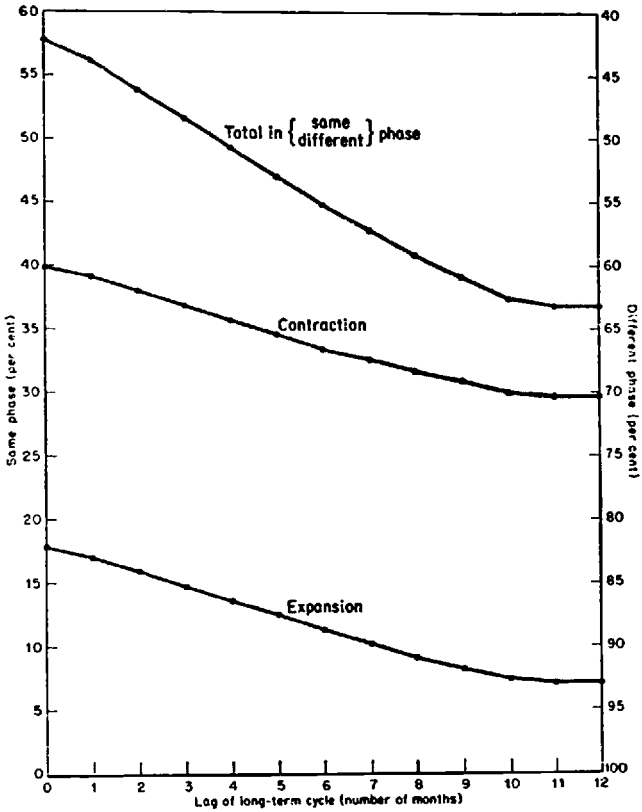
This general picture shows that the hypothesis is not without interest but that its examination is not easy. In the above attempt additional assumptions entered, such as that the cycles are unambiguously determined, etc. A complicated interdependence of this kind should be examined from many sides requiring work—also of a theoretical nature—beyond the plan of this study.

(20) *Summary of behavior of averages of all interest rates.* Table 124 collects some information about rates and differentials in a

CHART 66

Comparison of the Specific Cycles of Long–Short Interest Rate Differentials with the Specific Cycles of the Long-Term Rates, Prewar

Great Britain, 1879–1908



Source: Same as for Chart 65.

convenient summary form. It contains only means and medians.[23] In addition to the figures already studied, there are the averages of long-term and short-term "cross differentials." These show the average difference between the long-term rate in the first country and the short-term rate in the second. The meaning of these opera-

[23] They were in all cases directly obtained from the frequency distributions, except the arithmetic averages for the long-term interest rates, which were computed from those of the short-term and the short-term, long-term differentials. Others are likewise interdependent. A few slight disparities are due to repeated rounding off.

TABLE 124

Arithmetic Means and Medians of Interest Rates and Differentials

Arithmetic Means of:

	MEAN	
	Prewar	*Postwar*
Short-Term Interest Rates[a]		
New York	4.87	2.69
London	2.69	2.43
Paris	2.45	3.09
Berlin	3.17	4.81
Long-Term Interest Rates[a]		
New York	3.85	4.07
London	2.80	3.86
Paris	3.35	4.43
Berlin	3.74	6.88

	PREWAR		POSTWAR	
	Mean	*Median*	*Mean*	*Median*
Official Discount Rates[b]				
New York	—	—	2.76	2.52
London	3.36	3.08	3.68	3.14
Paris	2.92	3.00	3.39	3.01
Berlin	4.17	4.00	5.53	4.97
Differentials of Official Discount Rates[c]				
Berlin–London	0.81	0.87	2.10	1.91
New York–Paris	—	—	−0.97	−1.00
Paris–London	−0.37	−0.17	0.37	0.62
New York–Berlin	—	—	−2.77	−2.61
Berlin–Paris	1.23	1.01	1.79	1.48
New York–London	—	—	−0.58	−0.55
Differentials of Official Minus Open Market Rates[d]				
New York	—	—	0.05	−0.08
London	0.66	0.61	0.89	0.94
Paris	0.48	0.37	0.61	0.44
Berlin	1.00	1.00	0.69	0.59

[a] Computed from means of long-short differentials.
[b] Computed from frequency distributions of discount rates.
[c] Computed from frequency distributions of differentials of discount rates.
[d] Computed from frequency distribution of differentials of official open market rates.

TABLE 124, concluded

Cross Long-Term–Short-Term Interest Rate Differentials

Long	Minus	Short	Mean Differential: Prewar	Mean Differential: Postwar
New York		London	1.16	1.64
New York		Paris	1.40	0.98
New York		Berlin	0.68	−0.74
London		New York (comm.)	−2.07	1.17
London		New York (call)	−0.90	1.07
London		Paris	0.35	0.77
London		Berlin	−0.37	−0.95
Paris		New York (comm.)	−1.52	1.74
Paris		New York (call)	−0.35	1.64
Paris		London	0.66	2.00
Paris		Berlin	0.18	−0.38
Berlin		New York (comm.)	−1.13	4.19
Berlin		New York (call)	0.04	4.09
Berlin		Paris	1.29	3.79
Berlin		London	1.05	4.45

Interest Rate Differentials[a]

	Long-Term Rate: Mean	Long-Term Rate: Median	Short-Term Rate: Mean	Short-Term Rate: Median
Prewar				
Berlin–London	0.85	0.83	0.49	0.52
New York–Paris	0.51	0.52	2.41	2.34
Paris–London	0.43	0.36	−0.23	−0.21
New York–Berlin	0.11	0.04	1.68	1.64
Berlin–Paris	0.42	0.51	0.73	0.72
New York–London	0.96	0.82	2.18	2.08
Postwar				
Berlin–London	3.62	3.45	2.35	2.38
New York–Paris	−0.37	−0.37	−0.40	−0.40
Paris–London	0.55	0.91	0.67	0.83
New York–Berlin	−3.40	−3.44	−2.11	−2.10
Berlin–Paris	3.18	3.14	1.70	1.84
New York–London	0.16	0.08	0.24	0.17

Long-Short Differentials[a]

	Prewar: Mean	Prewar: Median	Postwar: Mean	Postwar: Median
New York	−1.02	−0.94	1.38	1.75
London	0.11	0.25	1.43	2.11
Paris	0.90	0.91	1.34	1.46
Berlin	0.57	0.64	2.07	1.96

[a] Computed from frequency distributions of long-term and short-term rates.
[b] Computed from frequency distributions of long-short differentials.

tions is immediate: the short-term investor at a given place considers not only the domestic long-term and foreign short-term rates but also foreign long-term rates.

(21) Comparison between the averages of the long-long-term and short-short-term differentials reveals a complicated pattern. When both markets are highly organized, the averages for the short-term differentials are higher. This applies to all prewar relations except Berlin–London; why this should be an exception is hard to see. After World War I there are only three conforming pairs left: Paris–London, New York–Paris, and New York–London, without doubt the three functioning relationships. So the theoretical expectation seems to have some justification. The differentials of the official discount rates were always greater before World War I than those of the open market short-term rates. After the war however the picture is confused. The long-term and short-term differentials on the other hand show no regularity in the prewar years, but are almost identical after the war for the three "regular" centers. For New York this normalization meant also a reversal of signs; before the war the short-term average had been much higher than the long-term, indeed exceeding in absolute amount any other. In the postwar period the gap has in all instances become wider, in London twelve and in Berlin four times as much. On the other hand the differences between the official and open market discount rates have changed differently, only two have risen and that of Berlin—the most disturbed market—has fallen. Surely it will be a long while before this evidence can be brought into a satisfactory theory. Or it will have to be discarded. Yet, on what grounds? The present attempts to theorize—without systematic empirical preparation—can be viewed only as guesses; but they may be suited to open up the subject.

(22) *Cyclical characteristics and covariation.* Charts 67 to 70 show the four series under consideration. There are very marked cycles both for the prewar and postwar periods. It is only from 1933 on that they almost disappear for the United States and Great Britain, either perfected central management of both basic rates or stagnation being the explanation. The amplitudes are very large, except for prewar United States where, however, the crises of 1873, 1893, and 1896 stand out sharply as troughs. Except for France there are seasonal variations before World War I, sometimes of an uncertain and complicated nature. They have been eliminated and the cycles in our tables refer to the corrected data.[24]

[24] Considerations about seasonal variations, and in particular if they occur in

TABLE 125

Dates of Specific Cycle Turning Points of Long-Short Interest Rate Differentials

GREAT BRITAIN	
Peak	*Trough*
Aug. 1871	Aug. 1870
	Nov. 1873
Oct. 1876	Aug. 1878
Sept. 1879	July 1883
June 1885	July 1890
Sept. 1892	Aug. 1893
Oct. 1894	Dec. 1899
Oct. 1901	May 1903
Oct. 1904	Nov. 1907
Apr. 1909	Apr. 1910
Mar. 1911	July 1913
May 1923	May 1920
	May 1925
July 1928	Oct. 1929
Sept. 1930	Jan. 1932
July 1933	Mar. 1934

GERMANY	
Peak	*Trough*
Aug. 1876	May 1877
May 1879	Feb. 1882
Feb. 1884	Apr. 1885
Sept. 1886	Feb. 1887
Jan. 1888	Feb. 1890
May 1892	Aug. 1893
Dec. 1894	Aug. 1896
May 1897	Mar. 1900
July 1902	Aug. 1903
Apr. 1905	July 1907
Nov. 1908	Aug. 1910
July 1911	Feb. 1913
July 1926	Mar. 1928
Jan. 1929	May 1929
Aug. 1930	July 1931
June 1932	Jan. 1934

FRANCE	
Peak	*Trough*
June 1876	Jan. 1882
June 1886	Dec. 1888
Feb. 1889	Mar. 1891
June 1892	Aug. 1893
Aug. 1895	Jan. 1900
Sept. 1901	July 1903
Aug. 1904	Aug. 1907
May 1909	Aug. 1913
	Apr. 1925
Nov. 1925	Oct. 1926
Oct. 1927	June 1929
June 1933	Dec. 1935
Dec. 1936	July 1937
June 1939	

UNITED STATES	
Peak	*Trough*
July 1871	Sept. 1873
Aug. 1876	Oct. 1877
Aug. 1878	June 1883
Sept. 1885	July 1887
Nov. 1888	Dec. 1890
June 1892	July 1893
Oct. 1894	Oct. 1896
Jan. 1899	Mar. 1900
Nov. 1900	Aug. 1903
Jan. 1905	Dec. 1907
July 1909	June 1910
Nov. 1911	June 1913
	Oct. 1920
Aug. 1922	May 1923
Oct. 1922	Aug. 1929
Sept. 1931	Nov. 1931
Sept. 1934	Dec. 1936
Dec. 1938	

Table 126 gives the number and duration of the cycles in the four countries. In the prewar period, the number ranges from seven to ten and the average duration from 37.2 to 54.1 months.

differentials, are found on page 137. See also the reference to A. Wald in footnote 34, Chapter I.

TABLE 126

Number and Duration of Specific Cycles of Long-Short Interest Rate Differentials of Four Countries, Seasonally Corrected Data

	NUMBER OF:			AVERAGE DURATION OF[a]: (*months*)			AVERAGE PER CENT DURATION OF SPECIFIC CYCLES[b]	
	Expansions	*Contractions*	*Full cycles*[c]	*Expansions*	*Contractions*	*Full cycles*[c]	*Expansions*	*Contractions*
	Prewar: February 1878–August 1913, 426 months							
Great Britain	8	8	8	17.9	34.5	52.4	34.2	65.8
France	7	7	7	21.1	33.0	54.1	39.0	61.0
Germany	10	11	10	17.8	20.6	37.2	46.4	53.6
United States	9	10	9	18.2	25.5	40.0	41.6	58.4
	Postwar: January 1925–December 1932, 96 months							
Great Britain	2	2	2	24.5	15.5	40.0	61.3	38.7
France	2	2	2	9.5	15.5	25.0	38.0	62.0
Germany	3	3	2	12.0	11.7	20.0	50.6	49.4
United States	1	1	1	25.0	2.0	27.0	92.6	7.4

[a] Duration of only complete cycles, expansions, and contractions are included in their respective columns.

[b] The percentages are calculated from a base equal to the average duration of expansions plus that of contractions. This sum is equal to the average duration of cycles only when the number of full cycles is the same as the number of expansions and contractions.

[c] Only complete cycles are counted; parts of cycles at both ends of a series are dropped. Cycles are measured from trough to trough. Similarly only complete expansions and contractions are counted in their respective columns.

The percentage distribution shows the contractions of the specific cycles always significantly longer than the expansions. The figures for the 96-month postwar period are added, but not more than two cycles occur, and the United States has only one. France is interesting in that the duration of the cycle has been cut by more than half, but the percentage share of the two phases has remained virtually the same.[25] As will be seen presently, there is a high degree of covariation between the cycles of these four series, a remarkable phenomenon indeed.

Because of the greater amplitude of the short-term rates, the differential between the long-term and short-term rates tends to behave like the short-term rate inverted. A comparison, for example,

[25] If the whole period 1925–1939 is taken, there are four cycles with an average duration of four months, showing expansion 53.7 per cent and contraction 46.3 per cent.

TABLE 127

Phase Comparison of Specific Cycles of Long-Short Interest Rate Differentials and Their Respective Reference Cycles for Four Countries

	SAME PHASE:			Different phase	SAME PHASE:			Different phase
	Expansions	Contractions	Total		Expansions	Contractions	Total	
	(MONTHS)				(PERCENTAGES)			
	Prewar: February 1878–August 1913, 426 months							
Great Britain	29	53	82	344	6.8	12.4	19.2	80.8
France	14	68	82	344	3.3	16.0	19.2	80.8
Germany	43	35	78	348	10.1	8.2	18.3	81.7
United States	65	88	153	273	15.3	20.7	35.9	64.1
	Postwar: January 1925–December 1932, 96 months							
Great Britain	12	26	38	58	12.5	27.1	39.6	60.4
France	23	4	27	69	24.0	4.2	28.1	71.9
Germany	17	14	31	65	17.7	14.6	32.3	67.7
United States	0	18	18	78	0	18.8	18.8	81.3

of the peaks (or troughs) of the short-term interest rate with the troughs (or peaks) in the corresponding long-short differential (Tables 12 and 125) shows quite a similarity, although not in all cases.

The specific cycles are closely related to their reference cycles, as can be immediately seen from Table 127 and Charts 67 to 70 where the latter are marked off in the customary way. It is striking to observe for the three European countries how closely packed the peaks of one series are with the troughs of the other. For the United States the correspondence is much smaller, there being many more reference cycles. This could lead to the interpretation (cf. Chapter I) that *the American differential is by virtue of its nature more closely tied to the other money markets than to general domestic American business.* But if this is the case here, then the theoretical implication of this relation must be different from that for the three European countries. The observations of (mostly European) theorists that, at a business cycle trough, the differential should be large referred primarily to European experience.

(23) The *covariation* between the differentials and their reference cycles being negative, Table 127 has to be read correspondingly, i.e., lack of covariation being good correspondence. The *true*

TABLE 128

Long-Short Interest Rate Differentials, Dispersion of Specific Cycle Turning Points, February 1878–August 1913

(426 months)

		COINCIDING PEAKS[a]			
	Average peak[b]	*Mean deviation (months)*	*Average mean deviation (months)*	*Percentage coinciding*
Four countries	Jan.–Feb. 1886	6.00		
	June–July 1892	1.25		
	Jan. 1895	3.50		
	Sept. 1901	5.25	3.52	67
	Dec. 1904	2.75		
	Apr. 1909	2.38		
Three European countries	Mar. 1886	6.00		
	July 1892	1.56		
	Feb. 1895	4.00		
	Jan. 1902	4.22	3.61	92
	Nov. 1904	3.44		
	Mar. 1909	2.44		
	COINCIDING TROUGHS[a]			
	Average trough[b]	*Mean deviation (months)*	*Average mean deviation (months)*	*Percentage coinciding*
Four countries	Oct. 1882	8.50		
	Sept. 1890	4.50		
	Aug. 1893	0.50		
	Feb. 1900	1.25	2.80	74
	July 1903	1.00		
	Sept.–Oct. 1907	2.00		
	June 1913	1.88		
Three European countries	July 1882	7.78		
	Aug. 1890	4.67		
	Aug. 1893	0.44		
	Jan. 1900	1.11	2.73	100
	July 1903	1.11		
	Sept. 1907	1.56		
	June 1913	2.44		

Average mean deviation of coinciding peaks as per cent of corresponding average for troughs

Four countries	126%
Three European countries	132%

[a] Coinciding turning points: within the range of the turning points there is no opposite turning point.

[b] Arithmetical mean of the turning points is computed: if the average falls exactly between two months, both are reported; if the average falls more closely into one month, only that month is reported.

TABLE 129

Phase Comparison of Specific Cycles of Long-Short Interest Rate Differentials for Groups of Countries

	SAME PHASE:			*Different phase*	SAME PHASE:			*Different phase*
	Expansions	*Contractions*	*Total*		*Expansions*	*Contractions*	*Total*	
	(MONTHS)				(PERCENTAGES)			
Prewar: February 1878–August 1913, 426 months								
4 Countries	67	140	207	219	15.7	32.9	48.6	51.4
3 European countries	78	177	255	171	18.3	41.5	59.9	40.1
Great Britain–France	102	236	338	88	23.9	55.4	79.3	20.7
Great Britain–Germany	106	189	295	131	24.9	44.4	69.2	30.7
France–Germany	112	191	303	123	26.3	44.8	71.1	28.9
U.S.–Great Britain	103	214	317	109	24.2	50.2	74.4	25.6
U.S.–France	93	200	293	133	21.8	46.9	68.8	31.2
U.S.–Germany	110	166	276	150	25.8	39.0	64.8	35.2
Postwar: January 1925–December 1932, 96 months								
4 countries	15	4	19	77	15.6	4.2	19.8	80.2
3 European countries	21	4	25	71	21.9	4.2	26.0	74.0
Great Britain–France	40	15	55	41	41.7	15.6	57.3	42.7
Great Britain–Germany	33	14	47	49	34.4	14.6	49.0	51.0
France–Germany	32	12	44	52	33.3	12.5	45.8	54.2
U.S.–Great Britain	22	20	42	54	22.9	20.8	43.8	56.2
U.S.–France	38	35	73	23	39.6	36.5	76.0	24.0
U.S.–Germany	21	24	45	51	21.9	25.0	46.9	53.1

covariation is very high; the figures are among the best observed in this entire study. Similarly Table 128 measures the dispersion of turning points of the two sets of four series by looking for coincidence of reference cycle troughs with differential peaks and vice versa.

(24) A direct *pairwise phase comparison between the long–short differentials* is, in contradistinction to all other previously formed differentials, possible and desirable. The resulting measurements are in Table 129. The covariation is very high—in the prewar period—even when larger groups of countries are formed (always recalling the significance test of section 2 of Chapter II). The best pairwise correspondence results for Great Britain–France, with 79.3 per cent of all months in the same phase. In view of the fact that this refers to the difference between two domestic interest rates, both subject to domestic policy (the short-term to the central bank, the long-term, indirectly but strongly in some periods, e.g., through the management of the public debt), such a figure is truly remark-

able. That a *relation* between the money and the capital markets is again related to the same *relation* in another country points indeed to strong interaction among these four markets, and it is not surprising to find the highest value for the pairing of the two most highly developed communicating markets. While the pairwise covariation is not as high as that of the reference cycles (cf. Table 4) it is almost as good as that of the intercountry comparison of short-term interest rates (Table 15) and better than that for the long-term rates compared with the reference cycles (Table 112).

(25) The coincidence of peaks and troughs, shown in Table 128 for all four and for the three European countries, produces certain dates that are not among those already observed. In general the coincidence of troughs is very much better than that of peaks, in conformity with the immediately preceding paragraphs. This is true both for the four countries, and for the three European taken separately, when 1882 and 1890 are omitted. For the averages it is, however, true without exception.

(26) *Summary.* The evidence allows a broader conclusion suggested by the study several times: the monetary economies are much closer to each other in times of stress and even crisis than in times of low activity or when the markets are at ease (which is usually, but not necessarily, the same thing). This applies to the prewar setup; afterward the situation is more inconclusive. Apparently the countries pull on each others' financial resources when trouble arises and the close contact relaxes after the crisis is passed. It may also be inferred[26] that the vulnerability of a country's money market increases if others with which it is in contact experience rising activity, even if the latter should be primarily of domestic character.

The underlying series show quite clearly that it is the short-term rate which produces this effect. Table 111 is, as we saw, highly inconclusive so far as long-term rates are concerned. But every single peak shown in Table 22 for the short-term rate recurs as a trough of the differential. Thus it is the *short-term interest rate that produces the pulling-together of the international money markets.* The short-term troughs and the peaks of the differentials are only very slightly at variance. While this result is perhaps not surprising, it was nevertheless necessary to establish it, in view of the few quantitative measures and the numerous guesses made in this field.

[26] See Chapter VII for further comments.