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CHAPTER VII

MEASURES OF STRESS BETWEEN INTERNATIONAL MONEY MARKETS

Section 1. Need for Quantitative Estimates

(1) In Chapter V various devices were introduced that permitted judging the nature and extent to which the chief money markets conformed to a behavior pattern widely held as characteristic. The fluctuations of the exchange rates could be checked against the limiting position of the gold points, and the interest rate differentials against a position defined as "permissible" in terms of the gold standard principle. However there is an interdependence between the two approaches that has not yet been elucidated.

A method can be devised that allows a far more comprehensive description of the mutual relationships and of the individual behavior of the money markets. The method is quantitative and objective within certain assumptions. These are, *first*, that the data are accurate enough to warrant the rather elaborate measurements; and, *second*, that the principles of the gold standard are correctly formulated, and that they can be extended to periods when a modified gold exchange standard was applied.

The crucial assumption is, as usual, the first one. Since much has been said about the quality of the data on various occasions, it is sufficient to emphasize once more that there is a more vigorous standard, on the basis of which they should be rejected, that it is easy to assume this attitude, and that it is, as far as one can see, impossible to replace the data by something substantially better. While bad data ought to be rejected mercilessly, there are data that allow a fair amount of operations that may even lead to the discovery of new relations and measurements, perhaps through the collection of a new type of material for future purposes. The following constitutes an experiment that may or may not be successful, but is definitely worth trying.

In considering the interdependence of both elements, we go beyond the attempts made by Weill and others (cf. Chapter V) to determine violations of the interest rate differential alone. We have

treated gold point violations by themselves; this is appropriate (though incomplete) because of the particular role assigned to them in monetary theory. But the absolute limits of the differentials have meaning only for part of the function played by the differentials. These limits are certainly violated, when the differentials go beyond their absolute bounds, but there are other violations too.

One more consideration is important: it would obviously be essential for this entire study to have information about the *balances of payments* of the various nations and in particular about their pairwise relations and movements of accounts and assets. Such information definitely does not exist in any acceptable form for the period before 1914. Those constructions and statements encountered in the literature are what is euphemistically known as "reasoned guesses or estimates." They cannot form the basis of time series, nor otherwise be used in combination with data that were subjected to more exacting requirements. Yet our understanding of these periods would be immeasurably increased if some information of this type were available. Now it is possible that the series computed for this chapter may serve as a reasonably successful substitute. They will allow at least the determination of the *direction* in which most likely *changes* in the balances of pairwise transactions occurred.[1] It will even be possible to group three countries against each single one, so that an idea of the changes in the whole balance can be formed. This is due to the fact that the four nations, without doubt, transacted with one another by far the largest percentage of their total transactions. The reader will have to judge for himself whether he can follow us in the use of the subsequent series; he will hardly deny, we hope, that they do have interesting properties deserving attention.

Section 2. The Interconnection of Exchange Rates and Interest Differentials

(2) We proceed now to an important application of the gold point statistics that will at the same time put them in much better perspective than could be done in the preceding tables. This involves a return to the solidarity hypothesis, as previously developed,

[1] This will not allow us always to determine turning points, because the functions are often not defined when they appear to occur. However it will usually be possible, for two or three successive months, to say whether an upward or downward movement has taken place.

especially pp. 166 ff. There it was shown that the risk in transferring funds from one country to another under a gold standard depended at least on two factors: (a) the distance between the gold points (possibly to be modified by other considerations pertaining to observed smaller fluctuations of the exchanges within these points), and (b) the duration of the loan.

A few words are necessary about condition (b). A difference of thirty days or even less is very significant for the solidarity assumption, since in each case a greatly different interest rate differential is involved for covering the exchange risk. Furthermore the situation is different for the various pairs of countries, since in some instances shorter and in other longer periods may be involved. A particular difficulty is offered by the London–New York relationship, where the choice is between the New York commercial paper rate with its time period of two to six months and the New York call money rate, which in its renewal form may be used for any indefinite short-period operation. This latter rate was at the basis of most, perhaps even all, operations which were carried out in "joint account" between some of the most closely associated London and New York investment houses (not necessarily merchant bankers). We have considered ranges from thirty days to one year.

(3) The necessary operations are carried out in Tables 74 and 75. There, for each of the six pairs of countries, the following relationships have been computed: we express the distance between the upper and lower gold points as a percentage of parity. If these gold points are correct and if the exchange rate cannot or does not fluctuate beyond them, then this percentage is the maximum exchange rate risk under those conditions. It will be covered if for an investment of one year's duration the difference in interest rates is at least that percentage. For investments of shorter duration the differential may go to correspondingly higher values.

Now it is clear that if one cannot be sure of "the" gold points it is entirely impossible to form valid opinions about the permissible differentials. But we can make alternative calculations—short of establishing time series for the gold point variations—and at the same time observe the influence of differences of information about the gold points upon the permissible differentials. This is carried out in our tables to an extent that must seem reasonably complete.

TABLE 74

Permissible Limits of Interest Rate Differentials, 1880–1914

Unit: width of gold points in per cent of parity

Assumed range of exchange rate risk		ASSUMED DURATION OF LOAN (DAYS)							*Minimum gold point base*	*Maximum gold point base*
		30	*60*	*72*	*90*	*120*	*180*	*360*		
		New York–London (parity $4.866 per £)								
Minimum width of gold points	$4.857–4.8762	4.84	2.39	1.99	1.59	1.19	0.79	0.39	0.395	0.394
Median of gold points	$4.845–4.890	11.62	5.65	4.69	3.73	2.79	1.85	0.92		
Maximum width of gold points	$4.827–4.900	19.58	9.35	7.73	6.14	4.57	3.02	1.50		
Maximum range of exchange rates observed	$4.8169–4.906	24.32	11.50	9.50	7.52	5.60	3.70	1.83	1.850	1.816
		Paris–New York (parity 518.26 fc per $100)								
Minimum width of gold points	fc 516.40–521.50	12.49	6.06	5.03	4.00	2.99	1.98	0.98	0.988	0.978
Median of gold points	fc 515.00–521.83	16.90	8.12	6.73	5.34	3.98	2.64	1.32		
Maximum width of gold points	fc 514.75–522.402	19.28	9.22	7.62	6.05	4.50	2.98	1.48		
Maximum range of exchange rates observed	fc 512.20–524.20	31.60	14.72	12.12	9.59	7.11	4.68	2.32	2.343	2.289
		Paris–London (parity 25.225 fc per £)								
Minimum width of gold points	fc 25.155–25.295	6.86	3.37	2.80	2.24	1.67	1.12	0.56	0.557	0.553
Median of gold points	fc 25.125–25.3275	10.03	4.90	4.06	3.24	2.42	1.61	0.80		
Maximum width of gold points	fc 25.10–25.35	12.49	6.06	5.03	4.00	2.99	1.98	0.99		
Maximum range of exchange rates observed	fc 25.092–25.414	16.44	7.91	6.55	5.20	3.88	2.57	1.28	1.283	1.267

TABLE 74, concluded

Assumed range of exchange rate risk		ASSUMED DURATION OF LOAN (DAYS)							*Minimum gold points base*	*Maximum gold points base*
		30	*60*	*72*	*90*	*120*	*180*	*360*		
		Berlin–New York (parity M 419.79 per $100)								
Minimum width of gold points	M 417.70–421.84	12.49	6.06	5.03	4.00	2.99	1.98	0.99	0.991	0.981
Median of gold points	M 16.80–421.85	15.42	7.43	6.16	4.90	3.65	2.42	1.20		
Maximum width of gold points	M 416.80–421.875	16.90	8.12	6.72	5.34	3.98	2.64	1.21		
Maximum range of exchange rates observed	M 416.20–423.40	22.62	10.73	8.87	7.03	5.23	3.46	1.72	1.730	1.701
		Berlin–London (parity M 20.43 per £)								
Minimum width of gold points	M 20.37–20.495	7.57	3.72	3.09	2.46	1.84	1.22	0.61	0.614	0.610
Median of gold points	M 20.34–20.505	10.12	4.94	4.10	3.27	2.44	1.62	0.81		
Maximum width of gold points	M 20.31–20.53	13.71	6.64	5.50	4.38	3.26	2.16	1.08		
Maximum range of exchange rates observed	M 20.32–20.556	14.78	7.14	5.91	4.70	3.51	2.32	1.16	1.161	1.148
		Berlin–Paris (parity M 81.00 per 100 fc)								
Minimum width of gold points	M 80.77–81.30	8.13	3.99	3.31	2.64	1.97	1.31	0.65	0.656	0.652
Median of gold points	M 80.55–81.35	12.62	6.12	5.08	4.04	3.02	2.00	0.99		
Maximum width of gold points	M 80.50–81.49	15.71	7.57	6.27	4.98	3.72	2.46	1.22		
Maximum range of exchange rates observed	M 80.30–81.50	19.28	9.22	7.62	6.05	4.50	2.98	1.48	1.494	1.472

TABLE 75

Permissible Limits of Interest Rate Differentials, 1925–1931

Unit: width of gold points in per cent of parity

Assumed range of exchange rate risk		ASSUMED DURATION OF LOAN (DAYS)							*Minimum gold point base*	*Maximum gold point base*
		30	*60*	*72*	*90*	*120*	*180*	*360*		
New York–London (parity $4.866 per £)										
Minimum width of gold points	$4.8534–4.8873	8.73	4.27	3.55	2.83	2.11	1.40	0.70	0.698	0.694
Median of gold points	$4.85028–4.89127	10.58	5.16	4.28	3.41	2.55	1.69	0.84		
Maximum width of gold points	$4.832–4.9067	20.04	9.56	7.91	6.28	4.67	3.09	1.54		
Average New York market gold points	$4.85145–4.89021	10.03	4.90	4.06	3.24	2.42	1.61	0.80		
Maximum range of exchange rates observed	$4.8428–4.8825	10.30	4.99	4.17	3.32	2.48	1.65	0.82	0.820	0.813
New York–Paris ($19.30[a] per 100 fc)										
Average New York market gold points	$19.2022–19.3925	12.55	6.09	5.05	4.02	3.00	1.99	0.99	0.991	0.981
($3.918[b] per $100 fc)										
1 private quotation	$3.905–3.943	12.28	5.96	4.94	3.94	2.94	1.95	0.97	0.973	0.964
Average New York market gold points	$3.9052–3.9405	11.25	5.52	4.58	3.65	2.72	1.81	0.90		
Maximum range of exchange rates observed	$3.903–3.947	11.43	6.91	5.81	4.56	3.40	2.25	1.12	1.127	1.115
Paris–London (fc 25.2215[a] per £)										
1 quotation	fc 25.125–25.325	9.94	4.85	4.03	3.21	2.40	1.59	0.79	0.796	0.790
(fc 124.2134[b] per £)										
Minimum width of gold points	fc 123.925–124.5275	6.04	2.98	2.54	1.97	1.48	0.98	0.49	0.486	0.484
Median of gold points	fc 123.8139–124.55	7.31	3.59	2.99	2.38	1.78	1.18	0.59		
Maximum width of gold points	fc 123.658–124.556	8.99	4.40	3.65	2.91	2.18	1.44	0.72		
Maximum range of exchange rates observed	fc 123.13–124.26	11.48	5.59	4.63	3.69	2.76	1.83	0.91	0.918	0.909

TABLE 75, concluded

Assumed range of exchange rate risk		ASSUMED DURATION OF LOAN (DAYS)							*Minimum gold point base*	*Maximum gold point base*
		30	*60*	*72*	*90*	*120*	*180*	*360*		
		New York–Berlin (\$23.81 per 100 RM)								
Average New York market gold points	\$23.7290–24.0075	14.85	7.15	5.94	4.71	3.52	2.33	1.16		
Maximum range of exchange rates observed	\$23.670–23.943	14.71	7.10	5.88	4.68	3.49	2.31	1.15	1.153	1.140
		Berlin–London (RM 20.429 per £)								
Minimum width of gold points	RM 20.392–20.487	5.74	2.83	2.35	1.88	1.41	0.94	0.47	0.466	0.464
Median of gold points	RM 20.37433–20.5006	7.70	3.78	3.14	2.50	1.87	1.24	0.62		
Maximum width of gold points	RM 20.33–20.53	12.43	6.03	5.00	3.98	2.97	1.97	0.98		
Maximum range of exchange rates observed	RM 20.34–20.51	10.43	5.09	4.22	3.36	2.51	1.67	0.83	0.836	0.829
		Berlin–Paris (RM 16.447[b] [a] per 100 fc)								
Minimum width of gold points	RM 16.399–16.495	7.24	3.56	2.96	2.36	1.76	1.17	0.58	0.585	0.582
Median of gold points	RM 16.393–16.502	8.25	4.05	3.36	2.68	2.00	1.33	0.66		
Maximum width of gold points	RM 16.3894–16.509	9.10	4.45	3.69	2.94	2.20	1.46	0.73		
Maximum range of exchange rates observed	RM 16.39–16.52	9.91	4.83	4.01	3.20	2.39	1.59	0.79	0.793	0.787

[a] Parity valid up to June 24, 1928.
[b] Parity valid beginning June 25, 1928.
[c] No gold point quotations available for preceding period.

For each pair of countries Table 74 gives *four entries: first,* the minimum distance between all observed gold points in Table 33 is taken; this is clearly the most unfavorable case that can be constructed for which any factual support can be adduced—it would support the argument of those who believe that gold points were too close.[2] *Second,* the differentials for the medians of gold points are computed. These are based on our statistics, depend on the number of observations, and would be different if we had been able or willing to include more data. *Third,* the maximum width of the observed gold points was taken. This is as extreme a case as the first one and would perhaps be supported as showing true conditions by those who might argue that the gold points were wide enough, not imposing any undue restrictions. *Fourth,* the maximum range of the observed exchange rate was taken, as if it were indicative of gold points. That is to say, we assume here that the exchange rates could never go beyond the gold points—in conformity with those views discussed above in pp. 241 ff. and that therefore the observed maximum width of the gold points is not really the "maximum," at least in those cases where the exchange rates went beyond that maximum as they did for every pair of countries at least once in the prewar period, as a glance upon Table 74 will show.[3] It could happen, of course, that even then the "maximum" gold points were never reached by the exchange rates, in which case the percentage for the latter would be smaller. Since, however, gold has always moved at one time or the other, even in those instances, this could be taken as a proof of the statement made in Chapter V that gold movements do not occur solely at the precise gold points, but before they are reached. This excludes as a possible indirect approach the taking as gold points those exchange rates at which the gold export and import statistics show a specie movement across the border.

In Table 75, which is built upon the same principles as Table 74, there are in some cases fewer entries. This is simply due to the fact that further data are lacking or that those used are so comprehensive and representative that a search for further data was unnecessary.

For each of these four groups (or less) the percentage width

[2] Of course those sharing this view may have in mind very different gold points; it is only argued that none *closer* to each other have been found by us. There probably are no others.

[3] In Table 75 there are several exceptions to this (see below).

was determined, which gives the maximal permissible differential for an investment of 360 days. This percentage was computed for the parity base of the respective exchange rate as well as for the upper and lower gold point base, i.e., export or import point, although the differences among these three are entirely negligible, as will be seen by comparing the last three columns.[4] Then the corresponding differentials were computed for shorter periods than one year, down to thirty days. If we knew the duration of the loans involved, it would be possible with the knowledge of the gold points exactly to determine the maximum permissible interest rate differentials between any two countries. This attempt has been made by several authors; but there are other closely connected questions that require attention first.

Tables 74 and 75 lend themselves to a good graphic representation. This is carried out in Charts 24 to 29. There, on the x-axis the duration of the loan is shown and on the y-axis the differential for the four methods of their determination. For reasons of economy we give charts only for the classical gold standard period before World War I.

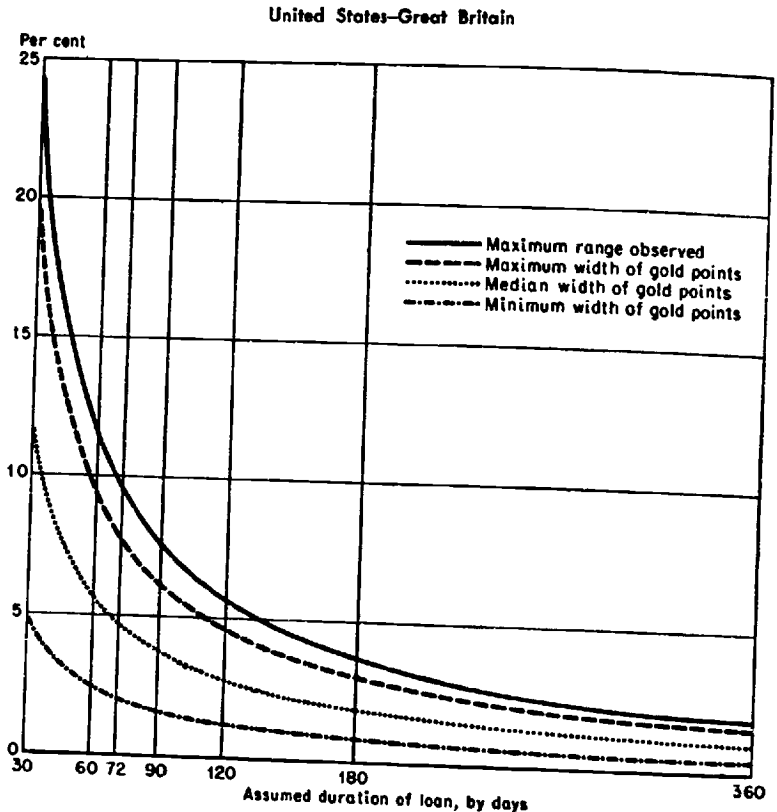
A number of important relationships must be pointed out briefly; for the rest, the tables and graphs are self explanatory. Each differential is the maximum permissible and is given as an absolute figure, i.e., neglecting the sign. For each stand of the exchange rate between the gold points there is a definite plus and minus interval for the interest rate differential, but the absolute permissible difference is always the same and indicated in our tables.

(4) A *test of the solidarity hypothesis* must therefore be made in two successive steps: to determine whether absolute differentials occurred in excess of the limits set; and whether there were violations when the exchanges were not at the gold points. The first test is simply to see whether an absolute differential greater than the one permitted for the width of the gold points and the duration of the loan ever occurred. If that happened, then we had a "violation." Their number would obviously not be exhaustive, although highly characteristic. For completeness the second test must be made, which has to take the stand of the exchange rate between

[4] Some differences that might be observed in these tables are due only to rounding out of figures often in fourth or fifth decimals. Another correction would be necessary regarding the parity, because its value depends upon cable transfer, three-month bills, etc. But this revision is so small that in view of the uncertain error element in the gold point statistics, it too can be neglected.

CHART 24

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914



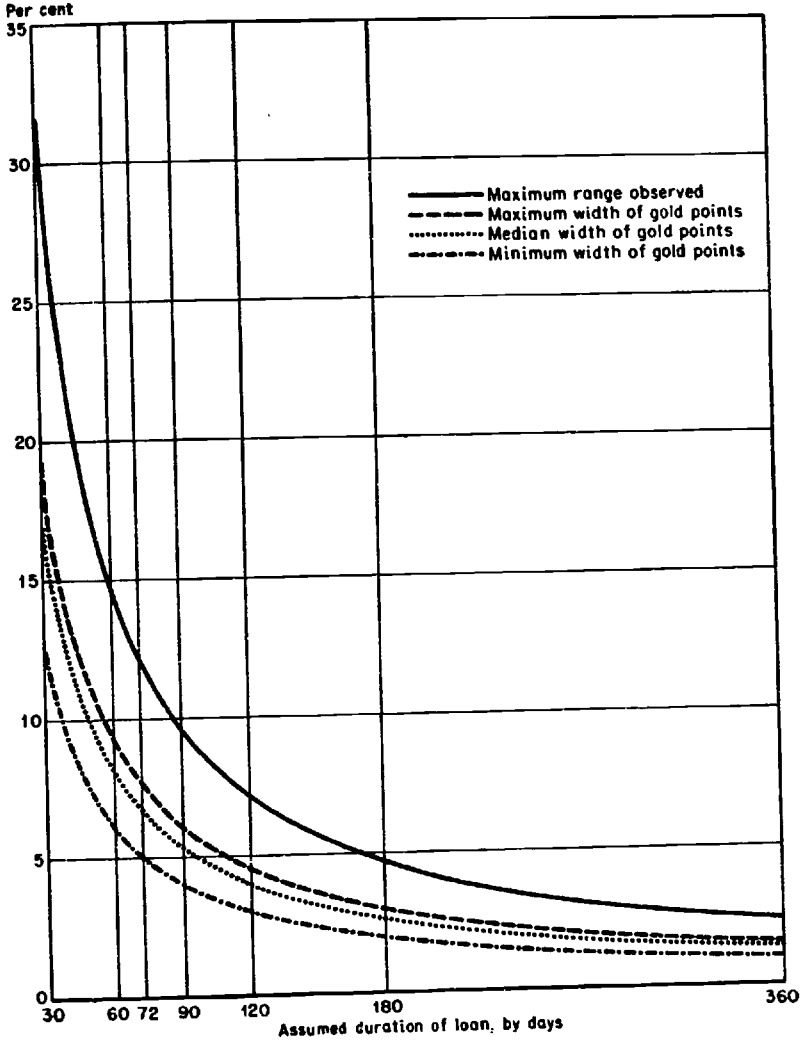
Source: Table 74. The reader will find data for the postwar period in Table 75. For description of chart see the accompanying text.

the gold points—including them!—into consideration. This entails that a given short-term differential even well below the stated absolute permissible maximum may be a "violation" at one exchange rate and not at another. The reason for this is simply that so far we have considered only the absolute value of the maximum difference between the interest rates, but have not yet distributed it over the various successive exchange rate notations according to the risk to be covered when these rates are the basis of international lending processes. Since these operations may go

CHART 25

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914

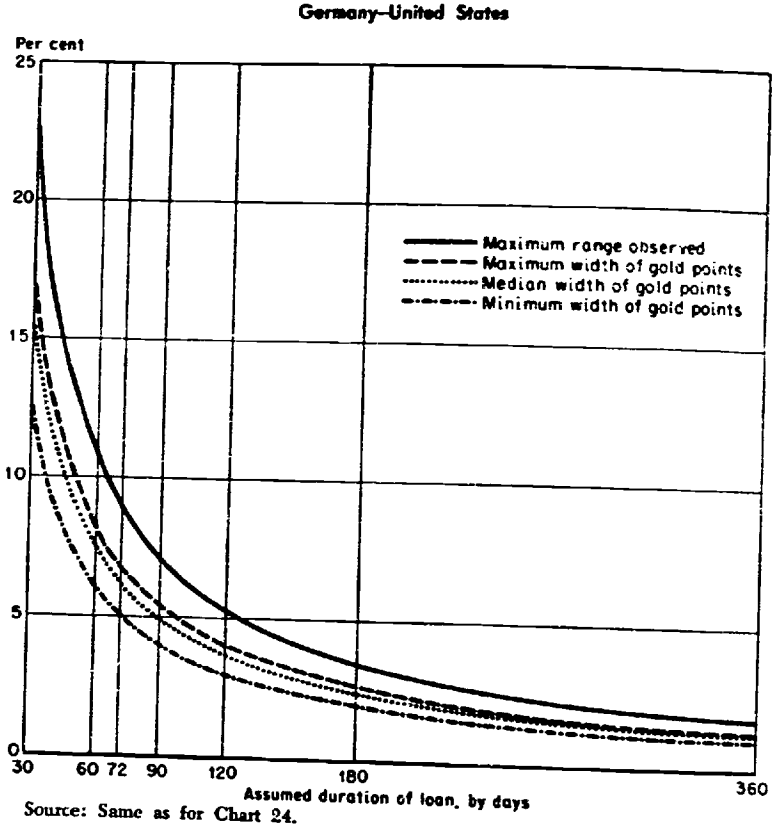
France–United States



Source: Same as for Chart 24.

CHART 26

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914



Source: Same as for Chart 24.

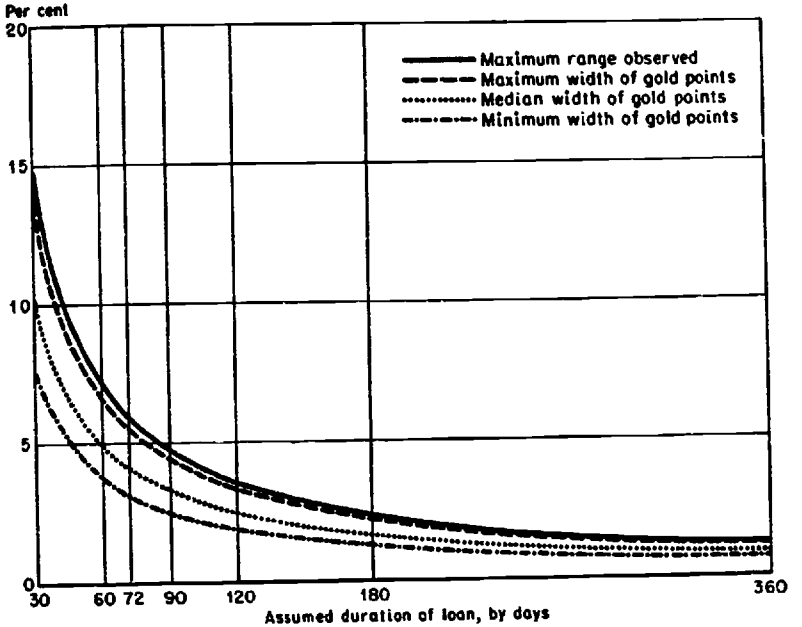
in both directions, though of course with different probabilities at the various exchange rates, the available maximum difference is distributed as plus and minus deviations in the direction of both countries. The total difference must never exceed the permissible limit, but the determination of the latter for each individual stand of the exchange rate has to be worked out separately. This is done later in the chapter. At present we are still concerned with the cruder over-all picture.

Both tests depend, obviously, on our ability to determine the permissible limits accurately. The *required* degree of accuracy is

CHART 27

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914

Germany–Great Britain



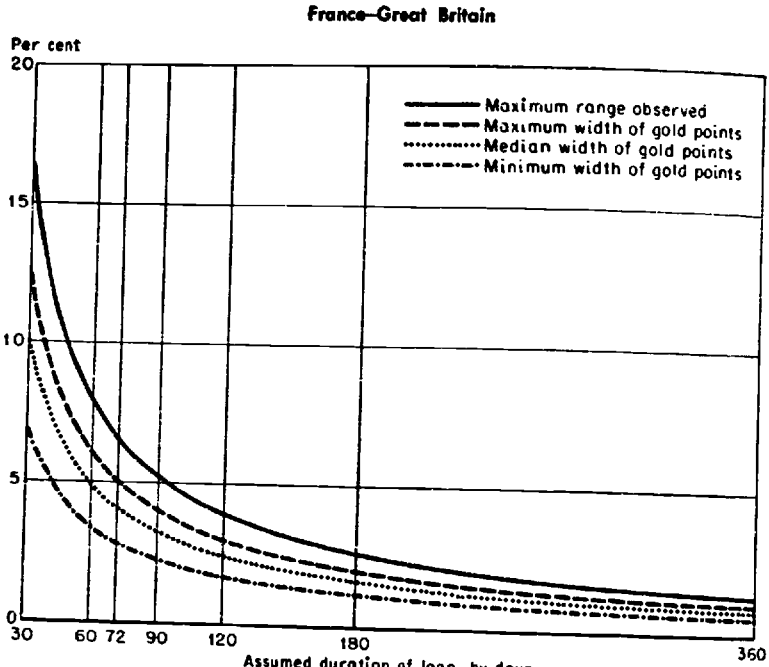
Source: Same as for Chart 24.

very high since Tables 74 and 75 show what great divergences in permissible limits occur, when only slight variations in assumption or information occur.

Consider, for example, the case of Paris and New York before 1914. Taking the most "unfavorable" condition, i.e., the minimum width of the gold points, we have 4.00 per cent at ninety days, but a more than 50 per cent higher figure, 6.06 per cent, at sixty days. Which shall be chosen, in view of the contradictory evidence? At the median the two figures are 5.34 and 8.12 per cent respectively. But perhaps the choice is even between 6.05 and 9.22 per cent? If we accept the teachings of many economists that the exchange rates *can never* go beyond the gold points, then the latitude even increases (at least!) to 9.59 and 14.72 per cent respectively. That can hardly be in conformity with a "fettering of the economy by the gold standard"! Which gold points or which opin-

CHART 28

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914



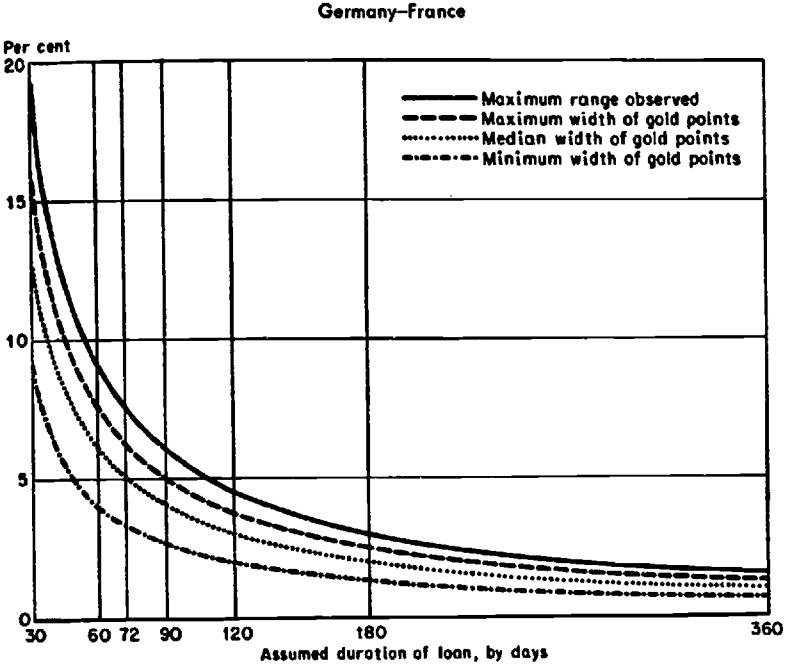
Source: Same as for Chart 24.

ions of economists shall be chosen? What (other) specific facts did these economists have in mind, if any, since they could not possibly have been these?

The differences among pairs of countries are equally striking; since the variations of the permissible differential for the differences in period of investment are automatic, it is not necessary to stress this purely computational aspect of the matter any further. Differences due to the gold points are of greater interest, since they give actually new information. It is not surprising that the greatest differences, before 1914, appear for New York, not only leading to the absolutely greatest values, but also to the largest differences if expressed as percentages of, say, the differentials of the minimum gold point width (of course, for one and the same assumed duration of the loan). The reader is advised to examine

CHART 29

Permissible Limits of Short-Term Interest Rate Differentials, Prewar, 1880–1914



Source: Same as for Chart 24.

Table 74 carefully from this point of view. He should note in particular—as can also be seen from Charts 24 to 29—the significance of the spread of the three gold points.

It is of especial importance to observe that *in all prewar cases the percentage width even of the widest gold points is smaller than that of the widest exchange rates,*[5] i.e., if we take—as shown in Table 74—the widest exchange rates actually noted as indicating the gold points, then we find those "gold points" considerably farther apart than those called "maximum gold points," which were directly established from our various gold point sources. It should be particularly remarked that this occurs also, and to no mean extent, for Paris–London, which we have repeatedly had occasion to single out from all pairs as that best conforming with the general

[5] This is of course another way of stating that violations had occurred.

ideas of a smooth-working gold standard relationship, or at least showing good covariation of monetary series.

It is also noteworthy, indeed curious, that the smallest interval of gold points anywhere is 0.39 per cent and occurs before 1914 for New York–London; in the postwar period the smallest is, for the same pair, almost twice as large—0.70 per cent—and no other postwar percentage is as small as the above-mentioned smallest prewar value. It was undoubtedly the relation with New York which the British (postwar) critics of the gold standard had chiefly in view, since the stress came from New York and—to a lesser degree—from Paris, which put London under pressure.[6] The minimum width of gold points with Paris after World War I was indeed only 0.49 per cent, instead of 0.56 per cent before 1914. This latter figure was, incidentally, the smallest of all the prewar ones and as far as we know there was no particular difficulty in the relations of London with Paris. On the contrary, as has been pointed out on various occasions, Paris came to the assistance of London several times.

The most noteworthy and by far most surprising observation is the following: consider the percentage width of the maximum range ever observed for the exchange rates in the two periods. Now we know that in all instances of the prewar period the exchanges went beyond the farthest known gold points to the extent indicated. The same occurred in the postwar period with the exception of Berlin–London and New York–London. In the first instance, Berlin–London, the widest recorded exchange rates were 0.83 per cent apart, but at their maximum width the known (acceptable) gold points were 0.98 per cent apart. In the second instance, the widest recorded exchange rates were 0.82 per cent apart, but the maximum known gold points were 1.54 per cent apart. Gold movements took place during this period; this was to be expected, as previously mentioned, because reparations and

[6] Such pressure as there was probably arose from the postwar stabilization of sterling at the prewar parity and the subsequent ineffective deflation in the United Kingdom. Neither was inherent in the gold standard. But these matters are often inexcusably confused; sometimes this may have been a deliberate political maneuver. At any rate the confusion should not occur in scientific publications.

To what extent the stress materialized in actual gold losses is a matter to be discussed separately. There need not always be an actual loss of gold to make a central bank feel highly uncomfortable, especially when it is difficult to make internal adjustments that would help to remove the threat of undesired gold losses. But all this requires special consideration (cf. Chapters IX and XI).

enormous loans were moving between these two capitals and great stress was often experienced in each. More interesting even, the observed excesses of exchange rate maximum range over the gold points in all other instances after the war is far smaller (absolutely and proportionately) and far more infrequently observed than those before the war!

Now if it was possible for the exchanges to go beyond the widest known gold points, then it is curious that they did not move at least as far after the war as before it, when—perhaps because of this incorrect behavior—the gold standard was not thought to hamper unduly the cyclical or secular development of the respective economies, while after the war it was so judged in some countries. At any rate we are here and now confronted with a strange mixture of unexpected fact[7] and inconclusive opinion, the latter moreover not clearly related to another body of fact that might conceivably have escaped attention or discovery in this investigation.[8]

(5) In view of the difficulty of obtaining information about the term of loans in foreign investment, the following thought suggests itself: do the averages of the six interest rate differentials give a clue as to that period? In other words, are the averages of the differentials plausibly characteristic of one of the critical periods, e.g., 60, 72, 90 days?

From Tables 74 and 75 we obtain Table 76.

Assuming *first* that the *average* indicates the period of investment, we see from Table 74 that this assumption is impossible to make because for the first two pairs the average is lower than even the most unfavorable, i.e., smallest, differential for one year's investment. For Paris–Berlin we are either below the median gold point width or between the smallest width intermediate between 180 and 360 days. The three last involve New York and the average would bring us varyingly up to 120 days, assuming the minimum gold points as valid. This too is unsatisfactory. Although the typical loan periods may differ from one pair of countries to another, the differences appear to be far too large to give the desired clue.

[7] The information about maximum gold point width for the postwar period is at least as good as that before 1914. Hence the fact that the exchanges did *not* go beyond the maximum points has nothing to do with a possible deficiency in the data.

[8] There would then still remain the need of reconciling these different facts!

TABLE 76

Permissible and Actual Short-Term Interest Rate Differentials

COMPARISON	1880–1914 PERMISSIBLE DIFFERENTIAL: *Estimated from maximum width of gold points for duration of loan (days)* 60	90	180	360	*Estimated from maximum width of exchange rates for duration of loan (days)* 60	90	180	360	1876–1914 ACTUAL DIFFERENTIAL: *Mean*	*Median*	*Standard deviation about zero*[a]	*Maximum*
New York–Paris	9.22	6.05	2.98	1.48	14.72	9.59	4.68	2.32	2.41	2.34	2.64	8.60
New York–London	9.35	6.14	3.02	1.50	11.50	7.52	3.70	1.83	2.18	2.08	2.48	9.40
New York–Berlin	8.12	5.34	2.64	1.21	10.73	7.03	3.46	1.72	1.68	1.64	2.05	7.80
Berlin–Paris	7.57	4.98	2.46	1.22	9.22	6.05	2.98	1.48	0.73	0.72	1.11	3.40
London–Berlin	6.64	4.38	2.16	1.08	7.14	4.70	2.32	1.16	0.49	0.52	0.96	2.80
Paris–London	6.06	4.00	1.98	0.99	7.91	5.20	2.57	1.28	0.23	0.21	0.90	3.00
				1925–1931							1925–1931[b]	
New York–Paris	5.52[c,d]	3.65[c,d]	1.81	0.90	6.91	4.56	2.25	1.12	1.58	1.57	1.70	2.80
New York–London	4.90[c]	3.24[c]	1.61	0.80								
	9.56	6.28	3.09	1.54	4.99	3.32	1.65	0.82	0.51	0.10	0.63	1.60
New York–Berlin	7.15[c]	4.71[c]	2.33	1.16	7.10	4.68	2.31	1.15	1.67	1.47	2.12	6.80
Berlin–Paris	4.45	2.94	1.46	0.73	4.83	3.20	1.59	0.79	3.08	3.18	3.32	7.60
London–Berlin	6.03	3.98	1.97	0.98	5.09	3.36	1.67	0.83	1.95	2.01	2.28	6.00
Paris–London	4.40[d]	2.91[d]	1.44	0.72	5.59	3.69	1.83	0.91	1.16	1.13	1.35	2.80

[a] Computed by taking square root of the variance plus the square of the mean.

[b] January 1927–July 1931 for differentials with Paris, January 1925–July 1931 for other differentials.

[c] Based on average New York market gold points.

[d] Based on French parity valid beginning June 25, 1928.

Assuming, *second*, that the *maximum differential* observed indicates the period of investment (on the ground that Table 74 deals with the theoretical *maximum* differentials only, which might only occasionally, if ever, have been attained by the movements of the two short-term rates), we see the following: the observed Paris–London maximum would place the duration around 72 and 90 days for the minimum and median gold point; this is not unreasonable. For Berlin–London it works for somewhat longer periods; Berlin–Paris would place it at approximately 72 to 100 days respectively. The three relations involving New York[9] shorten the required investment periods even further to 60 days and less, depending on the gold points chosen. The medians of the gold points would obviously suggest themselves first. It is clear that this approach is superior to the first one, but it is not entirely satisfactory. The results do not give periods widely different from those mentioned in the original descriptions of the interest rates (see Chapter III). For many economic investigations this might be considered a satisfactory level of accuracy. But here we are dealing with very fine measurements that exclude ready acceptance.

There is finally a *third* possibility—even to be combined with the preceding one—which however involves an extension of the solidarity hypothesis beyond the domain of short-term investment for which it was originally intended. There seems to have been no extension of it anywhere in the literature, but it suggests itself readily. If long-term international investments are considered, then the year is necessarily the upper limit to which the hypothesis can be applied, since within the period of one year all possible exchange rate risks under the gold standard are met by interest rate differentials. The extension hinges of course entirely[10] upon the likelihood that a widening of the (yearly) differential for long-term loans beyond the gold points could not persist, because it would give rise to a flow of funds, especially gold, until the differential went down to the extent of the exchange rate risk as determined by the width of the gold points, so there could be no different differential. If this is acceptable, all that is necessary is to determine the maximal differential observed in order to infer which gold points are correct.

[9] Including the New York call money rate.

[10] Besides assuming that the long-term and short-term rates are simply interrelated (see Chapter IX).

In Chapter IX, section 4, we shall find that the long-term absolute maximum differentials for 1880–1913 stayed continuously well *below* the maximum permissible limit of 1.37 per cent, taking the median gold points. Furthermore the behavior of the long-term rates cannot be reconciled with the short-term before World War I and later, nor can it be reconciled with the application of the gold point statistics. We therefore obtain no help by considering this third possibility for both periods together. Taking the first period alone we discover that the maximum widths of the "fine" gold points would have to be substantially less than those shown in Table 74 and thus would produce even more violations than will subsequently be shown.

If, on the other hand, the gold points are otherwise known, the violation of the extended solidarity hypothesis can then easily be ascertained at least for long-term investments. Such violations would be in the occurrence of long-term interest rate differentials in excess of the percentage width of the known gold points. (The influence of the exchange rate upon these long-term differentials can be neglected.) If they are frequent, or large, or both, then similar kinds of violations may be looked for when shorter-term investments are considered.

Section 3. Description of the Method of Measurement

(6) In the following a method or procedure is described which purports to give a quantitative estimate of the "pressure" exercised by the money market of one country upon that of another, or to estimate the "effort" made by one to retain its funds vis-à-vis such "pressure" exercised by the other. The time series to be computed will variously be referred to as "effort series," "permissible effort series," or "measures of stress."

The position of the exchange rate of A on B is an indication of the effort made by A to retain its funds if they are flowing to B or, equivalently, of the pressure exercised by B on A in order to attract funds. If the rate goes toward the gold export point of A and gold is actually leaving the country, it is a commonsense interpretation to say that A is then making a larger effort than when the rate is within the gold points. Likewise B exercises a greater or smaller pressure upon A, or puts it under a strain. The reasons for this occurrence may be manifold and can be determined only from separate and independent sources.

Similarly a permissible interest rate differential was defined, the criterion being derived from the width of the gold points. These differentials may sometimes reach the maximum that the rules of the system assign to them and, as we saw, they may even overshoot those bounds. If that happened, it was considered a "violation" of the underlying principle and taken as an indication of some abnormality or critical occurrence, or both (cf. pp. 303 ff.). Like the position of the exchange rate, the existence of a large difference between the short-term rates of A over B is an indication that A is making an effort to hold onto its funds or to attract funds from B. Country A therefore makes an *effort* or exerts a *pressure,* or both. From the sign of the differential—the permissible limits being stated in absolute values—and from the direction of change in magnitude, one may infer the source of the stress between the two countries.

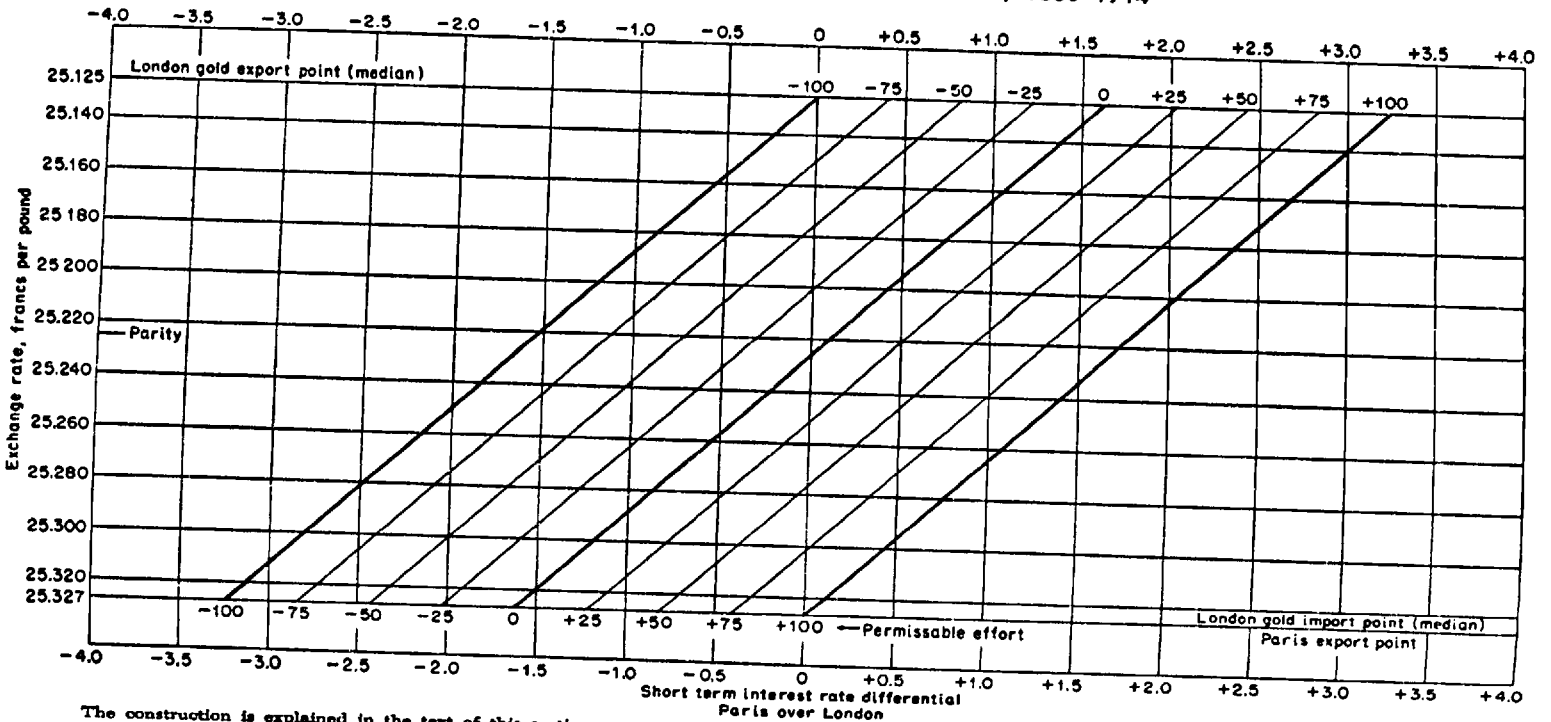
The construction of the effort series may be illustrated by means of an example (cf. Charts 30 and 31). Then an interpretation will state the assumptions and limitations for all six cases considered. We show London–Paris and London–New York. The example we discuss refers to London and Paris before 1914, based on the Paris exchange rate on London and the excess of the Paris open market rate over the London discount rate on three-months bank bills. The gold points are 25.125 to 25.327 fc per £ and hence the maximum differential for ninety days is ±3.24 per cent. On Charts 30 and 31 the exchange rates are shown on the vertical axis, with limits being set by the gold points. The interest rate differentials are shown on the horizontal axis. Charts for all pairs of countries were made uniform by adhering to the following: when the exchange was A on B and the differential A over B, the exchange rate on the chart runs from rising to falling—reading from the top to the bottom of the chart. When the exchange was given as A on B but the differential as B over A, the reverse procedure was used, i.e., on the chart the exchange rate goes falling to rising—reading from the top to the bottom. In our example the London gold export point is at the top of the chart and the Paris gold export point at the bottom.[11]

The next step is to account for the maximum permissible interest rate differential, which is ±3.24 per cent. We express the range

[11] It will be recalled that we have always assumed the export point of one country to be the equivalent of the import point of the other. While this is not always strictly true, it makes no difference whatever within the error of observation.

CHART 30

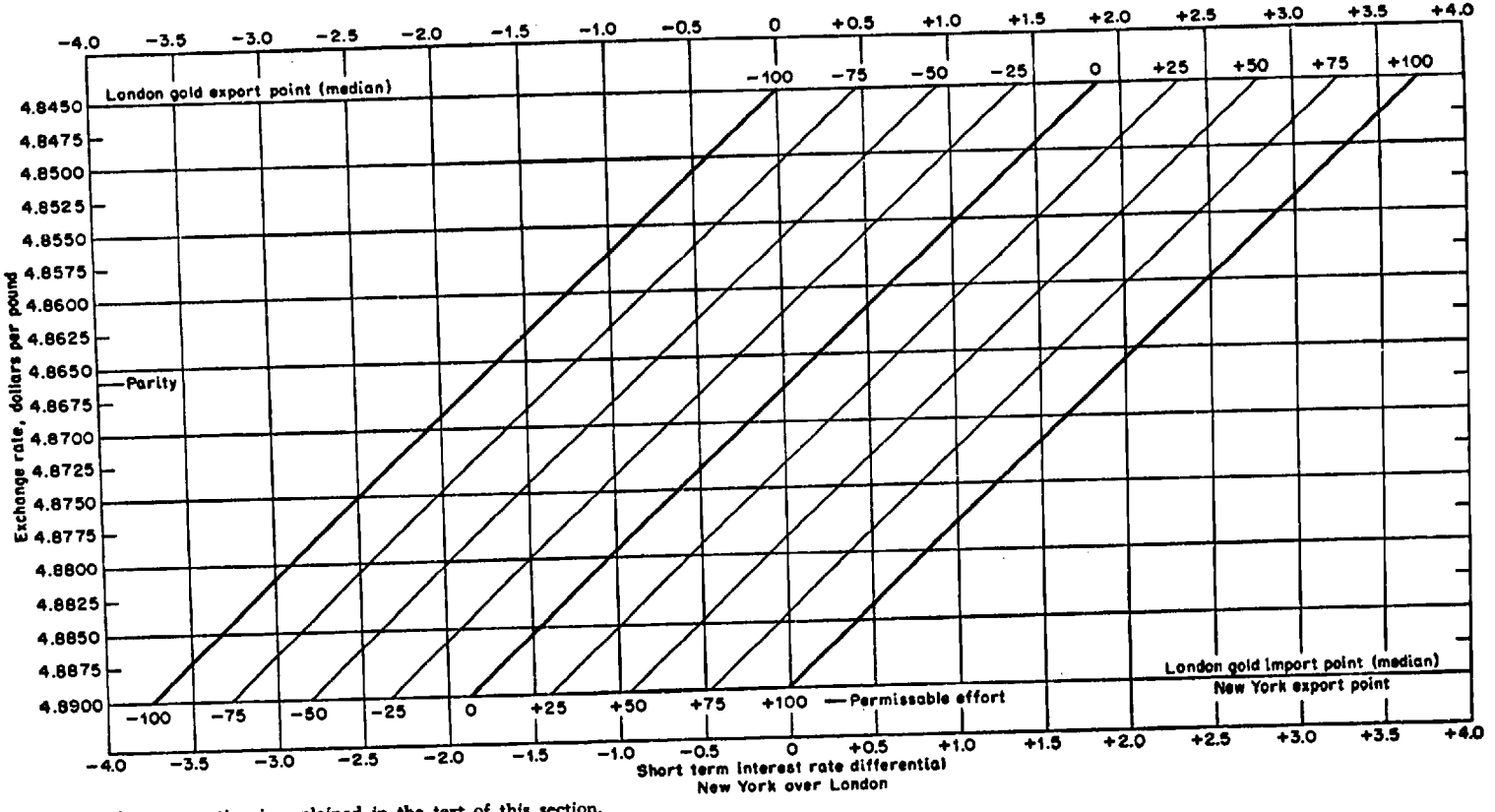
Construction of Effort Series, Prewar, Paris–London, 1880–1914



The construction is explained in the text of this section.

CHART 31

Construction of Effort Series, Prewar, London–New York, 1878–1914



The construction is explained in the text of this section.

the differential can assume for each particular position of the exchange rate as a percentage. At the London gold export point the permissible range is from 0 to +3.24 per cent. Should it be exceeded in either direction, this would constitute a violation. It is now seen what the consequences are of tying in the notion of a "permissible" differential with the simultaneous stand of the exchange rate: previously only an excess of over ±3.24 per cent was a "violation." But with the rate at the London export point, *any* positive difference of London over Paris (in the chart equivalently a negative of Paris over London) would constitute a violation,[12] since London, in the possible maximum appreciation of sterling alone, is already offering a complete compensation for the risk factor.[13] On the other hand, since the entire interval of 3.24 per cent is available, it is necessarily at the disposition of the other country to which gold is (potentially) flowing, in this case Paris. If the Paris interest rate should be 3.24 per cent over the London interest rate, we may say that Paris is exercising its maximum permissible pull and call this a 100 per cent effort. If the difference is zero, then London goes to its maximum effort also of 100 per cent. The two centers are always engaged in some sort of "tug of war" and it is a plausible normalization of the situation to assign a zero value to the midpoint between the two 100 per cent marks. In the present example it falls at 1.62 per cent. The pull exercised by each country has to be distinguished from that of the other. Hence we call the pull exerted by A "plus" and that of B "minus"—when the differential is A over B. This is purely notational.

At the Paris gold export point exactly the reverse situation is

[12] That is, since the pound could not fall any further (if the gold standard were to continue), then foreign investors could not lose on the exchange part of their transaction. Hence even equal interest rates in London and Paris should have induced a movement of funds to London, since the yields would be equal in both cities, but in addition it was impossible to suffer an exchange loss by moving funds to London; in fact there was almost a certainty of exchange profits, since the pound would probably rise somewhat from its present minimum rate.

[13] This assumes that the exchange rate may actually swing all the way to the other extreme (as was sometimes the case). A more refined approach might consider the most *probable* future positions of the exchange associated (after ninety days!) with the given position, allowing for whatever seasonal influences might be operating upon both factors. This is a highly complex situation, and the execution of such a legitimate program (which could easily be made still more complex) would involve tremendous labor, hardly warranted by the relative poverty of the statistics. A further complication is mentioned below.

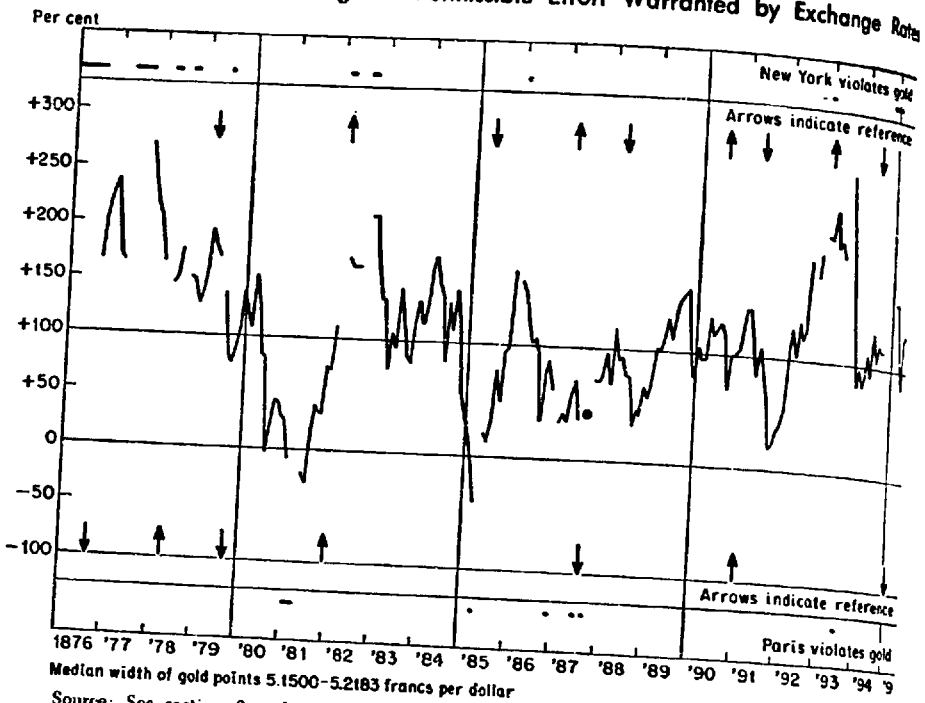
found. The range of the permissible differential is 0 to —3.24 per cent, where 0 to —1.62 per cent corresponds to an effort of 0 to +100 per cent for Paris and —1.62 per cent to —3.24 per cent to an effort of 0 to —100 per cent for London.

The corresponding four points of ±100 per cent for the two gold points can now be connected, as well as the zero line and all intermediate points. We obtain therefore the skew linear pattern of Chart 30. Along each line the same effort is registered. To illustrate: as the exchanges move from the London to the Paris export point, in order for Paris to maintain a 100 per cent effort, i.e., Paris making her *maximum permissible effort*, the differential Paris over London must move along a straight line from +3.24 per cent to 0 per cent. Correspondingly in order for London to maintain 100 per cent permissible effort, i.e., —100 (cf. above), the differential must move along a straight line from 0 per cent to —3.24 per cent as the exchange rate moves from the London to the Paris gold export point. The zero line is that of indifference, where the two efforts just compensate; the differential must then move from plus to minus 1.62 per cent. Yet always, whatever the exchange rate may be, provided it remains within the gold points, the absolute permissible width remains at 3.24 per cent.

If the interest rate differentials overshoot the permissible limit, the function is, strictly speaking, no longer defined. But it is a natural procedure to extend the parallel lines of equal effort beyond the 100 per cent line. This is of course somewhat arbitrary and the reader may disregard any use made of values over 100 per cent. However Charts 32 to 38 will show numerous violations, and the statistics are of considerable interest and significance. If the exchange rates overshoot the gold points—and we know that this too has happened frequently (cf. Tables 55 to 60)—then it is *not* possible to extend the measurement. The function is then no longer defined. In those cases no extension whatever is possible[14] and none will be shown in the later applications. As a consequence cycles cannot be defined either if an exchange rate goes beyond the gold points. It was shown that this was a frequent occurrence (within the definition and accuracy of the fixed gold point statistics). Thus the effort series, while they do exhibit often strong and extremely interesting cyclical movements, do not lend

[14] It would be interesting to speculate whether an extension could be achieved by defining a *compensatory* interest rate interval for a gold point violation. But this is an artificial construction which is best omitted at present.

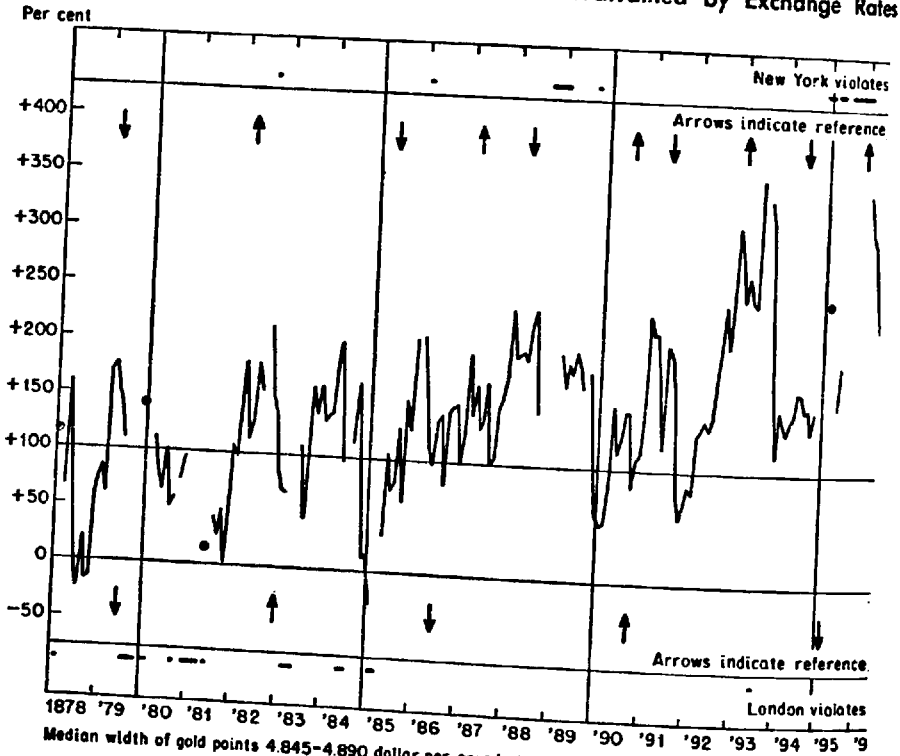
CHART 32 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 5.1500–5.2183 francs per dollar

Source: See section 3 and further discussion in section 4.

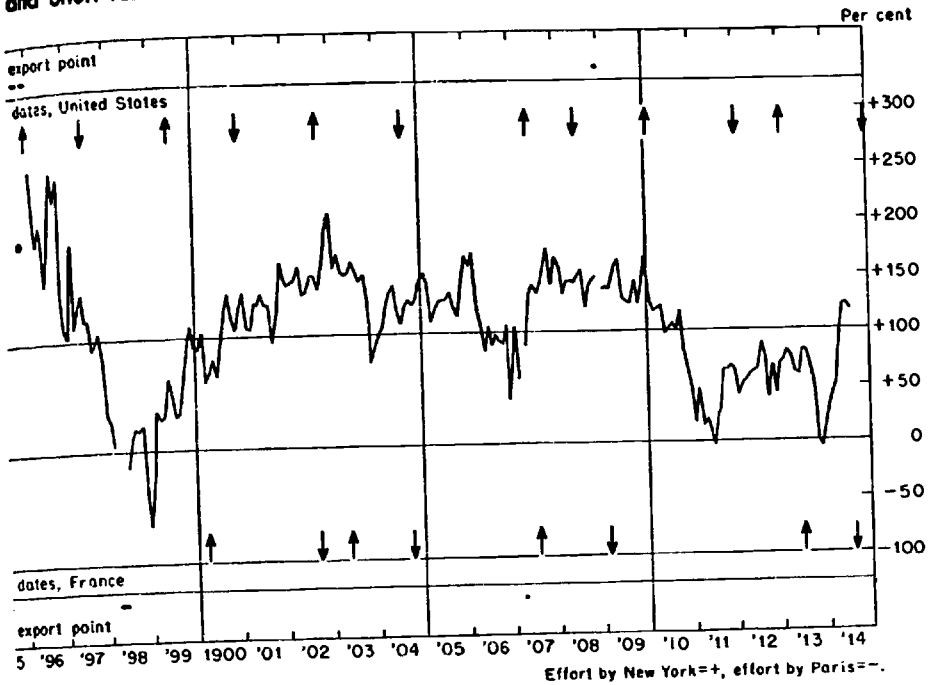
CHART 33 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 4.845–4.890 dollar per pound sterling.

Source: Same as for Chart 32.

and Short-Term Interest Rate Differentials, Prewar — New York and Paris, 1876–1914



and Short-Term Interest Rate Differentials, Prewar — New York and London, 1878–1914

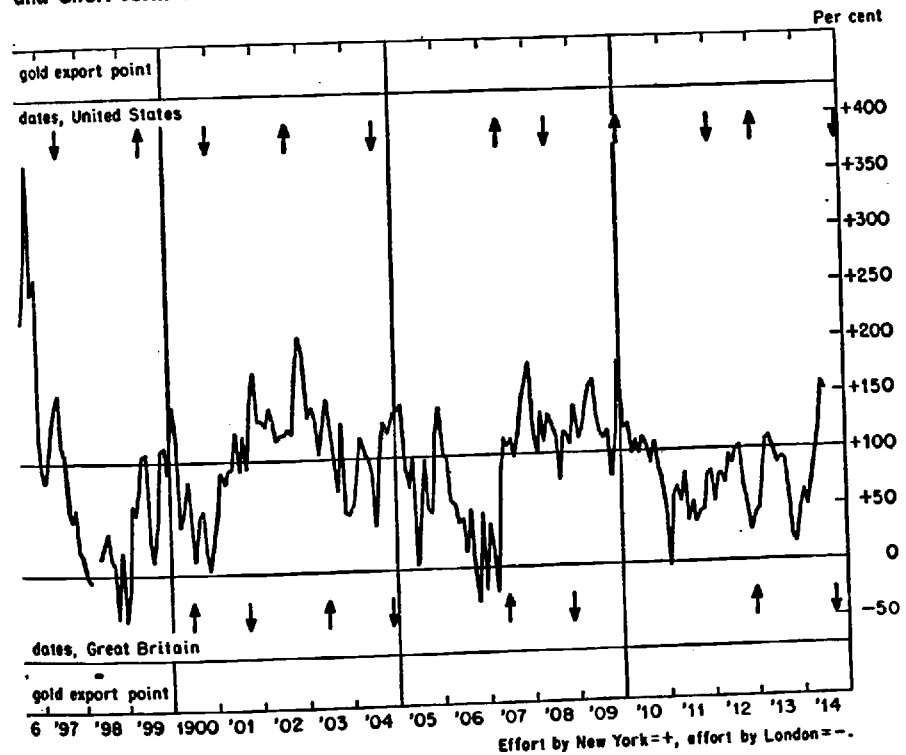
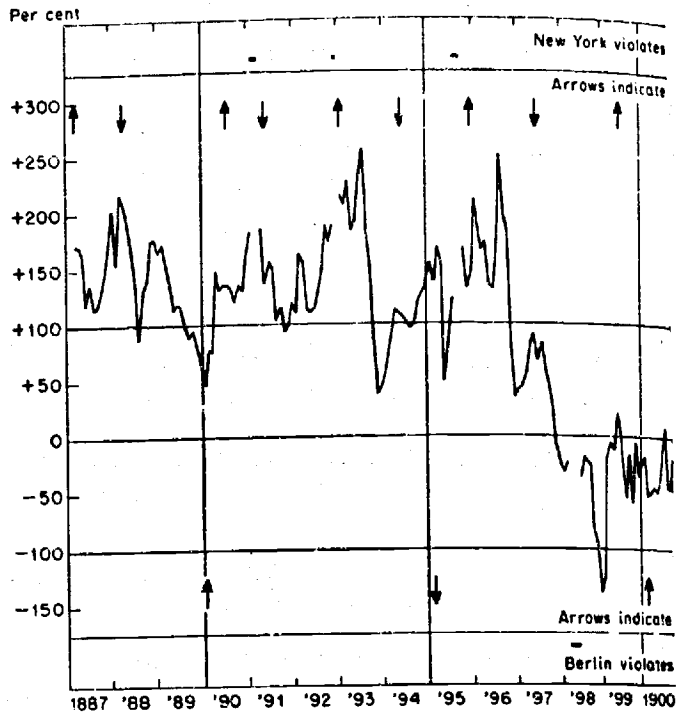


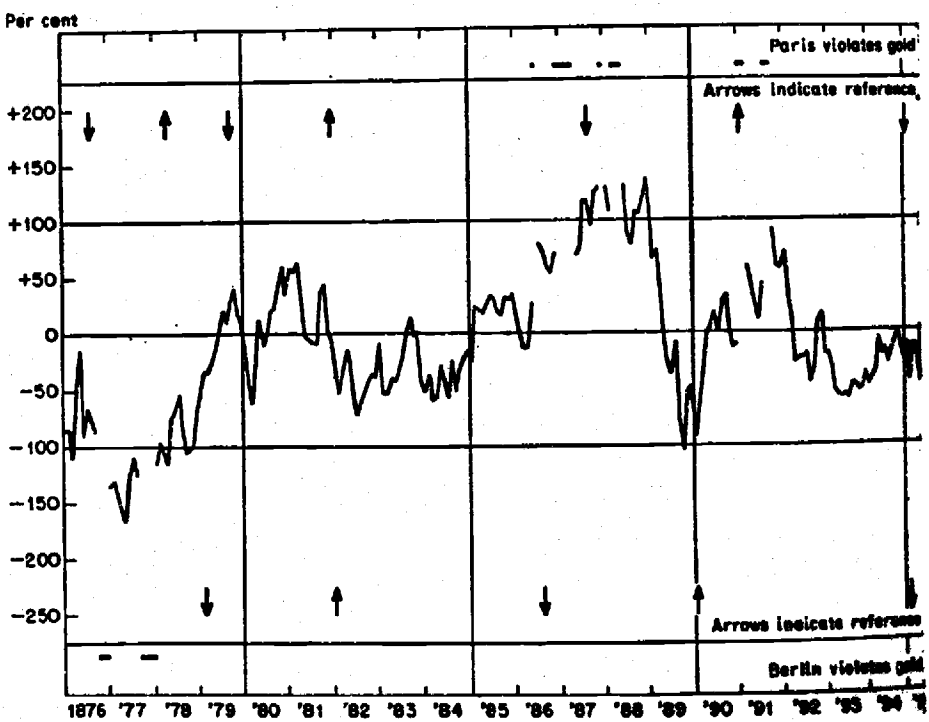
CHART 34 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 4.1680–4.2185 marks per dollar

Source: Same as for Chart 32.

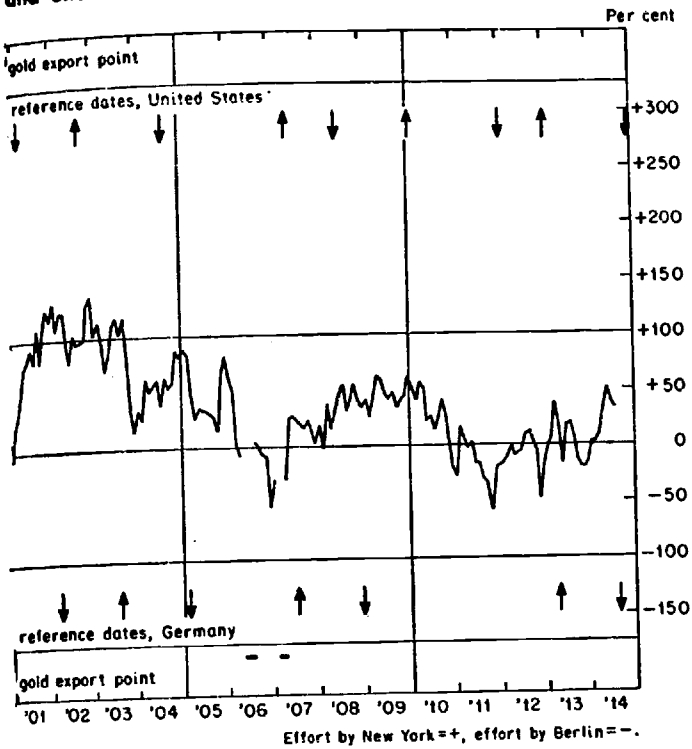
CHART 35 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 80.530–81.335 marks per 100 francs.

Source: Same as for Chart 32.

and Short-Term Interest Rate Differentials, Prewar — New York and Berlin, 1887–1914



and Short-Term Interest Rate Differentials, Prewar — Paris and Berlin, 1876–1914

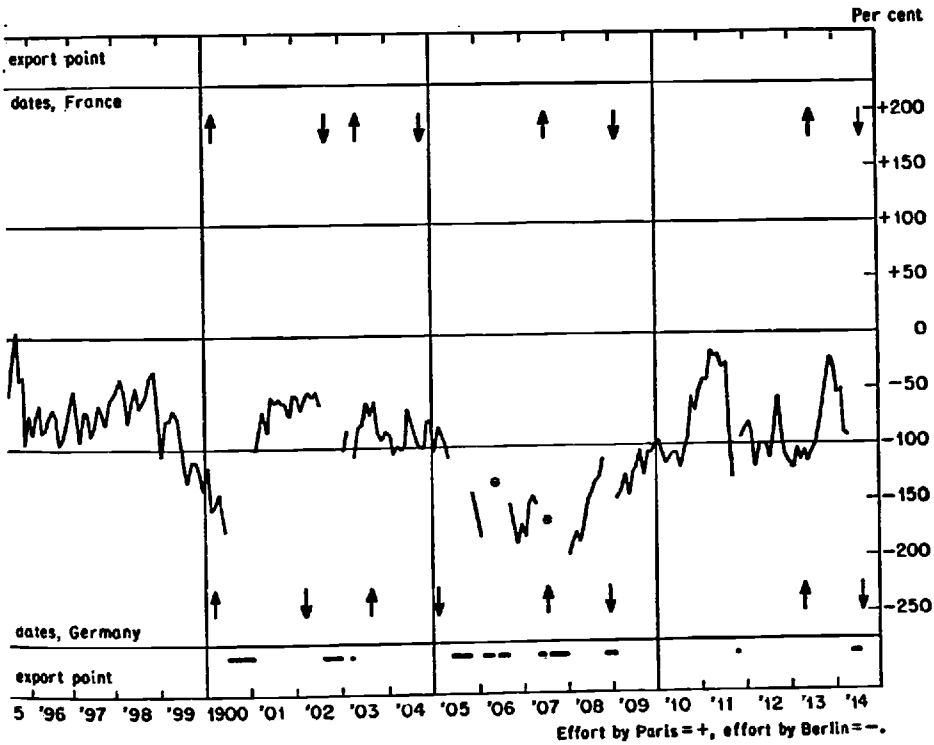
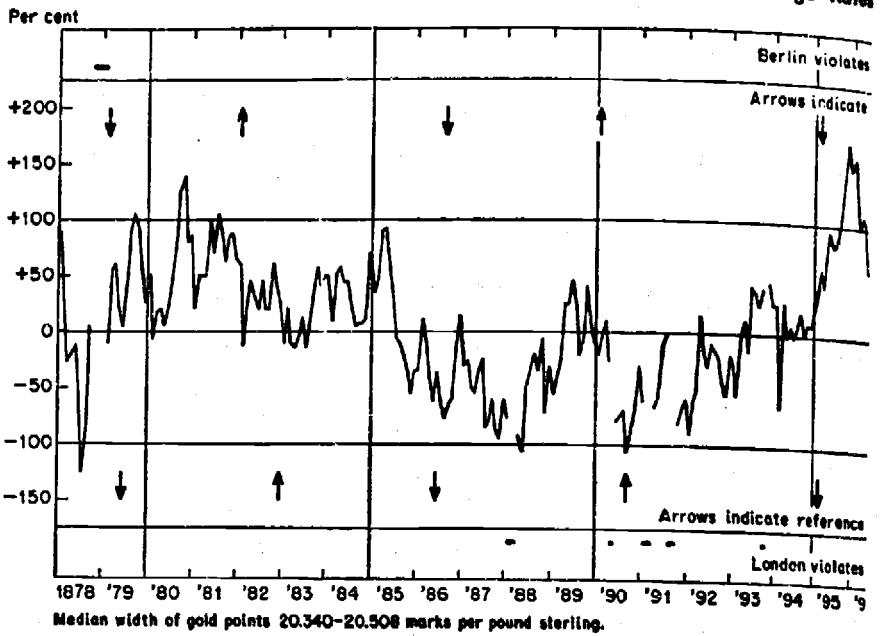


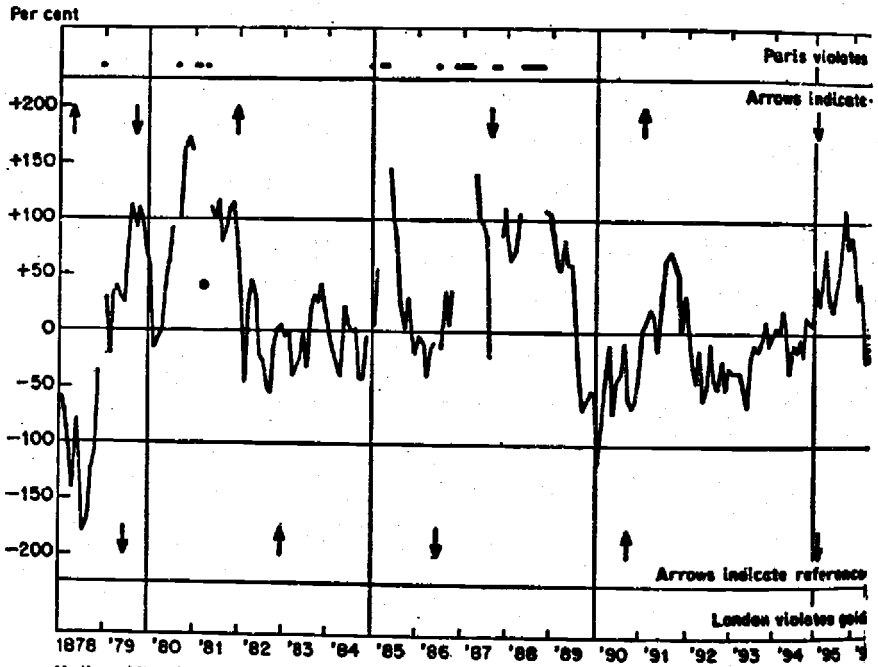
CHART 36 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 20.340–20.508 marks per pound sterling.

Source: Same as for Chart 32.

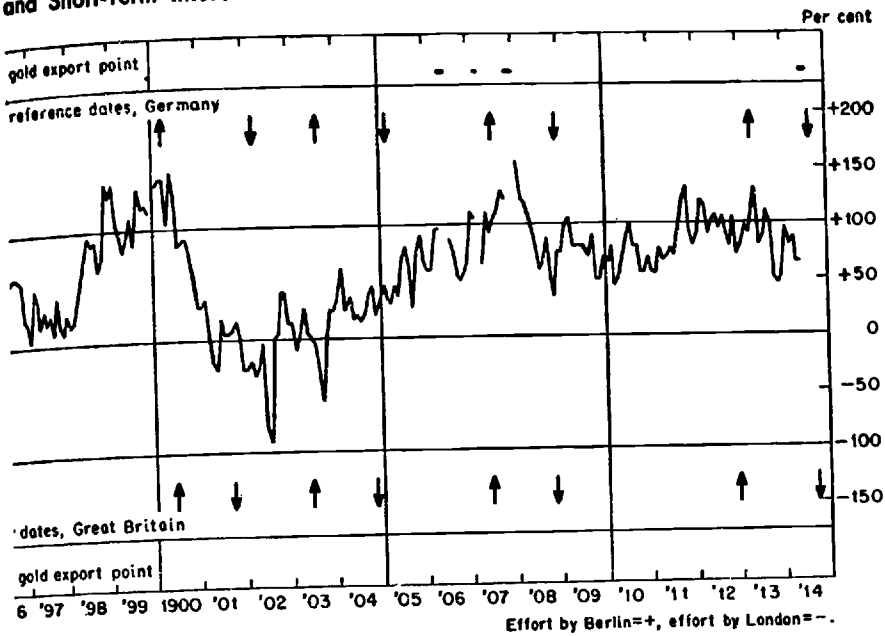
CHART 37 Percentage of Permissible Effort Warranted by Exchange Rates



Median width of gold points 25.125–25.327 francs per pound sterling.

Source: Same as for Chart 32.

and Short-Term Interest Rate Differentials, Prewar Berlin and London, 1878–1914



and Short-Term Interest Rate Differentials, Prewar Paris and London, 1878–1914

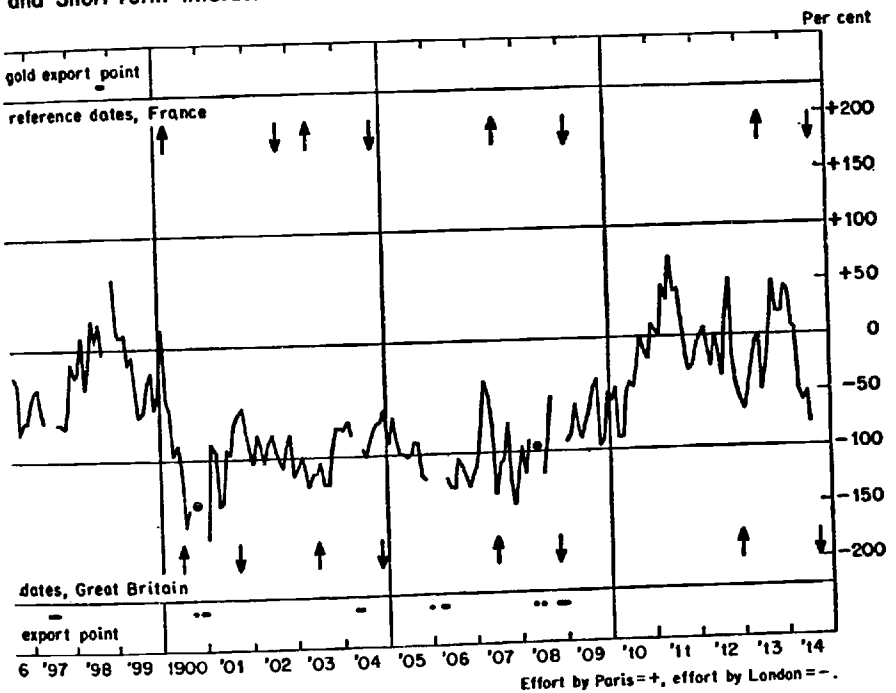
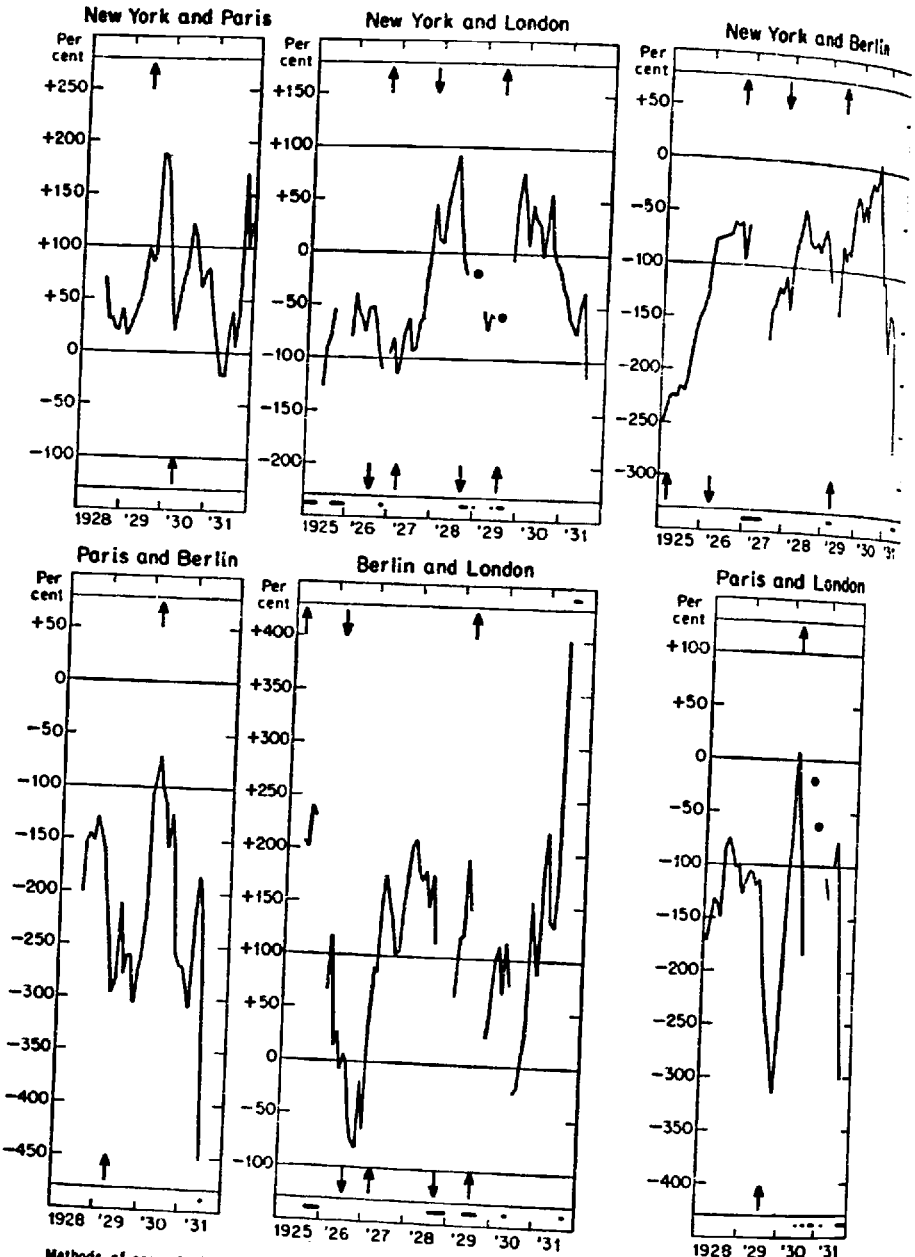


CHART 38

Percentage of Permissible Effort Warranted by Exchange Rates and Short-Term Interest Rate Differentials, Postwar

Six Pairs of Markets, 1925–1931



Methods of presentation of data, by pairs of countries, are the same in this chart as those used for the corresponding pairs of countries in Charts 32–37.

Source: Same as for Chart 32.

themselves to the establishment of continuous cycles. For some pairs, however, long continuous periods emerge and cycles can be measured, and the points of discontinuity are of course themselves important as indicating a particular kind of stress.

(7) The effort series were constructed on a monthly basis in spite of the great labor involved. But the underlying phenomena are so volatile—and it is generally believed that they are highly "sensitive" to disturbances and stimuli—that a monthly series seemed desirable.[15] They were obtained by inspecting for each month both the position of the exchange rate and the corresponding simultaneous differential and then determining from the chart for the pair of countries considered on which line of equal effort these two values would lie. This percentage value was then entered as the figure for the month. Since there are six pairs of countries and a total of 4,240 months, this meant collating 25,440 observations in order to obtain the new data. On these the following charts and interpretations are based. The final series were plotted on Charts 32 to 38. Where violations of the exchange rates occurred, blanks were left; however it is indicated which country made the violation. It is noteworthy that they are not always due to the country toward which the effort series moves. This is in part an indication of inability to distinguish between effort and pressure as already noted.

The method requires several specific assumptions, notably about gold points and about the duration of loans governed by the rate of interest. The uncertainties about gold points were extensively discussed in Chapter V. If wider gold points were chosen (but the same duration of the loan, i.e., ninety days), the curve of permissible effort would have been flatter than that shown on the charts. Many points of violations of the gold points would now fall within the 100 per cent band and more continuous curves would obtain, making determination of cycles easier because sharp peaks would appear within the defined zone. If narrower gold points were chosen the curves would be steeper with attending consequences.[16] If a longer loan period were chosen, the width of the

[15] In fact even a month is a long time interval. We deal with averages which smooth many subsidiary movements. This was repeatedly stressed but must be emphasized again in view of the many violations the charts show. A finer division of time would show many more which are now submerged because of compensatory movements within the monthly averages.

[16] Some of the changes would be so small as to be imperceptible for all practical purposes. This method, like any other, can give only rough approximations and one must beware of specious accuracy being imposed or demanded.

limits of the permissible differentials would be narrower (cf. Table 74) producing a greater number of violations of permissible effort and a steeper curve. If a shorter period were chosen, the curves would be flatter with fewer violations. Our choice of ninety days seemed to correspond with general information about a matter concerning which little detail is known.

To indicate the formidable difficulties of measurement in this field, we finally mention the following: during the long periods considered, the gold points (and the loan periods) undoubtedly underwent frequent variations and perhaps developed certain trends. The present method should therefore be applied to these varying conditions. This would mean the construction of a separate basic-line diagram (like Chart 30) for each gold point and loan period variation, instead of using only one for the whole period. It is less the costly and laborious process involved that we should like to stress, but rather the drastic simplifications associated even with the elaborate procedure actually chosen. This is an occasion where the economist can realize how raw our data are and how tremendously measurements may be improved.

The six series finally constructed are listed in Table 77 for the two periods before and after 1914.

Section 4. Interpretation of the Effort Series

(8) Since the value of the series lies in their over-all picture of the behavior of the money markets, and since they are to be supplemented by general information of the type contained in the appendix to this book, the discussion will be brief and limited in scope. Charts 32 to 38 enable the reader to use the information as fully and as accurately as may be desired. We shall make a number of general remarks, pointing up the behavior of the series and the main changes, and present some frequency distributions, indicating chiefly the important fact that continuous violations, i.e., exceptional stresses, were quite frequent. Various correlations of the series with other sets of data were attempted, but were not very fruitful. Obviously no correlation can be expected with any of the constituent series, although certain results may lead to the same interpretations, e.g., characterization of the break in behavior in the prewar and post-World-War-I periods. Noteworthy is the complete lack of interrelation of these series with gold movements.

TABLE 77

Data for Effort Series, Prewar and Postwar

Period	*Exchange rate*	*Interest rate differential*[a]	*Median gold points*	*Permissible differential 90 day loan (per cent)*
		Prewar		
Jan. 1876–July 1914	Berlin on Paris	Paris over Berlin	80.53–81.335 M per 100 fc	4.04
Jan. 1876–July 1914	Paris on N.Y.	Paris over N.Y.	515.0–521.83 fc per $100	5.34
Mar. 1887–July 1914	Berlin on N.Y.	N.Y. over Berlin	416.80–421.85 M per $100	4.90
Jan. 1878–July 1914	Berlin on London	Berlin over London	20.34–20.505 M per £	3.27
Jan. 1878–July 1914	N.Y. on London	N.Y. over London	$4.845–4.890 per £	3.73
		Postwar		
Jan. 1878–July 1914	Paris on London	Paris over London	25.125–25.327 fc per £	3.24
July 1928–1931	Berlin on Paris	Paris over Berlin	16.393–16.502 RM per 100 fc.	2.68
July 1928–Dec. 1931	Paris on N.Y.	Paris over N.Y.	25.6068–25.3774 fc per $1.00	3.65
Jan. 1925–June 1931	Berlin on N.Y.	N.Y. over Berlin	416.536–421.425 RM per $100	4.71
Jan. 1926–July 1931	Berlin on London	Berlin over London	20.37433–20.50 RM per £	2.50
Jan. 1926–July 1931	N.Y. on London	N.Y. over London	$4.85028–4.89127 per £	3.41
Jan. 1928–Aug. 1931	Paris on London	Paris over London	123.8139–124.55 fc per £	2.38

N.Y. = New York

[a] New York commercial paper rate used in computing these differentials.

Theoretically it ought to appear. Its failure to emerge may perhaps be due to the apparent inaccuracy of the gold series.[17]

Interpretation of the series may conceivably be made in terms of equilibrium. Since we have pointed out the vagueness of the notion of equilibrium for exchange rates and interest rates, there is little to be expected from the use of the idea here. The reader however may interpret differently. It will be agreed that the large variations that appear frequently are an indication of the need for adjustment and that continuous maintenance of excessive positions, especially when they are actually "violations," are an indication that the machinery of adjustment is working poorly. For many series there is, in the twentieth century, a marked tendency to fluctuate more closely around the zero line and to change more frequently from one side to another.[18] A similar behavior was found for the maximum short-term interest rate differentials.

Charts 32 to 38 contain the effort series 1878–1914 and 1925–1931 for the six pairs of countries. They uniformly show the same time intervals and scale for the percentage deviations. It is arbitrary which country is assigned the upper or the lower part, and the plus and minus signs serve only to distinguish the numbers for each entry. On the side of each money market the arrows indicate the reference cycle turning points for that country. While these are important bench-marks, neither correspondence nor lack of it should be too severely interpreted: the present series show primarily international relations, and one of the basic ideas was to construct series that might exhibit tensions in nature different from those measured by reference cycles. While there must be interrelations between the two, the new measures are still so tentative that they must be used with great care. The gold point violations are also shown and it is indicated which market committed them. Mostly they are violations by the country toward which the effort series swings in an extreme fashion. That this is not always the case may

[17] See my "Validity of International Gold Movement Statistics," *loc cit.*

[18] New York–Berlin shows for the period before 1914 an exceptionally good behavior for a long time. On the basis of other evidence we know that their contact was comparatively slight, and therefore their actual transactions proceeded in an atmosphere of calm, which does not exclude that each market was often in a perturbed condition. If New York–London show slight variations, it is different; there the volume of transactions steadily increased as greater harmony descended. This shows that still another variable, the volume of transactions, ought to be introduced quantitatively in order to arrive at correct interpretations—an obvious impossibility, because there are no data and there would be too many variables to handle at the present level of analysis.

be due to faults in the data or to quite exceptional circumstances. In general it is plausible that a country against which the effort series is moving—indicating difficulties arising from its contacts with the other (but possibly extending to third or fourth parties) —should also let the exchange rate slip beyond the gold export point.

We shall now discuss in a broad sense the main properties of the six series. Each should be compared with the data in the final appendix and with Table 140 giving a list of stock market panics and their international ramifications. The discussion is mainly in two groups, the first involving New York, the second, London.[19]

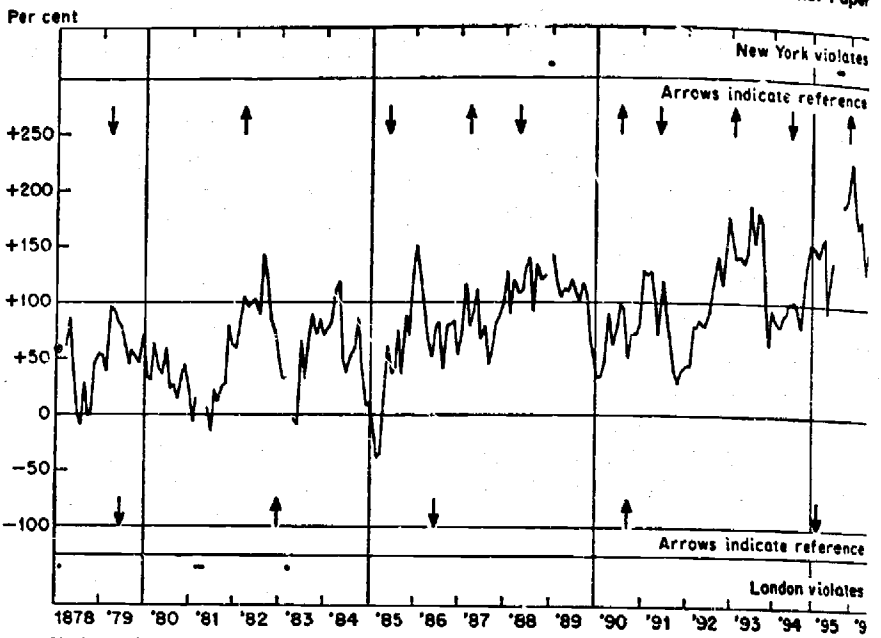
(9) (a) *New York* is particularly interesting. It developed only gradually into a well-functioning market, but its operations were always important. The gradual improvement of communications with Europe is a factor in the slow establishment of "normality." New York nearly always showed a tremendous effort, hardly ever letting the effort series go over to the side of the other three countries. Violations of the principle were the order of the day, and they are mostly of a continuous sort (see Table 78 for details). Nevertheless even in the forbidden zone changes occur and considerable cycles[20] can be observed. Many critical periods and moments stand out clearly, and in all three contacts the most difficult period for the New York money market was 1892–1896. These are the years which begin with the silver agitation and end with the victory of the gold standard (cf. the final appendix). They include furthermore the terrible crisis of 1893. The sensitivity of the series is really astounding. Also many other well-known events are quite sharply depicted. After about 1900 all three series involving New York begin to settle down, albeit (with the exception of Berlin) at a level higher than where our zero line runs. This may mean that our zero is not correctly chosen, but it is more likely to be an indication that New York was still laboring hard to

[19] The reader should bear in mind that the series are *not independent* from each other. It was shown how the six interest rate differentials arise from four basic series by subtractions. The interdependence of the exchange rates was discussed in Chapter V. Now these two sets of interdependent series are combined with each other by use of a principle that links them still further: the gold points into which the interest rate has entered, which in turn depends on the gold point interval, if the rate is connected with those of other countries, as we assume. These relationships could be formalized mathematically, but this digression is omitted here.

[20] Their standard determination is impossible because of the discontinuities without the use of further conventions.

CHART 39 Percentage of Permissible Effort Exerted by New York and London,

Excess of the New York Commercial Paper



Maximum width of gold points 4.827–4.900 dollars per pound sterling.

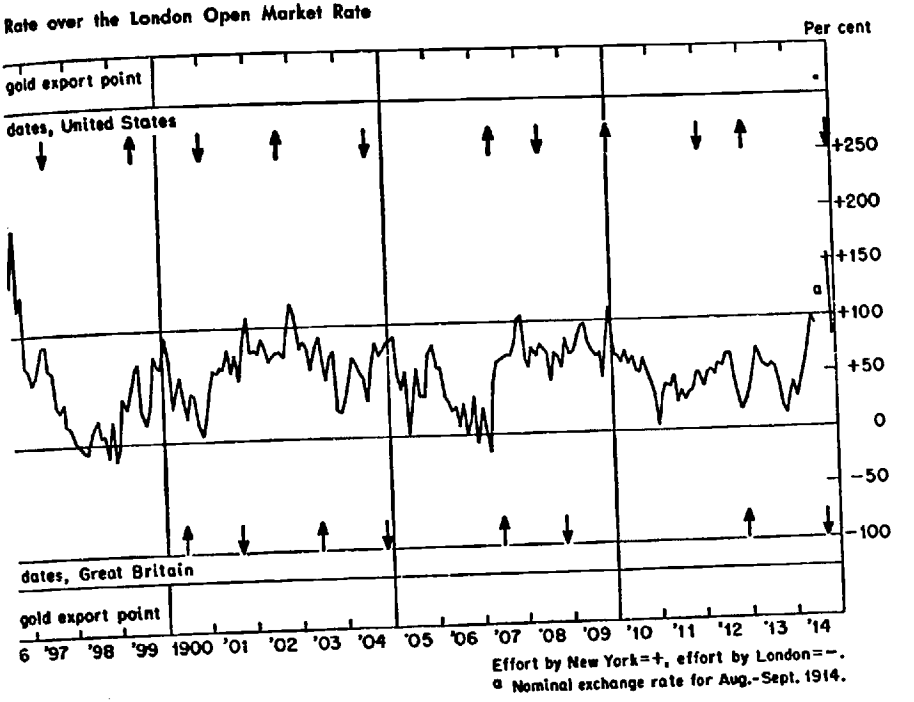
Source: NBER series; see discussion in section 4, subsection 9.

attract and hold funds. We can conclude this from observing the position of other series (not involving New York) around their zero lines.

The postwar period is in all series only measured for 1925–1931, because of the subsequent abandonment of the gold standard by England, exchange control in Germany, antigold legislation in the United States, etc. (an extension might be possible with some modifications). The picture is interesting and in some instances puzzling. The main effort this time is by Berlin and London, but New York begins to pull, especially vis-à-vis London, from the middle of 1927 on. London counteracts in 1928–1929 and succeeds in lowering the series again, helped by repeated violations of the gold points. The great Germain crisis of the middle of 1931 is clearly heralded from the second half of 1930 on. Similarly the increasing balance of payments difficulties London had to face shows up from the end of 1929 on.

In order to form a better idea of the effect of variations in the

Prewar, 1878–1914

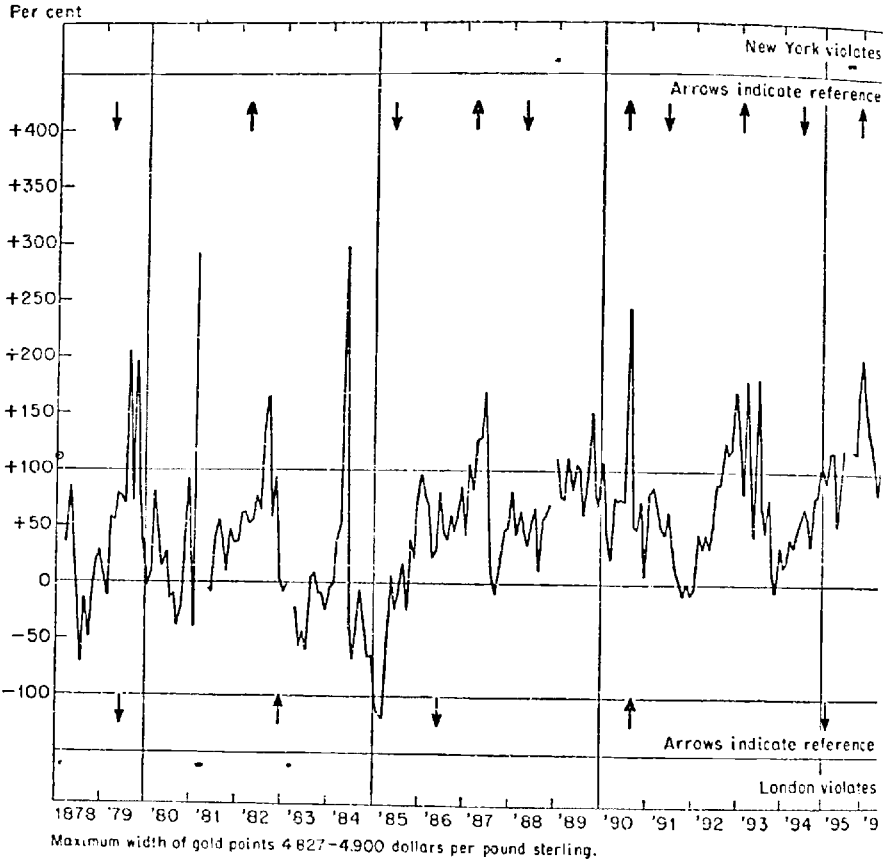


data two experiments were made (for New York alone). *First*, the New York–London balance was computed for the commercial paper rate (as in all previous cases) by assuming a *seventy-two-day loan period* and substituting the maximum width of the gold points for the median, which is used in all cases. *Second*, computations, as above, were made, using the call money rate instead of the commercial paper rate. In both cases, as elsewhere, the usual seasonal corrections were made.[21] The first modification (Chart 39) flattens the series considerably and puts large parts inside the 100 per cent limits that were formerly outside. Now only a few undefined points due to gold point violations remain, so that full cycles might be determined for many continuous years. But the over-all pattern remains the same, as comparison of this chart with Chart 33 will show. In the second series (Chart 40) the New York call money rate introduces a new factor: in spite of the two elements

[21] This may be quite objectionable with series of such high sensitivity, sharp but unsteady peaks, and their consequent easy transposition, etc.

CHART 40 Percentage of Permissible Effort Exerted by New York and London,

Excess of the New York Call Money Rate over the London Open Market



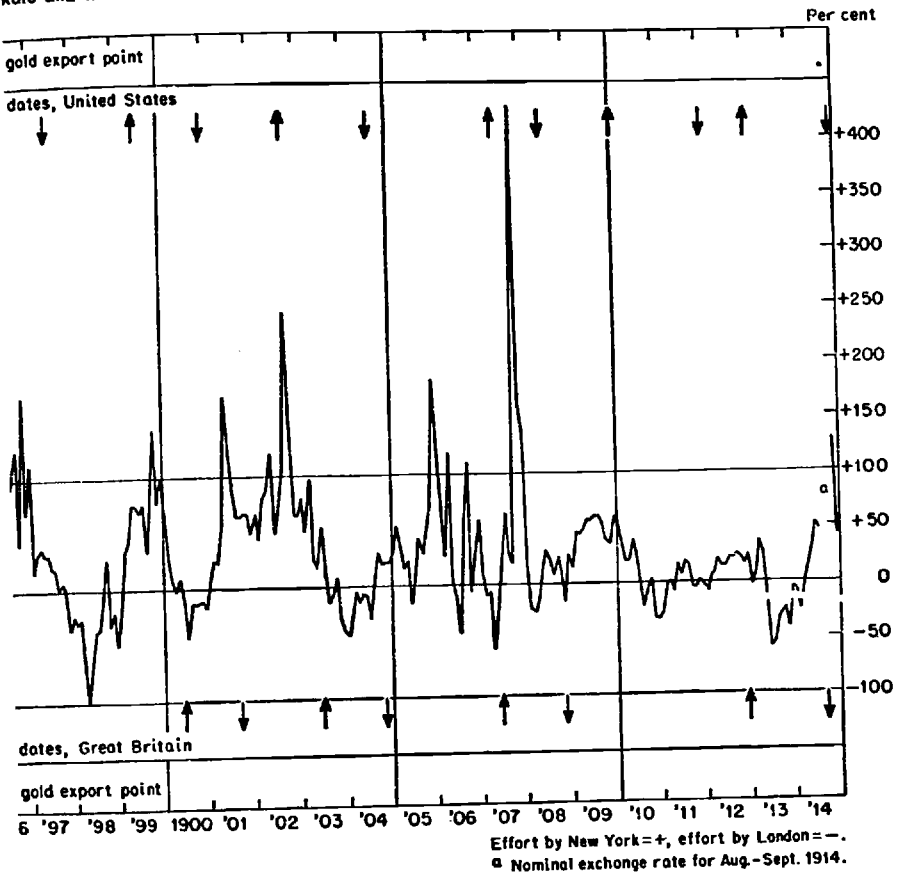
Maximum width of gold points 4.827–4.900 dollars per pound sterling.

Source: Same as for Chart 39.

working toward a flattened curve, new sharp *singular points* occur, always on the New York side. These are more clearly associated with panics and similar disturbances than the more gradual pulls shown in Chart 33, which however registers all these singular periods too. On previous occasions the role of the call money rate had been pointed out and it was found that there was no particular advantage in using it. This is confirmed in a general way by this experiment. On the other hand there is also no objection regarding the substitution, provided the general limitations of any interpretation are realized. The problem does not arise for other

Prewar, 1878–1914

Rate and the New York Rate of Exchange on London



countries; it was mainly in the United States that the call money rate played such an exceptional role, just as it was only in this country that new investment was largely supported by bank credit, rather than by permanent, previous individual savings.

(b) *London.* Since the London–New York series has already been discussed (for three variants), the London–Paris and London–Berlin series remain to be considered. The first is of primary importance and is the main European relationship. It is not very smooth, but is ruptured by many, mostly early, gold point violations on both sides. Where the function is defined it shows strong

cycles, especially throughout the 1890's, and gives the indication that from then on the two markets functioned smoothly and did not stray too badly from the bounds of the permissible pressure they might have exercised upon each other. This is in general conformity with other evidence about the period. We know even about collaboration between the two central banks, e.g., during the Baring crisis. At any rate whatever the troubles were that each of the two markets encountered, they seemed to make little additional trouble through their behavior in regard to each other. Neither the Boer War nor the Fashoda incident proved to be serious upsets. Even the Panama scandal of 1892 appears as a domestic French affair, rather than an event affecting the London–Paris relations. But the collapse of gold stocks in Paris in the last quarter of 1895 is not only seen in greater effort by Paris, but even casts its shadow ahead. From 1900–1909 London was pulling most of the time on Paris; the 1907 crisis does not show up in any particular manner. This merely means that the *relative* positions of these two markets did not undergo any significant change.

Everything changes profoundly for 1928–1931. Although these were not peaceful financial years for Paris, London was probably laboring under still greater difficulties. London went as far as 300 per cent in October 1929, a value that is exceeded on other occasions only by Berlin. This would indicate that London was far more shaken by the New York Stock Exchange collapse than any other records indicate. (A confirmation is also found from the London–Berlin chart.) The difficult times of 1931 that preceded the devaluation are also heralded properly. The sudden pulls of Paris from October 1929 to March 1930 are known to have coincided with large withdrawals of gold by France, and a release of French balances in London.

The London–Berlin series, although in several places undefined because of gold point violations, stays better within the bounds than any other. Much German financing was done via London, especially of the growing foreign trade. Cycles, and even long swings, are noticeable. 1895, 1899–1900, and 1907 stand out as periods of great stress for Germany. The first was a collapse in gold shares (international), in 1900 came another break of prices on the stock market, and the great crisis of 1907 hit Berlin hard, as is established by independent records. It is interesting that London's difficult years (to a large extent due to the American events) of the late 1880's to the middle 1890's are even reflected in its relations with the

financially less-developed German market. However, in interpreting this series, it ought to be recalled that the volume of transactions was probably less than that between London on the one hand and Paris or New York on the other. The postwar period shows just one tremendous effort on the part of Berlin to keep going—entirely through deviations from the permissible interest interval until the collapse came in the middle of 1931, well-heralded by our series for about one year. The method seems to have a not inconsiderable prognostic value.

(c) *Berlin.* This market needs to be discussed only in its relation to Paris, since it was already dealt with in (a) and (b). The prewar series falls into two quite clearly defined periods: up to approximately 1893 Paris made great efforts, subject to some cycles, the largest falling into 1886–1889; from 1895 on, the roles are interchanged and Berlin is exerting pressure. Also the gold point violations fall neatly into these two periods: in the first part they are Paris's, in the second, Berlin's. Since these are independent phenomena not connected with the present measurement, this division is an interesting corroboration.[22] We dispense with further detail and mention that the postwar picture shows again the now so familiar break in the pattern. Berlin made enormous efforts (if violations of over 200 per cent can still be regarded as something accessible to the method) interrupted only by the reversal from October 1929 to April 1930. Again the entire German effort made use of the interest rate only until, in July 1931, the standard broke and exchange control was introduced.

Common to all these series is that the interest rate is apparently far more flexible than the exchange rate. This is not surprising considering the rigidities with which the latter is deliberately surrounded in a gold standard. There are violations of the gold points; they are not better registered than the quality of both rates and gold points permit. But there is enough persistence to the phenomenon to make it probably real. The information about interest rates is certainly better than that for the gold points. Even if one were to discard our new method altogether, one would find the variance of the interest rates and their differentials far greater than

[22] In some other series a great effort of A is sometimes suddenly interrupted by a gold point violation by B. This is not unreasonable; it simply means that the pressure on B became too great and the exchange rate had to give way. There may have been institutional difficulties in raising the interest rate to meet the challenge. These occurrences invite particular attention of the historian.

that of the exchange rates. So the fact remains that each country had considerable facilities in playing with its interest rates, that it was not enslaved to an international situation, and that the monetary system found an outlet for pressures which, while technically involving nonconformity with its principles, could be tolerated and neither engendered distrust nor actually broke down. This entire situation is full of exceedingly interesting problems that await further formulation. The empirical basis given so far should be broadened. But it is clear that a comprehensive theory of interest that wishes to take the international factors into consideration will have to consist of a highly complicated set of theorems.

(10) In concluding this discussion of the series, the following experiment is also indicated:

The series measure only relations for *pairs* of countries. Is it possible to estimate the relation of a given money market with *all* others *simultaneously*? This is not easy to answer. If the rest of the entire world is considered, the method would break down, because for some there may be virtually no interaction, but great differences in interest rates may be registered, showing violations, while there really is no contact. But if we limit ourselves to countries whose money markets are sufficiently highly developed and actually communicate with each other, an extension is not implausible. We have carried it out for the four markets and show the results in Charts 41 to 44. We shall describe briefly their construction and limit the comments to a few words, since the reader can judge their value with all the information provided in this connection.

The principle of construction is simple and a close analogy to the one used for obtaining the series of absolute maximum short-term differentials (Chapter IV). For each month the greatest effort relative to a given market was picked as representing the worst to which the country was exposed. Successively in time different markets may have been responsible but no distinction was made in the curve, the intent being simply to discover the greatest pull, including that of the home market, if such were the case. Because of the reversibility of signs (of pull) in each of the six basic effort series, it is possible to assign uniformly a positive value to the foreign pull, and a negative to the domestic. All series are therefore comparable.[23] A high positive value means that the foreign countries are making an effort, a negative otherwise for the home market. At the top is

[23] Always allowing for their interdependence! See footnote 21, which is here more important than ever.

identified the market which exerts the greatest pressure relative to the home market; sometimes two markets may exert the same pressure. At the bottom the reference dates of the home country are marked. An advantage of the representation is also that the frequent gold point violations (shown on the upper part of the charts) can be studied.

(a) *New York.* Before 1914 there was continuous pressure by New York on the foreign markets interrupted in 1896–1900, thereafter easing, and normalization of the situation with specific turns as in 1906, 1911, etc. The general tendency of gradual emergence from very troubled conditions and development into a full member of a well-organized international financial community is unmistakable.

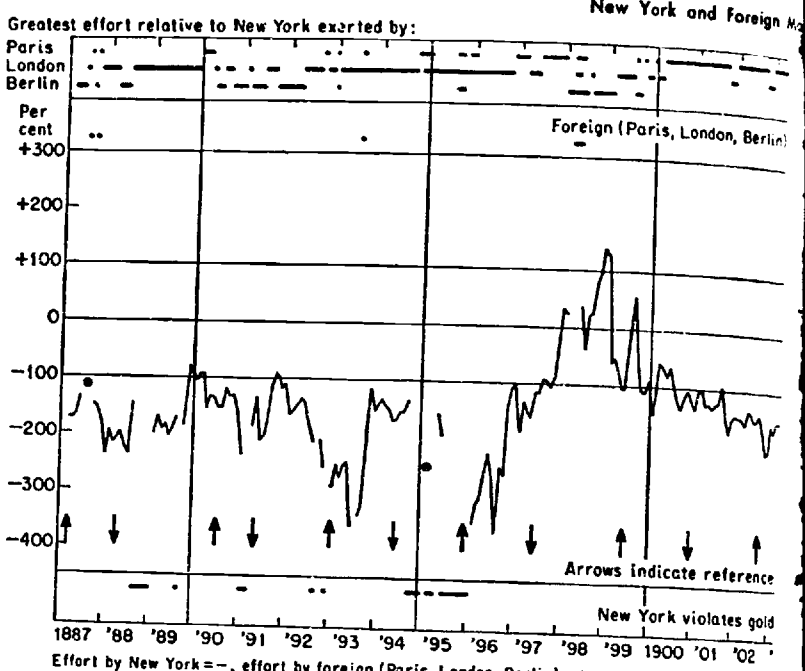
(b) *London.* The picture is different. The series show a market up to about 1897 laboring under great foreign pressure, the worst period being 1892–1897, due to the frequently mentioned American difficulties. The structurally different behavior from 1900 on, with the frequently alternating plus and minus positions, was commented upon at the beginning of this chapter. The occurrence of very sharp disturbances from the end of 1905 to 1907 is particularly noteworthy and the circumstances should be further explored, especially since this is not strongly evident from the constituent series. The postwar section gives an idea of the total disruption of the international money economy, even in that part of the postwar time that might now be considered almost "classical."

(c) *Paris.* This center is noteworthy for the great and distinct cycles prevailing up to 1900—if the numerous gold point violations can be so interpreted. From 1900 on Paris appeared to be under a mild pressure from abroad which, most of the time as we know, was never serious. With a slightly different definition of the permissible zone the curve would easily have fallen entirely within the bounds and offered a further proof of the increasing smoothness of the operations of international finance before 1914. From 1928–1931 the foreign pressure on France far outweighed any she exercised during that period, even when the previously mentioned French repatriation of balances from London in the form of gold occurred.

(d) *Berlin.* The division occurs in about 1904: up to then there was mostly foreign pressure, thereafter stabilization somewhat beyond the 100 per cent level, for which the same probable interpretation applies as in the preceding paragraph.

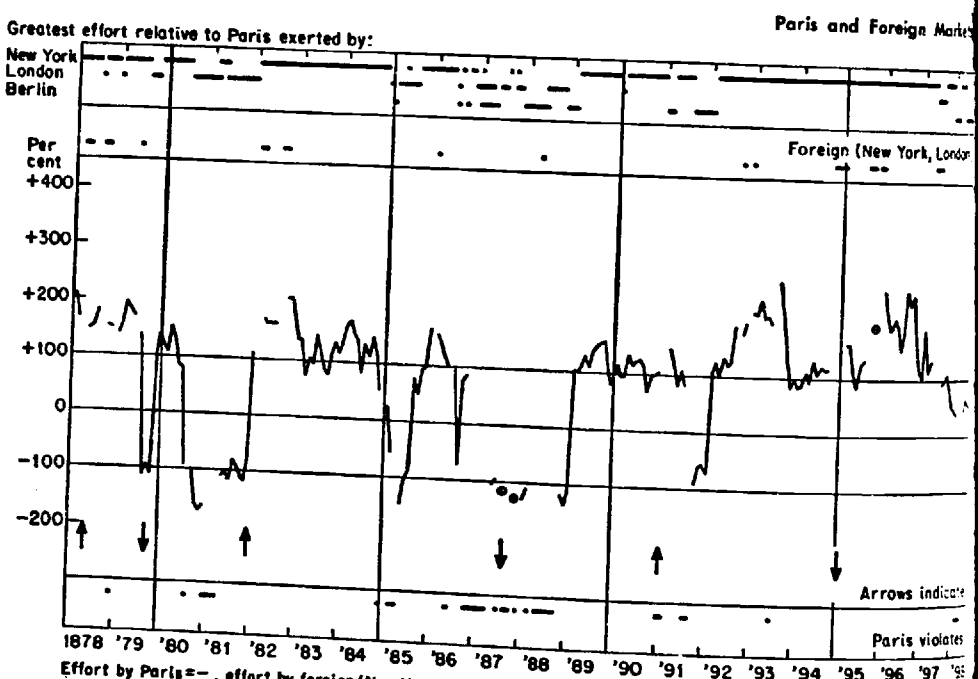
It remains to add some remarks about (weighted) *frequency*

CHART 41 Percentage of Permissible Effort Warranted by Exchange Rates



Source: NBER series; see the discussion in section 4, subsection 10.

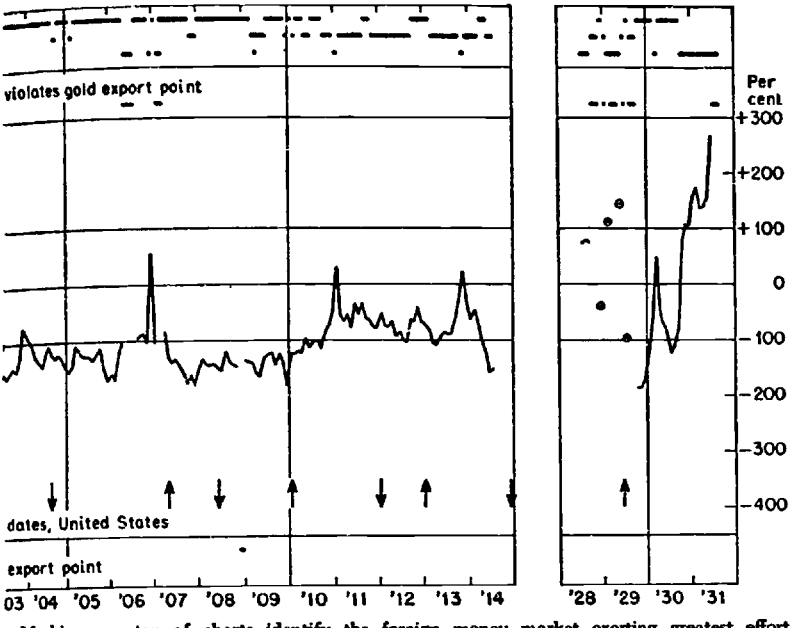
CHART 42 Percentage of Permissible Effort Warranted by Exchange Rates and



Source: Same as for Chart 41.

Short-Term Interest Rate Differentials, Prewar and Postwar

1887–1914, 1928–1931



Markings on top of charts identify the foreign money market exerting greatest effort relative to the country in question.

Short-Term Interest Rate Differentials, Prewar and Postwar

1878–1914, 1928–1931

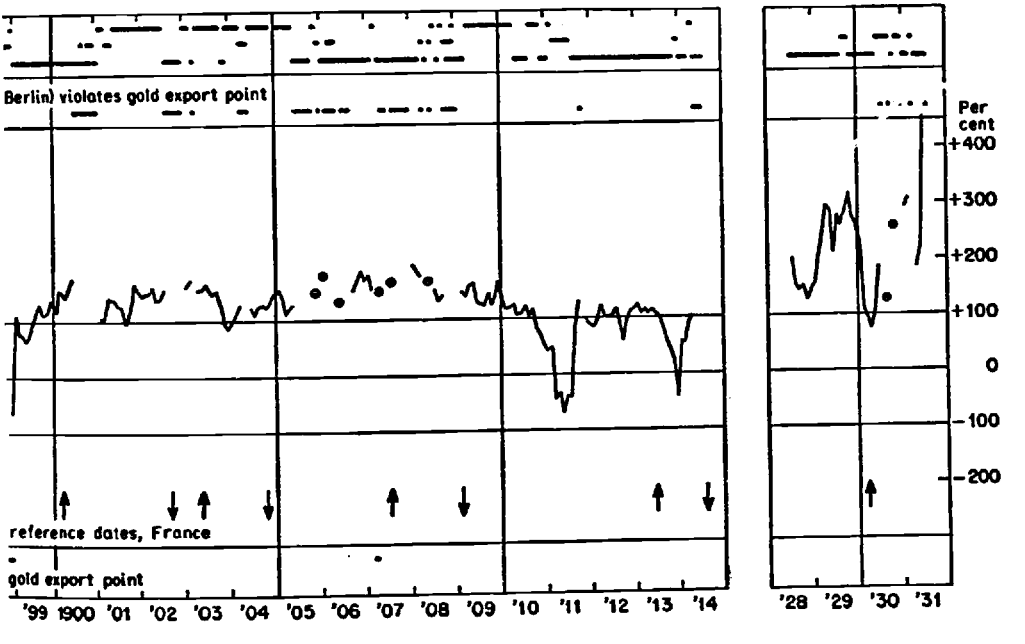
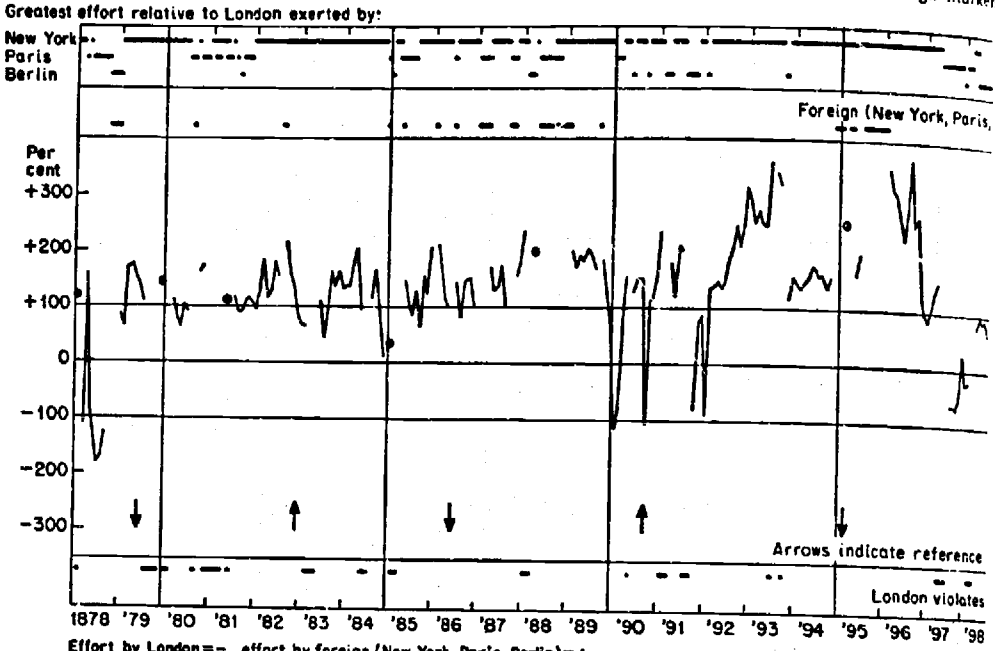


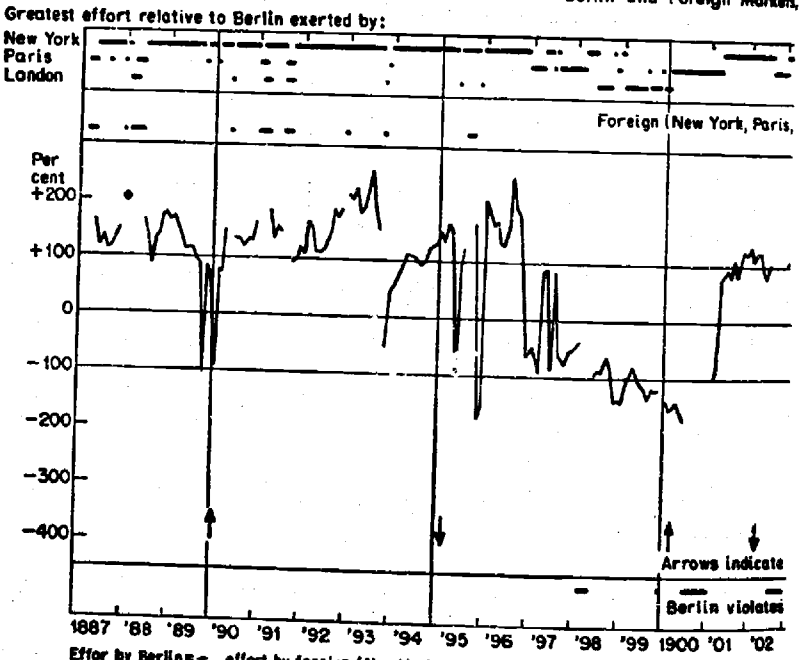
CHART 43 Percentage of Permissible Effort Warranted by Exchange Rates and London and Foreign Markets



Effort by London=−, effort by foreign (New York, Paris, Berlin)=+.

Source: Same as for Chart 41.

CHART 44 Percentage of Permissible Effort Warranted by Exchange Rates and Berlin and Foreign Markets,

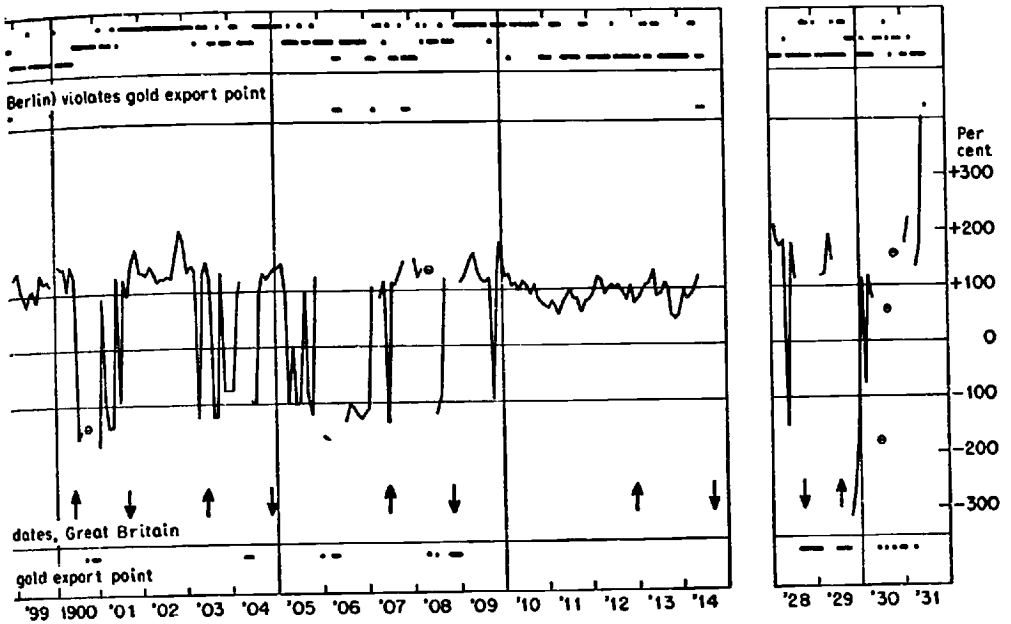


Effor by Berlin=−, effort by foreign (New York, Paris, London)=+.

Source: Same as for Chart 41.

Short-Term Interest Rate Differentials, Prewar and Postwar

1878–1914, 1928–1931



Short-Term Interest Rate Differentials, Prewar and Postwar

1887–1914, 1928–1931

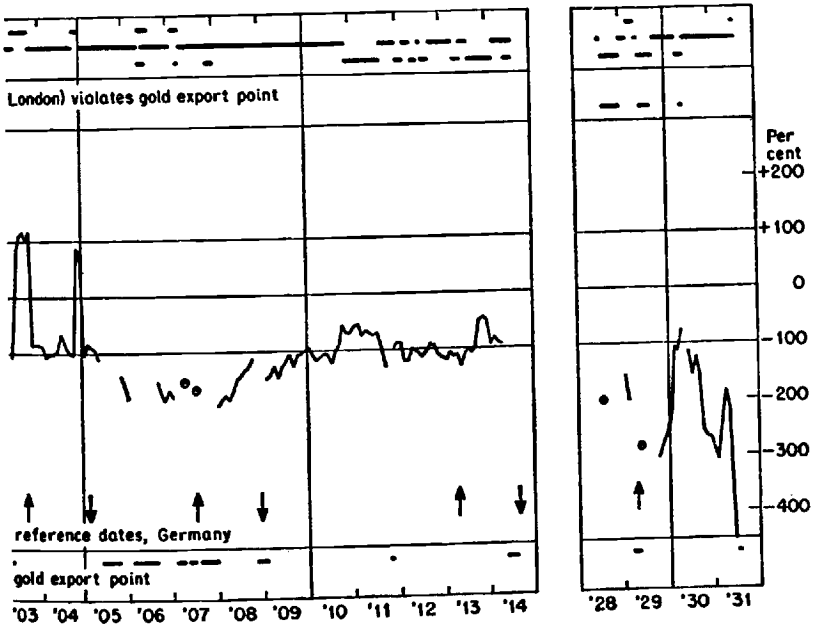


TABLE 78

Number of Continuous Months of Violation of Permissible Effort Series, Pairs of Countries

Number of Continuous Months New York and London Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
				Prewar: January 1880–July 1914, 415 months					
1[a]	13	13	New York	15	15	New York	17	17	New York
2	10	20	New York	7	14	New York	11	22	New York
3	7	21	New York	9	27	New York	4	12	New York
4	1	4	New York	2	8	New York	0	0	—
5	1	5	New York	1	5	New York	2	10	New York
6	3	18	New York	1	6	New York	0	0	—
7	1	7	New York	3	21	New York	1	7	New York
8	0	0	—	1	8	New York	0	0	—
9	1	9	New York	0	0	—	1	9	New York
10	1	10	New York	1	10	New York	1	10	New York
11	2	22	New York	2	22	New York	0	0	—
12	0	0	—	0	0	—	1	12	New York
13	1	13	New York	0	0	—	0	0	—
15	1	15	New York	0	0	—	0	0	—
17	1	17	New York	1	17	New York	0	0	—
22	1	22	New York	0	0	—	0	0	—
24	1	24	New York	0	0	—	0	0	—
Total	32	207		28	138		21	82	—
Average		6.5			4.9			3.9	
Median		3			3			2	
			Total months of continuous deviation as per cent of total deviations observed						
		71.1			65.1			55.3	
				Postwar: January 1925–August 1931, 80 months					
1[a]	3	3	New York	1	1	New York			
2	1	2	New York						
Average		2			0				

[a] Single deviations of 100, 125, and 150 per cent are not included in the computations.

(*table continues on next pages*)

TABLE 78, continued

Number of Continuous Months New York and Paris Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1880–July 1914, 415 months									
1[a]	13	13	New York	13	13	New York	9	18	New York
2	3	6	New York	9	18	New York	11	22	New York
3	2	6	New York	4	12	New York	2	6	New York
4	4	16	New York	5	20	New York	2	8	New York
5	4	20	New York	3	15	New York	0	0	—
6	2	12	New York	1	6	New York	1	6	New York
7	2	14	New York	1	7	New York	0	0	—
8	1	8	New York	0	0	—	0	0	—
10	1	10	New York	0	0	—	2	20	New York
11	0	0	—	1	11	New York			
13	1	13	New York	1	13	New York			
15	0	0	—	1	15	New York			
16	1	16	New York	0	0	—			
19	2	38	New York	0	0	—			
24	0	0	—	1	24	New York			
25	1	25	New York						
27	1	27	New York						
Total	25	211		27	141				
Average		8.4			5.2		18	62	
Median		5			4			3.4	
								2	
Total months of continuous deviation as per cent of total deviations observed		65.8			67.5			66.7	
Postwar: July 1928–December 1931, 42 months									
1[a]	0	0	—	2	2	New York	1	1	New York
2	1	2	New York	0	0	—	0	0	—
3	1	3	New York	1	3	New York	1	3	New York
4	1	4	New York						
Total	3	9		1	3		1	3	
Average		3			3			3	
Median		3			3			3	
Total months of continuous deviation as per cent of total deviations observed		100.0			33.3			50.0	

[a] Single deviations of 100, 125, and 150 per cent are not included in the computations.

TABLE 78, continued

Number of Continuous Months Paris and London Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1880–July 1914, 415 months									
1*	10	10	London (8) Paris (2)	7	7	London (5) Paris (2)	3	3	London (2) Paris (1)
2	9	18	London (4) Paris (5)	6	12	London	1	2	London
3	4	12	London (3) Paris (1)	1	3	Paris	1	3	Paris
4	2	8	London (1) Paris (1)						
5	0	0	—						
9	1	9	London						
10	1	10	London						
Total	17	57		7	15		2	5	
Average		3.4			2.1			2.5	
Median		2			2			2	
Total months of continuous deviation as per cent of total deviations observed		63.0			50.0			40.0	
Postwar: July 1928–July 1931, 37 months									
1*	2	2	London	3	3	London	2	2	London
2	1	2	London	0	0	—	1	2	London
3	1	3	London	1	3	London	0	0	—
5	0	0	—	0	0	—	0	0	—
7	0	0	—	0	0	—	1	7	London
8	0	0	—	1	8	London			
17	1	17	London				2	9	
Total	3	22		2	11			4.5	
Average		7.3			5.5			2	
Median		3			3				
Total months of continuous deviation as per cent of total deviations observed		60.0			40.0			50.0	

* Single deviations of 100, 125, and 150 per cent are not included in the computations.

TABLE 78, continued

Number of Continuous Months New York and Berlin Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1888–July 1914, 329 months									
1[a]	3	3	New York	3	3	New York (2) Berlin (1)	3	3	New York New York
2	1	2	Berlin	2	4	New York	4	8	New York
4	3	12	New York	2	8	New York	3	12	New York
5	0	0	—	2	10	New York	1	5	New York
6	1	6	New York	1	6	New York	1	6	—
7	2	14	New York	1	7	New York	0	0	—
8	0	0	—	1	8	New York	0	0	New York
9	1	9	New York	1	9	New York	1	9	
10	1	10	New York	0	0	—			
11	1	11	New York	0	0	—			
12	1	12	New York	0	0	—			
13	1	13	New York	1	13	New York			
Total	12	89		11	65		10	40	
Average		7.4			5.9			4	
Median		7			5			4	
Total months of continuous deviation as per cent of total deviations observed		80.0			78.6			76.9	Berlin
Postwar: January 1925–July 1931, 79 months									
1[a]	2	2	Berlin	3	3	Berlin	1	2	Berlin
2	0	0	—	0	0	—	2	4	—
3	0	0	—	1	3	Berlin	0	0	—
6	0	0	—	1	6	Berlin	0	0	—
8	2	16	Berlin	0	0	—	0	0	Berlin
10	0	0	—	0	0	—	1	10	—
13	1	13	Berlin	1	13	Berlin	0	0	
Total	3	29		3	22		3	14	
Average		9.7			7.3			4.7	
Median		8			6			2	
Total months of continuous deviation as per cent of total deviations observed		60.0			50.0			75.0	

[a] Single deviations of 100, 125, and 150 per cent are not included in the computations.

TABLE 78, continued

Number of Continuous Months Berlin and London Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1880–July 1914, 415 months									
1[a]	10	10	Berlin (7) London(3)	5	5	London(1)	1	1	Berlin
2	8	16	Berlin (8)	2	4	Berlin (4)			
3	0	0	—	2	6	Berlin	0	0	—
4	4	8	Berlin	0	0	Berlin	0	0	—
5	0	0	—	0	0	—	1	4	Berlin
6	1	6	Berlin	1	6	—			
10	1	10	Berlin			Berlin			
Total	14	40		5	16		1	4	
Average		2.9			3.2			4	
Median		2			3			4	
Total months of continuous deviation as per cent of total deviations observed		58.3			50.0			50.0	
Postwar: May 1925–July 1931, 75 months									
1[a]	3	3	Berlin	1	1	Berlin	4	4	Berlin
2	1	2	Berlin	1	2	Berlin	2	4	Berlin
3	0	0	—	0	0	—	0	0	—
4	2	8	Berlin	2	4	Berlin	1	4	Berlin
6	1	6	Berlin	1	6	Berlin	1	6	Berlin
9	0	0	—	1	9	Berlin			
16	1	16	Berlin				4	14	
Total	5	32		5	21				
Average		6.4			4.2			3.5	
Median		4			4			2	
Total months of continuous deviation as per cent of total deviations observed		62.5			83.3			50.0	

[a] Single deviations of 100, 125, and 150 per cent are not included in the computations.

TABLE 78, concluded

Number of Continuous Months Berlin and Paris Exceeded 100, 125, and 150 Per Cent in Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1880–July 1914, 415 months									
1[a]	11	11	Paris (1) Berlin(10)	11	11	Paris (3) Berlin(8)	2	2	Berlin Berlin
2	4	8	Paris (3) Berlin(1)	1	2	Paris	3	6	—
3	1	3	Berlin	2	6	Paris (1) Berlin(1)	0	0	—
4	1	4	Berlin	0	0	—	0	0	Berlin
5	2	10	Paris (1) Berlin(1)	2	10	Berlin	1	5	Berlin
6	0	0	—	1	6	Berlin	1	6	Berlin
7	1	7	Berlin	0	0	—	0	0	—
8	1	8	Berlin	0	8	Berlin			
9	1	9	Berlin	1	9	Berlin			
10	1	10	Berlin						
11	1	11	Berlin						
12	1	12	Berlin						
Total	14	82		7	41		5	17	
Average		5.9			5.9			3.4	
Median		5			5			2	
Total months of continuous deviation as per cent of total deviations observed		56.0			38.9			71.4	
Postwar: July 1928–July 1931, 937 months									
1[a]							1	1	Berlin
2							1	2	Berlin
10							1	10	Berlin
12				1	12	Berlin	0	0	Berlin
13				0	0	—	1	13	—
14	1	14	Berlin	0	0	—			
19	0	0	—	1	19	Berlin			
20	1	20	Berlin						
Total	2	34		2	31		3	25	
Average		17			15.5			8.3	
Median		14			12			10	
Total months of continuous deviation as per cent of total deviations observed		100.0			100.0			75.0	

[a] Single deviations of 100, 125, and 150 per cent are not included in the computations.

TABLE 79

Number of Continuous Months of Violation of Maximum Permissible Effort Series, Domestic Money Market and All Foreign Centers

Number of Continuous Months London and Foreign Centers[a] Exceeded 100, 125, and 15[illegible] per cent in the Maximum Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1878–July 1914									
1[b]	37	37	Foreign(27) London(10)	27	27	Foreign(21) London(6)	24	24	Foreign(22 London(2
2	15	30	Foreign(10) London(5)	16	32	Foreign(12) London(4)	15	30	Foreign(13 London(2
3	11	33	Foreign	8	24	Foreign(7) London(1)	3	9	Foreign
4	7	28	Foreign(6) London(1)	3	12	Foreign	0	0	—
5	2	10	Foreign	0	0	—	1	5	Foreign
6	4	24	Foreign	1	6	Foreign	0	0	—
7	2	14	Foreign(1) London(1)	2	14	Foreign	1	7	Foreign
8	0	0	—	1	8	Foreign	0	0	—
9	2	18	Foreign	0	0	—	1	9	Foreign
10	1	10	Foreign	1	10	Foreign	0	0	—
11	0	0	—	1	11	Foreign	0	0	—
12	1	12	Foreign	0	0	—	1	12	Foreign
17	1	17	Foreign	1	17	Foreign			
18	1	18	Foreign						
Total	47	214		34	134		22	72	
Average		4.6			3.9			3.3	
Median		3			3			2	
Total months of continuous deviation as per cent of total deviations observed		56.0			55.7			47.8	
Postwar: January 1928–July 1931, 43 Months									
1[b]	5	5	Foreign(3) London(1)	4	4	Foreign(2) London(2)	4	4	Foreign(2) London(2)
2	2	4	Foreign	2	4	Foreign	2	4	Foreign
3	2	6	Foreign(1) London(1)	2	6	Foreign(1) London(1)	1	3	London
4	2	8	Foreign	1	4	Foreign	1	4	Foreign
Total	6	18		5	14		4	11	
Average		3			2.8			2.8	
Median		3			3			2	
Total months of continuous deviation as per cent of total deviations observed		54.5			55.6			50.0	

[a] New York, Berlin, Paris.

[b] Single deviations of 100, 125, and 150 are not included in the computations.

TABLE 79, continued

Number of Continuous Months New York and Foreign Centers[a] Exceeded 100, 125, and 150 Per Cent in the Maximum Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1878–July 1914									
1[b]	6	6	New York	3	3	New York	10	10	New York
2	9	18	New York(8) Foreign (1)	6	12	New York(5) Foreign (1)	12	24	New York
3	0	0	—	3	9	New York	4	12	New York
4	3	12	New York	5	20	New York	1	4	New York
5	0	0	—	3	15	New York	1	5	New York
6	2	12	New York	1	6	New York	1	6	New York
7	1	7	New York	3	21	New York	1	7	New York
9	1	9	New York	0	0	—	1	9	New York
10	1	10	New York	2	20	New York	2	10	New York
11	1	11	New York	1	11	New York			
13	1	13	New York	0	0	—			
14	1	14	New York	1	14	New York			
15	0	0	—	1	15	New York			
16	1	16	New York	0	0	—			
18	1	18	New York	0	0	—			
19	1	19	New York	0	0	—			
25	1	25	New York	1	25	New York			
27	1	27	New York						
Total	25	211		27	168		23	77	
Average		8.4			6.2			3.3	
Median		6			4			2	
Total months of continuous deviation as per cent of total deviations observed		80.6			90.0			69.7	
Postwar: July 1928–August 1931									
1[b]	2	2	Foreign	1	1	Foreign	0	0	
2	1	2	New York	0	0	—	2	4	—
3	0	0	—	1	3	New York	1	3	Foreign New York
4	1	4	New York	0	0	—			
6	0	0	—	1	6	Foreign			
8	1	8	Foreign	0	0	—			
Total	3	14		2	9		3	7	
Average		4.7			4.5			2.3	
Median		4			3			2	
Total months of continuous deviation as per cent of total deviations observed		60.0			66.7			100.0	

[a] London, Paris, Berlin.

[b] Single deviations are not included in the computations.

TABLE 79, continued

Number of Continuous Months Paris and Foreign Centers[a] Exceeded 100, 125, and 150 Per Cent in the Maximum Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: January 1878–July 1914									
1[b]	23	23	Foreign (18) Paris (5)	32	32	Foreign (28) Paris (4)	16	16	Foreign
2	11	22	Foreign (8) Paris (3)	9	18	Foreign	13	26	Foreign
3	8	24	Foreign (6) Paris (2)	5	15	Foreign (4) Paris (1)	4	12	Foreign (3) Paris (1)
4	4	16	Foreign (3) Paris (1)	2	8	Foreign	3	12	Foreign
5	5	25	Foreign	5	25	Foreign	0	0	—
6	3	18	Foreign	2	12	Foreign	2	12	Foreign
7	3	21	Foreign	2	14	Foreign	0	0	—
8	1	8	Foreign	0	0	—	0	0	—
9	1	9	Foreign	1	9	Foreign	0	0	—
10	2	20	Foreign	0	0	—	1	10	Foreign
11	0	0	—	1	11	Foreign			
12	2	24	Foreign	1	12	Foreign			
16	1	16	Foreign						
20	1	20	Foreign						
Total	42	223		28	124		23	72	
Average		5.3			4.4			3.1	
Median		4			3			2	
Total months of continuous deviation as per cent of total deviations observed		64.6			46.7			59.0	
Postwar: July 1928–June 1931									
1[b]	2	2	Foreign	3	3	Foreign	3	3	Foreign
2	2	4	Foreign	1	2	Foreign	2	4	Foreign
3	1	3	Foreign	1	3	Foreign	1	3	Foreign
13	0	0	—	0	0	—	1	13	Foreign
20	1	20	Foreign	1	20	Foreign			
Total	4	27		3	25		4	20	
Average		6.8			8.3			5	
Median		2			3			2	
Total months of continuous deviation as per cent of total deviations observed		66.7			50.0			57.1	

[a] Berlin, New York, London.
[b] Single deviations are not included in the computations.

TABLE 79, concluded

Number of Continuous Months Berlin and Foreign Centers[a] Exceeded 100, 125, and 150 Per Cent in Maximum Permissible Effort Series

Length of violations (months)	100 PER CENT			125 PER CENT			150 PER CENT		
	No.	*Months*	*Violators*	*No.*	*Months*	*Violators*	*No.*	*Months*	*Violators*
Prewar: February 1887–July 1914									
1[b]	14	14	Foreign(6) Berlin (8)	13	13	Foreign(7) Berlin (6)	9	9	Berlin (2) Foreign(7)
2	4	8	Foreign(2) Berlin (2)	4	8	Foreign(3) Berlin (1)	7	14	Foreign(3) Berlin (4)
3	1	3	Berlin	4	12	Foreign(2) Berlin (2)	0	0	—
4	5	20	Foreign(3) Berlin (2)	1	4	Foreign	3	12	Foreign
5	1	5	Berlin	3	15	Foreign (1) Berlin (2)	3	15	Foreign(1) Berlin (2)
6	2	12	Berlin	2	12	Foreign(1) Berlin (1)	0	0	—
7	6	42	Foreign(4) Berlin (2)	0	0	—	0	0	—
8	0	0	—	1	8	Foreign	0	0	—
9	1	9	Foreign	2	18	Foreign(1) Berlin (1)	1	9	Foreign
10	2	20	Foreign(1) Berlin (1)	1	10	Foreign			
11	3	33	Foreign(1) Berlin (2)						
12	1	12	Foreign						
Total	26	164		18	87		14	50	
Average		6.3			4.8			3.6	
Median		6			4			2	
Total months of continuous deviation as per cent of total deviations observed		65.0			58.1			60.9	
Postwar: July 1928–June 1931									
1[b]	2	2	Berlin	2	2	Berlin	3	3	Berlin
2	1	2	Berlin	1	2	Berlin	1	2	Berlin
4	0	0	—	1	4	Berlin	1	4	Berlin
6	1	6	Berlin	0	0	—	0	0	—
10	0	0	—	0	0	—	1	10	Berlin
12	0	0	—	1	12	Berlin			
13	1	13	Berlin						
Total	3	21		3	18		3	16	
Average		7			6			5.3	
Median		6			4			4	
Total months of continuous deviation as per cent of total deviations observed		60.0			60.0			50.0	

[a] Paris, London, New York.
[b] Single deviations are not included in the computation.

distributions made from these data to throw some further light on the nature of these series.

Table 78 for pairs of countries and Table 79 for the aggregate balances show the number of months for which there were continuous violations of the 100, 125, and 150 per cent levels. They indicate how frequently violations of more than one month continuously occurred and what the total number of months for each entry actually was. They are therefore akin to Table 60, where the gold point violations were similarly counted. The tables are constructed by means of some simple rules: if the curves go through the 100, 125, or 150 per cent lines, respectively, the continuous number of months that they stay beyond are counted and entered in the three columns. Single deviations beyond the three limits are not counted. From these data the three columns are formed. Clearly the number of continuous violations of the 150 per cent limit can *at most* only be equal to that of the 125 per cent limit violations, etc. At the bottom of these frequency distributions the average duration of the continuous violations for each limit is shown as well as the percentage of months that were continuous deviations out of all deviations. We observe that this percentage is very large, which means that when the series went through one of the limits, they did so in a thorough manner—at least, in terms of time. The different behavior of the four money markets shows up very clearly, especially before World War I. The postwar data are offered more in the nature of an appendix; the deviations are short and infrequent, showing the substantial change that has occurred.

Section 5. Conclusion

(11) The discussion in this chapter has been surrounded by many reservations, and only cautious conclusions can be drawn. In design and interpretation the series presented here are intermediate, i.e., in the sense of goods along a production line; they are neither raw materials nor finished products, but in a stage where they may still be transformed into one thing rather than another. The same is true for most of the contents of this book. Or, they may have to be discarded. At any rate, however, the new method is a natural outgrowth of a theory that has been widely held and, with more or less precise formulation, has been used by numerous writers in the interpretation of the main phase of the modern money economy. While so far the method has not shed any decisive light upon

the *spread* of financial fluctuations from one country to another, it certainly has shown their interdependence and the existence of phenomena that agree with common sense. The chief among those is that the workings of the international monetary system had improved greatly up to 1914 and were tremendously upset by World War I. Other facts, less easily interpreted, are also in evidence; because of their systematic connection with the former phenomena, there is hope that they can be considered to be a fuller account of our experience.