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6. Cyclical Movements

Our major study of the cyclical behavior of interest rates is being conducted by Phillip Cagan, though important contributions have been made also by Reuben A. Kessel in connection with his study of the cyclical behavior of the term structure. Kessel's findings will be reviewed at the end of this section. The purposes of Cagan's study are (1) to discover what have been the cyclical movements in a wide variety of interest rates over a long period of time; (2) to compare these movements with cyclical fluctuations of general business and other variables that might cast light on the causes of interest rate movements; (3) to relate these findings to our other studies in ways that might help our understanding of the determinants of interest rates generally.

Description of Cyclical Movements

In order to avoid generalizations about cycles that rest only on highly special conditions, most of the following analysis omits reference to two periods: World War I and from 1930 to the unpegging of long-term rates in 1951.

Two major characteristics of cyclical fluctuations require special attention. One is timing and the other is amplitude and/or rate of change. With respect to either, there is a wide variety of behavior as we compare different cycles with one another, and as we compare different interest rate series with one another. Despite this diversity, certain generalizations can be made. We shall begin with timing.

TIMING

Long-Term Securities. It is well known that the cyclical variation of long-term interest rates have tended to lag behind the business cycle. Our study confirms that belief, but it also indicates that the lag has declined with the passage of time to the point where its continued existence is in doubt. Indeed, at the 1960 cyclical peak, all but one of

the long-terms in our major study led the business cycle by four months, and that one (corporate Baa's) was synchronous. The four leaders were U.S. government bonds, Moody's corporate Aaa's, Standard & Poor's municipals, and Standard & Poor's railroad bonds.

Of these series the last two are available from the start of this century. With respect to peaks, the data on these two series suggest that there was a fairly continuous trend from a very substantial lag in the pre-World War I period (about eight months) to no systematic lag at all during the 1950's. Their behavior at troughs is somewhat different. It is generally characteristic of almost all rates, both short and long, that there is a stronger tendency to lag at troughs than at peaks. The two series now reviewed (Standard & Poor's municipals, and Standard & Poor's rails) showed lags between 1900 and 1913 comparable to the large lags at peaks during the same period. But the lags at troughs persisted, often exceeding a year, even after World War I. By World War II the size of lag was substantially reduced, and even replaced by leads on two occasions. Thus the trend away from long lags characterizes troughs as well as peaks, though for troughs it started much later.

We may now generalize as follows with respect to the two long-term series extending from 1900 to 1960. (1) At both trough and peak there was a persistent tendency for closer and closer synchronization between the cycle in business activity and the movements of interest rates. (2) At troughs, although lags declined markedly, they continued to predominate over leads even through 1961. (3) At peaks the lag in these long rates not only diminishes but in a slight majority of cases is replaced by leads after World War II. (4) There is not as yet sufficient evidence to justify the view that there has been a genuine shift from long-term lag to lead, but there is an important contrast between behavior at peaks and at troughs. Business still seems to turn up before interest rates start to rise, but during the fifties rates turned down before business at least as often as after.

Other long-term series are not available over the full time period since 1900, but their behavior in the period covered is consistent with all the generalizations just made. Among the series in this group are those available since 1920 for governments and corporate Aaa's and Baa's. The only significant new result is that at peaks governments moved from lag to lead sooner and more consistently than any of the

other series. (There is one skipped turn and one synchronous turn, but there are no lags after 1923.) At troughs the lag in governments continued much as in the other long-term series studied.

On two long-term series we have usable data beginning in 1882, but these do not continue to the present. (Special features of the post-Civil War period make it undesirable to begin cyclical analysis before 1882.) These series are Macaulay's for railroad bonds and New England municipals. At peaks these series showed substantial lags in each case throughout the entire period from 1882 to 1913 (the median lags were nine months for each series). At troughs we find much longer median lags at the end of the nineteenth century (medians of fourteen months for rails and twenty for the New England municipals) and the lags are still appreciable during the first twelve years of the twentieth century (seven and five months respectively).

In summary, the general conclusions presented above for the first two series described hold for other long-term series. We can add, however, that with respect to peaks the lags were long not only in the early twentieth century but also in the late nineteenth. At troughs the lags were even longer in the earlier period.

Short-Term Securities. The short-term securities examined here include Treasury bills, call money, commercial paper, bankers' acceptances, and bank loans. Our analysis of call money and commercial paper goes back to 1882; for the others our analysis begins in 1920. The two longer series show median lags of three and seven months during six peaks at the end of the nineteenth century, compared with two and six months, respectively, during the four downturns between 1902 and 1913. After 1920 none of these series shows any pronounced trend, but all except bank loans show mixtures of leads and lags with medians not far from zero.

If one compares the different short-term series described here, he will note an almost steady increase in the frequency of lags from the first to the last named. Treasury bills, for example, led business cycle peaks at all their turns after 1920. Call money led in four out of seven; commercial paper was synchronous in three and led in one out of eight; acceptances led or were synchronous in three out of eight; bank loans led in only one, were synchronous in one, and lagged in six.

Turning to troughs, call money and commercial paper each showed median lags of four months for the last five troughs at the end of the nineteenth century. During the first twelve years of this century, call

money showed a median lead of one month, while commercial paper showed a median lag of four months. In the severe contraction of 1921 all series lagged behind the trough by eleven months or more. After that period Treasury bills led more often than they lagged, and all the other short-term series showed an overwhelming dominance of lags, without any clear trend.

The following generalizations are suggested for short-terms: (1) Shorts, like longs, show a trend toward fluctuations more nearly synchronous with the cycle, but this trend is less pronounced in shorts partly because they were much more synchronous than longs in the early years. (2) At troughs lags in shorts, as in longs, continue to predominate in almost all series. (3) Treasury bills almost always lead at the peak. Even at troughs they lead more often than any other series. (It may or may not be significant, but we recall that in the long-term market also it was Treasury securities that led more often than any other at the peak.) (4) Call money is the only short-term series other than bills with a substantial number of leads in either troughs or peaks. (5) In the 1960 peak all short-term securities led the business cycle (as did all longs but one).

Clustering of Turning Points Among Interest Rate Series and with the Reference Cycle. In a somewhat different analysis of these data, Cagan shows that with one exception turning points of interest rate series are very much closer to one another than to the business cycle. The one exception is the relation of commercial paper to call money before 1914. As might be expected from the earlier analysis, the tendency for turning points of interest rates to cluster more about each other than the business cycle is much more pronounced in troughs, where the lag of interest rates behind the cycle is especially pronounced.

AMPLITUDE OF CYCLICAL MOVEMENTS

Ever since the publication of Burns and Mitchell's *Measuring Business Cycles,* the term "amplitude" has had two different meanings in business cycle parlance. One is the conventional usage, where the amplitude refers to the difference between the trough and peak levels reached by a series. A second, referred to as "amplitude per time period," is of fundamentally different quality, referring not to the total rise or fall between peaks and troughs but to the rate of change. It is obvious that these need not be closely correlated. Change might

be very gradual, giving a low "amplitude per month," but might continue for a long period before the turn, so that the conventional "amplitude" would be quite great. On the other hand, in comparisons among series whose cyclical movements are of about the same duration, as is often the case with interest rates, the two types of measure yield substantially the same relative differences. As the context in the following section indicates, the term "amplitude per month," or rate of change, is the one usually used.

The amplitude of cyclical movement on call money rates and commercial paper rates was very wide between 1885 and 1913, averaging between 11 and 31 basis points per month. This amplitude declined during that period and it continued at generally much lower levels after 1919, as may be seen in Table 6. In sharp contrast to this, the amplitude of movement in long-terms was extraordinarily low in the

TABLE 6

Average Amplitude Per Month of Specific Cycles in Interest Rates

	Trough-to-Peak Rise Plus Peak-to-Trough Decline, in Basis Points Per Month			
	1953-61	1919-29	1900-13	1885-1900
Short-term rates				
Call money	7.3	19.5	27.9	31.1
Commercial paper	11.6	10.7	11.6	22.8
Bankers' acceptances	12.4	11.9		
Bank loans	5.4	4.7		
Treasury bills	14.5	11.3		
Long-term rates				
U. S. bonds	3.8	3.3		
Corporate bonds (Aaa)	2.3	2.5		
Corporate bonds (Baa)	3.7	4.4		
Corporate and municipal bonds	4.2	2.2	1.6	
Municipal bonds	4.3	2.6	1.5	
Railroad bonds (Macaulay)		2.2	2.1	1.5
New England municipal bonds			1.8	1.8

early period, averaging between 1.5 and 2.1 basis points per month between 1885 and 1913 on the two series available. Amplitudes on longs were substantially higher after World War I than before. Thus the secular change in amplitude was exactly the opposite on longs from what it was on shorts, and it was very marked in both cases.

The preceding table and discussion relate to the amplitude of interest rate movements without making any allowance for the nature of concomitant business cycles. The important question is thus raised:

TABLE 7

Ratio of Interest Rate Amplitudes in Specific Cycles of 1950's to Amplitudes in Matching Cycles of 1920's

Type of Loan	Ratio	
	Expansion	Contraction
Commercial paper	2.0	1.6
Treasury bills	2.1	1.3
Acceptances	1.8	1.1
Bank loans	2.2	0.8
Federal Reserve discounts	2.2	1.1

How have interest rate amplitudes changed relative to change in business cycle amplitudes? Cagan's research makes it reasonably clear that on short-term loans other than call money the amplitude of cyclical movements has increased relative to that of business cycles since the First World War. Two experiments led to this conclusion. In one, Cagan matched cycles in the fifties with those in the twenties when the business cycles were of similar amplitude. He then found the ratio of the amplitude of the interest rate cycle in the fifties to that of the matching cycle in the twenties. Any ratio greater than unity implied an increase in interest rate amplitudes relative to business cycle amplitudes. His results indicate an increase in amplitude on shorts in every case except in bank loan rates during contractions. Rates tested were those on commercial paper, Treasury bills, acceptances, bank loans, and Federal Reserve discounts. Table 7 presents the findings.

Another attempt to answer the same question was made by regression analysis in which one independent variable was the average monthly cyclical amplitude of the index of industrial production, and the other a dummy variable the values of which depended on whether the cycle referred to was in the twenties or in the fifties. The b-coefficients of the latter indicate whether interest rate amplitudes were higher during the fifties than the twenties. In all short-term rates except call money, these coefficients confirmed previous conclusions by indicating that interest rate amplitudes rose relative to amplitudes of industrial production between the 1920's and the 1950's. Indeed, even bank loans, which contradicted the general finding according to the first test, proved consistent with it in this test. The results are shown in Table 8. In only two cases was the b-coefficient statistically significant at the 5 per cent level, but the consistency of the results lends a measure of confidence to the conclusion that the amplitude of short-term rates has probably risen relative to cycles of industrial activity.

Turning to long-term rates, the evidence of an increase in amplitudes relative to business cycle fluctuations since the 1920's is not very clear. The regression procedure mentioned earlier indicated declines in the relative amplitudes of both governments and Baa corporates (Table 6). It showed a rise in corporate Aaa's, but this increase amounted to only one basis point per month. The amplitudes of municipals also increased. None of these coefficients was statistically significant at the 5 per cent level, though municipals showed almost that level of confidence.

This analysis has been concerned only with specific cycles in interest rates. Between business cycle peaks and troughs, long- and short-term rates have shown clearly higher amplitudes in recent years because of the more nearly synchronous timing of business and interest rate cycles.

Comments on Causation

For many of us the most important reason to learn about the cyclical behavior of interest rates is to help find the causes of this behavior. It is impossible to observe the fluctuations just described without thinking of many questions and possible hypotheses that call for further study. Systematic exploration of these questions is only beginning, but

TABLE 8

Specific Cycle Amplitudes in Interest Rates Adjusted for Severity of Corresponding Business Cycles, Change from 1919-29 to 1953-61

Rates	Estimated Amplitude, in Basis Points Per Month, for 1 Per Cent Change in Business Activity	Change in Amplitude Per Month, from 1919-29 to 1953-61, Holding Business-Activity Index Constant	
		In Basis Points Per Month	In Percentage of First-Period Amplitude
	(1)	(2)	(3)
Call money	.04 (±.13)	-10.4 (±14.6)	-53.3
Commercial paper	.08^{S} (±.05)	4.9^{S} (± 4.9)	+45.8
Treasury bills	.05^{S} (±.05)	5.2^{S} (± 5.2)	+46.0
Acceptances	.05 (±.12)	2.7 (±12.0)	+22.7
Bank loans	.03 (±.04)	2.1 (± 4.2)	+44.7
Federal Reserve discounts	.03 (±.09)	0.9 (± 9.6)	+10.8
U. S. bonds	.00 (±.03)	-1.4 (± 4.0)	-42.5
Corporates (Aaa)	.01 (±.03)	1.0 (± 2.9)	+40.0
Corporates (Baa)	.01 (±.05)	-1.9 (± 6.1)	-43.2
Corporates and municipals	.01 (±.03)	1.9 (± 3.3)	+86.4
Municipals	.01 (±.02)	2.0 (± 2.1)	+76.9

Note: Specific cycle amplitudes per month (in absolute value) were regressed on amplitudes of business activity per month over matching reference expansions and contractions and on a dummy variable (unity if phase was in the later period, zero otherwise). Column 1 is the regression coefficient for amplitude of business activity; column 2 is regression coefficient for the dummy variable; column 3 is ratio of column 2 to average specific cycle amplitudes during the period 1919-29. Business activity is measured by the Federal Reserve index of industrial production.

S means significant at .05 level.

Parentheses contain range of error at the 5 per cent level of significance.

Cagan has started two promising inquiries. One is concerned with movements in the rate at which the money supply changes, and the other with the behavior of banks with respect to loans and investments.

THE MONEY SUPPLY

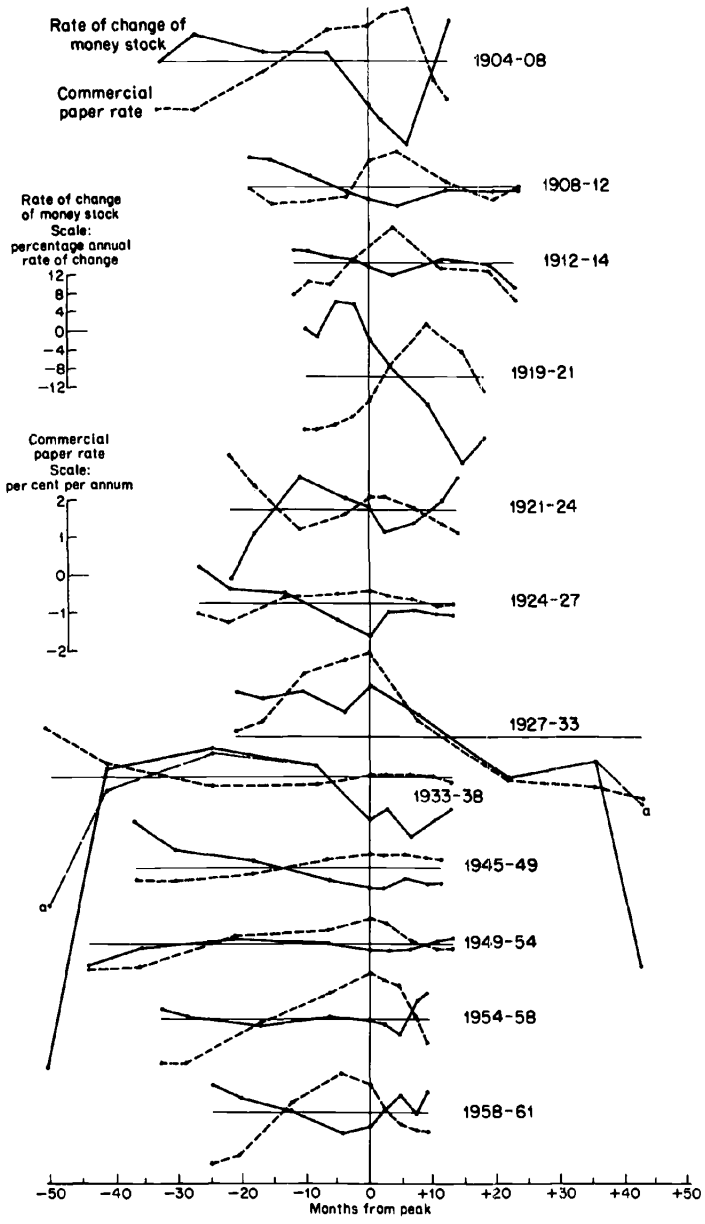
As indicated by our theoretical comments in Chapter 1, interest rates will be driven down, all else being equal, if the rate of increase of the money supply is increased. Otherwise put, interest rates will fall when (1) the money supply having been rising, its rate of growth increases; or (2) the money supply having been falling, its rate of decline either decreases or begins to increase. The description of such a change can be greatly simplified if we recognize that a rate of decline is simply a negative rate of increase, so that the first statement includes the other two. We shall use this terminology hereafter.

For each cycle from 1904–08 through 1958–61, Cagan has superimposed the reference cycle patterns for commercial paper rates on those for the percentage change in the money supply. As Chart 11 shows, the inverse conformity between these two series is striking, especially in view of our recognition of the fact that many other elements must influence interest rates. Indeed this conformity is marked in every cycle except the decline following 1929, when the rate of change in money supply fell throughout almost all of the business decline, and interest rates also fell. It is not difficult to imagine that demand forces in the market for funds dominated in this case.

Characteristically, the rate of growth of the money supply has fallen throughout or at least during the later part of a business expansion and risen throughout or during the later stages of a business decline. As already indicated, interest rates have generally done the opposite. Furthermore, one should note the way in which the frequent lags in the interest rate series have been accompanied by corresponding lags in the money series (taken invertedly). In this form of presentation a lead of interest rates at the peak appears only once, but on that occasion (1960) the inverted money series also leads. It may also be noted that in the 1960 peak the lead of interest rates occurred not only in commercial paper rates, but in all interest rate series except one, both short and long. This is the only time so near a unanimous lead has occurred in Cagan's cycle patterns, and the 1960 peak is the only one

CHART 11

Reference-Cycle Patterns of Commercial Paper Rate and Monetary Growth Rate, 1904–14, 1919–38, 1945–61 (Absolute Deviations from Cycle Averages)



during which an upturn in the money supply series came before the business peak. In a number of cases, though not uniformly, lags of the money series at the trough are also accompanied by lags in the interest rate series. Taken together, evidence of this kind occurs often enough to demonstrate that the close association between money behavior and interest rates is not merely a reflection of the business cycle on each series, but is probably a genuine direct relationship.

This finding of a timing association between the monetary growth rate and commercial paper rates led Cagan to more detailed study. Changes between reference cycle stages in the montary growth rate and interest rates series were correlated. This showed a strong inverse association for all interest rates. To avoid spurious correlation between common responses of the series to business cycles, a dummy variable was used to hold the expansion phase and contraction phase constant. The inverse association was still just as strong. This result is not the same as the widely noted dependence of individuals' demand for a stock of money on interest rates. The relation in Chart 11 is between the rate of change in the money stock and interest rates.

Cagan then investigated several alternative explanations of these correlations, to determine whether they reflected effect of money on interest or the opposite direction of influence. Various tests suggested that the correlations reflected primarily (though not necessarily exclusively) monetary effects on interest rates. These results are important and deserve to be followed up.

If we accept the suggested direction of influence, the question arises whether monetary cycles help explain the changed cyclical behavior of interest rates. Cagan concludes that much of the timing change in interest rates, and half or more of the amplitude increase, can be attributed to the effect of monetary cycles. What has happened is that monetary cycles (on an inverted basis) have become more nearly synchronous with business cycles though their amplitude of fluctuation has, if anything, declined. The greater synchronization has meant that the combined effect on interest rates of money and general business cycle factors has increased. Money and these other factors no longer offset each other as they once partially did.

We can only speculate about the reason for the remaining part of the increased amplitude of rates that the regression results indicate

cannot be explained in this way. Cagan conjectures that shifts over the cycle in the precautionary demand to hold money have moderated in recent years. Since these shifts work to dampen fluctuations in interest rates produced by business cycles, a moderation of them would increase the amplitude of cycles in interest rates.

BANK LOANS AND INVESTMENTS

Cagan has compared the cyclical patterns from 1919–21 through 1958–61 on short-term interest rates, long-term interest rates, bank investments, bank loans, and a number of other series. As is well known, bank loans and bank investments commonly move inversely to each other. The bank attempts to accommodate its loan customers and adjusts its investment portfolio as required to meet this need. If necessary, and sometimes when not necessary, it may borrow from the Federal Reserve instead of selling securities, but this does not prevent the opposite movements of loans and investments. The cyclical patterns reveal this inverse conformity clearly, with loans moving cyclically in agreement with business expansion and contraction. This means that, typically, banks throw securities on the market during the expansion of business. This cyclical pattern makes it plausible to believe that one of the important factors causing interest rates on bills and bonds to rise during business expansion may well be the action of banks; that is, a changed demand for bank loans is transmitted directly to the capital market through the securities in which banks trade, primarily Treasury bills but significantly also intermediate-term government notes and bonds. When the demand for bank loans increases, bank sales of securities reduce their prices and raise their yields. At the same time, bank rates on loans also increase in response to expanding demand.

Important evidence in support of this thesis is revealed by study of those cases where bank investments do not behave contracyclically. (It is entirely possible for both loans and investments to rise and fall together, as, for example, when there are substantial changes in reserves or reserve requirements.) Inverse conformity between interest rates and bank investments remains strong and distinct in almost all these cases, as well as when the bank investment behavior follows the business cycle pattern.

GENERAL COMMENT

We have indicated something of the means by which Cagan has used cyclical analysis to devise and test hypotheses about determinants of interest rate movements. The cyclical patterns show clear evidence of causal factors operating on both the demand side and the supply side of the capital market. In my view, a signal contribution of Cagan's work is the fact that he has developed strong empirical evidence confirming the kind of relation between money and interest rates that economists have long assumed must exist but have failed to demonstrate empirically. This is just the kind of relation described in the section on theory at the start of this paper. Various past efforts to find empirical support for this view have been thwarted by the fact that, in studies of the relation between the supply of money and interest rates, powerful demand influences have masked the supply side. Cagan's use of the rate of change of money supply, instead of the supply as a stock, has clearly revealed the influence we have long presumed and wanted to demonstrate.

It is obvious that much more work needs to be done, not only to test these influences more rigorously but also to explore some of the many other hypotheses and questions that are thrust upon one by study of the cyclical behavior of interest rates and related variables. In the second phase of the interest rate project, Cagan will continue to explore these questions. (See the final part of this paper.)

Kessel's Findings on Cyclical Behavior of Interest Rates

Independent of Cagan—indeed, preceding his work—Reuben Kessel carried out some very useful analyses of the cyclical behavior of interest rates. In some respects this study adds new information and in others it provides a check of Cagan's findings. Kessel's study, unlike Cagan's, concentrated on the behavior of governments and included analyses of securities classified according to term to maturity. In this respect it is significant that where Cagan's findings concern questions about cyclical behavior similar to those explored by Kessel, their conclusions were entirely the same. Two major instances of common findings may be cited briefly, and we shall then pass on to questions where the studies do not overlap.

First, between 1885 and 1913, interest rate cycles were far from being synchronous with business cycles, but the two moved closer together after World War I and much closer yet after World War II. During the thirties, however, interest rates were less synchronous with business cycles than during the twenties. Second, as generally observed, short-term rates on governments move much more widely over the cycle than do longs. The striking difference is indicated in both Table 6 (Cagan) and Table 9 (Kessel). In addition to these conclusions, later

TABLE 9

Cyclical Changes in Yields of Government Securities, October 1949-February 1961

Business Cycle			Absolute Values (%)			Changes		
						Trough	Peak to	Sum of
Trough	Peak	Trough	Trough	Peak	Trough	to Peak	Trough	4 and 5
			(1)	(2)	(3)	(4)	(5)	(6)
Three-Month Treasury Bills								
Oct. 1949	July 1953	Aug. 1954	1.05	2.10	.88	1.05	-1.22	2.27
Aug. 1954	July 1957	Apr. 1958	.88	3.59	1.16	2.71	-2.43	5.14
Apr. 1958	May 1960	Feb. 1961	1.16	3.53	2.29	2.37	-1.24	3.61
Average						2.04	-1.63	
Nine- to Twelve-Month Governments								
Oct. 1949	July 1953	Aug. 1954	1.08	2.40	.62	1.32	-1.78	3.10
Aug. 1954	July 1957	Apr. 1958	.62	3.89	1.40	3.27	-2.49	5.76
Apr. 1958	May 1960	Feb. 1961	1.40	4.32	2.79	2.92	-1.53	4.45
Average						2.50	-1.93	
Three- to Five-Year Governments								
Oct. 1949	July 1953	Aug. 1954	1.36	2.74	1.68	1.38	-1.06	2.44
Aug. 1954	July 1957	Apr. 1958	1.68	3.95	2.41	2.27	-1.54	3.81
Apr. 1958	May 1960	Feb. 1961	2.41	4.63	3.52	2.22	-1.11	3.33
Average						1.96	-1.24	
Twenty-Year Governments								
Oct. 1949	July 1953	Aug. 1954	2.20	3.09	2.52	.89	- .57	1.46
Aug. 1954	July 1957	Apr. 1958	2.52	3.62	3.11	1.10	- .51	1.61
Apr. 1958	May 1960	Feb. 1961	3.11	4.24	3.77	1.13	- .47	1.60
Average						1.04	- .52	

confirmed by Cagan, Kessel develops the following points:

1. At least since World War II, there has been a short-intermediate range of governments which fluctuates more than either the shortest- or the longest-term securities. One consequence of this has been that in periods of high rates the yield curve has sometimes been humped instead of continually rising or continually falling from left to right.[1] The relatively large movement of the short-intermediates is revealed in Table 9, as is the excess of short-term fluctuations over long-term. It may be observed from column 6 that the cyclical amplitude of the nine- to twelve-month governments exceeds that of Treasury bills not only in averages for the period following 1949 but also in each individual cycle during the period.

2. On the average, short-term rates on governments have been lower than longs ever since World War I, but the difference has been larger at cyclical troughs than at peaks. Rates on three-month Treasuries exceeded rates on long-term governments only during two periods (June 1920 to March 1921, and January 1928 to November 1929). According to Durand's basic yield data on corporate securities, short-term rates frequently exceeded long-term rates before 1930 but on only one occasion (1960) since then.

[1] As explained in an earlier footnote, the "yield curve" relates the yield of securities (plotted vertically) to their term to maturity (plotted horizontally). Thus a rising yield curve depicts higher rates on longs than on shorts.