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Volume Author/Editor: Reuben A. Kessel

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Chapter Author: Reuben A. Kessel

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THE APPLICATION OF THE LIQUIDITY PREFERENCE AND EXPECTATIONS HYPOTHESES TO THE CYCLICAL BEHAVIOR OF INTEREST RATES

A. Applications of the Lutz-Meiselman Model

IF BOTH liquidity effects and incorrect expectations are disregarded, one should expect to find that long-term rates are higher than short-term rates when the latter are low and lower than short-term rates when the latter are high; in the absence of trends in interest rates, the average yields of short- and long-term rates should be equal. Insofar as short-term rates are relatively low about cyclical troughs and high about peaks, yield curves ought to be negatively sloped at peaks and positively sloped at troughs. Peaks and troughs in specific cycles of short-term rates should be anticipated by movements in long-term rates. If the market anticipates increases or decreases in short-term rates, long-term rates should move in advance in the same direction. Hence, if peaks and troughs in short-term rates are coincident with the reference cycle, peaks and troughs in long-term rates ought to lead the business cycle, and the longer the maturity, the greater the lead. The reasoning here is the same as that which led Macaulay to expect time money rates to lead call money rates.

Analytically, the 91-day bill rate can be regarded as a spot or instantaneous rate of interest which reflects money market conditions at specific phases of the cycle. In contrast, the yield on long-term governments represents an average of the current and expected spot rates over the course of three or four reference cycles. Because

the term to maturity of long-term governments is longer than the usual reference cycle, the yields of these securities reflect an average of spot rates during both expansions and contractions. Hence, long-term rates vary relatively less than short-term rates. Money market conditions during a specific phase of a cycle are largely "averaged out" (the effects of abnormally low or high spot rates largely cancel) in the determination of the long-term rate. In contrast, money market conditions during specific cycle phases are completely reflected in bill yields. As a result, short-term rates ought to be more variable over the cycle than long-term rates. The expectations hypothesis implies that the shorter the term to maturity of a security, the smaller the number of spot rates that are averaged in order to determine its yield; consequently, the larger its variance over the cycle. Cyclical movements in the short- relative to the long-term rate can be analyzed as if the latter were a permanent or normal rate of interest and the short-term rate contained a large transitory component. This transitory component is largest about peaks and troughs. When positive, at peaks, short-term rates are high relative to long-term rates; when negative, at troughs, short-term rates are relatively low.[1]

The market regards current short-term rates as abnormally high when they are above long-term rates, and expects them to fall in the future. At such times, holders of long-term securities expect

[1] This implies that the correlation between a moving average of short-term rates and long-term rates over the cycle would be greater than the correlation between current short- with long-term rates. A moving average would abstract from cyclical effects on short-term rates; it would depict permanent short-term rates and abstract from transitory effects. It also would, of course, reduce the amplitude of the fluctuations in short- relative to long-term rates; in effect, it converts short- to long-term rates.

The view that the long-term rate is an average of short-term rates explains why Hicks found that time series of short- and long-term rates were less strongly correlated than averages of past and present short-term rates (both weighted and unweighted) and long-term rates. Presumably averages reflect expectations of "permanent" short-term rates. Hence they are more like long-term rates than actual short-term rates which embody a transitory component that is negative at troughs and positive at peaks. See Hicks, "Mr. Hawtrey On Bank Rates," p. 28. Hawtrey's position is similar to that of Charles C. Abbott, "A Note on the Government Bond Market," *The Review of Economic Statistics*, Vol. 17, 1935, p. 9. Both reasoned that the forces that affect short maturity yields are largely independent of the forces that affect long maturity yields because fluctuations in short-term rates are much greater than those in long-term rates.

to win capital gains because the passage of time will eliminate the abnormally high short-term rates from the average of present and future short-term rates that is the long-term rate. The opposite occurs when short-term rates are relatively low; i.e., the holders of long-term securities expect to incur capital losses as low short-term rates are eliminated from the average that is the long-term rate.

This does not, in itself, imply that it is more profitable to hold long- than short-term securities when rates are expected to fall. If the expectations of the market are correct, then the high yields of short- relative to long-term securities would just offset expected capital gains on the latter. The yield differential in this case represents what the market thinks is necessary to equalize the holding period yields of these securities, taking into account both coupons and capital gains. Conversely, when short-term rates are abnormally low, they are expected to rise. The abnormally large yield advantage of long-term securities in this case represents what the market thinks is necessary to offset the expected capital losses attributable to holding them. Whether or not the holding period yields of short-term relative to long-term securities are greater or less over the cycle depends upon which way the market erred in predicting future short-term rates. A fall in short-term rates that is larger than anticipated favors the holders of long-term securities, and vice versa.

These implications of the expectations hypothesis for the cyclical behavior of interest rates are in part incorrect because liquidity preference is not an independent variable in the analysis. Yet they go far towards providing an interpretation of the behavior of yield differentials between long- and short-term governments since 1920. In particular, they further our understanding of the sharp movements in short-term rates that occurred during this time.

In the 1920's there were two periods when short-term rates were above long-term rates (see Chart 7). During 1920, and again in 1929, the market anticipated lower future short-term rates. Although the absolute level of short-term rates during 1920 was about seventy-five basis points higher than it was in 1929, the anticipated fall was much greater in 1929. The yield advantage of short-term over long-term securities in 1929 was at least twice as great as it was in 1921. The fall in short-term rates from 1929 to 1931 was about 450 basis

points, whereas the fall from 1920 to 1922 was about 275 basis points. Both downward movements were greater than the other declines in short-term rates during this period.

In more recent years (1957 and 1959), short-term rates were again higher than long-term rates (see Chart 6). The absolute level of rates was higher in 1959 but the yield differential between long- and short-term securities was about the same. The subsequent downward movements in short-term rates were of roughly equal magnitude, about 275 basis points, and were the largest declines since the 1920's. In the 1930's, short-term relative to long-term rates were especially low. This was a consequence of abnormally low short-term rates; they were at historical lows.

The implications of a pure expectations model for the cyclical behavior of interest rates are inconsistent with the following observations: (1) short maturities yield less over the cycle than long maturities; yield curves are more often than not positively sloped; (2) short-term rates fail to exceed long-term rates at peaks as much as they fall below long-term rates at troughs; (3) the variance over the cycle in yields of three-month Treasury bills is less than the variance of nine- to twelve-month governments; (4) when short-term rates are above long-term rates, it is not the shortest term to maturity that bears the highest yield, i.e., yield curves at first rise with term to maturity and then fall; (5) long-term rates fail to lead turning points in short-term rates.

B. Applications of the Hicks Model

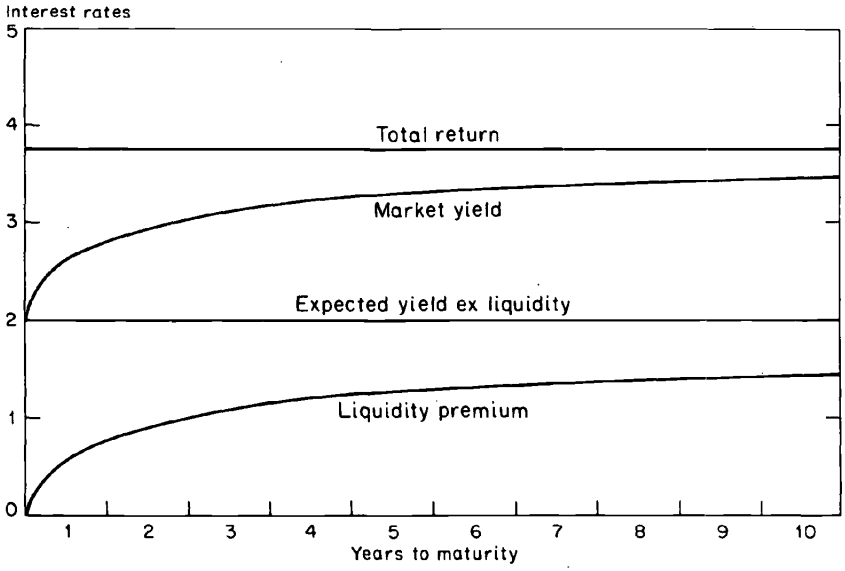
1. CYCLICAL BEHAVIOR OF GOVERNMENTS

To explain these observations, liquidity preference must be added to the analysis. This implies that interest rates no longer measure the total return derived from holding securities. Securities also yield a nonpecuniary or liquidity income to their holders. The evidence presented indicates that the nonpecuniary return from securities is inversely related to term to maturity and directly related to the level of pecuniary yields. The shorter the term to maturity, the larger the fraction of the total return from a security

that is nonpecuniary, and vice versa. The higher the level of interest rates, the wider the spread between the total return from a security and its pecuniary yield, and vice versa.

If, abstracting from differences in expectations of future short-term rates, the total return attributable to all maturities is the same, i.e., the sum of pecuniary and nonpecuniary returns is equal for all terms to maturity, then the pecuniary yield must be an increasing function of term to maturity. Therefore, if expectations have a

CHART 14
"Normal" or Average Yield Curve

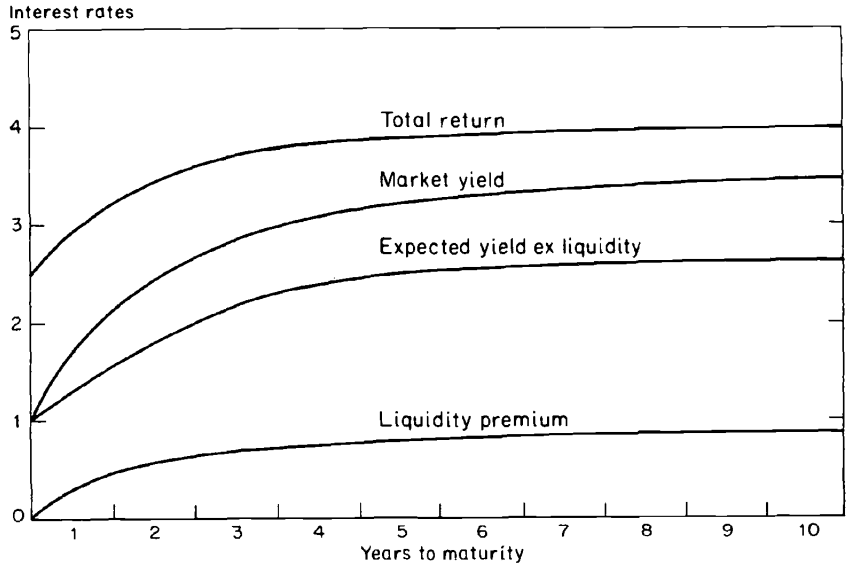


random effect on yield curves, the average yield curve will be positively sloped, and short-term rates will, on the average, be lower than long-term rates. The interaction of expectations and liquidity preference to produce a "normal" yield curve is shown in Chart 14. The "total return" curve is flat; it depicts a market in which future short-term rates are expected to be the same as the current rates. The liquidity yield is the fraction of total yields for any given maturity that is nonpecuniary. Subtracting the nonpecuniary com-

ponent from total return leaves the pecuniary yield curve, which is the yield curve observed in the market.[2]

Liquidity preference produces asymmetry in the relationship between short- and long-term rates at cycle peaks and troughs. It accounts for the failure of short-term rates to exceed long-term rates at peaks by as much as they fall below long-term rates at troughs.

CHART 15
Yield Curve at Cyclical Troughs

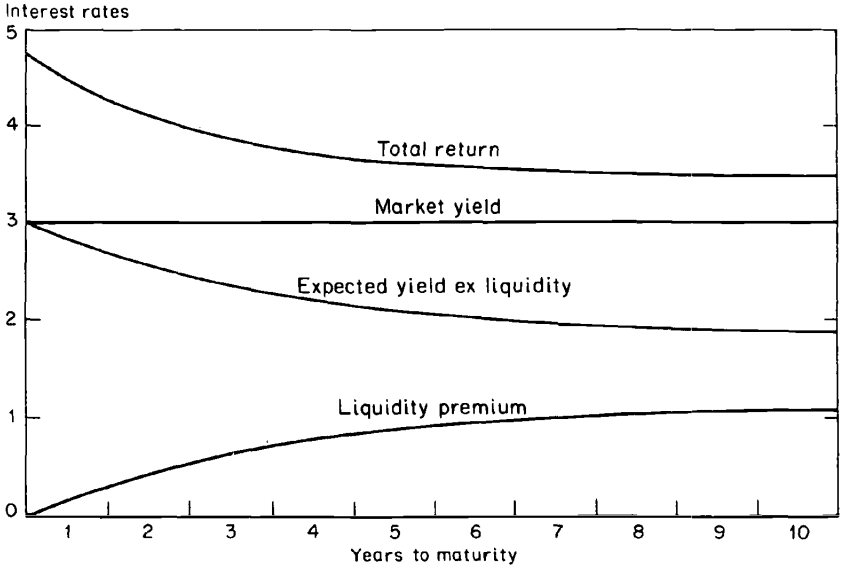


At cyclical troughs, both liquidity and expectational forces operate independently to establish short-term rates below long-term rates. Liquidity preference produces a pecuniary yield differential of long-term over short-term securities. At troughs, the market regards the current short-term rate as abnormally low and expects it to be

[2] Liquidity return as a percentage of total return was obtained by first fitting a yield curve to average yields as a function of term to maturity for the three latest reference cycles. Then the ratios of yields for particular maturities to twenty-year government bond yields were computed. The difference between the ratio for any given term to maturity and one constitutes the fraction of total yield that is nonpecuniary for that term to maturity.

higher in the future. Hence, expectations also push short-term below long-term rates. Both effects operate to widen the spread between these rates (Chart 15). The total-return curve slopes positively because the market expects future yields on short maturities, both pecuniary and nonpecuniary, to be higher than current short maturity yields. Subtracting the liquidity component from the total yield curve produces a market yield curve with a long-short differ-

CHART 16
A Flat Yield Curve



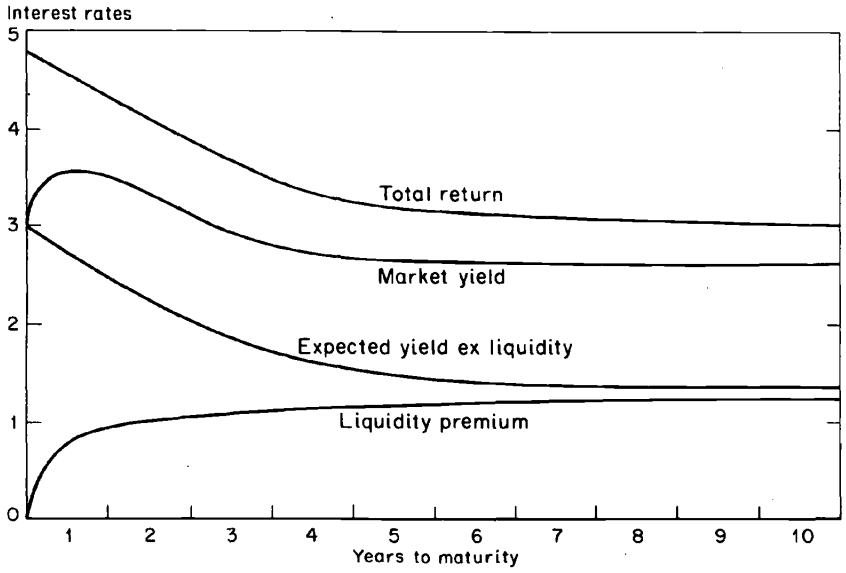
ential greater than the differential for the corresponding total yield curve.

At cyclical peaks, in contrast to cyclical troughs, liquidity and expectational forces produce opposite effects on yield curves. Liquidity preference, as always, operates to establish short-term below long-term rates. However, expectations act in the opposite direction. Because the market expects future short-term rates to be lower, the total yield curve declines as a function of term to maturity. Whether or not the resulting market yield curve is rising, falling, or both depends upon the relative strength of these opposing

forces. Because these forces work in opposite directions at cyclical peaks but in the same direction at troughs, short-term yields do not exceed long-term yields at peaks as much as they fall below long-term yields at troughs.

The foregoing analysis implies that flat market yield curves should be interpreted as indicating that the market expects future pecuniary yields of short maturities to be lower than current short-term rates. With no change in expectations, the fraction of the total

CHART 17
Yield Curve at Cyclical Peaks



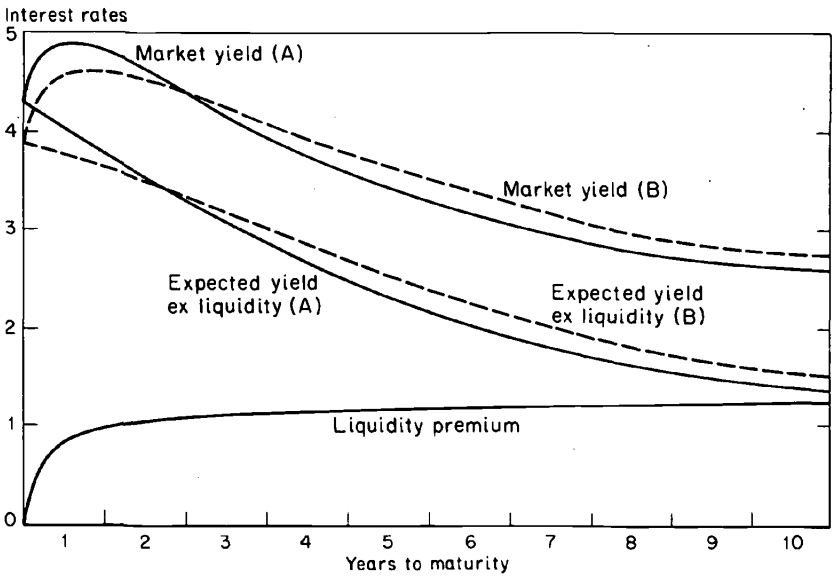
return that is nonpecuniary for a forward rate which pertains to a specific period of calendar time will rise with the passage of time. Hence, its pecuniary yield will fall below current spot rates. A flat market yield curve is shown in Chart 16. A falling total-return curve is a necessary condition for its existence.

Charts 17 and 18 depict yield curves with segments that are negatively sloped (yield curves with such shapes are also referred to as humped). Such curves are produced by expectations of sharply falling interest rates, i.e., interest rates that are falling more sharply

than those in Chart 15. The more sharply interest rates are expected to fall, the shorter the term to maturity of the peak in yields; the more gradual the expected fall, the further out on the yield curve the peak will be. If the expected fall in short-term rates is very gradual, no negative segment appears. Yield curves with negative segments have been relatively rare, at least since the 1920's; expectations of interest-rate declines are usually not sharp enough to offset the effects of liquidity preference.

CHART 18

Effects of Alternative Expectations of Falling Rates upon the Shapes of Yield Curves



Liquidity preference also explains why the shortest term to maturity is not the highest yielding security in the term structure at cyclical peaks. In order for a yield curve to exist that has the shortest term to maturity bearing the highest yield, expectations of extremely sharp declines in short-term rates are required. Such expectations, while a theoretical possibility, did not exist during the two most recent cyclical peaks and possibly have never existed.

The liquidity preference hypothesis implies that nonpecuniary

yields are a decreasing function of term to maturity. Hence, the range of pecuniary yields that will be observed in the market will increase with term to maturity. For example, suppose liquidity yields for Treasury bills and nine- to twelve-month governments are at all times 50 and 25 per cent of total returns. Further, assume that total returns, which are of course not directly observable in the market, range from 4 to 8 per cent. Pecuniary yields will then range from 2 to 4 per cent for bills, and from 3 to 6 per cent for nine- to twelve-month governments. Hence liquidity preference implies that the variance in yields over the cycle increases with term to maturity.

The expectations hypothesis implies just the opposite: that the shorter the term to maturity, the greater the variance. Therefore, the actual variance observed in the market for any specified term to maturity represents a composition of these conflicting forces. The available evidence on variance as a function of term to maturity suggests that liquidity effects dominate expectational effects for governments with maturities equal to or less than nine-to-twelve months. For three- to five-year governments and longer maturities, expectational effects dominate. The absence of time series between these maturity ranges precludes a precise estimate here of the borderline separating the domains of dominance of expectations and liquidity.

During expansions, yield differentials between Treasury bills and nine- to twelve-month governments widen. Insofar as liquidity effects dominate expectational effects, liquidity premiums ought to widen from trough to peak since, according to the liquidity preference hypothesis, they are an increasing function of the absolute level of interest rates. Consequently, if only liquidity effects are at work, the differentials between bills and nine- to twelve-month governments would increase more than the increases observed. Adding expectations to the analysis implies, given the assumption that the market can recognize transitorily high or low levels of spot rates, the addition of an opposing force. Converse implications are implied for contractions. Liquidity operates to narrow, and expectations to widen, the spread between bills and nine- to twelve-month governments. Since liquidity is dominant for this maturity range,

the observed spreads decrease during contractions. For evidence on how these differentials have actually behaved, see Charts 5 and 6.

These findings for governments do not necessarily apply to corporates or to the issues of government agencies unless the nonpecuniary component of total yield is the same. In general, governments appear to be more liquid, ignoring the influence of term to maturity, than either agency issues or corporates.[3] Among short-term securities, governments have a comparative liquidity advantage over agencies or corporates. The bill market has very low transactions costs and bid and asked prices are firm for extremely large transactions. This suggests that when yield curves are humped, the peak in yields will have a longer term to maturity for corporates than for governments.

In the absence of liquidity premiums, and assuming the market can forecast turning points in the specific cycles of interest rates, cyclical peaks in long-term rates would precede those of short-term rates and would be observable first. Similarly, troughs in long-term rates would precede troughs in short-term rates. The rationale that Macaulay used to argue that the seasonal peak in time money rates should precede that in call money rates is relevant here. Insofar as the market can predict turning points in short-term rates, the long-term rate (which is an average of future short-term rates) should reach its peak first in anticipation of the peak in short-term rates.

When liquidity preference is introduced into the analysis, however, the sequence in the timing of peaks and troughs of long- and short-term securities becomes less obvious. If liquidity premiums are a function of spot rates, then an amount is added to long-term rates which increases as short-term rates increase and reaches a peak when the latter reach their peak. The peak in long-term rates must

[3] The evidence for the proposition that agency issues are less liquid than governments is of two kinds. (1) Agencies have higher transactions costs. The spread between bid and asked prices, as reported in dealer quotation sheets, ranges from two-thirty-seconds for short-term securities to a whole point, the equivalent of ten dollars, for long-term securities. (2) The value of agencies as collateral for bank loans is poorer than it is for governments. Per dollar of borrowing, the market value of collateral in the form of agencies, term to maturity aside, is higher than it is for governments. The Joint Economic Committee *Study of the Dealer Market*, p. 95, reports that the margin requirements for agencies are 5 per cent.

occur later, therefore, than it would have occurred in a world of pure expectations.

How much later this peak will occur can only be partially determined by a priori reasoning. It is clear that the peak in long-term rates should not occur after the peak in short-term rates. Since the maximum amount that will be added to long-term rates because of liquidity preference will occur when short-term rates reach their peak, the peak in long-term rates must either precede or be synchronous with that of short-term rates.

Since the end of World War II, the behavior of time series of governments with various terms to maturity indicates that all securities, irrespective of maturity, reach their peaks and troughs synchronously. Hence, without going further into the question of whether liquidity premiums add enough to long-term rates to delay their peaks until all peaks are synchronous, irrespective of term to maturity, one cannot say, using this evidence alone, whether the market can or cannot predict turning points in interest rates. In view of the inability of the market to predict turning points of other series, on balance, it seems reasonable to interpret these findings as being consistent with the view that the market cannot predict turning points in specific cycles of interest rates.[4]

2. CYCLICAL BEHAVIOR OF AGENCY ISSUES AND CORPORATES

The thesis has been advanced that liquidity premiums are caused primarily by a desire to avoid the risk of capital loss. The evidence indicates that yield differentials, when only liquidity differences exist, increase with the absolute level of rates. The observations of an upward trend in liquidity premiums for the three latest cycles, and regressions of liquidity premiums upon spot rates, show that liquidity premiums increase when interest rates increase. This thesis has implications for the cyclical and secular behavior of other rates of interest. It implies that low-quality bonds ought to yield

[4] The highest correlation (.98) of seasonally adjusted time series for three-month Treasury bills with nine- to twelve-month governments was obtained by assuming the two series to be synchronous. The correlations with one-, two-, and three-month leads and lags were: .95 for one month, .90 for two, and .83 for three. No difference, to two decimal places, was observed for leads and lags of equal duration.

more, the cycle aside, than high-quality bonds because they are relatively less liquid, i.e., price variance is greater as a result of the greater default risk. Consequently, it should be possible to observe that high-quality bonds yield less than low-quality bonds generally and that the yield differential between high- and low-quality bonds increases from trough to peak, and decreases from peak to trough. By symmetrical reasoning, the spread between government agency issues and governments, ignoring term to maturity, should increase with the absolute level of interest rates.

To test one of these propositions, yield differentials between governments and government agency issues were regressed against their sums. The results of this test are mixed. For nine- to twelve-month maturities, the spreads between governments on the one hand, and Federal National Mortgage Association, Federal Land Bank, and Federal Home Loan Bank issues on the other, are consistent with the hypothesis advanced; spreads increase as the absolute level of interest rates increase. The same is true for maturities ten years and over. The best results were obtained by regressing the yield differential between a government bond, the three and one-quarter of 1983, and an index of AA utility yields of bonds with coupons of three and one-eighth to three and three-eighths against their sum. The correlation was positive and 40 per cent of the variation in the spread was explained.[5] However, for three- to five-year governments and FLB and FNMA issues, the slopes of the regression coefficients were negative, one significantly so.

The consequences of changes in the level of interest rates for yield differentials between low- and high-quality bonds over the cycle is somewhat more difficult to detect. During contractions, the level of rates falls and the market usually increases its estimates of the risks of default by the issuers of low-quality securities. Conversely, the level of rates rises during expansions and the market usually decreases its estimates of the risks of default. Hence, li-

[5] All of the agency issues exhibited a significant downward trend over time in yield differentials compared with governments. Presumably this reflects the diffusion of knowledge about the investment merits of these securities that has occurred in recent years. The data for the agencies consist of incomplete series, mostly for the last decade, compiled by Charles E. Quincey and Co., and Allen Knowles, the fiscal agent of the Federal Home Loan Banks. The AA utility series is compiled by Salomon Bros. & Hutzler.

quidity and cyclical forces work in opposite directions upon yield differentials. During the post-World War II period, the revaluation of risks over the cycle has dominated liquidity forces. Hence, the yields of Baa Moody's bonds, for all categories, have fluctuated less than corresponding Aaa bonds.

The behavior of low- and high-quality bond yield differentials over time seems to support the view that the level of rates and these differentials are related. Since 1945, the spread between Moody's AAA and BAA series has increased with the level of interest rates. The regression of the difference on the sum indicates that the difference rises with the level of rates.

Prewar investigations of the relationship between the yield differential of high- and low-grade bonds and the level of interest rates also conforms to this finding.

> Ratios of promised yields (or yield spreads) to the basic rates on high-grade issues deserve more attention than they can be given in this report. According to the classical theory of investment values, the simple yield spread, or algebraic difference between the promised yield and basic rate, would provide the best measure of the risk premium for issues properly priced in the market, since the yield is conceived of as the algebraic sum of the pure rate of interest and the risk premium. It is a matter of record, however, that yield spreads frequently narrow when basic rates fall, and widen when basic rates rise . . . , perhaps because of the efforts of investors to compensate for changes in basic rates.[6]

For any preassigned cyclical downturn in bill rates, yield differentials between low- and high-grade bonds should decrease most during severe and least during mild contractions. Conversely, during strong upturns, the differential ought to increase more for sharp than for mild recoveries. The data on the behavior of differentials between low- and high-grade bonds, since the end of World War II, while they support the view that there has been a secular rise in the differential, do not support the view that the differential is at a maximum at peaks and minimum at troughs. In fact, the maximum differential seems to appear midway between the cyclical peak and the trough. This seems to be accounted for by differences

[6] W. Braddock Hickman, *Corporate Bond Quality and Investor Experience*, Princeton University Press for National Bureau of Economic Research, 1958, p. 288. For further discussion, see following pages.

between low- and high-grade bonds in the timing of their specific cycle peaks and troughs. In the postwar period, specific cycle peaks and troughs of high-grade bonds consistently preceded those of low-grade bonds. Hence, the maximum yield differential between the two could not have been associated with business cycle turning points.[7]

Hickman's investigation of the relationship between low- and high-grade bond yields over time suggests that the long-run rate of return to investors in low-grade bonds is greater than it is for high-grade bonds. He concludes that "the highest returns were obtained by investors who could afford to take the greatest risks." [8] He found that both the variance and the average rate of return was greatest for investments in low-grade bonds. In this respect, his finding is symmetrical with the relationship between long- and short-term government yields, taking into account both capital gains and interest receipts.

[7] Part of the increase in the measured yield differential between low- and high-grade bonds is attributable to differences between the economic, as distinguished from the temporal, term to maturity of these bonds. If calendar term to maturity is the same for both grades, then economic term to maturity, which Macaulay termed duration, must be shorter on the lower-grade issues. (See *Movements of Interest Rates,* Chapter II, for a discussion of this point.) The weights assigned to receipts in the near, relative to the distant, future for computing yield to maturity is greater for low- than high-quality bonds. Hence, a rise in rates during an expansion, with no change in investor attitudes towards risk, will increase measured yield differentials for the same reason that yields of three- to five-year governments rise relative to twenty-year governments during an expansion. This same point explains why the market believes that if interest rates are expected to fall, securities with equal yields and terms to maturity will have different relative price rises if their coupons are not the same. The size of the coupons will be inversely related to the rate of change of capital values.

In fact, this phenomenon seems to account for a trivial portion of the cyclical variation in the yield differential between low- and high-quality bonds. To determine the quantitative importance of this effect, a constant risk differential of 1 per cent for all spot and forward rates was assumed for two hypothetical ten-year bonds. At peaks, the higher-grade bond was assumed to consist of a six-month spot rate of 5 per cent, with the first forward rate being 4.5 per cent and all succeeding forward rates, 4 per cent. At troughs, the higher-grade bond was assumed to consist of a six-month spot rate of 2 per cent, with the first forward rate being 3 per cent and all succeeding forward rates 4 per cent. The yield to maturity of these two postulated securities differed by ninety-eight basis points at troughs, and one hundred and two at peaks.

[8] Hickman, *Corporate Bond Quality,* p. 138.