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8. The Yield Spread Between New and Seasoned Corporate Securities

Procedure and Major Regressions

The importance of examining the behavior of yields on new and seasoned issues in relation to one another was briefly discussed in Chapter 2 and need not be repeated here. Our method has been primarily regression analysis. We first considered all the variables that we expected to significantly influence the spread. We included variables suggested by other studies, we considered our own hypotheses, and we compared the yield spread with data for related variables to seek correlations that might be suggested by the actual movements of the different series.

Our work covers the first decade after the 1951 Accord, whereby the pegging of long-term government rates was discontinued, and the primary analysis was based on two significantly different types of series: Moody's series of Aa corporates and a series of Aa utilities compiled by Sidney Homer of Salomon Brothers and Hutzler (Charts 19 and 20). The Moody series on outstandings is calculated from monthly averages of the midpoints between bid and asked prices reported in the daily quotation sheets of dealers. The quotations cover about ten industrials, ten utilities, and seven rails. Maturities average about twenty-six years, and the range around this has been very small over the period studied. Similar homogeneity among new issues cannot be achieved because of the paucity of new offerings in any month. Maturities show a wide range of variation, but most run about thirty years. The industries represented can change completely from month to month. In nine months of the decade no new Aa securities were issued, and our number of observations was reduced accordingly.

The Homer series is based on utilities only and depends upon much more subjective decision making by the compiler. Issues used were

CHART 19

Monthly Averages of Yields on Moody Aa Corporate Bonds, 1952–63

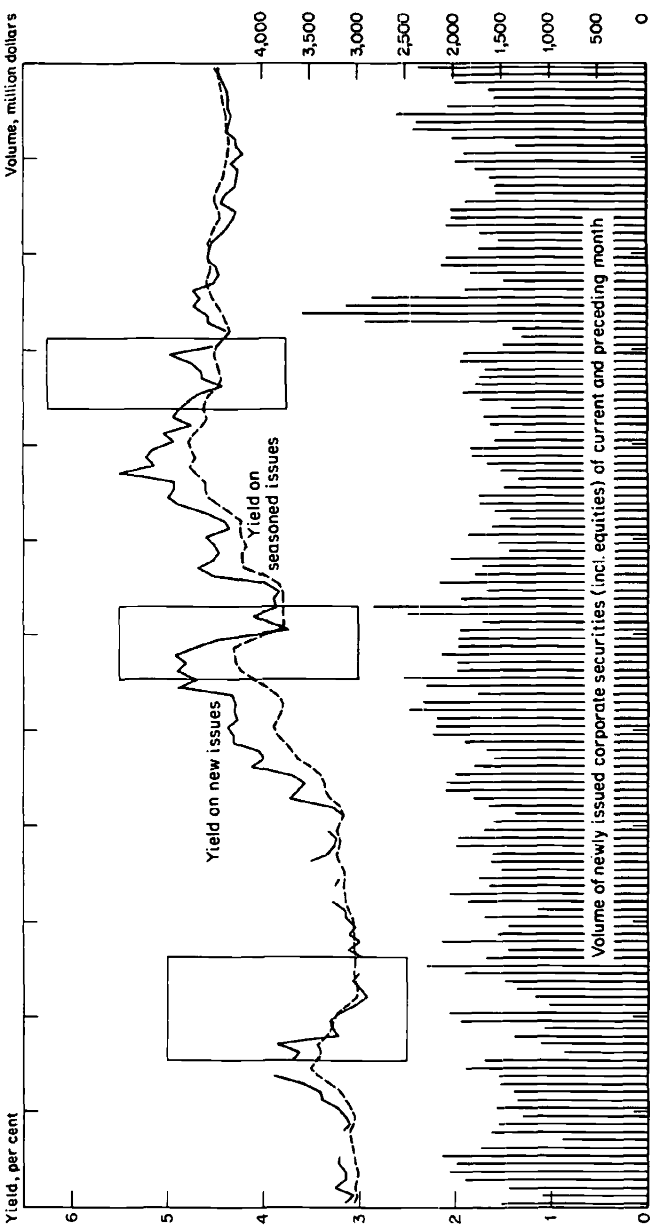
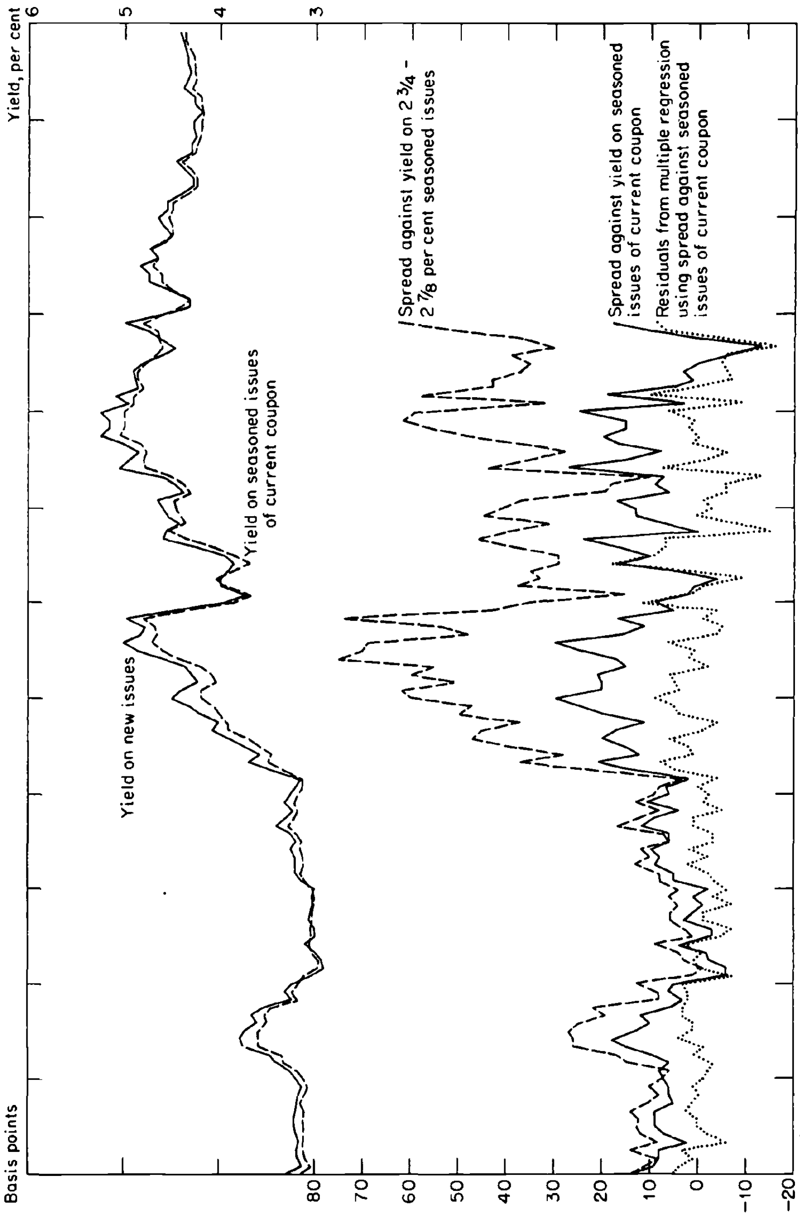


CHART 20

First-of-Month Yields, Yield Spreads, and Residuals on Homer Aa Public Utility Bonds, 1952–63



mostly Moody Aa's, but some Aaa's that normally sell at Aa yields were included. Data are not monthly averages but first-of-month quotations. The seasoned series is based on five to ten callable long-term bonds, usually priced according to dealer quotation sheets. New-issue yields are based on offering yields of larger issues coming to market at approximately the first of the month. Partial adjustments are made on slow-moving issues, where market response indicates inappropriate pricing. The most important subjective judgment of all is an adjustment in the yields on seasoned issues to indicate the yield of those with coupon similar to the coupon of new issues. This was necessary in order to eliminate the influence of coupon on yields in the new-seasoned comparisons. These adjustments were made jointly by Homer and ourselves.

The dangers of introducing subjective judgments are obvious, but each was made in order to deal with a genuine limitation of the "objectively" determined series, including the dubious values of some Moody quotations caused by lags in response of dealer quotation sheets. The most satisfactory regression derived for the Moody Aa corporates, fitted to the period March 1951 through December 1960, is:

$$M_1 = -.105 + .230M_{10} + .462M_{30} + .361M_{36} + .236M_{37} + .149M_{38} + .0837V_{44}$$

S.E.:	.034	.018	.035	.082	.060	.045	.021
t:	−3.05	12.93	13.17	4.39	3.90	3.29	3.98

The key to symbols follows:

M_1 = Monthly average of new-seasoned yield spread
M_{10} = Average coupon difference, new minus seasoned issues
M_{30} = Change in yield on new issues, current minus previous month
M_{36} = Seasoned-yield change, preceding month minus average of two and three months preceding
M_{37} = Seasoned-yield change, average of two to three months preceding minus four to six months preceding
M_{38} = Seasoned-yield change, average of four to six months preceding minus seven to twelve months preceding
V_{44} = New-issue volume, current and preceding months, including direct placements and public offerings of bonds and equities. In billions of dollars

With over one hundred observations, the t-values indicate that all b-coefficients are significant at the 1 per cent level or better.[1] For tech-

[1] The confidence one should place in these significance tests is limited, because this particular regression was selected after much trial and error. A firmer test will come when it is applied to new data (cf. p. 118).

nical reasons the equation exaggerates the coefficient of multiple correlation (R), but its true value is probably about midway between .92 and .95. This indicates that our equation has "explained" about 87 per cent of the variation in new-outstanding yield spreads.

The corresponding regression, using the Homer series of Aa utilities, is:

$$H_1 = -.041 + .297H_{35} + .133H_{36} + .130H_{37} + .094H_{38} + .0422V_{46} + .021T_{21}$$

S.E.:	.026	.052	.044	.036	.031	.0145	.0078
t:	−1.59	5.74	3.04	3.61	3.00	2.91	2.69

The key to symbols is in most respects essentially the same as in the Moody series, the only differences being these: H (Homer) replaces M (Moody); no variable corresponds to M_{10} since coupon adjustments have already been made in this series; for technical reasons H_{35} (change in yield on seasoned issues) appears instead of M_{30} (change in yield on new issues); V_{46} replaces V_{44} because Homer yield data are for the first of the month and so volume of new issues here represents volume for the two preceding months; a new variable, T_{21}, represents the current Treasury-bill rate.

As in the Moody series, all b-coefficients are significant at the 1 per cent level or better. For technical reasons the equation understates the coefficient of multiple correlation (R), but its true value is probably something in excess of .75. This indicates that the equation "explains" about 56 per cent of the variance in yield spread *after* correction for coupon difference. This is equivalent to more than 92 per cent of the variance in spreads when uncorrected for coupon as in the Moody regression. Analysis indicates that the reason for the superior Homer fit is both because Homer used only utilities and because his judgments give a better series. Both series give satisfactory results.

Direct Implication of Regressions

SPURIOUS SPREAD

The most important implication of these regressions is that much of the commonly observed new-seasoned yield spread and its variation is essentially spurious. The apparent spread results to a large extent from the fact that new and seasoned issues may not be homogeneous with respect to coupon. High-coupon issues are less attractive than otherwise similar low-coupon issues, and consequently the market demands a higher yield on them. There are two reasons for the greater attractiveness of low-coupon bonds. Most important, high-coupon issues are more likely to be called than others; when they are called, this requires reinvestment of funds just when rates are relatively low. A second reason for the relative attractiveness of low-coupon bonds (hence low-priced bonds) is that the income from them will be more largely capital gain than in the case of an equal yield on high-coupon (hence high-priced) issues. This gives tax advantages to the holder of low-coupon securities. It appears that this tax consideration does not provide much of the explanation of differences between yields of high- and low-coupon issues, however, because most corporate bonds are held by institutions not subject to regular corporate profits taxes. The influence of coupon on yield is so important that Mark Frankena is preparing a special study of this question. A summary of part of his preliminary work is presented at the end of this chapter.

When correction is made in the Moody series on seasoned issues in order to give yields of bonds with coupon similar to that of new issues, the average spread for the decade is reduced from 23.7 to 13.7 basis points. With respect to variation of spread, an even larger proportion is explained by coupon differences. The simple correlation between the uncorrected Moody spread and the coupon difference between new and seasoned issues is .84, indicating that 71 per cent of the variance is explained by this variable alone or by others closely correlated with it.

The Homer series show even greater influence of coupon differences on the level of spread. The average spread between yields on new issues and yields on 2¾–2⅞ per cent utilities was 26.5 basis points for the decade, whereas the average spread when outstandings are corrected for coupon is only 9.4 basis points.

RELATIVE IMPORTANCE OF VARIABLES

As indicated above, the regressions suggest that the variables used may "explain" something in the neighborhood of 90 per cent of monthly yield spreads between new and outstanding securities. They also make it possible to measure the relative importance of the individual variables. From the point of view of realized variations of the spread, this depends not only on the value of the b-coefficient and its statistical significance but also on how much the variable in question moved about during the period studied. To test the importance of variables from this view, we have asked how much the yield spread would have varied if a given independent variable moved within the limits of a band that would include about 95 per cent of its occurrences. (More precisely, we took a band between plus and minus two standard deviations from the mean.) The answers to that question, based on the two regression equations, are in Table 15.

TABLE 15

Importance of Selected Variables in Explaining Yield Spreads

Variable			Theoretical Variation of Yield Spread (basis points)	
Moody Equation	Homer Equation		Moody Equation	Homer Equation
M_{10}		coupon difference	46.3	
M_{30}	H_{35}	Δ yield from last month	37.5	12.3
M_{36}	H_{36}	Δ yield: 2-3 months to last month	13.6	6.8
M_{37}	H_{37}	Δ yield: 4-6 months to 2-3 months preceding	12.3	8.4
M_{38}	H_{38}	Δ yield: 7-12 months to 4-6 months preceding	10.2	7.7
V_{44}	V_{46}	Two-month volume of new issues	11.7	5.9
	T_{21}	Current Treasury-bill rate		7.5
Addendum:		Width of band theoretically including 95% of the observations of the yield spread itself	83.6	32.4

Note: For technical reasons, the Moody correlation and the influence of the first change-of-yield variable in the Moody series are exaggerated here. Other tests show this exaggeration to be small, but it cannot be precisely quantified.

ZERO YIELD SPREADS

Another question may be of interest: if bond yields were entirely stable, and if no coupon difference existed between new and seasoned issues, under what circumstances would the yield spread have disappeared? The Moody equation implies that this would have occurred if the two-month volume of new issues equaled $1.2 billion. The actual two-month volume averaged $1.7 billion. The Homer equation implies that yield spreads would have disappeared under stable bond rates if the bill rate had been about 2 per cent and if the new-issue volume had been negligible. In fact, the bill rate averaged 2.21 per cent.

Hypotheses for Explanation of Yield Spreads

Although correction for coupon removes a significant part of the apparent spread between yields on new and seasoned issues, we still wish to explain what remains. The following hypothesis was partly developed early in our study and then tested with the data; in part it grew out of modifications of our earlier thought which the data forced upon us.

The explanation has two major components. In the first place, since dealers are in the business of selling securities, they wish to make new offerings attractive enough to sell promptly. Under many circumstances this leads to sweetening the yield on new issues, especially when there is reason to fear that failure to clear shelves promptly may bring losses through falling security prices. One part of the explanation of yield spreads, then, should be found in an examination of the elements that might lead dealers to want to encourage rapid security sales.

A second component of the cause of new-seasoned yield spreads is suggested by this question: Why does the market ever let a spread of this kind develop? So long as new issues are available, why would anybody buy an otherwise similar seasoned issue at prices that imply a lower yield? Put otherwise, why is not the market price of outstandings forced down to match the yields available on new offerings?

SWEETENING OF NEW-ISSUE YIELDS

With respect to the first of these components of the determinants of new-seasoned yield spreads (sweetening by dealers), it seems reasonable that rising yields in the immediate past might encourage the fear of further decline in security prices. Simple inspection of the data strongly supports this hypothesis. Next we considered it possible that the direction of yield movements over a more extended past period might also influence expectations. Experimentation resulted in the introduction of the four change-in-yield variables shown in both regressions described above. In some variants of our tests, one of these (M_{36}) showed an unexplainable negative sign, but in these cases it was not statistically significant. Except for that, all change-in-yield variables had positive b-coefficients in a wide variety of regressions (e.g., many other series than the two mentioned above, and different time periods). Almost always, as in the two regressions described here, these b-coefficients were statistically significant at the 1 per cent level or better.

A second consideration that might be expected to influence the amount of sweetening expected from dealers is the volume of new issues thrown on the market in the immediate past and current period. The most influential feasible variable we found for volume was the two-month volume of all new corporate issues, including direct placements and equities. The significance of this variable was not uniformly high among our different tests, but it showed a consistently positive b-coefficient and it exhibited high statistical significance in our two major regressions, as shown above.[2]

Tightness of the money market appears to be a significant explanatory variable. We found this influence most reliably indicated when we used the Treasury-bill rate as our index of a tight market. Because of very high correlation with coupon difference between new and seasoned issues (M_{10}), this variable does not appear in the Moody equation, but it is significant at the 1 per cent level in the Homer equation and is included there.

Two closely related reasons for this relation suggest themselves. One is that dealers may be concerned about the financing of their position in new securities when the money market is tight. A similar reason is

[2] The influence of the size of individual new issues was not tested. It is possible, if market segmentation is quite pronounced, that the size of individual new issues would affect the yield spread while aggregate new issue volume did not.

that the carrying cost will be higher (or the gain on it less) under these conditions.

In all these respects our armchair hypothesis received confirmation from statistical tests. At one point, however, we received a surprise. It would seem reasonable to suppose that dealers would watch closely the performance of other recent issues, and that they would increase the sweetening of their own if others had moved slowly. We therefore entered a variable showing the proportion of new issues that moved off the market slowly in the current and preceding months. No matter how we put our equations together, the correlation showed the "wrong" sign: the yield spread was lower when there were more slow movers. The explanation which seems to us most plausible is that causation is working in the opposite direction from what we had assumed: when sweetening is small, the proportion of slow movers will be large, assuming other things are equal. This interpretation is given some support by the fact that the negative correlation is highest when the proportion of slow movers is taken for the same time period as that when the yield spread is measured. When the slow mover variable is lagged, the correlation moves toward zero.

One other negative finding may be of interest. It is commonly argued that the level of yields on seasoned issues is a major determinant of the new-seasoned yield spread. In simple correlations this appears to be true. But the multiple correlation shows that most of this apparent influence disappears when correction is made for coupon differences between new and outstanding securities. Some part may persist, but the remaining correlation between spread and bond rates is less than that between spread and bill rates. When the latter is used, any remaining influence of the level of outstanding yields is virtually or wholly eliminated.

LAG IN MOVEMENT OF SEASONED YIELDS

We turn now to the second type of consideration that might cause yield spreads to exist. These spreads depend, we have indicated, upon the failure of the yields on seasoned issues to move up rapidly to whatever yields are provided on new securities. We have sought without success variables that might logically be expected to influence the degree of friction in the market and that empirically manifest this influence. But the extraordinarily great influence of one variable already included may be attributable in part to the presence of such a lag. If the various factors that determine interest rates operate directly on the new-issue market, new-issue rates should respond promptly to these forces. If there is sluggishness in the market for seasoned issues, then a spread should be created when rates generally rise, and the spread should be much greater when rates rise rapidly. This has been shown to be the fact. The change in yield from the preceding month is by all odds the most powerful and the most significant variable in all our equations (assuming securities homogeneous with respect to coupon). It is entirely possible that this variable performs double duty, influencing the sweetening by dealers and reflecting the influence of lags in seasoned yields on the yield spread.

THE PRIMARY MARKET: NEW ISSUES OR SEASONED?

The preceding paragraph raises some important questions regarding the way the securities markets behave. Do the forces that determine interest rates operate primarily and directly on new issue rates, to which seasoned issues respond with a lag? Or can we think of the market for seasoned issues as the major market, where the determinants of interest rates operate directly, and then add that new-issue yields will reflect these rates subject to the modification imposed by dealer desires to sweeten yields? We conducted a study of leads and lags which should contribute to an understanding of this problem.

First we considered the question: Suppose new-issue yields turn down from month t to month $t+1$, but suppose that even at $t+1$ these yields are higher than seasoned yields in month t. If the "true" market is the new-issue market, seasoned yields should continue to rise, attempting to close the spread, even though rates on new offerings are falling. In twenty-two of thirty-one cases this occurred. If, on the other hand, seasoned yields turned down along with new issues even when the new yield in month $t+1$ exceeded the seasoned rate for month t, then seasoned rates must be directly influenced by yield-determining conditions and not simply move toward closing the gap with new issues. This occurred nine times.

We explored answers to the same general question by other experiments. One was the study of simultaneous and lagged correlations. We found that the Moody Aa corporate series for the period from 1952 through 1963 had virtually no correlation between the first differences (one-month changes) of new-issue yields and those seasoned-issue yields during the preceding month, but that there was a substantial correlation (.54) between the first differences of seasoned yields and those of new-issue yields of the preceding month. The correlation between first differences of new and seasoned yields for the same month was only slightly higher (.60). Since there was no positive correlation between the first differences of new-issue yields and those of new-issue yields of the previous month, this indicates that in predicting changes in seasoned yields the changes in new-issue yields for the previous month are not simply serving as a proxy variable for the simultaneous new-issue yield changes. In line with these correlations, it is noticeable in Chart 19 that most of the reversals in new-issue yields occur a month or so earlier than those in seasoned yields for Moody's corporates. It is much less noticeable in Chart 20 for public utility yields.

Both of these experiments support the following conclusion. Market forces operate directly on the yields of both new and seasoned issues, though certainly more rapidly and probably more strongly on the former. Movements on new-issue yields are a compromise between forces in the market for money and credit and forces leading to different degrees of sweetening by dealers. Movements in seasoned yields are a similar compromise between forces emanating in the market for money and credit and forces tending to eliminate the yield spread between new and outstanding issues.

THE PERFECTION OF THE CAPITAL MARKET

One of the important aims of our entire interest rate project is to discover how nearly perfect are the markets for money and credit. Do securities of essentially equal quality sell for similar yields whether they are direct placements or publicly offered securities, whether they are mortgages or bonds, whether they are in California or New York, whether they are seasoned or newly issued, and so forth? In a perfect market the answer would be "yes," though the identification of "equal quality" may be too imprecise to provide conclusive evidence. In the case of new and seasoned issues it is probably easier to establish homogeneity among securities than anywhere else, yet we have seen problems even here, especially with respect to coupon. Our finding on this point is that the market is more nearly perfect than would appear from observation of yield spreads uncorrected for coupon. Furthermore, the imperfection that remains after coupon correction is eliminated rather quickly. Our studies show that the yield spread between a new issue and similar outstandings tends to disappear within about three months from date of issue.

A NOTE ON HETEROGENEITY

It should be recognized that even with "perfect" markets, yield spreads as recorded should not be expected literally to equal zero during any given month. In the first place, an Aa rating does not represent a single point on the quality spectrum but a band stretching from the weakest Aaa to the strongest A. The new issues of a given month will not normally fall in the middle of the band, and even the average of outstandings will vary some. Second, despite the invaluable service provided by Moody's ratings, the market will sometimes reach a different view of quality. This is especially true in relating obligations in different industries.

These elements of heterogeneity do not suggest that yields on new would be higher than those on seasoned issues. One other feature of heterogeneity, however, may imply such a tendency, even with perfect markets. Viewing a given bond as a unique instrument, as in some sense it must be, a new issue is either unseasoned, in which case it may be considered inferior by the market for that reason, or it is an addition to the supply of some already outstanding bond, in which case the supply of that issue may be increased substantially and encounter resistance from investors who feel they already hold enough of it.

Reliability of Findings

Despite the encouraging statistical significance of our b-coefficients and the high coefficients of multiple correlation, one type of test gives disturbing results. Similar regressions over different time periods show sizable differences in b-coefficients, and the predictions for 1961–62 derived from the Moody regressions for 1951–60 prove to be extremely bad. The average prediction of spread was nearly 23 basis points too high. On the other hand, it is interesting to note that the Homer regression provides an excellent forecast of yield spreads for 1961–62, the average discrepancy being less than 3 basis points, apart from two bizarre quotations. It is also significant that the most important variables appear to provide a large part of the explanation of yield spreads in different time periods. And although the b-coefficients change substantially, they are almost always of positive sign, indicating the same kind of influence if not the same amount. The last two variables, however, volume of new issues and bill rate, while generally retaining the appropriate sign, moved in and out of the statistically significant range as different regressions were attempted. Even our predictions with Moody data, though wide of the mark, indicate a shift of the function (i.e., a change in the constant term) after 1960 rather than an entirely new functional relationship; the coefficient of correlation between computed and actual spreads was .78, reflecting the fact that the computed and actual values generally rose and fell together, though the curve for computed values was well above the other.

There are two plausible explanations for this shift. One, as suggested by William H. White, is based on the possibility that after 1959 the market became accustomed to high rates and gave up the expectation that they would tend to move back toward a significantly lower "normal." This changed expectation would imply less chance that security prices would rise to the point where call features would impede capital gain. Hence high-coupon issues (new issues) would no longer tend, for this reason, to sell at higher yields than outstandings. This explanation is consistent with our finding that the coupon difference did have far less influence on the yield of securities after 1960 than before. It is also consistent with the fact that the Moody equation, which includes a term for coupon correction based on the decade of the fifties, was the one that gave extremely bad (high) predictions of yield spreads; whereas good predictions were provided by the Homer series, where coupon correction is made by cross-section studies at the time of observation. A second explanation, suggested by Sidney Homer, is that the secular growth of large institutional investors has caused an increased demand for new issues, driving down their yields.

These considerations suggest to me that our regressions cannot well be used for future quantitative prediction—with the possible exception of the Homer equation, which still looks good even for that demanding requirement. Rather, the usefulness of these regressions is to help test hypotheses about basic influences that cause yield spreads. In view of the fact that under our hypothesis the yield spread is determined by highly subjective factors (e.g., dealer expectation of future rates), it would hardly be reasonable to expect great stability in the coefficients of variables such as those listed. Perhaps the surprising finding is that there is as much regularity as the data reveal.

One final observation suggests general support for the kind of explanation of yield spreads given here. Data have been plotted for the period 1920–40, and spreads for those years follow a similar pattern. They were usually positive, especially in times of rising rates. But they fell to low or even negative values at the end of periods of sustained declines in interest rates.

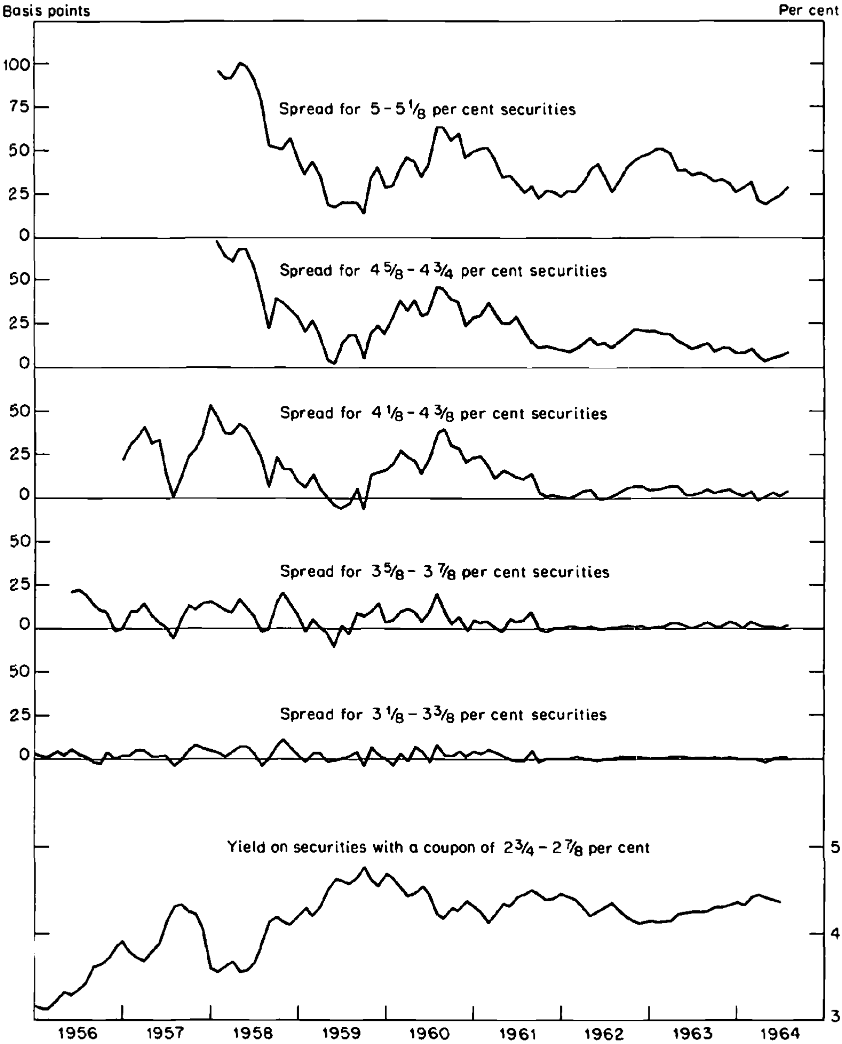
The Influence of Coupon and Call on Bond Yields

Because of the importance of coupon differences in explaining the new-seasoned yield spread, Mark Frankena, a student at Swarthmore College, is studying the determinants of the spreads between the yields on seasoned securities with different coupons. This study uses series constructed by Sidney Homer for the average yields on callable long-term Aa public utility bonds, as well as the yields on the individual securities included in the averages. As in the study of the Homer series reported above, the data are not monthly averages but the yields prevailing on the first of each month. They cover the period from January 1957 (in the case of intermediate coupon securities) and February 1958 (in the case of higher-coupon securities) through August 1964. Because the yields and hence coupons on newly issued Aa utilities did not reach 4 per cent until the second half of 1956 and rose to 5 per cent for the first time in the second half of 1957, these are the full periods for which observations of the yields on high-coupon seasoned securities were available.

The size and importance of the spreads between the yields on issues with different coupons has been noted above. In the period between January 1957 and August 1964, when the coupon on new issues was 4 per cent or higher in all but two months, the spread between seasoned securities with current coupon and those with a 2¾ per cent coupon accounted for an average of 72 per cent of the total spread between the yields on new issues and on the outstanding 2¾ per cent coupon securities. Chart 21 shows the spreads between the average yields of securities in various coupon groups and the average

CHART 21

Spread of Yield from That on 2¾ to 2⅞ Per Cent Securities, 1956–64



SOURCE: Data supplied by Sidney Homer.

yield on securities with a coupon of $2\frac{3}{4}$ to $2\frac{7}{8}$ per cent. The large size and the great variability of these spreads is apparent, with the spread for the 5 per cent group averaging 41 basis points and reaching a high of 100 basis points in May 1958, which was equal to more than one-fourth of the yield on the low-coupon securities. The low was 13 basis points in October 1959. Viewed together with the level of yields on the $2\frac{3}{4}$ coupon bonds, the chart also demonstrates, as already noted in the summary of the new-issue study, that after 1961 the size of spreads at any given level of yields on deep-discount bonds was substantially lower than in the earlier period, particularly for the coupon rates in the 4 per cent range.

Superficially it might appear that coupon should be irrelevant to the yield of a security. Market prices should so adjust themselves that at any one time the yields of securities would be equal to one another regardless of the coupon they bear. Further thought, however, suggests at least three major reasons why a yield spread could develop between high- and low-coupon bonds. We shall discuss these in turn.

MECHANICAL NECESSITY

One reason for a yield spread according to coupon follows by mechanical necessity from the fact that securities cannot readily sell significantly above call price. If they did, the threat of call would establish the probability of loss to the buyer who had paid more than that amount. In consequence, whenever rates fall far enough in the market that a high-coupon bond reaches its call price, any further price increase is estopped. This means that the yield to maturity cannot fall further on this bond even though rates may continue to fall in the rest of the market. We may conclude that if no other cause of spread existed, then after a high-coupon security reaches its call price any further fall in low-coupon bond yields must cause an equal increase in the spread between the two yields.

In the following model we shall assume that a 3 per cent coupon is low enough to face no threat of call, and we shall let it fully reflect market interest rates where no distortion from call occurs. The 3 per cent bond will, therefore, be used as a base from which we shall measure the yield spread provided by higher coupon issues. We shall further assume that the call prices of all issues are such that their yield to maturity when they sell at call price is .5 per cent less than their yield at par.

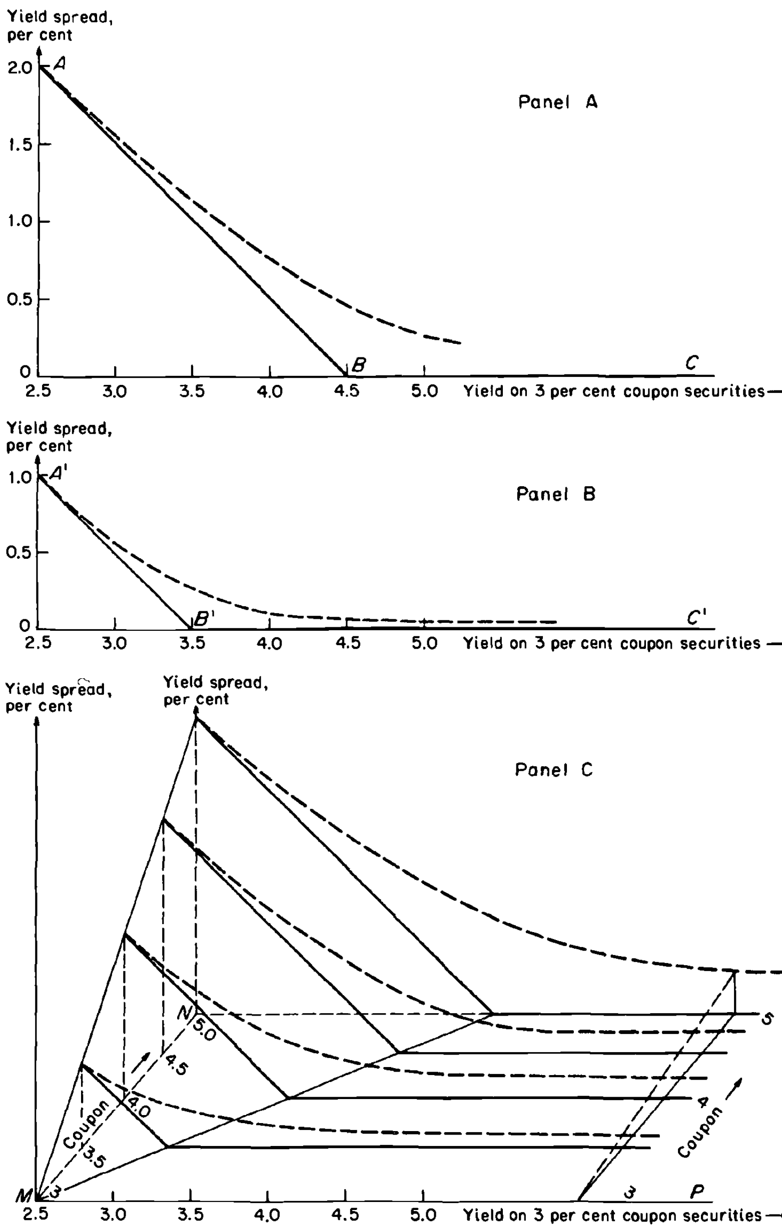
In Chart 22, panel A, the height of the solid line (*ABC*) shows the spread between the yield of a 5 per cent bond and that of a 3 per cent bond, assuming no cause operates except the mechanical one described above. This curve shows that under this assumption, if the 5 per cent bond sold at call price (so that it yielded 4.5 per cent), the spread would be zero when the 3 per cent one sold to yield 4.5 per cent also. Corresponding to this point on the horizontal axis, and to all points on the right of it, the "spread" curve lies on the horizontal axis. That is, there is no "mechanical" reason for a yield spread when rates on low-coupon bonds exceed 4.5 per cent. If the low coupon yield falls to 2.5 per cent, the spread must rise to 2 per cent (4.5–2.5) since the high coupon return is unable to fall below 4.5 per cent. In summary, *ABC,* which shows by its height the spread between the yields of these two securities, slopes at 45 degrees from *A* to *B,* where it becomes horizontal at zero. Under similar assumptions *A′B′C′* in panel B shows approximately the minimum spread mechanically possible between the yield of a 4 per cent security and that of the 3 per cent security. These curves suggest a more general three-dimensional model as shown in panel C by the solid lines. Here the coupon spread between low- and higher-coupon securities is depicted by the height of the plane above the floor, this being determined by the coupon of the security in question (measured from *M* toward *N*), and by the level of yield on the low coupon issue (measured to the right from *M* toward *P*).

THE INFLUENCE OF POTENTIAL CAPITAL GAINS

The curves and surfaces just described indicate a minimum below which spreads can fall only very little: only to the extent, indeed, implied by slight price rises above call price. But other considerations may cause the spread to be more than indicated by this analysis, though not less. Since the high-coupon bond cannot rise above its call price, buyers have more opportunity of capital gains when holding low-coupon issues. In view of this, high-coupon bonds must sell to yield enough more than low-coupon bonds to compensate for the foregone opportunity of capital gain. The yield spread so caused will be large when the chance of greater capital gain on low coupons is especially great. The dotted line in panel B of Chart 22 indicates possible spreads as a result of this consideration. At times when both security prices are very low, the imminence of call threat is minor,

CHART 22

Yield Spread as a Function of Coupon Rate and Level of Yields on Low Coupon Issues (Hypothetical Cases)



and the yield spread might be quite small. For example, if we found ourselves in the neighborhood of *C′* the threat of call might seem remote enough to permit a very low spread, as shown by the height of the dotted line. At *B′*, however, there is no significant possibility of any capital gain at all on the high-coupon bond, and so it would surely have to offer a yield advantage to attract buyers. Thus the dotted line there is appreciably above zero. By the time rates fall to 2.5 per cent, however, further yield declines are unlikely because of the usual limits of variation in market interest rates and they are impossible if our "standard" low-coupon security is still callable. For this reason, little additional spread beyond the mechanically determined minimum may be required. Thus the dotted curve may approach *A′B′* as rates fall from their level at *B′*.

It seems reasonable that expectations about the direction of future interest rate movements should influence the market's judgment about the danger of call on high-coupon bonds, with consequent effects on yield spreads. If, as our other studies suggest, falling rates tend to produce the expectation of further declines, then the dotted curve should tend to rise when rates fall, since this fall suggests that prices may rise toward call price on high-coupon bonds. When rates are rising, the call threat would be reduced and the dotted curve of panel B should shift down.

TAX CONSIDERATIONS

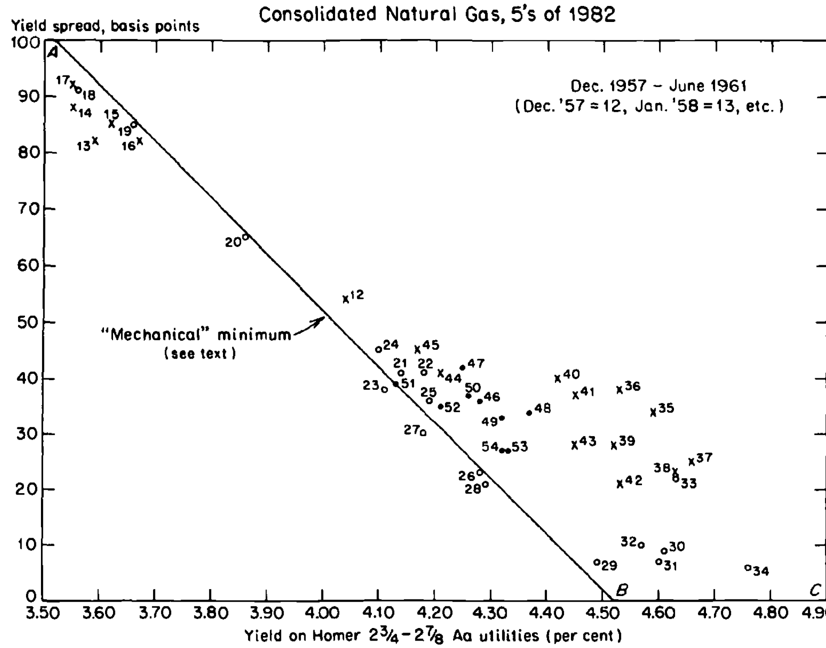
A third major reason why the market might provide a higher yield on high-coupon bonds than on low is founded on income tax considerations. Since coupon receipts are taxed as income, and since for many investors capital gain is taxed at a much lower rate, the market should much prefer low-coupon bonds where a larger part of any given yield to maturity is in the form of capital gains. A yield advantage would be required on high-coupon securities in order to attract buyers. This advantage would occur at all yields where the low-coupon bond was selling below par. It would be operative to the extent that the market is dominated by investors who stand to benefit from the substitution of capital gains for ordinary income.

Frankena's study is an attempt to test these and other hypotheses against available data. Chart 23 illustrates his findings for selected individual securities. Line *ABC* has the same interpretation as in

CHART 23

Yield Spread Between High- and Low-Coupon Issues, 1957–61

x = falling rates   o = rising rates   • = no trend



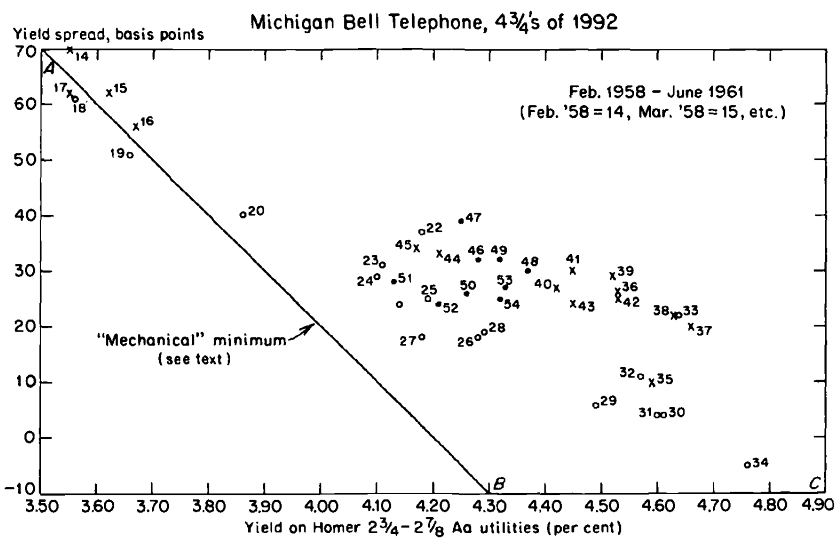
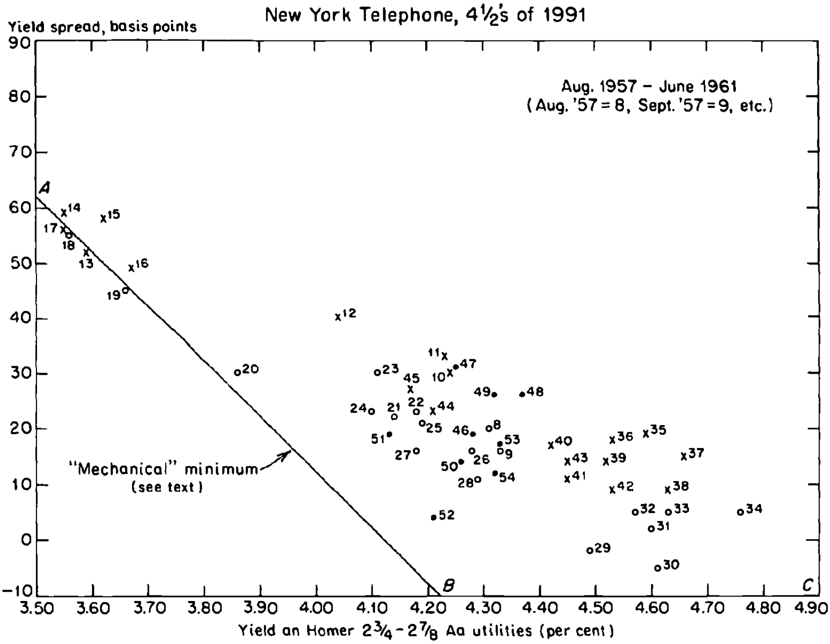
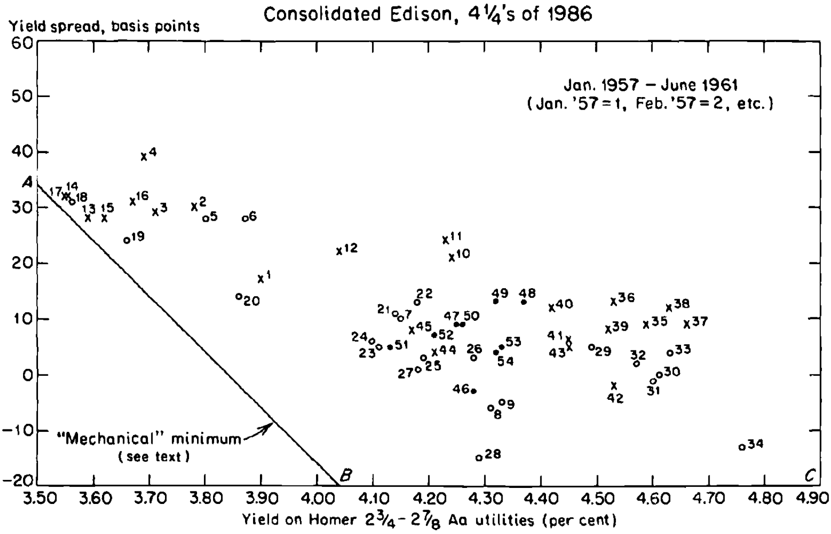


CHART 23 (concluded)

x = falling rates o = rising rates • = no trend





panel A of Chart 22. Observations of yield spreads at times of falling rates are marked X, circles pertain to periods of rising rates, while dots distinguish periods of no trend. These charts reveal all the characteristics we hypothesized in relation to the first two causes of a yield spread based on coupon. No observations lie significantly below *ABC* except in the highest-coupon security in a time of rising rates. Spreads are substantial at *B*, where the bond in question would have been at call price if there were no spread. The excess of spread above *ABC* declines on either side of *B*. When rates are rising, generating the expectation of further fall in security prices, the threat of call is taken less seriously and hence the spreads (O) are generally much less than when rates are falling (X).

This chart fails to answer the question: Do the spreads tend to level out in the neighborhood of zero as we move to the right, and if so, at what point does this leveling occur? Charts similar to the first panel in Chart 23 for other issues generally indicate that the spread does come close to zero, and that this commonly occurs when the price of the high-coupon issue is at or below par. This fact suggests that the tax advantage of low-coupon securities is probably not important. According to market practitioners there are so few corporate bonds in the hands of taxable institutions and individuals that their influence on this market is almost negligible.

After presenting this neat picture of the implications to be drawn from our empirical study, I must unfortunately muddy the water by describing some unsolved problems. In the first place we have greatly clarified the picture presented above by admitting to Chart 23 only the period from January 1957 to June 1961. Had we taken a much longer span we would have observed a fairly sharp shift of our implied curve from one time to another. The year 1958 is an occasion to itself, when sharply falling rates were followed by expectation of further fall even from their low point. These observations can be seen appropriately clustered at the upper left of each panel (points numbered 13 to 19 are January–July 1958, respectively). The years 1959–60 present another pattern as shown in the rest of the graph. But the period 1961–64, not included in the chart, clusters well below the points shown here. None of the variables we have examined appears to provide an adequate explanation for this shift. The best rationalization known to us has been provided by Sidney Homer. After 1960 the volume of new publicly offered corporate issues declined markedly relative to governments. New corporate issues had fairly low coupons, and many outstanding high-coupon issues were called. Since governments are non-callable through most of their term and therefore serve partly as substitutes for low-coupon issues, this shift, together with the lower volume of high-coupon corporates, implied lower prices and higher yields on low coupons and higher prices and lower yields on high-coupon issues. The result would be a smaller yield spread between high- and low-coupon issues. The shift is also consistent with the possibility that during 1961 the market, having become accustomed to the higher level of rates of the past few years, no longer expected them to fall sufficiently to justify the calling of issues with coupons in the 4 per cent range or lower. Such a change in expectations would reduce the yield compensation required as an incentive to hold high-coupon issues.

Our second unsolved problem is that of deriving a satisfactory regression equation to describe the hypersurface corresponding to the dotted curves of panel C in Chart 22, but reflecting also the shifts of this surface brought about by yield changes (as opposed to the level of yields, which is already shown). It is clear from our data that this surface is not linear, nor is it linear in logarithms. One reason is that the change-in-yield variable has little influence when rates are so low that there is little chance of their falling further, but substantial influence when rates are somewhat higher, as we have shown in Chart 23. Another complication arises from the fact that the influence of the level of rates is compelling as the determinant of a floor to spreads when rates are low, but it provides a much less binding effect when rates are high. A related problem arises in 1958, when the rapid decline of rates "takes statistical credit" for the high spreads which were in fact brought about by the mechanical limits depicted by *AB*. A fourth and less difficult problem arises from the fact that spreads and change-in-yield variables are sometimes negative, which forces a modification of equations expressed in logarithms.

One test equation which we explored, although it does not overcome all these problems, showed all the variables of our model clearly significant and with the proper sign for our hypotheses. It also provided a coefficient of multiple correlation of .92. The independent variables included were coupon, yield of low-coupon bonds, change of yield of low-coupon bonds during each of three past periods, and the volume of new issues. The influence of volume appeared to be most significant in relation to the shift of the curve between 1959–60 and 1962–63, but it was not significant within the latter period. This finding is consistent with Homer's suggested explanation of the change that took place between these two periods.

The influence of these variables is consistent with the first two hypotheses described in this review, but not with the third. That is, there is clear evidence of the mechanically necessary spread that must arise when low-coupon issues yield less than the call-price yield of high-coupon bonds. There is quite consistent evidence that the limitation on capital gains from high-coupon issues increases this spread above the mechanical minimum for some distance on both sides of the point where the yield of the low-coupon bond equals the call-price yield of the high-coupon bond. And there is general evidence that spreads at rates above this level are not sufficient to confirm the view that tax advantages of low-coupon bonds account for any appreciable amount of the spread.