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DETERMINANTS OF LONG-TERM BOND RISK PREMIUMS

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The views expressed here are solely those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Richmond.

Introduction

Investor risk aversion in the long-term bond markets strongly influences the ability of many businesses to finance capital expenditures. The cost of corporate debt capital includes a premium above the Government debt rate, reflecting the possibility of default. This price of risk [13, 15, 18, 27] contains clear implications for investment and economic growth.¹

The economic sources of variation in this credit risk premium have been explored only by [18, 27]. In contrast, the sources of variation in term structure interest-rate risk premiums have been extensively explored. (See [15]).

This study develops a behavioral portfolio model that can examine variations in bond credit risk premiums. Its implications are examined empirically for the 1961-75 period, showing the effects of deficit spending, economic activity, inflation, and monetary growth on the risk premiums.

Investor Return, Risk and Utility

The logical approach to risk-return analysis begins with utility functions of individual investors operating in competitive security markets. The widely-recognized Capital Asset Pricing Model contains a suitable

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¹"The analysis and judgment of investors, then, determines the supply schedules of funds for various kinds of ventures, which, in conjunction with a structure of demand for funds that arises from demands for ultimate output of the economy, determines the yield required (above entrepreneurial return) to finance each type of activity. Other economic resources ordinarily are available on about equal terms to various types of ventures. In developed economies entrepreneurship or promotership is in abundant supply, and it is investors' responsibility to choose among promoters and managements. Under these conditions, clearly the judgment of investors represents the principal forward-looking or planning intelligence governing the allocation of resources and the nature of economic change." [9: 182].

foundation for such micro-analysis.² (Since the proofs of portfolio behavior models are rather long, the reader is referred to the original references for technical details).

This model assumes that each investor receives a determinate level of utility from holding earning assets. He holds assets as a means of increasing lifetime consumption. The amount of wealth he holds at the end of the investment period serves as the store of value from which he can enjoy consumption in excess of later income. His means of increasing wealth is investment in portfolios of financial assets bearing positive returns. The higher the expected return, the higher the expected terminal wealth. But almost all assets bear risk of capital loss. Only one asset yields a risk-free positive return: this return is fairly low.

This model initially assumes that:

- "(1) All investors are single-period expected utility of terminal wealth maximizers who choose among alternative portfolios on the basis of mean and variance (or standard deviation) of return.
- (2) All investors can borrow or lend an unlimited amount at an exogenously given risk-free rate of interest R_F , and there are no restrictions on short sales of any assets.
- (3) All investors have identical subjective estimates of the means, variances, and covariances of return among all assets.
- (4) All assets are perfectly divisible and perfectly liquid, i.e., all assets are marketable and there are no transactions costs.
- (5) There are no taxes.

²See [1, 14, 16, 19, 20, 29]. [14] is recommended for the reader who is unfamiliar with portfolio theory.

- (6) All investors are price takers.
- (7) The quantities of all assets are given." [19: 358-59].

Under these conditions, investor utility functions follow the continuous, differentiable form:

$$U^k = f^k [E(\tilde{R}), \sigma(\tilde{R})],$$

where the utility U of the k -th investor holding a portfolio increases with its expected rate of return $E(\tilde{R})$,³ but decreases with its investment risk, the standard deviation of return $\sigma(\tilde{R})$:

$$\frac{\partial U}{\partial E(\tilde{R})} > 0; \frac{\partial U}{\partial \sigma(\tilde{R})} < 0.$$

A rational investor is risk-averse. As he bears more risk, he requires a larger return to compensate for the higher probability of loss. An investor's degree of risk aversion is defined in risk-return terms by his locus of constant utility. This is utility locus is convex to the risk axis in risk-return space. That is:⁴

$$\frac{\partial E(\tilde{R})}{\partial \sigma(\tilde{R})} > 0; \quad \frac{\partial^2 E(\tilde{R})}{\partial \sigma(\tilde{R})^2} > 0.$$

When all risk-averse investors strive for maximum expected return for given risk, or minimum risk for maximum expected return

³The tildes denote random variables. Differentiation with respect to random variables, which assume values according to a prescribed probability density function, is of course impossible. Investors define utility over the anticipated mean and standard deviation of such distributions.

⁴See [1, 19]. Second-order conditions are met by the sign of the second partial derivative with respect to risk.

("Markowitz efficient portfolios") by combining holdings of risky assets with the riskless asset, a determinate risk-return market relationship emerges.⁵ This relationship shows the equilibrium tradeoff between the return on portfolios and risk. The tradeoff defines the "capital market line."

The capital market line for efficient portfolios is:

$$E(\tilde{R}) = R_F + \lambda \sigma(\tilde{R}),$$

where λ is a positive constant, "the market price of risk," and R_F is the riskless rate of interest. Assets whose expected return exceeds that appropriate for their risk class should be in excess demand: their prices rise until portfolios containing them again lie along the capital market line. The prices of assets whose return is less than appropriate for their risk class similarly fall. Although all investors do not hold identical portfolios, the slope of each investor's isoutility locus, the optimum tradeoff between expected return and risk when the rate of change of utility is zero [19], is:

$$-\left[\frac{\partial U}{\partial \sigma(\tilde{R})} / \frac{\partial U}{\partial E(\tilde{R})} \right] = \lambda$$

Assuming constant absolute risk aversion and normally distributed returns, the utility function assumes a form such as:

$$E[U(\tilde{R})] = \exp [-c (E(\tilde{R}) - c\sigma^2(\tilde{R}))/2],$$

⁵For a rigorous aggregation procedure that combines individual preferences into market relationships, see [20].

where the parameter c denotes investor risk avoidance: $c > 0$.⁶

Summary diagrams may clarify the basic structure of this model. Figure 1 (p. 6) shows two-dimensional anticipated risks and rewards for portfolio investments. The set of efficient risky-asset only combinations appears as the segment AMB . The Capital Market Line CML originates at R_f . It is tangent to the highest obtainable risk asset portfolio combination; point M denotes this "market portfolio."

Conservative investors prefer to assume lower-than-average risk while receiving low rates of return. They hold a low proportion of risky assets and a high proportion of the riskless asset at points such as (R_c, σ_c) . They lend the riskless asset to investors who prefer to assume higher than average risk. Aggressive investors' leveraged portfolios earn high expected returns at points such as (R_a, σ_a) .

The aggregation of these individual preferences generates the linear CML relationship in a form that does not require information on individual investors' utility functions. The "representative" investor's highest obtainable isoutility locus is thus tangent to the efficient risky investment opportunity set. He neither lends nor borrows the riskless asset. He expects to receive market return R_m while assuming risk σ_m .

⁶See [16]. The common assumption of quadratic utility functions implies unrealistic behavior such as taking less risk when wealth increases and receiving negative marginal utility from high returns. See [1, 25].

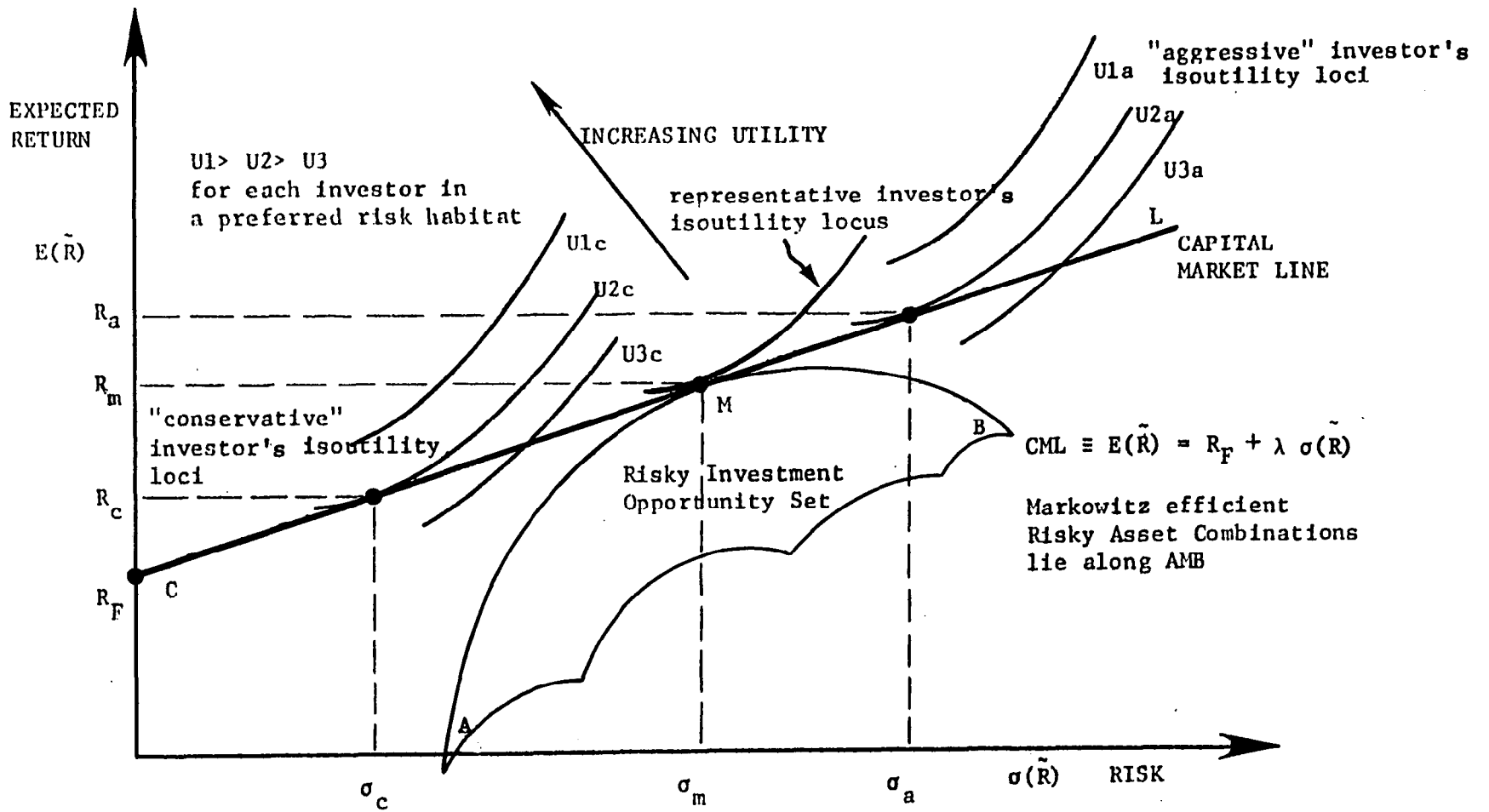


Figure 1. The Capital Asset Pricing Model. Source: Adapted from [14:117] and [19:360].

Figure 1 is derived by projecting a parabolic investor utility surface in three dimensions into two-space. Figure 2 (p.8) depicts relevant portions of the representative investor's utility function. As this investor increases his portfolio holdings of risky assets from 100% of the riskless asset (point R_F) along CML, which he takes as given, his total utility initially increases. His utility increases at a decreasing rate until the positive marginal utility of return equals the negative marginal utility of risk. He moves from lower to higher isoutility levels until his highest isoutility curve is tangent to CML. This point (M) is where the market's risk-return tradeoff equals the slope of the CML. To the right of this point along CML, his marginal disutility of risk overcomes his marginal utility of return. Total utility then declines.

A more aggressive investor's utility surface lies above the one shown in Figure 2 in utility space. A more conservative investor's utility surface lies closer to the origin.

Investor Confidence and Utility

If investors experience an increase in risk aversion, their utility surfaces will tilt downward toward the risk axis.⁷ The marginal utility curve shifts downward in a nonparallel fashion. The demand for risky assets at existing interest rates falls. The demand for safe assets correspondingly rises.

This effect can be illustrated within the loanable funds model of

⁷An extensive list of factors that reduce investor confidence, such as declining output, fear of financial panic, and social unrest appears in [9].

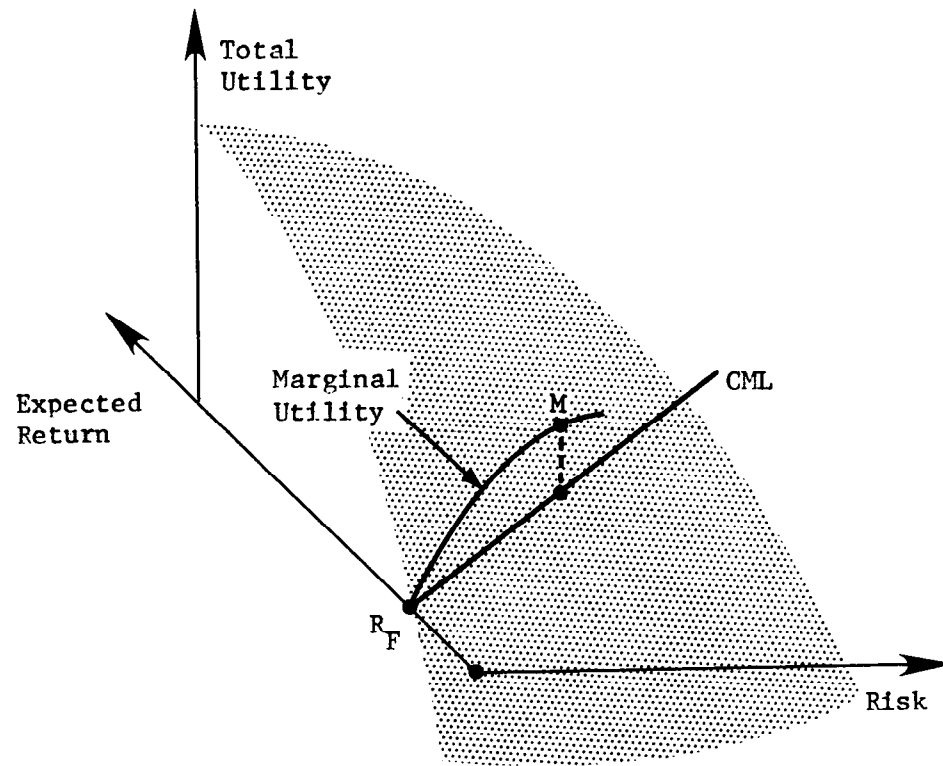


Figure 2. Representative Investor's Utility Function.
 Source: Adapted from [24:265].

interest rate determination [15, 17]. The highly related default-free and risky bond markets are shown in Figures 3A and 3B.⁸ The default-free market contains Government and AAA bonds. The risky market encompasses most corporate debt.

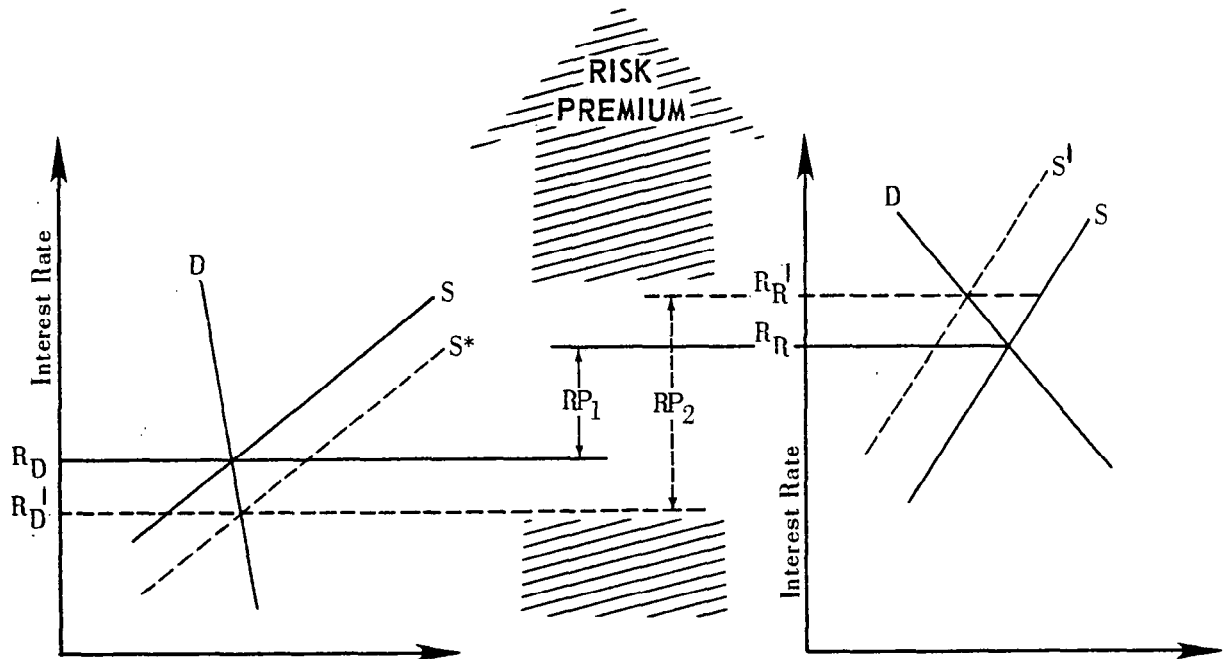


Figure 3A. Supply and Demand for Default-free Long Term Bonds.

Figure 3B. Supply and Demand for Risky Long Term Bonds.

Source: Adapted freely from [15:329-31]

The loanable funds flowing through these markets are originally in equilibrium as indicated by the solid lines. The absolute bond risk premium is $(R_R - R_D) = RP_1$. Now suppose that investor confidence declines. The supply of funds flowing into the risky market declines to S' . A

⁸Government and corporate bonds are close substitutes for many investors, including financial institutions. See [26].

large part of these funds flow into the default-free market. (Some of them may flow into money or short-term Government debt.) Thus its supply increases to S^* . If the demand for funds remains unchanged, the default-free rate falls to R_D' , while the risky rate rises to R_R' . The absolute risk premium increases to $(R_R' - R_D') = RP_2$.

Changes in the subjective desire to avoid risk thus produce the effects:

$$\frac{\partial \lambda}{\partial c} \geq 0; \quad \frac{\partial R_F}{\partial c} < 0.$$

This confidence effect should accompany other relevant changes caused by economic activity. In practice, the change in "c" may be hard to separate from changes in anticipated return and risk.

Changes in Asset Risk

Suppose that investors believe that the riskiness of portfolio assets (σ) increases without any initial change in interest rates. An investor whose portfolio includes medium-grade bonds, for example, might be at equilibrium at (R_1, σ_1) in Figure 4 (p.11). His expectation of portfolio risk then increases to σ_2 . The point (R_1, σ_2) lies below the Capital Market Line originating at R_F . He and other investors now seek to regain their positions along CML. They sell risky assets and buy low-risk assets. The returns required on risky assets rise with this excess supply. (This sequence of events has effects similar to the loss of confidence sequence illustrated immediately above.) The riskless rate falls with the excess demand to a point such as R_C . Somewhat risky (σ_2) portfolios now require return R_3 instead of R_2 . The Capital Market Line itself shifts to CML' . The representative investor is now at point N, instead of point M. The "price of risk" along CML' clearly increases.

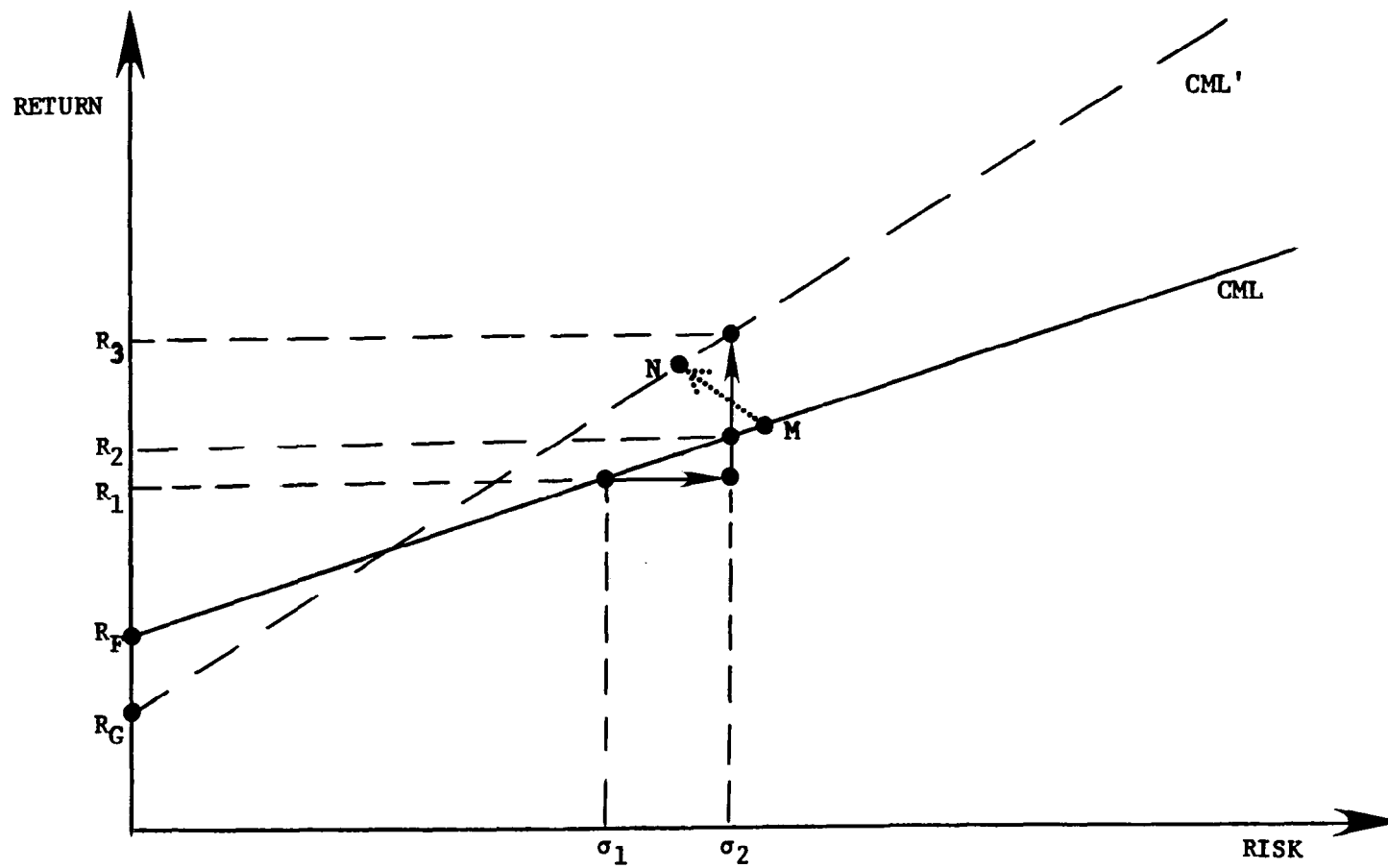


Figure 4. A General Increase in Risk and the Capital Market Line

This increase in σ may have objective causes. One of these is changing interest rates themselves.

Interest Rates and The Price of Risk

When the riskless rate of interest rises, the intercept of the capital market line shifts upward by the same amount. The capital market line also rotates--with an increasing slope--in risk-return space. That is [16]:

$$\frac{\partial \lambda}{\partial R_F} > 0; \frac{\partial \sigma(\tilde{R})}{\partial R_F} > 0; \text{ hence, } \frac{\partial E(\tilde{R})}{\partial R_F} > 0 \text{ at equilibrium.}$$

This rotation of CML partly reflects a loss of confidence in the economy during tight money periods.⁹

Figure 5 (p.13) illustrates this shift in CML when the riskfree rate increases from R_{F1} to R_{F2} . The "price of risk" increases more than proportionally when the riskless rate increases.

The reward for assuming subjective risk σ_1 is now $P_2 > P_1$. The representative investor may shift his portfolio from point M to point R, since the higher returns available at new equilibrium overcome his desire to avoid risk. In terms of Slutsky-type equations used in analyzing consumer behavior, the "income effect" of higher returns exceeds the "substitution effect" of bearing less risk to achieve a given return. Higher rates encourage a move away from liquidity [17].

The Capital Asset Pricing Model and Financial Markets

The predictions of the Capital Asset Pricing Model have been

⁹The Treasury bill rate and the well-known Survey Research Center Index of Consumer Sentiment are highly related. They were correlated -0.73 from 1962:I through 1975:II.

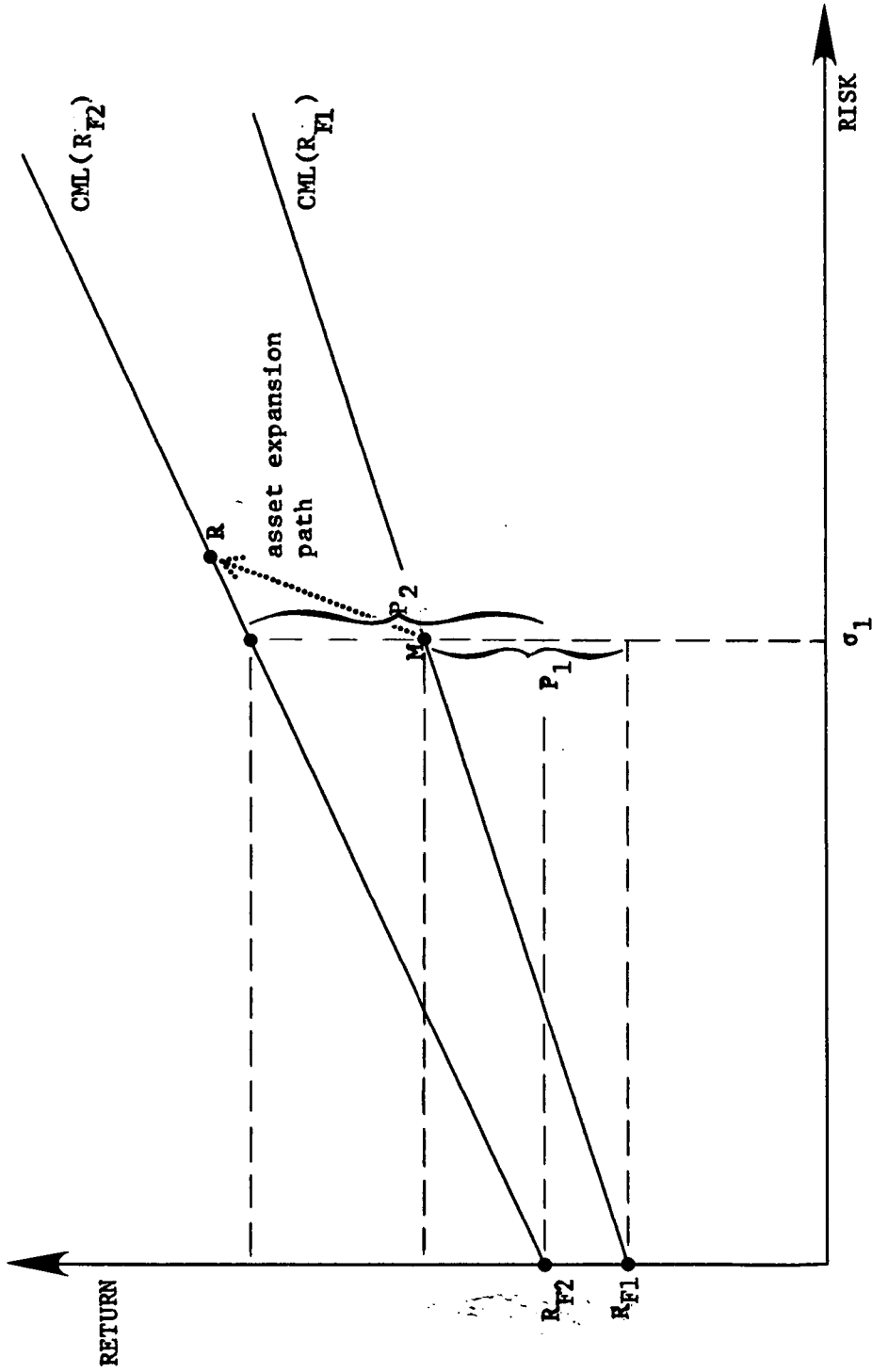
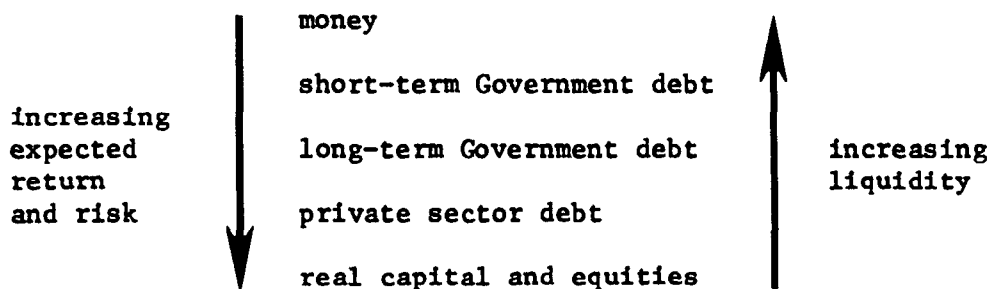


Figure 5. Higher Interest Rates and the Capital Market Line.
Source: Adapted from [16:450]

tested for a wide range of securities. Its general implications seem to hold for a wide variety of financial investments.¹⁰ An operational specification of the underlying sources of variation in "c," R_F , and σ is required to analyze risk premiums, however.

Liquidity, Risk, and Portfolio
Choice

Investors face a rich menu of possible investment selections, ranging from no-return cash to high-return risky physical capital assets. These assets may be broadly arrayed according to their degree of liquidity, risk and return under equilibrium conditions [15, 31]:



Each asset provides its own rate of return. Investors balance return against risk, buying or selling assets until the community is content to hold the existing stocks of these assets. The more similar the assets are to each other, the greater their direct substitutability.

Each asset's return is determined by supply and demand in its own market, which is strongly affected by supply and demand in related

¹⁰See [29] for intertemporal and interclass risk-reward relationships among bonds, preferred stocks, and common stocks, and [19] for a summary of equity risk-reward research.

markets. Shifts in required returns thus result from a variety of sources.

Liquidity

One source of shifts in required returns is an increase in liquidity. An increase in "money" lowers average portfolio return unless invested in higher-return, less-liquid assets.¹¹ New injections of liquidity should flow largely into higher-return, riskier assets until portfolio balance is restored.

Moreover, some investors believe that changes in credit and money precede changes in business conditions [32]. Acting on this belief, they may purchase riskier bonds when increasing liquidity suggests that higher future interest coverage may result in capital gains.

Liquidity also increases the size of portfolios. Private financial wealth can be defined as:

$$W = M + \frac{B}{r} + \frac{E}{\rho}$$

where W is wealth, M is the quantity of money, B is the quantity of bonds, expressed in terms equivalent to perpetual bonds with a \$1 coupon, r is the current market interest rate, E is the expected earnings stream from real capital, and ρ is the market-determined rate of discount for profits.

Deflating all terms by the price level defines "real" financial wealth.

[2]. With higher liquidity, r declines, while, as shown above, ρ declines to a greater extent. Wealth rises as the capitalized value of bonds and equities increases, as well as with the direct increase in M. Risk aversion,

¹¹Portfolio return $E(R)$ is defined as $\sum w_i E(X_i)$ where w_i is the proportion of assets held in the i th asset and $E(X_i)$ is the expected return on the i th asset. $E(X_1)$ is zero for M1, so that it is an inefficient asset when compared to Treasury bills, the riskless asset of the Capital Asset Pricing Model. The rational investor only holds enough M1 to meet transactions demand where its marginal implicit return is equal to that of a riskless earning asset. He holds M2 and M3 to meet precautionary and speculative demands, not to serve as a permanent source of high income.

which should be negatively related to wealth, falls.

Deficit Financing

An exogenous increase in the supply of a particular asset should raise its rate of return, as well as required returns on riskier assets. For example, deficit financing--largely an increase in the supply of short-term Government debt--reduces the liquidity of individual and institutional investors. Their demand for cash falls when they purchase Governments at resulting higher interest rates. With the rise in R_F [17], risk premiums increase.

This liquidity effect is reinforced by declining investor confidence in the private sector. For example, in one Keynesian model,

...under conditions of a budget deficit, there exists an inverse relationship between investment and [the change in Government bonds] ...the appearance of public hostility and fear of deficit spending (adverse expectations) can, in theory, profoundly interfere with the stimulative capacity of the fiscal action causing the deficit. At the extreme, a perverse result, i.e., a negative spendings multiplier ...might even be obtained. [6: 365-66].

The result of these conditions may be described as the "crowding-out effect": the displacement of private loanable funds by Government debt. Crowding out has three dimensions: (1) the volume of private funds displaced, (2) the absolute rise in interest rates, and (3) the rise in risk premiums, resulting from the deficit financing. Since the first two of these dimensions have been examined elsewhere [5, 17, 30], this study examines the crowding-out effect manifested in bond risk premiums.

Inflation

Inflation increases interest rates as the demand for loanable

funds rises.¹² Inflation also affects risk premiums, not only through the resulting higher riskless rate, but also through the confidence effect.

A considerable body of evidence shows that inflation reduces social confidence.¹³ Most people feel that a high rate of experienced inflation, particularly if it exceeds a "normal" rate of inflation, indicates that their future expenses will increase more rapidly than their future incomes. This feeling is particularly rational when (1) cost-push inflation is imported through cartelized commodities or devaluations and (2) inflation shifts individuals into higher tax brackets and raises other taxes. The resulting uncertainty concerning future real income and wealth results in a desire for less risk in portfolio holdings.

And as shown above, investors' wealth also declines when R_F increases. This lower wealth reinforces the desire to avoid risk: the supply of funds to the default-free market may rise during inflationary periods. Moreover, idle cash is "dishoarded"--converted to riskless earning assets--when inflation occurs, further lowering R_F relative to risky rates. For these reasons, inflation raises risk premiums, despite the possible higher short-run interest coverage it may provide on risky bonds.

¹²The demand for external finance will increase even when persistent inflation lowers the return on existing business capital investments. See [21, 22].

¹³See [17, 18]. The Index of Consumer Sentiment, designed to quantify uncertainty in the economy, was correlated -0.79 with the rate of change in the Consumer Price Index from 1962:I through 1975:II.

How to Measure Bond Credit Risk?

Credit risk premiums in the long-term bond markets are specified as yield differentials between Moody's A Industrial¹⁴ and the Federal Reserve's long-term Government bond series. These seasoned rate series largely remove the callability, marketability, and taxability factors that determine other types of interest rate spreads [8, 15]. These rates are closely related to new issue rates:¹⁵

...new issues are floated with utmost care in order that they may be fitted into the existing interest rate structure with a minimum of upset.[27:210]

Moreover, new long-term Government bonds generally could not be issued at rates exceeding 4.25 percent. They seldom appeared during the 1960's and 1970's.

Risk premiums are expressed in two ways. The first is the yield-to-maturity differential in basis points between the two series (Figure 6, p.19). The second divides this yield spread by the long-term Government yield (Figure 7, p.20). The resulting percentage "price of risk" shows market risk aversion independently of the absolute level of interest rates. (A risk premium of 50 basis points represents more credit risk avoidance when the long-term Government rate would be 300 basis points than when it would be 800 basis points). It is theoretically

¹⁴Industrial A Bonds are upper medium-grade obligations of fairly sound unregulated businesses. This rating reflects a positive default risk representing such factors as earnings variation, leverage, and period of solvency. See [13]. For the purpose of this study, the rating need not represent ex post default experience. It need only represent the market's expectation of some credit risk, but not the large risk of speculative bonds.

¹⁵Although new issues yield slightly more than seasoned bonds (because of capital gain tax incentives to receive appreciation on seasoned issues, underwriters' desires to offer readily salable securities, and other factors), they may be regarded as part of a single market that includes seasoned bonds. See [11, 28].

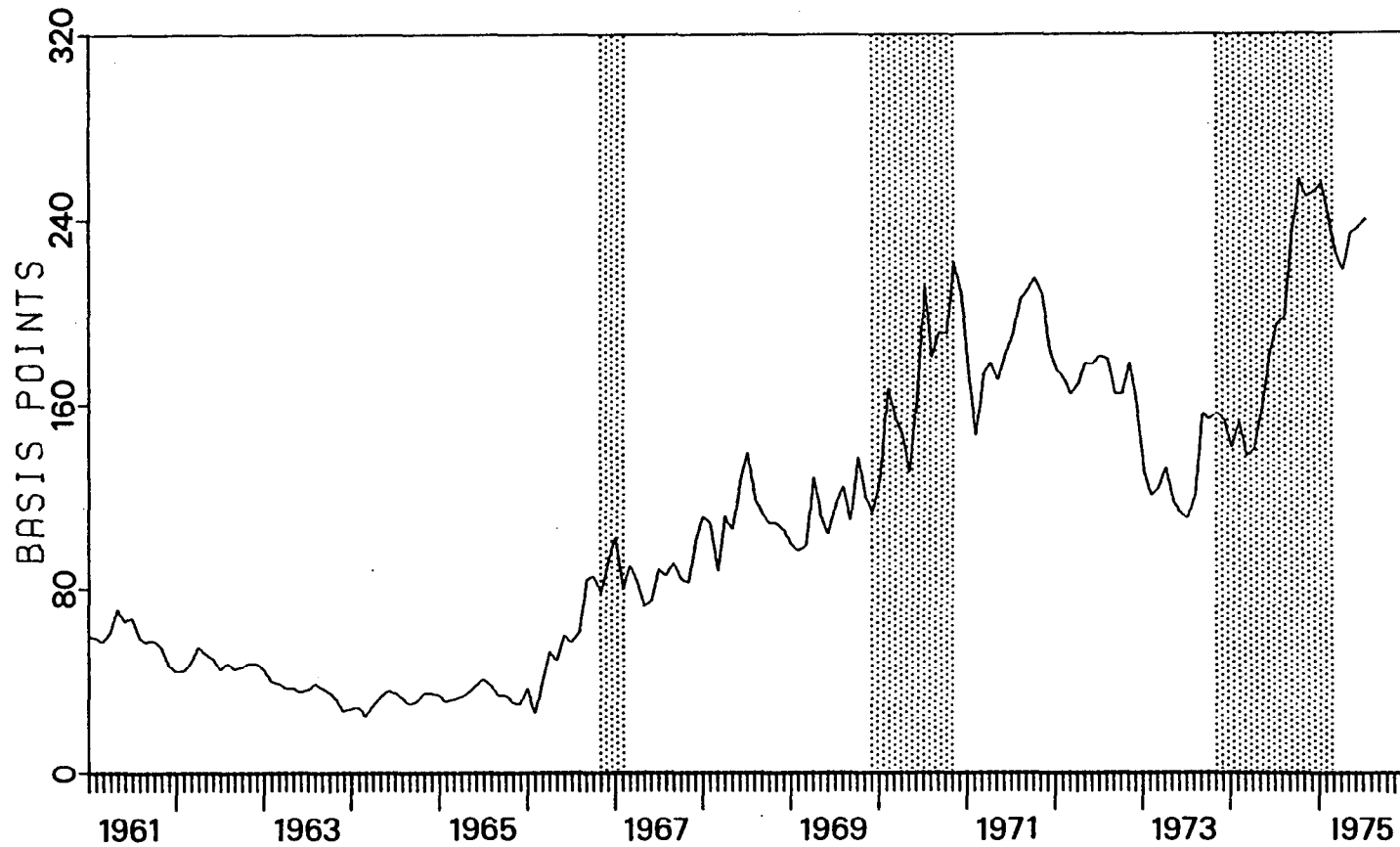


Figure 6. Risk Premiums on Long-term Industrial A Bonds in Basis Points: January 1961 through July 1975. The shaded areas indicate recessions, including the short unofficial recession of 1966-67.

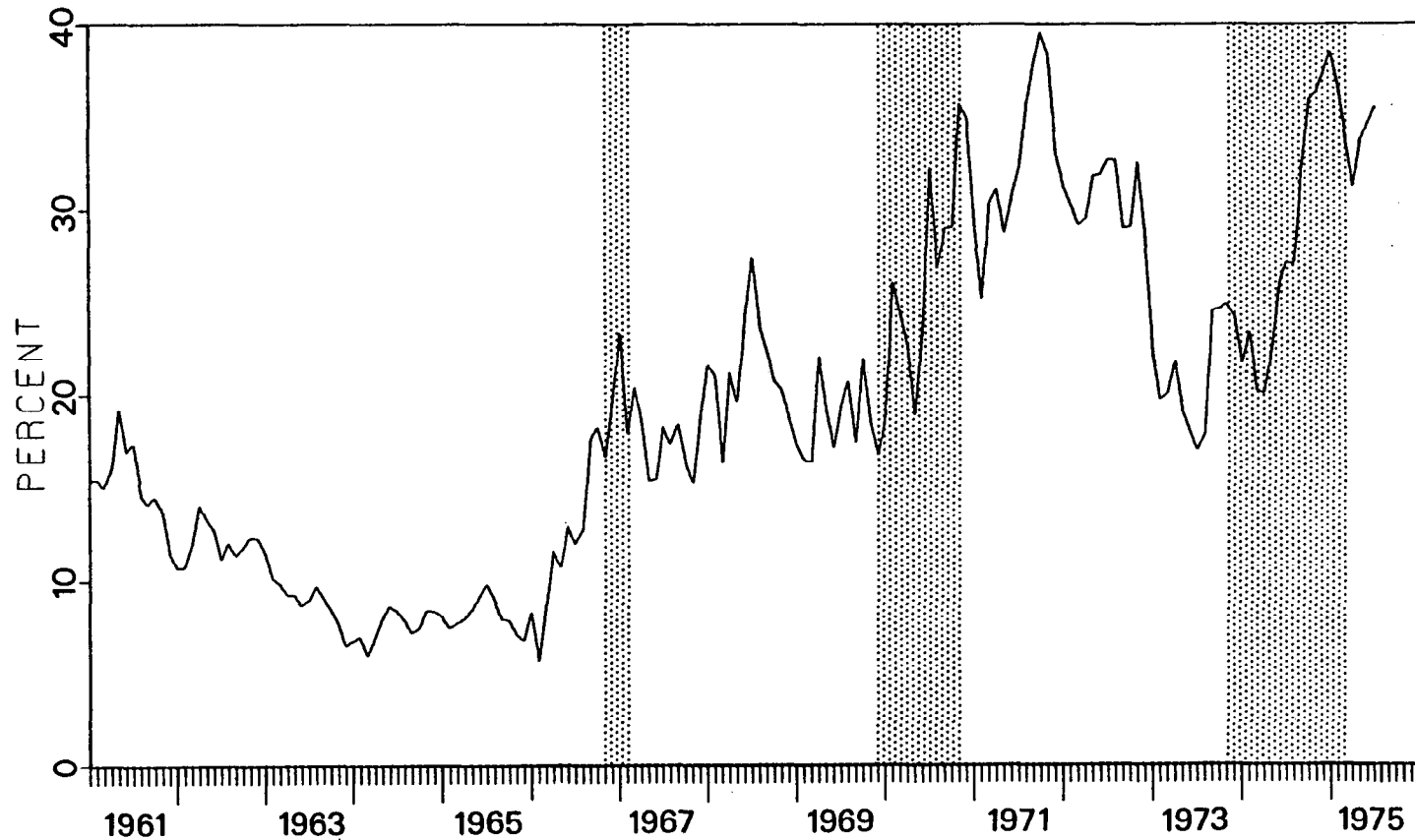


Figure 7. Risk Premiums on Long-term Industrial A Bonds in Percent: January 1961 through July 1975.

important to see if this second risk premium reacts differently to economic factors than the first one.

Previous Studies: A Summary

Two investigators [18, 27] have examined the fundamental determinants of somewhat similar rate differentials. Two others [15, 16] have provided indirect evidence concerning sources of variation in risk premiums.

Risk premiums react inversely to the pace of economic activity [15, 18, 27]. This result is not surprising. Figures 6 and 7 show that risk premiums tend to increase during recessions. Risk premiums were higher in mid-1968 than during the 1966-67 contraction, however. For most of 1971 and 1972, the risk premiums were at high levels typical of recessions, not recoveries. What accounts for this anomaly?

Changes in investor confidence may explain this noncyclical variation. For example, risk premiums vary inversely with the Index of Consumer Sentiment [18]. They are also negatively related to another measure of investor confidence, namely the dividend yield on industrial equities [27]. Furthermore, risk premiums vary positively with the rate of inflation [27]. An increase in Federal expenditure, a factor that reduces investor confidence and raises interest rates, increases corporate bond rates more than Government bond rates [26].

Variations in purely financial conditions also change risk premiums. An increase in long-term rates slightly stimulates risk premiums [18]. But an increase in the commercial paper rate may lower risk premiums [27]. And risk premiums fall when an increase in liquidity, defined as nonborrowed bank reserves plus currency, lowers the corporate rate more than the Government rate [26].

Most of these adjustments originating in the financial sector

occur fairly rapidly [18, 27]. Those originating in the real sector may take as long as one year to be fully realized [26]. Finally, risk premiums may tend to assume a "constant," institutionally-determined level despite financial and industrial fluctuations [18].

Bond Rate Spread Equations

These empirical findings together with portfolio theory suggest that equations to estimate risk premiums should follow the form:

$$RP_t = CON + aU_t + \sum_{i=0}^{11} b_i FD_{t-i} + \sum_{i=0}^{11} c_i INF_{t-i} + \sum_{i=0}^3 d_i LIQ_{t-i};$$

$$CON > 0, a > 0, \sum b_i > 0, \sum c_i > 0, \sum d_i < 0.$$

The time period subscripts t indicate each monthly observation. RP is the measured risk premium. The constant term CON examines any tendency for risk premiums to assume a secular value independent of business and financial conditions. The unemployment rate U , a coincident indicator, indicates the cyclical position of the economy. The Federal deficit FD may stimulate risk premiums over a relatively long period, as investors project trends in the deficit into the future. Similarly, the rate of inflation INF should affect risk premiums over a long period as investors and issuers incorporate experienced inflation in their expectations of future inflation.¹⁵ The change in liquidity LIQ should lower risk premiums over a fairly short period.

¹⁵Rational expectation formation may involve only weighting a historical trend series if information is costly to obtain. See [12].

Methodology

This analysis focuses on the more traditional risk premium stated in basis points; it indicates any differences that occur when the risk premium is expressed as a percentage. The risk premium equations cover the 174-month period from January, 1961 through July, 1975.

The unemployment rate is expressed as a seasonally adjusted percentage. The U. S. budget deficit is given in millions of dollars. Inflation is defined as the annualized rate of change of the Consumer Price Index. The liquidity variable is defined as the annualized rate of change of M3. (The effects of changes in other measures of money and credit on the risk premiums appear in the Appendix.)

The distributed lags employ the smoothing technique of third-degree Almon polynomial approximation without constraints on beginning or ending values. This technique finds a time response without constraining the adjustment path to a predetermined shape. The maximum time lag is limited to one year, since interactions between deficit spending, inflation, monetary growth, and unemployment over longer periods reduce the ability of single-equation models to identify "causality." The time period for the liquidity variable is limited to four months, following the generally accepted rapid adaptation of interest rates to monetary variations.

The Cochrane-Orcutt correction for first-order autocorrelation [7] is used. This technique solves a common problem in time series analysis, namely "runs" of successive overprediction and underprediction. Its correction factor for autocorrelation is " ρ ". The effectiveness of this technique can be judged by the satisfactory Durbin-Watson statistics.

Tables 1 and 2 (pp. 24,25) present the basic results of the analysis in basis point and percentage terms, respectively. The summed

Table 1
Determinants of Risk Premiums in Basis Points

<u>Predictor</u>	<u>Coefficient</u>	<u>"t" Statistic</u>
Unemployment Rate (t)	12.7988	2.65
Sum of Federal Deficit Coefficients (t to t-11)	0.1228	2.12
Sum of Inflation Coefficients (t to t-11)	11.4477	3.02
Sum of M3 Growth Rate Coef- ficients (t to t-3)	-2.2344	-1.80
Constant	12.3264	0.34
\bar{R}^2	0.9672	
Standard Error	11.8514	
Durbin-Watson	2.09	
ρ	0.9558	
Federal Deficit (t)	0.0015	2.99
(t-1)	0.0011	2.04
(t-2)	0.0008	1.35
(t-3)	0.0006	1.00
(t-4)	0.0005	0.89
(t-5)	0.0006	0.95
(t-6)	0.0007	1.14
(t-7)	0.0009	1.42
(t-8)	0.0011	1.80
(t-9)	0.0014	2.33
(t-10)	0.0017	3.05
(t-11)	0.0020	3.73
Inflation Rate (t)	0.1803	0.48
(t-1)	0.7323	1.68
(t-2)	1.0797	2.10
(t-3)	1.2812	2.38
(t-4)	1.3552	2.62
(t-5)	1.3302	2.73
(t-6)	1.2346	2.56
(t-7)	1.0969	2.18
(t-8)	0.9547	1.80
(t-9)	0.8094	1.59
(t-10)	0.7165	1.63
(t-11)	0.6955	1.79
M3 Growth Rate (t)	-0.8380	-1.86
(t-1)	-1.0668	-2.25
(t-2)	-0.5934	-1.24
(t-3)	0.2638	0.56

Table 2
Determinants of Risk Premiums in Percent

<u>Predictor</u>	<u>Coefficient</u>	<u>"t" Statistic</u>
Unemployment Rate (t)	2.3876	2.53
Sum of Federal Deficit Coefficients (t to t-11)	0.0021	1.83
Sum of Inflation Coefficients (t to t-11)	1.2647	1.85
Sum of M3 Growth Rate Coef- ficients (t to t-3)	-0.4558	-1.85
Constant	4.5153	0.71
\bar{R}^2	0.9326	
Standard Error	2.3592	
Durbin-Watson	2.11	
ρ	0.9371	
Federal Deficit (t)	0.0003	2.66
(t-1)	0.0002	1.91
(t-2)	0.0001	1.31
(t-3)	0.0001	0.97
(t-4)	0.0001	0.83
(t-5)	0.0001	0.82
(t-6)	0.0001	0.92
(t-7)	0.0001	1.11
(t-8)	0.0002	1.40
(t-9)	0.0002	1.85
(t-10)	0.0003	2.50
(t-11)	0.0003	3.17
Inflation Rate (t)	-0.0072	-0.09
(t-1)	0.0967	1.16
(t-2)	0.1567	1.59
(t-3)	0.1811	1.78
(t-4)	0.1784	1.86
(t-5)	0.1569	1.77
(t-6)	0.1252	1.42
(t-7)	0.0915	0.97
(t-8)	0.0644	0.64
(t-9)	0.0521	0.53
(t-10)	0.0631	0.74
(t-11)	0.1059	1.37
M3 Growth Rate (t)	-0.1151	-1.28
(t-1)	-0.1964	-2.07
(t-2)	-0.1421	-1.50
(t-3)	-0.0022	-0.02

distributed lag coefficients appear at the top; while the individual distributed lag time coefficients appear at the bottom. The significance of these coefficients is given by their "t" statistics. A "t" statistic greater than 1.29 in absolute value indicates a significant relationship.¹⁶ The R^2 values are corrected for degrees of freedom.

The regressions in Tables 1 and 2 are consistent with the portfolio behavior model. Both forms of risk premium respond similarly to the same set of predictors. The first measure is more sensitive to determinants of absolute interest rates such as Federal deficits and inflation than the second measure since nominal rates themselves may influence investor behavior. The second measure, which more nearly represents the theoretical measure of risk aversion, is about equally sensitive to all four determinants of risk premiums.¹⁷

High unemployment increases risk premiums, since both confidence and interest coverage fall during recessions. This result is well known.

More importantly, Federal deficit spending raises the risk premiums over a three-month period. Its effect declines slightly over the next three to four months but then rises progressively over the remainder of a year. Crowding out, measured indirectly through interest rate differentials, has occurred in the American economy. Federal deficits not only increase absolute interest rates, they also increase bond risk premiums.

¹⁶This significance level is 0.10 for a one-sided test with 160 degrees of freedom. Excessive emphasis should not be placed on the coefficients and "t" statistics of individual monthly lagged variables. The summed values indicate the magnitude and significance of a persistent trend of "one unit change" of these volatile series [23].

Inflation raises risk premiums after one month, when investors determine the past month's inflation. The maximum effect of inflation, however, occurs about three to four months later, and continues for the remainder of the lagged period. Its effect on percentage risk premiums declines somewhat beyond a six-month lagged period.

An increase in liquidity, represented by an increase in the growth rate of M3, lowers risk premiums for a three-month period. Liquidity coefficients lagged for longer periods are insignificant or erratic. (The t-3 coefficient demonstrates this declining liquidity effect.)

Finally, risk premiums do not tend to assume some institutionally-determined value independent of the economic climate. The constant terms in Tables 1 and 2 are not significant. Investors and debt issuers cannot profitably rely on any "historical" tendency for risk premiums to be a certain level, as implied by some Wall Street financial releases.

Conclusions

This analysis shows that risk premiums are influenced by fundamental economic factors. They rise and fall with the unemployment rate. They increase during inflationary periods, with a twelve-month distributed lag reflecting adaptations to inflationary trends. Risk premiums fall when the liquidity of the economy increases, with a three-month distributed lag reflecting portfolio reallocations when M3 grows. Finally, risk premiums rise when the Government budget runs a deficit, with a twelve-month distributed lag reflecting Federal budgetary trends. These results are consistent with portfolio allocation theories of how risk premiums are determined. Real sector disturbances as well as financial fluctuations influence the relative price of business long-term financing.

In particular, extensive Federal deficit financing drives up the relative cost of capital for sound corporations. The resulting lower investment depresses current and future aggregate output, thereby tending to increase inflation during later periods. These factors, plus political pressure to increase the deficit when unemployment rises raise the risk premiums still further. Indeed, this vicious circle may be what produced the higher level of bond risk premiums that followed the Federal budget deficits in the mid-sixties and which generally continued to the present day. This experience suggests that continued deficit spending at high levels, especially if accompanied by high unemployment and inflation, bodes ill for the future health of the private sector.

APPENDIX I: Monetary Aggregates, Bank Credit, and Risk Premiums

The higher supply of loanable funds resulting from an expansive financial climate flows more into the risky bond market than into the riskless one, as indicated above. What is the appropriate indicator of the higher liquidity?

Traditionally, M1 was regarded as the store of liquidity and medium of exchange that determines portfolio balance and spending decisions. More recently, M2 and M3 have received greater theoretical and empirical attention as determinants of portfolio shifts and real-sector spending. (See [4].) Furthermore, it is well known that increases in bank credit (loans and investments) form an essential link in the transmission of monetary policy from changes in high-powered money to portfolio balance and economic activity. A theoretical case can be made for treating growth in any of these aggregates as the specification of liquidity.

Bank credit, though, is a liability of the nonbank public. It does not enter directly into most investors' evaluation of their portfolio liquidity. While it is one indicator of the availability of credit and perhaps of future business conditions, it is seldom reported.

Growth in one of the closely followed M1, M2, or M3 qualifies as a better theoretical indicator of liquidity in the portfolio choice model. These indirect sources of loanable funds are assets of the non-bank public. Growth rates of those three monetary aggregates, indeed, are classified as leading indicators [32].

Rapid growth of M2 and especially M3 suggests that inflation-stimulated demand for interest-bearing liquid assets suitable for the "precautionary" and "speculative" uses of money has lessened the traditional role of M1. And the nearly constant income velocity of M2 and M3, contrasting sharply with the secular rise in the velocity of M1 [3] suggest that M2 and M3 behave as the almost-constant-velocity

aggregates fulfilling all of the traditional functions of money.

The equations in Tables 3 and 4 (pp. 31, 32) test the hypotheses that growth in each one of these aggregates can serve as a measure of liquidity. The monetary and credit coefficients measure the effect of a one percent increase in their seasonally adjusted annual growth rates from month $t-3$ through t . The "fit" of all of these equations is fairly similar, as shown by the \bar{R}^2 , standard error, and autocorrelation statistics.

Growth in M3 has the largest coefficient in these Tables. Its coefficient is larger than that of growth in M2. Growth in bank credit in turn has a lesser but still significant coefficient. Growth in M1 is the weakest influence on risk premiums. Its liquidity coefficient only approaches a significant level in Table 3, and is about one-half that of growth in M3 in Table 4. Growth in M3 thus appears to represent the most relevant measure of liquidity for this analysis, as well as for the analysis of nominal interest rates [17].

Table 3

Comparison of Monetary and Credit Influences on Risk Premiums in Basis Points

<u>Unem- ployment Rate</u>	<u>Sum of Federal Deficit Coef- ficients</u>	<u>Sum of Inflation Coef- ficients</u>	<u>Sum of M1 Growth Rate Coef- ficients</u>	<u>Sum of M2 Growth Rate Coef- ficients</u>	<u>Sum of M3 Growth Rate Coef- ficients</u>	<u>Sum of Bank Credit Growth Rate Coef- ficients</u>	<u>Constant</u>	<u>\bar{R}^2</u>	<u>Standard Error</u>	<u>Durbin- Watson</u>	<u>ρ</u>
11.8937 (2.43)	0.0105 (1.75)	12.3740 (3.29)	-0.9606 (-1.24)				0.8531 (0.02)	0.9664	12.0006	2.05	0.9509
12.1128 (2.51)	0.0123 (2.06)	11.9610 (3.21)		-1.9398 (-1.99)			10.0073 (0.28)	0.9670	11.8977	2.08	0.9534
12.7988 (2.65)	0.0128 (2.12)	11.4477 (3.02)			-2.2344 (-1.80)		12.3264 (0.34)	0.9672	11.8514	2.09	0.9558
11.0677 (2.37)	0.0105 (1.86)	11.9914 (3.31)				-1.4028 (-2.44)	12.8243 (0.37)	0.9691	11.5158	2.03	0.9557

Table 4

Comparison of Monetary and Credit Influences on Risk Premiums in Percent

<u>Unem- ployment Rate</u>	<u>Sum of Federal Deficit Coef- ficients</u>	<u>Sum of Inflation Coef- ficients</u>	<u>Sum of M1 Growth Rate Coef- ficients</u>	<u>Sum of M2 Growth Rate Coef- ficients</u>	<u>Sum of M3 Growth Rate Coef- ficients</u>	<u>Sum of Bank Credit Growth Rate Coef- ficients</u>	<u>Constant</u>	<u>R²</u>	<u>Standard Error</u>	<u>Durbin- Watson</u>	<u>ρ</u>
2.1893 (2.32)	0.0018 (1.59)	1.4500 (2.24)	-0.2400 (-1.57)				2.3487 (0.40)	0.9318	2.3728	2.08	0.9313
2.2239 (2.37)	0.0020 (1.78)	1.3960 (2.12)		-0.3887 (-2.01)			3.9956 (0.65)	0.9324	2.3630	2.10	0.9339
2.3876 (2.53)	0.0021 (1.83)	1.2647 (1.85)			-0.4558 (-1.85)		4.5153 (0.71)	0.9326	2.3592	2.11	0.9371
1.9157 (2.12)	0.0018 (1.68)	1.4406 (2.22)				-0.2492 (-2.20)	4.5929 (0.76)	0.9375	2.2728	2.05	0.9375

APPENDIX II: Time Trends and Risk Premiums

Variations in risk premiums might also be explained by a time trend. Figures 6 and 7 show that the risk premiums were higher in the second half of this period than in the first half. Some analysts attribute this difference to a supply shortage of new long-term Government securities. The supply of corporate bonds continued to increase after Congress limited the supply of Government bonds by refusing to raise their 4.25 percent interest rate ceiling. The risk premiums might then have risen if investors preferred Governments in relatively low supply [15:331].

And social unrest, characterized by a widespread distrust of business, occurred from the late 1960's onward. This "anticapitalistic" sentiment became manifest in several forms: environmentalism, investigations into "abuses of corporate power," new taxes, riots, etc. "Any one of these could generate apprehension about the riskiness of financial assets." [15:331].

The possibility that either or both of these factors contributed to secularly higher levels of risk premiums independent of economic factors is tested by a time variable. It assumes the value of zero before October, 1967, and unity thereafter. When the equations incorporate this variable plus those examined above, its coefficient is negative and insignificant. This test supports neither the relative supply-interest rate ceiling nor the social unrest hypotheses.

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