Profitability and the Time-Varying Liquidity Premium in the Term Structure of Interest Rates

by

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PROFITABILITY AND THE TIME-VARYING LIQUIDITY PREMIUM IN THE TERM STRUCTURE OF INTEREST RATES

The existence, magnitude, and determinants of a "liquidity premium" in the term structure of interest rates have been a source of controversy in the analysis of interest rate behavior for decades. This issue has received renewed attention in the past few years due to the failure of the "expectations" theory of the term structure to perform adequately in empirical tests. (See, for example, N. Gregory Mankiw and Lawrence Summers, 1984, and Mankiw, 1986.) The expectations theory, which holds that any long-term interest rate must equal the expectation of the movements in shorter-term rates over the term to maturity of the long-term security, is the oldest theory of the term structure. The idea behind this theory, which Burton Malkiel (1966, p. 17) says dates back in some form "at least to Irving Fisher," is that arbitrage will prevent a long-term security from yielding more over its life than a combination of shorter-term securities bought consecutively over that holding period. Once it is realized, however, that the yields on the shorter-term securities cannot be known with certainty, other considerations than pure expectations may need to be taken into account.

The extreme opposite to the expectations theory is the theory of "segmented markets," which holds that borrowers and lenders participate in specific maturities of securities and never move. (See, for example, J.M. Culbertson, 1957.) Thus the yield for each maturity is determined by the specific supply of and demand for that maturity. This is obviously untenable in its extreme form, and so is more sensibly replaced by the idea of a "preferred habitat" for participants, who will only depart from their preferred maturities if yield opportunities are particularly favorable elsewhere. (See Franco Modigliani and Richard Sutch, 1966.) This captures the notion that in the face of uncertainty arbitrage on the basis of expectations is risky and so risk-averse borrowers and lenders will require an expected premium to abandon their preferred habitat.

If the preferred habitat of most lenders is the short end of the market and the preferred habitat of borrowers the long end, there will be a premium in the yield of longer-term securities. As this type of habitat preference represents capital risk-aversion or fear of illiquidity, the premium may be said to be a liquidity premium.[1] John Hicks (1978 [1939], Chap. 11) is usually credited with first arguing for the existence of this "constitutional weakness" in the long end of the loan or securities market, following John Maynard Keynes's (1971 [1930], Vol. II, pp. 127-129) discussion of the existence of "normal backwardation," or the premium required by speculators in futures markets to absorb price risk from the hedgers. Nicholas Kaldor (1939) and Michal Kalecki (1939) contemporaneously with Hicks also presented the idea that

[1]The premium required to hold long-term rather than short-term securities is often simply referred to in the literature as the risk premium or the term premium. Since in this paper we are concerned with risk but with a particular form of risk and we want to emphasize its connection with J.M. Keynes's liquidity preference theory, we will normally use liquidity premium.

long-term interest rates would be determined by expectations of future movements in short-term rates plus a liquidity premium.

There have been numerous empirical studies of the term structure. Broadly, the evidence may be said to be consistent with some influence from expectations plus the existence of a liquidity premium. Long rates or the spread between long and short rates have seemed to be systematically related to expectations of future rates, though the expectations embodied in long rates or the spread are biased upwards as the liquidity preference theory would predict. The degree of influence of expectations and the behavior of the liquidity premium, however, have remained matters of controversy. In several recent studies (e.g., Robert Shiller, 1979; Shiller, John Campbell, and Kermit Schoenholtz, 1983; David Jones and Vance Roley, 1983; Mankiw and Summers, 1984; and Mankiw, 1986) the expectations theory has performed poorly, even allowing for the existence of a constant liquidity premium, in attempts to test the joint hypothesis of rational expectations and the expectations theory. Shiller, Campbell, and Schoenholtz and Mankiw and Summers, among others, have suggested renewing the search for the determinants of a time-varying liquidity premium as a possibility for explaining what is going on but have had little success themselves in finding such.

The Time-Varying Liquidity Premium

Earlier work on variations in the liquidity premium had focused on the issue of whether or not the premium varied with the overall level of interest rates. Findings indicated that the premium did vary with the level of rates, but some investigators found the variation to be inverse, while others found it to be direct. Theoretical justifications were offered for both cases.[2] Recent work attempting to explain time variations in liquidity premia, such as that of Shiller, Campbell, and Schoenholtz (1983) and Mankiw (1986), has used various measures of interest rate volatility, such as the standard deviation of an interest rate or the covariance of bond returns with consumption growth or with stock market returns, in order to capture the riskiness involved in holding less liquid bonds.

Tracy Mott (1985-86) has suggested that the liquidity premium might be inversely related to the level of profitability of business fixed investment. This is due to changes in liquidity preference which should accompany changes in the profitability of investment as greater or lesser desirability to invest in long-lived capital equipment and structures is matched by greater or lesser desirability of investing in long-dated financial securities. The argument is intended to support Keynes's emphasis on the volatility of investment spending as the major cause of economic fluctuations. Fluctuations in the profitability of investment, according to this argument, not only directly cause fluctuations in investment spending but also reinforce and exacerbate these fluctuations by sympathetic movements in the availability of long-term finance. (See also Joan Robinson, 1952.)

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[2]This work is surveyed in James Van Horne (1978, pp. 101-103).

This financial response also impedes the power of monetary policy to offset investment fluctuations by varying the quantity of bank reserves, since an increase or decrease in the quantity of reserves may not get translated easily into an increase or decrease in the quantity of long-term lending for fixed investment.

The origins of such a view concerning the interactions between physical and financial investment can be found in Keynes's Treatise on Money (1971 [1930], Chaps. 10-11). There Keynes proposed that extra-normal profits in the investment goods industries, inducing expansion in investment spending, would occur as the value of new investment goods rose above the cost of production of new investment goods. The value of new investment goods would be determined both by the expected profitability of these goods and the interest rate used to discount them. These factors in turn should be determined by the resultant of the beliefs and actions of financial investors, given their attitudes towards the state of the real and financial economy and the credit position of the central bank. This reasoning of course is identical to that of James Tobin's "q"-theory of investment. (See, for example, Tobin, 1969.)

Keynes then described the willingness of investors to move between the short and long ends of the securities market, given the availability of credit from the central bank and the banking system, as "the degree of excess bearishness." In the General Theory Keynes criticized this idea as involving "a confusion between results due to a change in the rate of interest and those due to a change in the schedule of the marginal efficiency of capital..."(1964 [1936], p.174). Keynes could then separate the analysis of the behavior of liquidity preference from that of expected profitability. This was undoubtedly an advance, but it contributed to forgetting the possibility of some connection between the two.

Keynes's discussion of the relation of liquidity preference to the rate of interest thus came to focus on his <u>speculative</u> motive to be liquid. Keynes (1964 [1936], pp. 201-204) and some of his interpreters (e.g., Kaldor, 1939; Axel Leijonhufvud, 1968) have spoken of the long-term interest rate as being primarily determined by the views of financial market speculators concerning the "normal" or "safe" rate, as in accordance with the expectations theory of the term structure. On this view, liquidity preference tethers the long-term rate due to speculative activity enough to keep it from moving sufficiently to offset fluctuations in investment spending. That is, should investment fall, the drop in the demand to borrow will not cause a drop in long-term interest rates large enough to revive investment spending (or consumption spending in some of these interpretations) because speculators will sell bonds on any significant rise in prices in expectation of a subsequent fall in bond prices when the long-rate returns to "normal" in the near-enough future.

The existence of a liquidity premium in the term structure, however, requires concern with Keynes's <u>precautionary</u> motive to be liquid. Tobin (1958) showed that fear of capital losses--capital risk aversion--was an aspect of liquidity preference which was a function not only of income, as Keynes had it, but also of the level of interest rates relative to expected. This idea is really a union of speculative and precautionary concerns. Investors who are capital risk averse will be concerned with expectations about future movements in rates, and fear of unfavorable movements in rates will lead them to demand a premium for bearing the risk of betting on their expectations. Concern for both the mean and variance of the distribution of interest rates will thus cause the term structure to exhibit expectations biased upwards of future movements in rates.

The idea that Shiller, Campbell, and Shoenholtz and Mankiw were working on then regarding the variability of the liquidity premium was that changes in the variance of the distribution might lead to changes in the liquidity premium. As mentioned, however, their efforts have been unsuccessful. The idea that Mott, following Keynes and Robinson, proposed was that changes in the profitability of investment rather than changes in the volatility of interest rates might be the cause of variability in the liquidity premium. Concerns regarding profitability, though, properly are dealt with under the domain of default risk on risky securities. Liquidity concerns have to do not with the question of the realization of the payments due on securities but with the value of securities if cashed prior to maturity. Though changes in default risk would affect this value, it would also be changed solely by market interest rate movements even for default-risk-free securities, such as U.S. government bonds, on which there is no concern for the profitability of the issuing agent.

Profitability in the aggregate, however, might affect the degree to which investors are concerned for liquidity. In other words, the concern for interest rate movements which may affect adversely the current value of one's portfolio may itself vary over time as the economic environment as a whole becomes more or less risky. A simple and straightforward way this might occur would be for investors who are selling risky bonds and stocks because of concern over default risk at a time when profit expectations have fallen to hold the cash they have thus freed up in Treasury bills rather than in less risky corporate securities or default-risk-free but long-term and so less liquid Treasury bonds.

Keynes must have thought liquidity preference to be related to profitability in some such fashion, for he wrote in his General Theory chapter on the trade cycle (Chap. 22), "Moreover, the dismay and uncertainty as to the future which accompanies a collapse in the marginal efficiency of capital naturally precipitates a sharp increase in liquidity-preference--and hence a rise in the rate of interest" (Keynes, 1964 [1936], p. 316). Not much empirical evidence has been brought to bear as yet on this matter. One such piece, though, is Peter Temin's (1976, pp. 103-121) suggestion that the liquidity premium on long-term U.S. government securities rose in the early 1930s during the Great Depression. Another is found in the work of Charles Nelson (1972, Chap. 6), who regressed his estimates of the liquidity premium against the level of interest rates and an index of business confidence. He found the liquidity premium to be related negatively to both.[3] Other researchers, such as James Pesando (1975) and Benjamin Friedman (1979), however, have failed to find any significant relationship between "economic activity" variables and the liquidity premium.[4] Finally, Eugene Fama (1986) found that expected liquidity premia on Treasury bills and on private securities vary with the business cycle across maturities of each type of security in a way that finds them an increasing function of maturity in good business conditions but a humped or inverted function during recessions and months preceding cycle peaks.

Estimation

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[3]Does the work mentioned earlier on the relation of the liquidity premium to the level of interest rates shed any light on the relation of the liquidity premium to profitability? Profitability generally is highest cyclically when interest rates are highest, though this is more true for short rates than long rates. The cyclical peak for both short and long rates normally occurs after the peak in profitability, and the peak for long rates is usually later than the peak in short rates. The argument advanced by partisans of the idea that the liquidity premium should be negatively related to the level of rates has been on speculative or expectational grounds: the greater the deviation from the "normal" rate, the greater the chance that rates will move towards the normal rate. (See, for example, Malkiel, 1966, Chap. 3.) Those arguing for a positive relation between the liquidity premium and the level of rates say that the opportunity cost of holding "money" (presumably currency plus bank deposits paying no interest or with interest ceilings) rises when rates rise, leading people to move from money to short-term securities. And, indeed, the work done confirming the positive relationship has all been with very short-term securities.

[4]We should note that Friedman did find a significant relation between several of his economic activity variables and the liquidity premium but that this relation failed to obtain when the level of interest rates, which of course moves with economic

Our study of the empirical relation of the liquidity premium to profitability involves two projects. First, we estimate a "traditional" or "old-fashioned" sort of equation for the term structure, which takes the long-term rate to be a function of a distributed lag of short-term rates. This assumes that, since under the expectations hypothesis the long rate is an expectation of the future short rate, there is a forecast of future short rates in the recent movements of short rates. This type of specification is found in the large-scale macroeconometric models.

We estimated a rather simple form of such an equation taken from Mankiw (1986). This equation is

$$(1) \quad R_t - r_t = \alpha_0 + \alpha_1(r_t - r_{t-1}) + \alpha_2(r_{t-1} - r_{t-2}) + \alpha_3(R_{t-1} - r_{t-1}) + \epsilon_t,$$

where R = long rate, r = short rate, and ϵ = a random error term. Under such a specification the constant term, α_0, is the liquidity premium, or amount by which the long rate exceeds the expectation of the future short rate due to liquidity concerns. Variation in the liquidity premium may be found then in the residuals of the equation, assuming that the differences between the actual values of the dependent variable and the fitted values from the regression also reflect, in large enough measure, liquidity concerns.

Because such a specification might seem to be overly simplistic, even on the grounds of the older way of looking at the issue, and in order additionally to offer an alternative specification within that framework, we also looked at the old Modigliani and Sutch (1966) term structure equation as a method of exploring variation in the liquidity premium. The advantage of this specification is that it allows for a more complex lag structure. Modigliani and Sutch argued that the information contained in past interest rates should have both a regressive as well as extrapolative nature. This would imply an inverted U-shape for the weights on the lagged rates. Modigliani and Sutch concluded that using the Almon Lag technique to estimate a fourth-degree polynomial would give sufficient flexibility to reproduce closely the true lag structure.

The equation we estimated for this specification then was

$$(2) \qquad R_t = \alpha_0 + \alpha_1 r_t + \Sigma_{i=1}^{m} \beta_i r_{t-i} + \epsilon_t,$$

where again α_0 is the liquidity premium and the residuals of the equation are taken as its variations over time.

The problems of these "traditional" specifications of course is that they do not take into account any information other than past movements in interest rates. Even with this weakness, though, it would be interesting to note if the historical relation between long-term and short-term rates identified by these equations showed a systematic deviation which was correlated with our measures of profitability and liquidity concerns. In addition, the "forward-looking" specification to which we are about to turn, with its assumptions of an efficient market and investors with rational expectations, is not problem-free, either.

Still, assuming the market to be efficient, holding period yields on long-term securities should not systematically exceed those on short-terms except as an allowance for risk aversion. As an hypothesis, this can serve as a test of rational expectations in the term structure. Mankiw (1986, pp. 74-81) subjects the theory to such a test by, among other things, regressing excess holding period returns on long-term government securities over short-terms against the spread between long and short rates. He finds that the spread is significantly correlated with the excess holding period return. In a separate test he regresses the change in the long rate on the spread and finds that the spread successfully predicts changes in the long rate, another violation of market efficiency.

Mankiw (1986, pp. 81-91) thus suggests that the spread could be correlated with excess holding period returns because it is proxying for the risk of holding long-term securities (the degree of liquidity preference). He says that in such an event an estimation of the following equation,

$$(3) \qquad H_t - r_t = \alpha + \beta(R_t - r_t) + \gamma(RISK_t) + \epsilon_t,$$

where H = the holding period return on long-term securities, should show β insignificantly different from zero.

Mankiw, however, does not run such a regression, but rather regresses his candidates for RISK against the spread. This is because, as he says, for RISK to drive the significance of β to zero in equation (3) RISK and the spread $(R_t - r_t)$ must be positively correlated. From our point of view, though, we do want to estimate equation (3), and we give the following two reasons or justifications. First, if we were to regress the variables we want to test as representing RISK against the spread, no one would be surprised at their success because many of them display a pronounced correlation with the business cycle as does the spread. Second, we believe that there may well be a reason for the spread properly to be a significant predictor of the excess holding period return. In a way, all we are saying is that the spread is perhaps a proper proxy for RISK, but it may be a type of risk different from the risk we are attempting to measure. After all, the major risk concern investors have when buying long-term securities is the risk of receiving a capital loss. Our concern is more exactly not the changes in this risk but rather the changes in <u>consideration</u> for this risk. Another way of putting it is to say that we are not concerned with movements <u>along</u> a liquidity preference schedule but with movements <u>of</u> the schedule as a whole. The level of the spread is indeed a proper proxy for movements along a liquidity preference schedule insofar as it serves as the expectation of future rate movements. To the extent that there are transactions costs and uncertainty the spread should rationally forecast excess holding period returns on long-term securities because to the extent that there are mean-reverting tendencies in interest rates the higher the spread is the greater the risk of a capital loss on long-term securities.[5] This is really nothing but a restatement of the logic of the expectations theory of the term structure or the speculative demand for liquidity. Volatility measures as measures of time-varying risk, as Mankiw uses, are getting at similar information to that given by the spread. Our measures are attempts to get at a different kind of information.

Our measures of factors affecting the degree of liquidity preference or capital risk aversion can be grouped into three categories. First, we have a list of variables that serve as measures of actual or expected profitability. These are capacity utilization (IPXCA), real cash flow divided by capacity (GCFZ), real profits divided by capacity (GPATZ), a composite profitability index, compiled by the Bureau of Economic Analysis for <u>Business Conditions Digest</u>, divided by capacity (DLEAPZ), real stock prices divided by capacity (RSPZ), and since we were appealing to Keynes's idea of a sympathetic response of liquidity preference to changes in investment spending, real gross private nonresidential investment divided by capacity (GIN8Z). Capacity (Z), which is arrived at by dividing industrial production (Y) by capacity utilization (Y/Z) in a reverse engineering of how the Federal Reserve makes its estimate of capacity utilization, is in the

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[5]For a recent discussion of mean-reverting tendencies in interest rates as an explanation of the forecast power in long-term forward rates see Fama and Robert Bliss (1987).

denominator of all these variables to take care of the fact that they grow over time with the economy in a way that interest rates and liquidity premia do not. Capacity seemed to be the right thing to take care of this, since it is a measure of the value of the assets of business which does not suffer from the excess variability of capital market valuations or from the problems in valuing capital raised in the Cambridge capital controversy, as it is defined in terms of how much output it can create. True, there may be problems with the Fed's measurements, but there are hopefully of small order, and the variable is certainly easy to generate with available data. The price deflator used is the GNP deflator.

The next set of variables are those which measure the burden of outstanding debt to business. The measures of this burden which we constructed are the ratio of net interest to cash flow (BURD), the ratio of net interest to profits (GJAT), the outstanding stock of debt, which we created by dividing net interest by an interest rate, divided by capacity (DEBTZ), and real current liabilities of business failures divided by capacity (FAILZ).[6]

Finally, variables which we thought would capture overall business risk and profitability conditions are the default risk

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[6]Because the failure rate is so high for new businesses, it has been argued that current liabilities of business failures mainly reflects the number of start-ups rather than the overall troubles of business. On the other hand, Friedman (1986, p. 46) notes that this statistic (scaled in relation to gross national product in his study) tends to bulge around and just after business cycle troughs.

premium given by the difference between Moody's BAA and AAA corporate rates (DRP), suggested by Alan Blinder in the comments on Mankiw and Summers (1984, p. 246), and a dummy variable, CONTRQ, which took on the value of one in every quarter from business cycle peak through trough and zero in every quarter from trough through peak.

The danger in using so many variables as possible proxies for business difficulties of course is that the estimation can easily become an exercise in data mining. Mankiw (1986, p. 75) points out that in attempts to explain the liquidity premium or excess holding period yields, enough attempts will eventually succeed in finding something that works, and so the t-statistics should be discounted by the number of unsuccessful attempts. One obviously wants to limit one's choices of variables in accordance with the theory being explored. We feel we have been careful to do that, but even so there are a number of candidate variables we can use. Rather than just to take a few, and perhaps then to be capriciously lucky or unlucky, we felt it was best to take more and then demand robustness across them in the trials.

Our method of estimation then proceeded as follows. For the traditional equations (1) and (2) of course the residuals from each equation were the dependent variables. First, we regressed each set of residuals against a constant and the profitability, debt burden, and general business risk variables one at a time. Then, we regressed each set of residuals against a constant and every combination of a profitability and debt burden variable, on the grounds that there could well be separate influences from both profitability and debt burden concerns that would call for such a multiple regression.

The next step was to add to the right hand side of each of these two regressions various other sets of variables representing other possible influences on the term structure that might either have effects that our hypothesized variables are mistakenly picking up or add information necessary to reveal the significance of our variables. Our first such set included PIPQ, the percentage change in industrial production, as a measure of information about the stage of the business cycle, PSMCQ, the change in sensitive materials prices, to signal inflationary warnings[7], and INFLA, the percentage change in the GNP deflator, to give of course the actual rate of inflation. The second set was only one of two variables, MSTD8S, an eight-quarter moving standard deviation of the short-term rate, or MSTD8L, an eight-quarter moving standard deviation of the long-term rate. These are ad hoc measures of interest-rate volatility used heretofore in the literature. (See, e.g., Shiller, Campbell, and Schoenholtz, 1983, p. 199.) The third set was either the long-rate (FYGL2Q--the quarterly unweighted average of all Treasury bonds neither due nor callable in less than ten years) or the short-rate (FYGN3Q--the quarterly average of the discount rate on new issues of three-month Treasury bills) itself, as a test of

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[7]This variable is also used sometimes as a leading indicator for the cycle.

the significance of the height of interest rates. This test was especially important for us because of Friedman's (1979) finding that the success of economic variables in his regressions on term premia on six-month T-bills derived from expectations surveys was completely explained away by the cyclical movement in the height of interest rates.

For equation (3) we ran essentially the same regressions except that the excess holding period yield ($H_t - r_t$) was the dependent variable and SPREAD (= $R_t - r_t$) was always on the right hand side for reasons given above. Thus we are just substituting our variables for RISK in the equation. H_t, the holding-period return, is given, following Mankiw and others, by a linearized expression, $R_t - 100(R_{t+1} - R_t)/\rho$, where ρ is a constant equaling the average long-term rate.

The interest rates used for long and short rates respectively are FYGL2Q and FYGN3Q explained above. All of our data comes from the Citibase tape. Since some of our series are only available on a quarterly basis, we were forced to use or derive quarterly observations throughout. Our data covers the period from the first quarter of 1950 to the fourth quarter of 1986. Though some regressions had to miss observations on either end of the sample due to generating lags and leads, no regression covered a smaller range than 1953:3 to 1986:1.

Results

The results from the "traditional" specifications were disappointing. None of our variables were significant when the residuals from equation (1) or equation (2) was regressed on each plus a constant. In the multiple regressions combining the profitability and debt burden variables some of the profitability variables were significant with the right sign but as many of the debt burden variables were significant with the wrong sign in enough of the same equations that we don't see much support for our hypothesis there. Some of the profitability and debt burden variables are highly (negatively) correlated with each other, and many of them are also highly correlated with both the standard deviations of interest rates and the level of interest rates, which we are using as checks on the significance of the explanatory power of our hypothesis. Thus we don't feel that the slight success we get with some of the profitability variables in some of the multiple regressions is worth reporting.

Given the criticisms that have been leveled against the method of expectations formation in those specifications, this may not be too troubling. Equation (3) is more consistent with economic theory, at least since the rational expectations revolution, yet its underlying motivation--that agents do not make systematic errors, or that the market is not systematically wrong, and so extra return over time can only be a compensation for extra risk--has its own problems, which we touch on below.

In any event, the results from the estimations of equation (3), at least with the debt burden variables substituting for RISK in the equation, are quite favorable for our hypothesis. GJAT and FAILZ are always significantly different from zero with the right sign (a positive sign, since they should increase the risk of lending long-term according to our argument), and BURD is often significant with the right sign. DEBTZ is never significant, but one might argue that the other three variables are better measures of the burden of debt, since they relate directly to the ability to cover current debt payments.

The favorable results for GJAT and FAILZ (which are reported in the Appendix, along with the results for BURD) obtain no matter which of the other variables (profitability, cycle stage and inflation, volatility, or level of interest rates) are included with them in a regression. Some of these other variables are also sometimes significant, though there seem to be some oddities in some of their signs. For example, the volatility variables (MSTD8S and MSTD8L) sometimes are significant with negative signs, indicating volatility to be compensated by a lower excess holding period yield on long-term securities. PSMCQ, the change in sensitive materials prices is also sometimes significant with a negative sign. If PSMCQ is taken as an inflation warning signal, this would be odd. If, however, it serves more as an indicator of an increase in business activity, the negative sign would be correct. The long- and short-term interest rates, when significant, switch signs. They have negative coefficients when they are significant and neither volatility variable is in the regression and positive when otherwise significant. Since they are highly correlated with the volatility variables, this switch is perhaps not surprising.

The profitability variables are never significant unless there is also a debt burden variable in the regression. Even then, the profitability variables are rarely significant. In the few trials in which one of them is significant, it usually has the wrong sign. In fact, the only profitability variable which is ever significant with the right sign (negative, since higher profitability should decrease the risk of long-term lending on our argument) is GCFZ in some of the regressions with FAILZ.

Conclusions

We conclude then that, to the extent that excess holding period yields on long-term securities can be said to be compensation for the risk of lending long-term, our conjecture that levels of profitability and debt burden of firms affect such risk is borne out by the data, at least insofar as the debt burden part of the hypothesis is concerned. Even on default-risk-free U.S. government securities liquidity preference, or movement towards the shorter end of the market, is exhibited when debt burdens rise in the aggregate.

In terms of Keynes's ideas about liquidity preference responding to movements of the marginal efficiency of capital schedule we have not found a general version of such a response but only a somewhat more specific response to debt burden ratios. This would support an interpreter of Keynes such as Hyman Minsky (1975, 1977), who would reinterpret Keynes to place more emphasis on the systematic build up of "financial fragility" in expansions which sows the seeds for subsequent downturns. The results of our estimations seem to be telling us that such increases in debt burdens elicit a reaction in the bond market which raises the required yield on long-term lending. This would also impede the ability of monetary policy to ameliorate the situation, since the central bank can increase the availability of funds but may not be able to get those funds into the long-term end of the market, which is presumably the important area to influence business investment spending.[8]

Of course we have only explained at best 28 per cent of the variance in excess holding period yields. The idea that there is a lot else going on in financial markets would not be strange to Keynes. But once we open ourselves to the idea that financial markets may not be very efficient with respect to information, we also raise the question of why our results should be believable.[9] We claim that the bond market rationally anticipates our measures of debt burden, but we know that it does not rationally anticipate inflation (See, e.g., Summers, 1983.), and our results support this. In defense of our results, it may be that debt burdens and their effects on bonds are much easier to observe or infer than inflation and its effects.

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[8]This was the major problem Keynes was concerned with in his discussion surrounding the idea of a "liquidity trap." See Keynes (1964 [1936], pp. 205-208).

[9]For evidence questioning the efficiency of financial markets see a number of papers by Shiller, summarized very nicely in Shiller (1986). Fama (1984) also notes how hard it is to infer much about term premia on bonds due to the high variability of their returns.

Finally, we should note that our concerns about the relation between profitability, broadly defined, and interest rates really have to do of course with corporate borrowing. There the pertinent interest rates are corporate rates. A study of time-varying liquidity preference in the Treasury yield curve is relevant to this concern and interesting in its own right. It really represents taking the strongest case, where it is least likely that the phenomenon will be observed, to test the hypothesis that profitability concerns affect default-risk-free government securities. The logical extension then is to look for a response of liquidity preference to changes in profitability in corporate interest rates. The cyclical behavior of default risk, as measured for example by the spread between the BAA and AAA rate, has been studied. (See, e.g., Dwight Jaffee, 1975.) Since economic troubles may likely cause defaults on short-term debt before long-term, there may be little cyclical movement from long- to short-dated corporate securities in response to bad economic conditions.[10] Therefore, particularly if one is concerned with the issue of the transmission of monetary policy, an interesting idea might be to take a Treasury bill rate, which presumably the Fed can control,

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[10] Fama (1986) finds that expected default premia across private securities in the short end of the market actually decline with maturity and increase in recessions more on shorter-term securities. Thus on average he finds no term premium on his sample of private securities. A discussion of earlier studies of the relationship between the risk structure and the term structure of interest rates which explains this sort of phenomenon and extends the analysis of the issues involved appears in Van Horne (1978, pp. 164-172.)

as the short rate and alternately the corporate AAA and BAA rate as the long rate in a study of the effect of profitability on liquidity preference like this one.[11]

[11]Robert Engle, David Lilien, and Russell Robins (1987) attempt to explain the time-varying liquidity premium on both the Treasury yield curve and AAA bonds relative to the T-bill rate using the ARCH-M model, which allows the conditional variance to be a determinant of the expectation of excess holding period yields. It would be interesting to see if our debt burden variables could outperform this ARCH-generated conditional variance.

APPENDIX

C	SPREAD	FAILZ	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-4.34	1.54	0.69								.24	1.79
(-4.54)	(2.79)	(3.62)									
-2.87	1.57	0.61	-0.27	-0.83	-0.62					.26	1.96
(-1.98)	(2.54)	(3.11)	(-1.01)	(-1.23)	(-0.72)						
-3.23	1.24	0.80				-1.54				.25	1.81
(-2.69)	(2.13)	(3.94)				(-1.53)					
-3.76	1.12	0.92					-3.29			.26	1.86
(-3.74)	(1.88)	(4.01)					(-1.77)				
-2.94	1.20	0.92						-0.35		.25	1.82
(-2.18)	(2.01)	(3.75)						(-1.47)			
-2.94	0.84	0.92							-0.35	.25	1.84
(-2.18)	(1.16)	(3.75)							(-1.45)		
-2.60	1.46	0.69	-0.29	-0.69	-0.15	-1.23				.26	1.96
(-1.77)	(2.33)	(3.28)	(-1.11)	(-1.06)	(-0.16)	(-1.07)					
-3.05	1.34	0.83	-0.29	-0.83	0.02		-3.34			.27	2.01
(-2.11)	(2.14)	(3.52)	(-1.11)	(-1.30)	(0.02)		(-1.64)				
-2.48	1.46	0.83	-0.30	-0.76	0.18			-0.35		.26	2.00
(-1.66)	(2.35)	(3.02)	(-1.11)	(-1.17)	(0.16)			(-1.12)			
-2.48	1.11	0.83	-0.30	-0.76	0.18				-0.35	.26	2.00
(-1.66)	(1.50)	(3.02)	(-1.11)	(-1.17)	(0.16)				(-1.12)		
-2.93	1.18	0.88				-0.99		-0.18		.25	1.83
(-2.16)	(1.97)	(3.44)				(-0.64)		(-0.48)			
-2.93	1.01	0.88				-0.99			-0.18	.25	1.83
(-2.16)	(1.31)	(3.44)				(-0.64)			(-0.48)		
-3.70	1.12	0.93					-3.17	-0.02		.25	1.84
(-2.37)	(1.86)	(3.79)					(-0.98)	(-0.05)			
-3.70	1.10	0.93					-3.17		-0.02	.25	1.84
(-2.37)	(1.42)	(3.79)					(-0.98)		(-0.05)		
-2.47	1.44	0.80	-0.30	-0.71	0.16	-0.67		-0.23		.25	1.99
(-1.65)	(2.30)	(2.85)	(-1.13)	(-1.08)	(0.14)	(-0.43)		(-0.55)			
-2.47	1.21	0.80	-0.30	-0.71	0.16	-0.67			-0.23	.25	1.99
(-1.65)	(1.56)	(2.85)	(-1.13)	(-1.08)	(0.14)	(-0.43)			(-0.55)		

C	SPREAD	FAILZ	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-3.27	1.33	0.79	-0.29	-0.86	-0.18		-4.13	0.15		.26	2.00
(-2.02)	(2.12)	(2.90)	(-1.07)	(-1.33)	(-0.16)		(-1.23)	(0.30)			
-3.27	1.49	0.79	-0.29	-0.86	-0.18		-4.13		0.15	.26	2.00
(-2.02)	(1.87)	(2.90)	(-1.07)	(-1.33)	(-0.16)		(-1.23)		(0.30)		

C	SPREAD	GJAT	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-3.84	2.32	6.41								.21	1.77
(-3.71)	(4.71)	(2.56)									
-1.79	1.86	7.97	-0.12	-1.17	-1.67					.25	2.00
(-1.32)	(3.12)	(2.76)	(-0.45)	(-1.85)	(-1.67)						
-2.19	1.59	14.4				-4.24				.26	1.87
(-1.93)	(2.98)	(4.05)				(-3.08)					
-3.64	1.77	15.4					-6.98			.24	1.88
(-3.59)	(3.37)	(3.66)					(-2.63)				
-1.07	1.79	18.3						-1.04		.24	1.95
(-0.72)	(3.40)	(3.47)						(-2.55)			
-1.07	0.75	18.3							-1.04	.24	1.95
(-0.72)	(0.96)	(3.47)							(-2.55)		
-0.97	1.38	13.8	-0.09	-0.90	-1.32	-3.26				.27	2.03
(-0.70)	(2.24)	(3.61)	(-0.35)	(-1.42)	(-1.33)	(-2.28)					
-1.68	1.23	17.7	0.00	-1.39	-1.68		-7.42			.28	2.16
(-1.27)	(2.00)	(3.98)	(0.00)	(-2.24)	(-1.73)		(-2.83)				
-0.23	1.59	16.8	-0.03	-1.24	-1.07			-0.82		.26	2.13
(-0.15)	(2.66)	(3.10)	(-0.10)	(-1.98)	(-1.03)			(-1.92)			
-0.23	0.77	16.8	-0.03	-1.24	-1.07				-0.82	.26	2.13
(-0.15)	(0.95)	(3.10)	(-0.10)	(-1.98)	(-1.03)				(-1.92)		
-0.75	1.40	20.4				-3.38		-0.66		.26	1.97
(-0.51)	(2.56)	(3.87)				(-2.29)		(-1.53)			
-0.75	0.73	20.4				-3.38			-0.66	.26	1.97
(-0.51)	(0.95)	(3.87)				(-2.29)			(-1.53)		
-2.04	1.64	19.5					-4.58	-0.62		.25	1.95
(-1.25)	(3.07)	(3.65)					(-1.39)	(-1.24)			
-2.04	1.02	19.5					-4.58		-0.62	.25	1.95
(-1.25)	(1.27)	(3.65)					(-1.39)		(-1.24)		
-0.08	1.30	18.6	-0.03	-1.00	-0.98	-2.62		-0.56		.27	2.11
(-0.05)	(2.11)	(3.40)	(-0.13)	(-1.57)	(-0.95)	(-1.72)		(-1.22)			

C	SPREAD	GJAT	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-0.08	0.75	18.6	-0.03	-1.00	-0.98	-2.62			-0.56	.27	2.11
(-0.05)	(0.93)	(3.40)	(-0.13)	(-1.57)	(-0.95)	(-1.72)			(-1.22)		
-1.42	1.23	18.5	0.01	-1.39	-1.57		-6.88	-0.14		.28	2.17
(-0.86)	(2.00)	(3.42)	(0.03)	(-2.23)	(-1.50)		(-2.06)	(-0.26)			
-1.42	1.09	18.5	0.01	-1.39	-1.57		-6.88		-0.14	.28	2.17
(-0.86)	(1.34)	(3.42)	(0.03)	(-2.23)	(-1.50)		(-2.06)		(-0.26)		

C	SPREAD	BURD	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-3.82	2.59	1427								.18	1.73
(-2.68)	(5.34)	(1.58)									
-2.42	2.19	2255	-0.15	-1.26	-1.65					.23	1.97
(-1.58)	(3.84)	(1.97)	(-0.52)	(-1.98)	(-1.48)						
-3.69	2.33	3340				-2.84				.20	1.77
(-2.62)	(4.66)	(2.54)				(-1.98)					
-4.23	2.53	2496					-2.49			.18	1.75
(-2.85)	(5.17)	(1.78)					(-0.99)				
-3.64	2.58	2925						-0.36		.18	1.77
(-2.51)	(5.30)	(1.40)						(-0.79)			
-3.64	2.21	2925							-0.36	.18	1.77
(-2.51)	(3.27)	(1.40)							(-0.79)		
-2.41	1.99	3711	-0.12	-1.13	-1.65	-2.13				.23	1.98
(-1.59)	(3.40)	(2.46)	(-0.42)	(-1.75)	(-1.48)	(-1.48)					
-3.01	2.02	4091	-0.07	-1.43	-1.90		-3.82			.23	2.03
(-1.92)	(3.48)	(2.47)	(-0.26)	(-2.22)	(-1.70)		(-1.53)				
-2.31	2.17	3700	-0.09	-1.32	-1.64			-0.34		.22	2.01
(-1.50)	(3.79)	(1.64)	(-0.33)	(-2.06)	(-1.47)			(-0.74)			
-2.31	1.83	3700	-0.09	-1.32	-1.64				-0.34	.22	2.01
(-1.50)	(2.43)	(1.64)	(-0.33)	(-2.06)	(-1.47)				(-0.74)		
-3.67	2.33	3511				-2.79		-0.05		.22	1.77
(-2.56)	(4.64)	(1.67)				(-1.81)		(-0.10)			
-3.67	2.29	3511				-2.79			-0.05	.22	1.77
(-2.56)	(3.38)	(1.67)				(-1.81)			(-0.10)		
-4.12	2.54	2747					-2.12	-0.10		.18	1.76
(-2.50)	(5.15)	(1.29)					(-0.62)	(-0.16)			
-4.12	2.44	2747					-2.12		-0.10	.18	1.76
(-2.50)	(3.17)	(1.29)					(-0.62)		(-0.16)		

C	SPREAD	BURD	PIPQ	PSMCQ	INFLA	MSTD8S	MSTD8L	FYGL2Q	FYGN3Q	$\bar{R}^2$	D.W.
-2.38	1.99	4096	-0.10	-1.16	-1.65	-2.00		-0.11		.23	2.00
(-1.55)	(3.39)	(1.80)	(-0.35)	(-1.76)	(-1.48)	(-1.29)		(-0.23)			
-2.38	1.88	4096	-0.10	-1.16	-1.65	-2.00			-0.11	.23	2.00
(-1.55)	(2.50)	(1.80)	(-0.35)	(-1.76)	(-1.48)	(-1.29)			(-0.23)		
-3.23	1.99	3484	-0.09	-1.42	-1.97		-4.75	0.25		.23	2.02
(-1.94)	(3.40)	(1.55)	(-0.33)	(-2.20)	(-1.73)		(-1.39)	(0.40)			
-3.23	2.24	3484	-0.09	-1.42	-1.97		-4.75		0.25	.23	2.02
(-1.94)	(2.78)	(1.55)	(-0.33)	(-2.20)	(-1.73)		(-1.39)		(0.40)		

The dependent variable is $H_t - r_t$. The numbers in parenthesis are t-statistics.

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