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THE CHANGING BEHAVIOR OF THE TERM STRUCTURE OF INTEREST RATES*

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We reexamine the expectations theory of the term structure using data at the short end of the maturity spectrum. We find that prior to the founding of the Federal Reserve System in 1915, the spread between long rates and short rates has substantial predictive power for the path of interest rates; after 1915, however, the spread contains much less predictive power. We then show that the short rate is approximately a random walk after the founding of the Fed but not before. This latter fact, coupled with even slight variation in the term premium, can explain the observed change in 1915 in the performance of the expectations theory. We suggest that the random walk character of the short rate may be attributable to the Federal Reserve's commitment to stabilizing interest rates.

I. INTRODUCTION

The most prevalent explanation of fluctuations in the yield curve is the expectations theory, which posits that the slope of the yield curve reflects the market expectation of the future change in interest rates. Numerous studies, however, present evidence that the data are inconsistent with the joint hypothesis of the expectations theory and rational expectations.[1] Indeed, the rejections of the expectations theory date back at least to Macaulay [1938, p. 33], who pointed out the implications of the theory but concluded that "experience is more nearly the opposite."

Perhaps the most striking rejections use data at only the short end of the maturity spectrum. Recently, Fama [1984]; Jones and

1. See, for example, Kessel [1965] and Shiller [1979]. Flavin's [1983] recent work casts doubt on some of these rejections.

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Roley [1983]; Mankiw and Summers [1984]; and Shiller, Campbell, and Schoenholtz [1983] all conclude that yields on Treasury bills of less than one year do not obey the expectations theory. While stories of highly variable risk premiums, changing asset supplies, or segmented markets might explain the failure of very long-term yields to behave according to the theory, such stories seem less plausible applied to the markets for three-month and six-month bills.[2]

Although the number of studies rejecting the theory is large, the results of these studies are not independent. Indeed, they examine almost identical periods of history, primarily the 1960s and 1970s, the period during which an active market in three-month and six-month Treasury bills existed. It is reassuring that these studies reach the same conclusion, but confirmation requires examination of truly independent data.

In this paper we examine the term structure of interest rates at the short end of the maturity spectrum for the period from 1890 to 1979. We divide our sample into different monetary "regimes" to examine whether the failure of the expectations theory is robust. Our goal is to identify the conditions under which the expectations theory works badly and the conditions, if any, under which it works well.

In Section II we briefly review the expectations theory. The theory posits that there are no expected profit opportunities. It implies that the spread between the long rate and the short rate predicts the path of the short rate.

We discuss the data in Section III. Prior to the founding of the Federal Reserve System, the National Monetary Commission in 1910 collected extensive data on interest rates and banking. We have extended the data on three-month and six-month time rates through 1958.[3] This data set provides an opportunity both to reexamine findings based on more recent data and to expand our understanding of the earlier historical period. We argue that it provides a good data set with which to examine the expectations theory.

In Section IV we present tests of the expectations theory both

2. For discussions of changing risk premiums and the term structure, see Bodie, Kane, and McDonald [1983]; and Campbell and Shiller [1984]. Friedman [1977] discusses the role of relative asset supplies in determining the slope of the yield curve.

3. Mankiw and Miron [1985] contains a data appendix.

with the older data and with Treasury bill data from the 1960s and 1970s. The results are surprising. While we confirm the failure of the expectations theory using recent data, we find that the expectations theory works much better during some previous monetary regimes. In particular, for data prior to the founding of the Federal Reserve, the slope of the yield curve has substantial predictive power for the path of the short rate.

In Sections V and VI we propose an explanation for the difference in the performance of the expectations theory in the different periods. If the term premium varies through time, then the expectations theory will be rejected using the standard test. The extent of the failure, however, depends on the variance of predicted changes in the short rate. We argue that the relative success of the theory with the data from before the founding of the Fed is attributable to the greater predictable changes in the short rate.

In Section VII we discuss the role of the Federal Reserve and its relation to the performance of the expectations theory. With the creation and increased activism of the Fed, changes in the short rate became less predictable, and the expectations theory performed more poorly. We speculate that the failure of the expectations theory using post-Fed data may be due to the Federal Reserve's commitment to stabilizing interest rates.

We conclude in Section VIII by discussing the implications of our results for the expectations theory of the term structure under recent monetary and fiscal regimes.

II. The Expectations Theory of the Term Structure

In this section we briefly review the expectations theory for one-period and two-period bills. Let r_t be the yield on a one-period bill, and let R_t be the yield on a two-period bill. The expectations theory posits that

$$R_t = \theta + \tfrac{1}{2}(r_t + E_t r_{t+1}), \tag{1}$$

where E_t denotes the expectation formed at time t. The current two-period yield is an average of the current one-period yield and the expected one-period yield, plus a constant term premium θ. The return from investing in a two-period bill equals, up to a constant, the expected return from investing sequentially in two one-period bills.[4]

Equation (1) is easily rewritten as

$$(E_t r_{t+1} - r_t) = -2\,\theta + 2\,(R_t - r_t). \tag{2}$$

The theory relates the expected change in the short rate $(E_t r_{t+1} - r_t)$ to the slope of the yield curve $(R_t - r_t)$. In other words, the spread between the long rate and the short rate reflects the market's forecast of the path the short rate will follow. The test of the theory entails examining whether this forecast is a rational one; that is, whether the market's expectation is correct on average. More formally, we write the realized future short rate as the sum of the expectation and a forecast error:

$$r_{t+1} = E_t r_{t+1} + \nu_{t+1}, \tag{3}$$

where ν_{t+1} is orthogonal to information available at time t. Equation (2) becomes

$$(r_{t+1} - r_t) = \alpha + \beta\,(R_t - r_t) + \nu_{t+1}, \tag{4}$$

where, according to the theory, $\alpha = -2\,\theta$ and $\beta = 2$. Under the null hypothesis, the error term in equation (4) is orthogonal to the right-hand side variables; ordinary least squares therefore produces consistent estimates of the coefficients.

III. Data

We apply the test in the previous section to data from several monetary regimes. Our first data set is on three-month and six-month Treasury bill yields during the first week of the quarter from 1959:1 to 1979:2. As we note above, much research analyzes these data; we present results for this period as a contrast to our results using data from 1890 to 1958. We end this first sample in 1979 because the behavior of interest rates appears substantially different since the Fed's announced change in operating procedure in October 1979. In the last section, however, we return to discuss the implications of our results for this alternative monetary regime.

4. We discuss this linearized version of the expectations theory. For a discussion of the linearization, see Shiller, Campbell, and Schoenholtz [1983]. Note that we can equivalently write equation (1) as stating that the expected one-period holding return on a two-period bill, $2R_t - E_t r_{t+1}$, equals the one-period yield r_t plus a constant.

Our other data are on the time rates available at New York banks from 1890 to 1958. In 1910 the National Monetary Commission compiled these data from 1890 to 1909 by tabulating them from the *Financial Review,* a periodical that analyzed current financial market developments. We updated this series to 1958 using the *Review* and the *Commercial and Financial Chronicle,* which took over the *Review* in 1921.[5] In this paper we examine the yields on three-month and six-month time loans during the first week of the quarter.[6]

We divide the period from 1890 to 1958 into four regimes. The first regime is from 1890:4 to 1914:4, which ends at the founding of the Federal Reserve System. The second regime is from 1915:1 to 1933:4. This second regime ends at the introduction of the New Deal banking reforms, which is also the approximate end of the classical gold standard and the approximate beginning of interest rate pegging. The third regime is from 1934:1 to 1951:1, which ends at the Accord, the agreement between the Fed and the Treasury Department that the Fed would no longer peg interest rates. The fourth regime is from 1951:2 to 1958:4, ending at the time when an active market in both three-month and six-month Treasury bills begins.[7]

These time rates are the interest rates banks charged for loans of fixed maturity. We believe these rates represent the equilibrium of a competitive and large credit market, even at the beginning of our sample. First, New York was the major financial center of this time, when there were between 10,000 and 20,000 commercial banks nationwide.[8] Second, these short-term loans were a primary loan instrument at the time. James [1978, p. 61] reports that at the turn of the century most loans in bank portfolios were short-term; maturities of greater than six months were rare. He also reports [p. 64] that loans of fixed maturity were more common in New York than loans without a definite payment period (demand loans). Thus, we are studying in this paper the interest rates on a primary form of credit during this period.

5. The rates are reported as a range, which is typically 12 to 25 basis points in size. We use the midpoint of the range.

6. We have also estimated the equations using monthly data, correcting the standard errors for the implied MA(2) residual. The results are almost identical to those reported here. (While using monthly data appears to triple the number of observations, the new data are clearly not independent of the quarterly data. The increase in efficiency may therefore be small.)

7. Further division into finer subsamples does not qualitatively affect the results.

8. See James [1978, p. 25].

The expectations theory as represented in equation (1) is essentially an expected arbitrage condition. It states that, up to a constant, the expected cost of rolling over one-period bills equals the expected cost of rolling over two-period bills. This calculation is exactly the sort that we would expect agents obtaining these time loans to make. Moulton [1918] claims that at least 40 to 50 percent of unsecured loans in major cities were renewed at maturity [p. 707]; more than 20 percent were used to finance fixed capital investments [p. 648]. Presumably, these debtors would decide whether to roll over short-term or longer term loans on the basis of expected cost—precisely the calculation underlying the expectations theory of the term structure. It thus appears a priori that the expectations theory would be a good model for these time loan rates.

IV. The Predictive Power of the Spread

We begin by estimating equation (4) for the data from the 1960s and 1970s. The first column in Table I presents the result, which is similar to that in other studies. We find a coefficient on the spread that, although positive, is insignificantly different from zero. Moreover, the coefficient is significantly different from the theoretically predicted value of two; we can reject the null hypothesis that it equals two at the 1 percent level. The adjusted R-squared of 0.01 indicates that the spread has negligible predictive power. Contrary to the expectations theory, the slope of the yield curve appears to contain no information about the path the short rate will follow.[9]

We next go back in time through the various regimes and perform the same test. Table I contains the results. For the subsamples from 1915 to 1958, we obtain results surprisingly similar to that for the recent sample. The coefficient on the spread is always significantly different from two and usually not significantly different from zero. The adjusted R-squared is always small. Thus, the slope of the yield curve appears to exhibit no predictive power at any time since 1915.

For the period from 1890 to 1914, however, we obtain very different results. While the coefficient on the spread is still significantly different from two, it is three times as large as the one

9. This conclusion holds not only for Treasury bill data, but for all short rate series we have examined for this period.

TABLE I

THE PREDICTIVE POWER OF THE SPREAD

	Dependent variable: $r_{t+1} - r_t$				
Period	1959–1979[a]	1951–1958	1934–1951	1915–1933	1890–1914
Constant	−0.03	0.08	0.13	−0.11	−0.57
	(0.12)[b]	(0.05)	(0.05)	(0.11)	(0.14)
$R_t - r_t$	0.46	−0.66	−0.50	0.83	1.51
	(0.37)	(0.71)	(0.22)	(0.45)	(0.18)
$\bar{R}^2$	0.01	0.00	0.06	0.03	0.40
D.W.	1.78	1.73	1.77	1.88	2.08
s.e.	0.67	0.25	0.14	0.84	1.18

a. The results for 1959–1979 use Treasury bill data; all other periods use time loan data.
b. Standard errors are in parentheses.

we obtain with data from the 1960s and 1970s and almost twice as large as that from the period immediately after 1914. The adjusted R-squared of 0.40 is an order of magnitude larger than any obtained with more recent data. Although data from this period do not fully confirm the expectations theory, the slope of the yield curve does contain substantial information on the path of the short rate.

The various data sets suggest different conclusions. Confirming many previous studies, we find that recent data provide no support for the expectations theory. A similar conclusion applies to the period from 1915 to 1958. Data from 1890 to 1914, however, suggest that expectations are an important determinant of fluctuations in the yield curve. Our next task is to explain this difference.

Before turning to the explanation that appears successful, however, we briefly discuss two possible explanations that are not consistent with the data:

1. As Miron [1984] discusses, interest rates exhibit a seasonal pattern prior to the founding of the Fed but essentially no seasonal pattern starting in 1915. One might suspect that the high coefficient for the early period is solely due to the seasonal pattern. We test this hypothesis by examining the nonseasonal variation in interest rates, a task accomplished by adding seasonal dummies to the equation. Inclusion of seasonal dummies has little effect on the estimated coefficient on the spread, implying that the relative success of the expectations theory is not wholly attributable to seasonal variation.

2. Another possibility is that the relative success of the expectations theory is due to the fact that there were major financial panics in 1890, 1893, and 1907. One might argue that since the short rate was only temporarily high, market participants should perceive this and make the expectations theory work especially well. Separating the data into a subsample including the panics and a subsample excluding them, however, does not show any systematic difference in the performance of the expectations theory.

V. The Role of Predictability

The essence of the expectations theory is that the spread reflects expected changes in the short rate. It might appear that a prerequisite for testing the theory is that interest rates be expected to change at some point during the sample. Further, one might think that the absence of expected changes can explain a rejection of the theory. This is not exactly true, however. If the expected future short rate always equaled the current short rate, then equation (1) would imply that the spread is constant. If the spread were constant, the standard errors of the coefficients in (4) would be infinite. Hence, the absence of predictability alone cannot explain any statistically significant rejection of the theory.

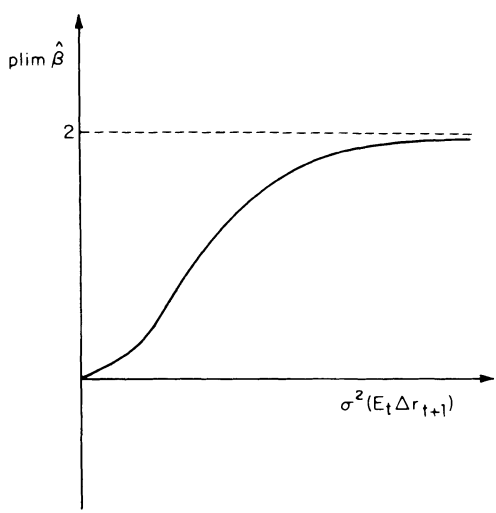

FIGURE I
Coefficient as a Function of the Variance of Expected Changes $\rho \geqslant 0$

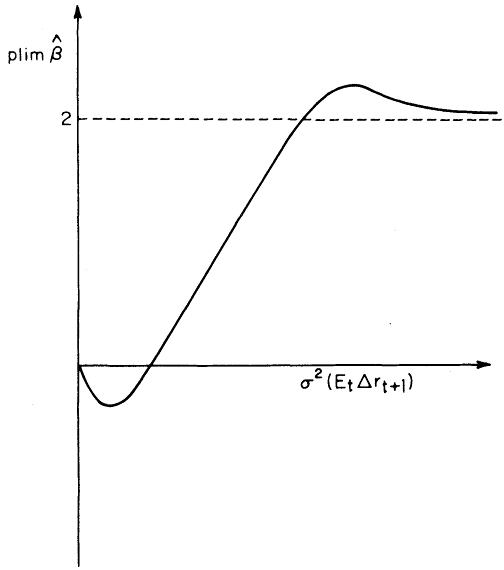

FIGURE II
Coefficient as a Function of the Variance of Expected Changes $\rho < 0$

Suppose, however, that the term premium θ changed somewhat through time. In this case, if changes in the short rate were unpredictable, the spread would always equal the term premium θ_t. Estimation of equation (4) would yield an estimate of β of zero; with sufficient data the hypothesis that β equals two would be rejected. Hence, the absence of predictability together with even slight variation in the term premium can in principle explain an observed rejection.

As in Mankiw and Summers [1984], we can show formally how variation in the term premium can bias downward the coefficient on the spread in equation (4). If the correlation between θ_t and $E_t\Delta r_{t+1}$ is ρ, then the estimate of β converges to

$$\frac{2\,\sigma^2(E_t\Delta r_{t+1}) + 4\,\rho\,\sigma(E_t\Delta r_{t+1})\,\sigma(\theta_t)}{\sigma^2(E_t\Delta r_{t+1}) + 4\,\sigma^2(\theta_t) + 4\,\rho\,\sigma(E_t\Delta r_{t+1})\,\sigma(\theta_t)},$$

where $\sigma^2(x)$ denotes the variance and $\sigma(x)$ denotes the standard deviation. If the short rate is not at all predictable ($\sigma(E_t\Delta r_{t+1}) = 0$), then the coefficient is zero. Moreover, as the variance of expected changes in the short rate approaches infinity, the coefficient approaches two, the value predicted by the expectations theory. Only if ρ is greater than or equal to zero, however, is the coefficient a monotonic function of the variance of expected changes, as in Figure I. If ρ is negative, the coefficient as a function of the predictability of the short rate has the shape in Figure II; it first falls from the origin, then rises above two, then falls again to asymptote at two.

VI. Evidence on Predictability

The previous section suggests a natural explanation of the different results for the various periods. In particular, it suggests that the high value for the coefficient obtained for the 1890 to 1914 sample may be attributable to a greater variance of predicted changes in the short rate at the turn of the century. To test this hypothesis, we examine a reduced-form forecasting equation. We regress the future change in the short rate on the current and lagged short rate and the current and lagged long rate. Table II presents the results.

Even with the more general forecasting equation, the short rate shows no predictable changes in any subsample since 1915. The adjusted R-squared never exceeds 0.05. Furthermore, the F-

TABLE II

Forecasting Equations

	Dependent variable: $r_{t+1} - r_t$				
Period	1959–1979[a]	1951–1958	1934–1951	1915–1933	1890–1914
Constant	0.33	0.40	0.16	0.38	0.16
	(0.26)[b]	(0.21)	(0.11)	(0.34)	(0.73)
r_t	−0.58	0.08	−0.05	−0.66	−1.40
	(0.40)	(0.90)	(0.60)	(0.48)	(0.20)
r_{t-1}	0.52	0.70	0.61	0.56	−0.26
	(0.40)	(0.78)	(0.57)	(0.48)	(0.20)
R_t	0.68	0.02	−0.14	0.73	1.22
	(0.40)	(0.89)	(0.50)	(0.51)	(0.27)
R_{t-1}	−0.68	−0.90	−0.44	−0.71	0.26
	(0.41)	(0.78)	(0.49)	(0.51)	(0.30)
$\bar{R}^2$	0.03	0.05	0.04	0.04	0.41
$D.W.$	1.95	2.04	1.56	2.11	1.92
$s.e.$	0.66	0.24	0.15	0.84	1.17
F-statistic	1.62	1.39	1.70	1.70	17.90
Significance level	0.82	0.74	0.84	0.84	0.99

a. The results for 1959–1979 use Treasury bill data; all other periods use time loan data.
b. Standard errors are in parentheses.

statistic for the null hypothesis that all the coefficients, except the constant, are zero is never significant at even the 10 percent level using the conventional critical value.[10] This forecasting equation suggests that the short rate is a martingale. In other words, the best forecast of the future short rate during the recent samples may have been the current short rate.

As one would expect from Table I, the short rate is substantially more predictable in the 1890 to 1914 sample. The adjusted R-squared of the forecasting equation is 0.41; the F-statistic is significant at the 1 percent level using the conventional critical value. It appears that market participants at the turn of the century would not have always expected the short rate to remain at its current level.

The top panel of Table III presents a rough attempt to measure the extent of predicted changes in the short rate. The top row gives the variance of the change. It shows that the short rate was most volatile at the turn of the century. The second row gives the variance of the innovation of the forecasting equation in Table II. The third row of Table III gives the difference of these first two variances, which is a measure of the variance in predicted changes.[11] It indicates that the variance of predicted changes in the short rate is substantially greater for the 1890 to 1914 data than for any of the other data sets. Moreover, the variance of

TABLE III

RELEVANT VARIANCES ACROSS REGIMES

Period	1959–1979	1951–1958	1934–1951	1915–1933	1890–1914
$\text{var}(\Delta r_t)$	0.4450	0.0628	0.0223	0.7292	2.3249
$\text{var}(\Delta r_t - E\Delta r_t)$	0.4316	0.0598	0.0214	0.7030	1.3760
$\text{var}(E\Delta r_t)$	0.0134	0.0030	0.0009	0.0262	0.9489
$\text{var}(R_t - r_t)$	0.0397	0.0040	0.0065	0.0459	0.4148
$\text{var}(R_t - \frac{1}{2}(r_t + r_{t+1}))$	0.1328	0.0230	0.0153	0.1900	0.4148
$\text{var}(\frac{1}{2}(r_{t+1} - Er_{t+1}))$	0.1079	0.0149	0.0053	0.1757	0.3440
$\text{var}(\theta_t)$	0.0249	0.0071	0.0100	0.0143	0.0708

10. Dickey and Fuller [1981] show that larger critical values are generally required to reject a unit root. Thus, the true significance level is likely even less than it appears in Table II.

11. The assumption of rational expectations implies that the covariance of the expectation and the forecast error is zero. Therefore, we know that $\text{var}(\Delta r_{t+1}) = \text{var}(E_t\, \Delta r_{t+1}) + \text{var}(\text{forecast error})$.

predicted changes is very small from 1934 to 1958, the period for which the coefficient on the spread in Table I is negative.

Figure III displays the estimated coefficient on the spread from Table I together with the estimated variance of expected changes from Table III. This figure vividly illustrates the high correlation across monetary regimes between predictability of the short rate and the relative success of the expectations theory.

We find further evidence on predictability in the spread between the long rate and the short rate. From equation (2), we see that, under the assumption that ρ is not too negative, greater predictable changes imply more movement in the spread. That is, the larger is the variance of $(E_t r_{t+1} - r_t)$, the larger is the variance of $(R_t - r_t)$. This test also confirms our proposed explanation. Comparing the middle panel in Table III with Table I shows that the variance of the spread moves closely with our estimated coefficient.

A simple univariate examination of the short rate also suggests that there were more predictable movements prior to 1915. Table IV presents regressions of the change in the short rate on the two lagged levels of the short rate. Only for the earliest regime

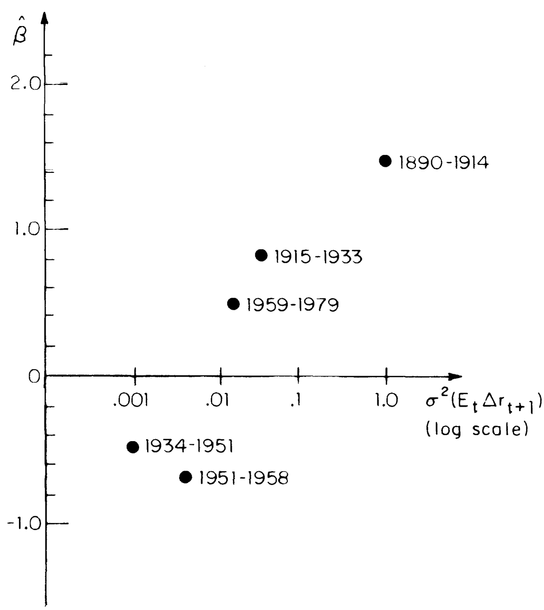

FIGURE III
Relation Between Coefficient and Variance of Expected Change across Regimes

do we obtain a significant coefficient. During the period from 1890 to 1914, when the short rate is above its mean by 100 basis points, one would expect a 57 basis point drop. That is, the short rate is mean-reverting. During any of the other regimes, lagged values of the short rate do not appear to provide significant information on future changes in the short rate.

While our analysis so far examines the variance of predicted changes in the short rate, it is also possible that the variance of the term premium varies across regimes. The bottom panel of Table III presents a rough attempt to measure var(θ_t). The top line gives the variance of the difference in holding return between the long-term instrument and the short-term instrument. This variance can be decomposed into a "news" variance and a term premium variance. As above, we measure the variance of unexpected interest rate changes using the variance of the innovation of our forecasting equation. The variance of the term premium is then the difference between these two variances. While it appears that the variance of the term premium is not constant, the variation is much smaller than the variation in the variance of predicted changes in the short rate. For example, across all five subsamples, var(θ_t) varies by a factor of ten, while var($E\Delta r_t$) varies by a factor of 1,000. The predictability of the short rate appears the major determinant of the success of the expectations theory.

Thus, the evidence from the various regimes appears consistent with our proposed explanation. The term premium varies somewhat through time. Since 1914 the short rate has been ap-

TABLE IV

UNIVARIATE FORECASTING EQUATIONS

	Dependent variable $r_{t+1} - r_t$				
Period	1959–1979[a]	1951–1958	1934–1951	1915–1933	1890–1914
Constant	0.35	0.32	0.14	0.37	2.60
	(0.23)[b]	(0.20)	(0.11)	(0.26)	(0.48)
r_t	0.06	0.10	−0.15	−0.01	−0.57
	(0.11)	(0.18)	(0.14)	(0.11)	(0.10)
r_{t-1}	−0.12	−0.19	0.05	−0.07	−0.06
	(0.12)	(0.17)	(0.14)	(0.11)	(0.10)
$\bar{R}^2$	0.00	0.04	0.00	0.01	0.28
D.W.	1.98	1.93	1.57	2.11	1.95
s.e.	0.67	0.25	0.15	0.85	1.29

a. The results for 1959–1979 use Treasury bill data; all other periods use time loan data.
b. Standard errors are in parentheses.

proximately a random walk; fluctuations in this term premium therefore have dominated fluctuations in the slope of the yield curve. During the period from 1890 to 1914, however, there were substantial predictable changes in the short rate; thus, expectations played a more important role in yield curve fluctuations.

VII. The Expectations Theory and the Federal Reserve

The failure of the expectations theory using recent data is a consequence of the random walk character of the short rate.[12] A similar conclusion holds for the period from 1915 to 1958. Our results with the turn of the century data suggest that if the short rate had, during recent experience, fluctuated in a more predictable fashion, the long rate would have moved accordingly. In their study of the expectations theory using recent data, Shiller, Campbell, and Schoenholtz [1983] conclude:

> The simple theory that the slope of the term structure can be used to forecast the direction of future changes in the interest rate seems worthless. *Of course, some version of the expectations theory ought to appear in the data if the Federal Reserve were to create a large and predictable pattern of short-term rates.* We merely claim that the theory is useless for interpreting the data provided by recent history and that forecasting interest rates using the slope of the term structure will only be successful if there is a break in the historical interest rate pattern. (Emphasis added.)

Our examination of data from 1890 to 1914, a very different monetary regime, supports this conjecture.

Our results on the predictability of the short rate suggest at least two questions: first, why was the short rate partly predictable from 1890 to 1914? And second, why was the short rate not at all predictable from 1915 to 1979?

That the short rate was partly predictable at the turn of the century is not surprising. James [1978, p. 142] documents that credit flows were highly seasonal; interest rates also exhibited a significant seasonal pattern. Moreover, during this period there was no lender of last resort that might stabilize interest rates in the face of financial panics or other temporary fluctuations in

12. We use the term "random walk" informally. The data actually suggest that the short rate is only a martingale: it appears that the variance of the innovation may be positively related to the level of the short rate. This property of the higher moments, however, is not important here.

credit demand. Thus, some changes in interest rates during this period were transitory, making their path somewhat predictable.

That the short rate became a random walk after the creation of the Federal Reserve and remained so throughout the period from 1915 to 1979 is probably a result of Fed policy. During much of this period the Fed's announced policy was to stabilize (or even to peg) interest rates. One simple description of interest rate stabilization is

$$\Delta r_{t+1} = 0; \tag{10}$$

that is, the change in the short rate is zero. The data, however, obviously reject this characterization of the policy, since the short rate did change throughout this period. A second, less restrictive description of Fed policy is

$$E_t \, \Delta r_{t+1} = 0; \tag{11}$$

that is, the *expected* change in the short rate is zero. At each point in time, the Fed set the short rate at a level that it expected to maintain. Under this characterization of policy, while the Fed might change the short rate in response to new information, it always (rationally) expected to maintain the short rate at its current level.

It is of course difficult to judge whether equation (11) is a result of deliberate Federal Reserve policy without an explicit model incorporating the objectives and constraints of the Federal Reserve. Explicit modeling of this problem, however, could easily produce an equation such as (11). Hall [1978] shows that individuals who desire to smooth consumption and who face a linear stochastic budget constraint will make consumption a random walk. We envision a Fed that desires to smooth interest rates but faces some constraint or has other objectives as well, such as inflation or output. Depending on the nature of the Fed's tradeoffs, its optimal policy may well entail making interest rates a random walk.

If equation (11) does describe the policy of stabilizing interest rates and if market participants knew it was the policy, then the short rate expected by the market would always equal the current short rate. The spread $(R_t - r_t)$ would always equal the term premium θ_t. Fluctuations in the spread would have no predictive power for the path of the short rate. Thus, the failure of the expectations theory with data from the 1960s and 1970s, a fact documented here and in many previous studies, may be an ineluctable result of Federal Reserve policy during this period.[13]

VIII. CONCLUSIONS

In this paper we reexamine the expectations theory of the term structure using data from different monetary regimes. In contrast to studies using only recent data, we find support for the view that expected changes in interest rates are reflected in the slope of yield curve. We concur with the conclusion that expectations do not play a key role in understanding fluctuations in the yield curve from recent history. This conclusion, however, may be an inevitable result of the policy regime that was then in effect.

Our explanation for the performance of the expectations theory assumes small changes through time in the term premium. We do not, however, isolate the underlying causes of these movements. Possibilities include changes in risk, changes in relative asset supplies, measurement error, and expectations that are only near rational.[14] The fact that the short rate has been near a random walk for much of recent history implies that only a small amount of such "noise" is necessary to generate the observed rejections of the expectations theory.

Our analysis focuses on the short end of the maturity spectrum. While three-month and six-month interest rates provide perhaps the cleanest test of the expectations theory, the relation between short-term rates and much longer term rates, such as those for twenty-year bonds, is probably more important for macroeconomic policy. It would be useful to extend our results to the market for such long-term instruments.

Our results have immediate implications for current policy discussions. First, since the Federal Reserve's announcement in October 1979, the monetary authority has been less committed to stabilizing interest rates; therefore, a more predictable pattern

13. Whether the change in the short rate process is attributable to a change in the real rate process or a change in the inflation process is a topic for future research. See Barsky [1985] for one examination of the changing stochastic process for inflation.

14. A casual examination of the average term premium across regimes does not produce evidence supporting simple theories of the risk premium, such as that proposed by Engle, Lilien, and Robins [1985]. In particular, the average term premium increased from 0.11 in 1915–1933 to 0.21 in 1934–1951, while all the variances presented in Table III declined. More sophisticated models of the risk premium, however, might explain this change.

of short rates may emerge. If it does, then the expectations theory may well appear again in the data—as it did in the period from 1890 to 1914. Unfortunately, there are so far too little data to test this conjecture.[15]

Second, our results lend credence to the view that policies that would cause future short rates to be higher have an immediate effect on long rates. This effect is critical to the common claim that the expectation of persistent Federal deficits is causing long-term interest rates to remain at a high level. While it may be impossible to document this expectational effect using recent data, our examination of historical data provides substantial support for this view.

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