The Information in the Term Structure: An Update

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October 2000

Overview and Summary

During the early to mid 1980s, Eugene Fama wrote a series of papers on the informational content of the term structure of interest rates. One of the main findings of these papers is that, for most forecasting horizons, the best forecast of future spot interest rates is the current interest rate. This implies that there is more information in the term structure about expected returns than there is about future interest rates. In other words, if forward interest rates do not predict future interest rates, then forward rates must necessarily predict returns on fixed income instruments.

Based on Fama's papers, Dimensional Fund Advisors Inc. introduced a series of fixed income portfolios that use the information in the term structure to select securities. The investment returns to these portfolios have been favorable, confirming Fama's research. However, since the time period covered by Fama's research ends in the early 1980s, an update of this body of research is in order. The objective of this study is to provide such an update. The returns to DFA's fixed income portfolios suggest that the patterns uncovered by Fama's research are still in place today. The results of this paper directly verify that this is the case.

For the June 1964-November 1999 sample period, the term structure contains information about what the spot interest rate will be one month ahead. During the August 1982-November 1999 subperiod, there is also some ability to predict spot rates two and three months ahead. Beyond that, the term structure contains little information about future spot rates

The relation between forward rates and future fixed income returns is much stronger than the relation between forward rates and future spot rates. This is seen in the regression results for the full sample period as well as the June 1964-July 1982 and August 1982-November 1999 subperiods. Portfolio simulations designed to mimic DFA portfolio strategies confirm these regression results. Portfolios that use the information in the term structure reliably outperform a number of fixed-maturity alternatives.

Finally, the information contained in the term structure is independent of whether the yield curve is upward sloping or inverted. Regression tests show that inverted yield curves do not contain any more information about future interest rates than do normal yield curves. Taken together, the results of this study strongly confirm Fama's earlier research and suggest that the DFA fixed income strategies are still a valid way of using the information contained in the term structure of interest rates.

Introduction

How much information about future interest rates is contained in the yield curve? According to the expectations hypothesis of the term structure, forward rates are useful predictors of future spot interest rates. Contrary to the expectations hypothesis, most empirical studies find little evidence of a relation between forward rates and future spot rates. An exception is Fama (1984), who finds that forward rates can predict spot rates one month ahead. Still, the evidence to date suggests that the relation between forward rates and expected returns is stronger than the relation between forward rates and future spot rates.

The regression results of Fama (1984) provide important insights into the information content of the term structure. However, since the sample period for that study ended more than eighteen years ago, it is time to take another look at the data. Do the more recent results confirm the earlier findings, or has something changed? The answer to this question is the primary objective of this paper. A secondary objective is to test whether there is any more information about spot rates contained in an inverted yield curve than in a normal curve. Inverted yield curves are fairly rare, so it is tempting to ascribe some special meaning to such an occurrence.

The results generally confirm the conclusions of Fama (1984). Forward rates have power to forecast Treasury bill returns for the entire June 1964-December 1999 sample period. Forward rates still predict spot rates one month ahead, and in later periods there is evidence of predictive ability two or three months ahead. Beyond that, the relation between forward rates and future spot rates is weak. There is no evidence of extra information in inverted yield curves. Finally, portfolio results show that a variable maturity strategy that uses the information in the term structure consistently earns higher average returns than several fixed-maturity alternatives.

The next section provides background information for the regressions and describes the dataset. Section III presents the regression results, and Section IV discusses the results of a trading strategy that exploits the regression results. Section V concludes.

Background for the Regression Tests

The Basic Regressions

According to the expectations hypothesis, forward rates are useful predictors of future spot interest rates. In the special case of the pure expectations hypothesis, forward rates are unbiased predictors of future spot rates. The more general (and more realistic) case allows for premiums in forward rates, and variation through time in these premiums can make it difficult to assess the predictive ability of forward rates. Fama (1984) approaches this problem by running pairs of time series regressions as follows:

(1)

$$H\tau_{t+1} - R_{t+1} = \alpha_1 + \beta_1(F\tau_t - R_{t+1}) + \varepsilon_t$$

(2)

$$R_{t+\tau} - R_{t+1} = \alpha_2 + \beta_2(F\tau_t - R_{t+1}) + \eta_{t+\tau-1}$$

In these regressions, $H\tau_{t+1}$ is the holding period return for the month ending at t+1 on a τ-month bill. R_{t+1} is the one-month spot rate of interest that is available for the month ending at t+1. Similarly, $R_{t+\tau}$ is the one-month spot rate of interest that will be available for the month ending at t+τ. $F\tau_t$ is the forward rate for month t+τ, observed at time t. The dependent variable in (1) is the premium on a τ-month bill that is realized at time t+1. The regressor in both equations is the forward-spot differential.

According to the pure expectations hypothesis, the forward rate is an unbiased estimator of future spot rates. Consequently, the slope coefficient in (2) should be 1.0. Further, since there are no premiums in forward rates in a pure expectations world, the slope coefficient in (1) should be zero. In the more general case where premiums may exist, both slope coefficients can be greater than zero, and the slope in (2) will typically be less than 1.0.

More Specific Tests

While regressions (1) and (2) provide important information about the predictive ability of forward rates, there are some problems that must be addressed. First, it should be noted that (2) has overlapping observations on the dependent variable. A related problem concerns the interpretation of the slope coefficient in (2). If we observe values of β_2 for different values of τ that are reliably different from zero, it does not necessarily follow that the forward rate can predict spot rates all the way out to month τ. Since $R_{t+\tau} - R_{t+1}$ represents the cumulative sum of τ-1 monthly changes in the spot rate, we might observe a nonzero β_2 for $\tau>2$ simply because forward rates can predict spot rates one month ahead, and the one-month spot rate change is part of the (τ-1)-month change.

To address these issues, Fama (1984) supplements regressions (1) and (2) with the following:

(3)
$H\tau_{t+1} - H(\tau-1)_{t+1} = \alpha_1 + \beta_1(F\tau_1 - F(\tau-1)_t) + \varepsilon_{t+1}$

(4)
$R_{t+\tau} - R_{t+\tau-1} = \alpha_2 + \beta_2(F\tau_t - F(\tau-1)_t) + \eta_{t+\tau-1}$

To see what these regressions are doing, let τ=6. Then (3) asks if the difference between the six-month and five-month forward rates (the forward rate spread) can predict the return difference (the return spread) next month between a six-month bill and a five-month bill. Regression (4) asks if the forward rate spread can predict the difference between the spot rates that will be available for months six and five. Thus, if a slope coefficient is observed in (4) that is reliably different from zero, it will not be because the forward rate can predict spot rates one month ahead. Instead, it will be evidence of the forward rate containing information about spot rates τ-1 months ahead.

Inverted Yield Curves

Yield curves usually slope upward. A typical explanation for this observation includes a combination of the expectations hypothesis and the liquidity preference hypothesis: investors prefer the liquidity of short maturities, so they demand a premium for holding longer maturities. These premiums, combined with expectations of future interest rates, result in yield curves that slope upward, on average.

According to this explanation, an inverted yield curve must mean that interest rates are expected to come down. If the yield curve slopes downward, even with a liquidity premium for longer maturities, then expected future spot rates must be really low.

To test for extra information in inverted yield curves, regression equations are used that allow the slopes (and intercepts) to be different when the yield curve is inverted over an interval. Let $D\tau_t$ be a dummy variable that is equal to 1.0 if the yield on a τ-month bill is less than the yield on a (τ-1)-month bill, and zero otherwise. Then $D\tau_t$ indicates whether the yield curve is inverted over the interval from τ-1 to τ. Consider the following adaptations of (3) and (4):

(5)
$H\tau_{t+1} - H(\tau-1)_{t+1} = \alpha_1 + \delta_1 D\tau_1 + \beta_1(F\tau_t-F(\tau-1)_t) + \gamma_1 D\tau_t(F\tau_t - F(\tau-1)_t) + \varepsilon_{t+1}$

(6)
$R_{t+\tau} - R_{t+\tau-1} = \alpha_2 + \delta_2 D\tau_1 + \beta_2(F\tau_t - F(\tau-1)_t) + \gamma_2 D\tau_t(F\tau_t - F(\tau-1)_t) + \eta_{t+\tau-1}$

Suppose that inverted yield curves reliably forecast lower interest rates. Then γ_2 will be reliably positive. Further, since increased ability to forecast spot rates will weaken the relation between forward rates and realized returns, γ_1 will be negative. These are the signs that must be present in order to conclude that inverted yield curves have more power to forecast spot rates.

Data Description

The data for this study are taken from the Fama files in the US Treasury database that is maintained by the Center for Research in Security Prices (CRSP) at the University of Chicago. The Fama files are an updated version of the dataset used in Fama (1984). While Fama's regressions use Treasury bills with maturities up to six months, the CRSP database contains information for bills with maturities up to one year. Consequently, this study provides regression results for values of τ up to eleven (there are still several missing data points for τ=12, so the regressions stop at τ=11). For purposes of this study, the dataset for twelve-month bills starts at June 1964. (Fama's 6-month dataset starts in July 1959.)

Regression Results

Table 1 shows results for regressions 1 (Panel A) and 2 (Panel B). The results are shown for the entire sample period and for two subperiods. The first subperiod ends at the point where the Fama (1984) sample period ends, and the second subperiod extends the results through 1999. Since the last available holding period return ($H\tau_{t+1}$) is for December 1999, the last observation for regression (1) is for t=November 1999. For regression (2), the last observation for each regression is month t = (January 2000 - τ; τ=2,3,...,11).

Table 1

Regressions of the Realized Premium and the Change in the Spot Rate on the Forward-Sport Differential
(t-statistics in parentheses)

Panel A: Regression equation (1)

$$H\tau_{t+1} - R_{t+1} = \alpha_1 + \beta_1(F\tau_t - R_{t+1}) + \varepsilon_t$$

Dependent Variable	6/64-11/99 Slope	6/64-11/99 Adj. R^2	6/64-7/82 Slope	6/64-7/82 Adj. R^2	8/82-11/99 Slope	8/82-11/99 Adj. R^2
$H2_{t+1}-R_{t+1}$	0.51 (10.25)	0.20	0.52 (6.60)	0.16	0.47 (10.41)	0.34
$H3_{t+1}-R_{t+1}$	0.81 (9.56)	0.18	0.93 (6.26)	0.15	0.67 (10.41)	0.34
$H4_{t+1}-R_{t+1}$	0.91 (7.34)	0.11	1.04 (4.95)	0.10	0.72 (7.53)	0.21
$H5_{t+1}-R_{t+1}$	0.96 (7.24)	0.11	1.06 (4.52)	0.08	0.85 (8.77)	0.27
$H6_{t+1}-R_{t+1}$	0.75 (4.64)	0.05	0.75 (2.72)	0.03	0.77 (5.74)	0.13
$H7_{t+1}-R_{t+1}$	0.90 (4.88)	0.05	0.92 (3.00)	0.04	0.89 (5.57)	0.13
$H8_{t+1}-R_{t+1}$	0.85 (3.95)	0.03	0.78 (2.07)	0.01	0.97 (5.47)	0.12
$H9_{t+1}-R_{t+1}$	1.59 (7.25)	0.11	2.09 (5.62)	0.12	0.97 (5.12)	0.11
$H10_{t+1}-R_{t+1}$	1.26 (5.03)	0.05	1.31 (3.02)	0.04	1.13 (5.17)	0.11
$H11_{t+1}-R_{t+1}$	1.09 (3.87)	0.03	0.99 (2.08)	0.02	1.18 (4.68)	0.09

Panel B: Regression equation (2)

$$R_{t+\tau} - R_{t+1} = \alpha_2 + \beta_2(F\tau_t - R_{t+1}) + \eta_{t+\tau-1}$$

Dependent Variable	6/64-11/99 Slope	Adj. R^2	6/64-7/82 Slope	Adj. R^2	8/82-11/99 Slope	Adj. R^2
$R_{t+2}-R_{t+1}$	0.59 (10.31)	0.20	0.52 (5.75)	0.13	0.73 (12.22)	0.42
$R_{t+3}-R_{t+1}$	0.27 (3.58)	0.03	0.01 (0.10)	0.00	0.61 (9.31)	0.29
$R_{t+4}-R_{t+1}$	0.47 (5.51)	0.06	0.35 (2.51)	0.02	0.65 (8.50)	0.26
$R_{t+5}-R_{t+1}$	0.26 (3.25)	0.02	0.15 (1.08)	0.00	0.38 (5.65)	0.13
$R_{t+6}-R_{t+1}$	0.36 (4.35)	0.04	0.29 (2.10)	0.02	0.45 (6.10)	0.15
$R_{t+7}-R_{t+1}$	0.41 (4.94)	0.05	0.30 (2.22)	0.02	0.56 (7.22)	0.20
$R_{t+8}-R_{t+1}$	0.36 (4.18)	0.04	0.22 (1.51)	0.01	0.52 (6.53)	0.17
$R_{t+9}-R_{t+1}$	0.32 (3.88)	0.03	0.25 (1.90)	0.01	0.39 (4.66)	0.09
$R_{t+10}-R_{t+1}$	0.32 (3.75)	0.03	0.21 (1.53)	0.01	0.53 (6.23)	0.16
$R_{t+11}-R_{t+1}$	0.49 (5.52)	0.07	0.53 (3.76)	0.06	0.48 (5.07)	0.11

Data courtesy of the Center for Research in Security Prices, University of Chicago.

The results in Table 1 show a strong relation between the forward-spot differential and realized premiums. All of the slopes in the premium regressions are reliably positive, and most of the estimated slopes are close to 1.0. Table 1 also reveals a fairly strong relation between the forward-spot differential and future spot rate changes. Most of the slopes are more than two standard errors above zero; outside the June 1964-July 1982 subperiod, all are reliably positive. However, as discussed earlier, it is necessary to look at results for regressions (3) and (4) in order to truly assess the predictive ability of forward rates.

Table 2 presents these results. For regression 3 (Panel A), nearly all the slopes are reliably positive. The smallest t-statistic in the table represents a p-value of about 0.06. The forward rate spread appears to be a reliable predictor of returns.

Table 2

Regressions of the Return Spread and the Change in the Spot Rate on the Forward Rate Spread

(t-statistics in parentheses)

Panel A: Regression equation (3)

$$H\tau_{t+1} - H(\tau-1)_{t+1} = \alpha_1 + \beta_1(F\tau_t - F(\tau-1)_t) + \varepsilon_{t+1}$$

Dependent Variable	6/64-11/99 Slope	Adj. R^2	6/64-7/82 Slope	Adj. R^2	8/82-11/99 Slope	Adj. R^2
$H2_{t+1}-H1_{t+1}$	0.51 (10.25)	0.20	0.52 (6.60)	0.16	0.47 (10.41)	0.34
$H3_{t+1}-H2_{t+1}$	0.60 (9.06)	0.16	0.65 (6.29)	0.15	0.48 (7.21)	0.20
$H4_{t+1}-H3_{t+1}$	0.40 (5.16)	0.06	0.38 (3.15)	0.04	0.44 (6.08)	0.15
$H5_{t+1}-H4_{t+1}$	0.48 (9.21)	0.16	0.41 (5.14)	0.10	0.63 (11.39)	0.38
$H6_{t+1}-H5_{t+1}$	0.16 (3.56)	0.03	0.17 (2.65)	0.03	0.12 (1.99)	0.01
$H7_{t+1}-H6_{t+1}$	0.37 (7.58)	0.12	0.38 (5.50)	0.12	0.32 (4.99)	0.10
$H8_{t+1}-H7_{t+1}$	0.26 (4.49)	0.04	0.16 (1.87)	0.01	0.48 (6.94)	0.19
$H9_{t+1}-H8_{t+1}$	0.56 (11.46)	0.23	0.71 (9.15)	0.28	0.33 (6.73)	0.18
$H10_{t+1}-H9_{t+1}$	0.54 (10.31)	0.20	0.56 (7.52)	0.20	0.28 (3.62)	0.06
$H11_{t+1}-H10_{t+1}$	0.43 (9.08)	0.16	0.47 (6.82)	0.18	0.30 (5.20)	0.11

Data courtesy of the Center for Research in Security Prices, University of Chicago.

Confirming the results of Fama (1984), regression 4 (Panel B) shows that the forward rate spread is able to predict spot rates one period ahead. In the August 1982-November 1999 subperiod, there is also evidence of predictive ability two and three months ahead. Beyond that, the ability to predict spot rates is inconsistent; most slope coefficients are not reliably different from zero, the coefficients appear to be random, and the adjusted R^2 values indicate that little of the variation in spot rates is being explained. So, while there is some evidence of an ability to predict spot rates over short horizons, the relation between forward rates and holding period returns appears to be much stronger.

Table 2 (continued)

Panel B: Regression equation (4)

$$R_{t+\tau} - R_{t+\tau-1} = \alpha_2 + \beta_2(F\tau_t - F(\tau-1)_t) + \eta_{t+\tau-1}$$

Dependent Variable	6/64-11/99 Slope	Adj. R^2	6/64-7/82 Slope	Adj. R^2	8/82-11/99 Slope	Adj. R^2
$R_{t+2}-R_{t+1}$	0.59 (10.31)	0.20	0.52 (5.75)	0.13	0.73 (12.22)	0.42
$R_{t+3}-R_{t+2}$	0.06 (0.85)	0.00	-0.15 (-1.45)	0.01	0.55 (6.23)	0.16
$R_{t+4}-R_{t+3}$	0.10 (1.25)	0.00	0.03 (0.22)	0.00	0.26 (2.53)	0.03
$R_{t+5}-R_{t+4}$	0.05 (0.87)	0.00	0.08 (0.96)	0.00	-0.02 (-0.20)	0.00
$R_{t+6}-R_{t+5}$	0.00 (0.00)	0.00	0.01 (0.21)	0.00	-0.04 (-0.57)	0.00
$R_{t+7}-R_{t+6}$	-0.11 (-2.19)	0.01	-0.14 (-2.16)	0.02	0.02 (0.25)	0.00
$R_{t+8}-R_{t+7}$	0.14 (2.52)	0.01	0.12 (1.47)	0.01	0.20 (2.62)	0.03
$R_{t+9}-R_{t+8}$	0.08 (1.53)	0.00	0.10 (1.31)	0.00	0.04 (0.70)	0.00
$R_{t+10}-R_{t+9}$	0.08 (1.94)	0.01	0.11 (1.86)	0.01	0.02 (0.28)	0.00
$R_{t+11}-R_{t+10}$	0.18 (4.07)	0.04	0.25 (4.12)	0.07	-0.03 (-0.50)	0.00

Data courtesy of the Center for Research in Security Prices, University of Chicago.

Table 3 shows results for the regressions that look for extra information in inverted yield curves for forecasting spot rates. Recall that a reliably positive γ_2, coupled with a negative γ_1, is evidence of extra information in an inverted curve. Table 3 shows that one of the γ_2 estimates (τ=11) is reliably positive, but the corresponding γ_1 estimate is also positive. None of the other γ_2 estimates are even 1 standard error above zero. These results do not support the hypothesis of special information in inverted yield curves.

Table 3

Regressions to Test for Information in Inverted Yield Curves
(t-statistics in parentheses)

Panel A: Regression equation (5)

$$H\tau_{t+1} - H(\tau\text{-}1)_{t+1} = \alpha_1 + \delta_1 D\tau_t + \beta_1(F\tau_t - F(\tau\text{-}1)_t) + \gamma_1 D\tau_t(F\tau_t - F(\tau\text{-}1)_t) + \varepsilon_{t+1}$$

Dependent Variable	(β_1) **Slope on** $F\tau_t - F(\tau\text{-}1)_t$	(γ_1) **Slope on** $D\tau_t{*}(F\tau_t - F(\tau\text{-}1)_t)$	**Adj. R^2**
$H2_{t+1}$-$H1_{t+1}$	0.50 (8.16)	0.06 (0.34)	0.19
$H3_{t+1}$-$H2_{t+1}$	0.60 (8.19)	0.10 (0.32)	0.16
$H4_{t+1}$-$H3_{t+1}$	0.22 (2.11)	0.36 (1.77)	0.06
$H5_{t+1}$-$H4_{t+1}$	0.44 (6.52)	-0.01 (-0.02)	0.17
$H6_{t+1}$-$H5_{t+1}$	0.20 (3.78)	-0.31 (-2.17)	0.03
$H7_{t+1}$-$H6_{t+1}$	0.29 (4.40)	0.11 (0.89)	0.12
$H8_{t+1}$-$H7_{t+1}$	0.27 (4.25)	-0.25 (-1.23)	0.04
$H9_{t+1}$-$H8_{t+1}$	0.54 (9.35)	-0.08 (-0.48)	0.24
$H10_{t+1}$-$H9_{t+1}$	0.18 (2.03)	0.58 (4.60)	0.24
$H11_{t+1}$-$H10_{t+1}$	0.33 (5.97)	0.36 (2.81)	0.18

Panel B: Regression equation (6)

$$R_{t+\tau} - R_{t+\tau-1} = \alpha_2 + \delta_2 D\tau_t + \beta_2(F\tau_t - F(\tau-1)_t) + \gamma_2 D\tau_t(F\tau_t - F(\tau-1)_t) + \eta_{t+\tau-1}$$

Dependent Variable	(β_2) Slope on $F\tau_t - F(\tau-1)_t$	(γ_2) Slope on $D\tau_t^*(F\tau_t - F(\tau-1)_t)$	Adj. R^2
$R_{t+2} - R_{t+1}$	0.56 (7.79)	0.13 (0.61)	0.20
$R_{t+3} - R_{t+2}$	0.10 (1.25)	-0.38 (-1.07)	0.00
$R_{t+4} - R_{t+3}$	0.13 (1.20)	-0.33 (-1.55)	0.01
$R_{t+5} - R_{t+4}$	0.09 (1.21)	-0.28 (-1.73)	0.00
$R_{t+6} - R_{t+5}$	-0.02 (-0.30)	-0.07 (-0.44)	0.00
$R_{t+7} - R_{t+6}$	-0.16 (-2.41)	-0.02 (-0.14)	0.02
$R_{t+8} - R_{t+7}$	0.18 (2.90)	-0.48 (-2.36)	0.02
$R_{t+9} - R_{t+8}$	0.12 (2.05)	-0.16 (-0.94)	0.00
$R_{t+10} - R_{t+9}$	0.09 (1.21)	0.00 (0.00)	0.00
$R_{t+11} - R_{t+10}$	0.09 (1.67)	0.39 (3.33)	0.06

Data courtesy of the Center for Research in Security Prices, University of Chicago.

Capturing the Premiums in Treasury Bill Returns

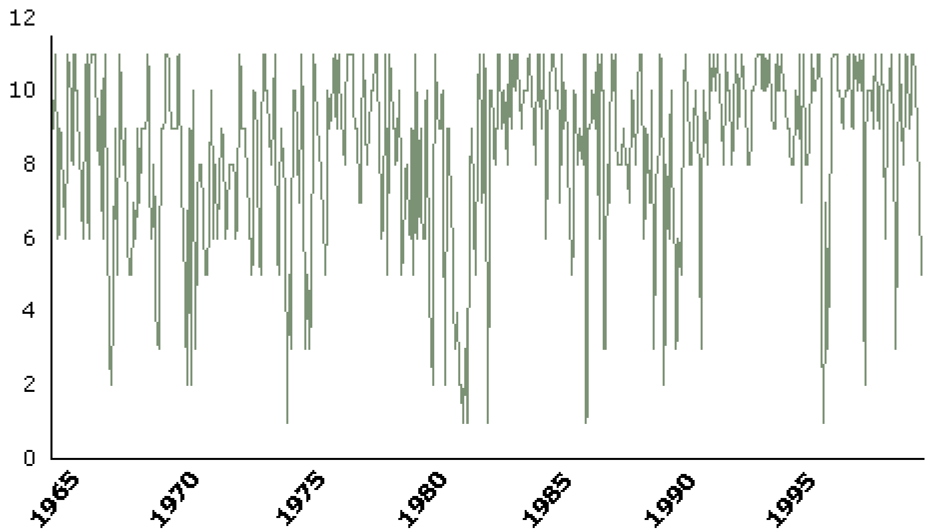
The regression results discussed above show that the relation between forward rates and expected returns is stronger than the relation between forward rates and future spot rates. We can conclude from this that there are premiums in forward rates that vary through time. Further, investors can form portfolios that capture these premiums. The trading strategy that is tested here is based on Fama (1986) and Fama and Bliss (1987):

At the end of each month find the combination of buy maturity and sell maturity that maximizes the forward rate. Invest $1 at the buy maturity. Sell all securities purchased earlier that have maturities equal to or less than the current sell maturity. Do not invest the proceeds from the sales.

This type of variable-maturity strategy allows the average portfolio maturity to change in order to capture the premiums contained in forward rates. The average return to this strategy should be higher than a fixed-maturity strategy, since the portfolio composition changes in response to the information contained in forward rates. Figure 1 shows how the average maturity of the portfolio changes over time.

Figure 1

Average Maturity of Variable-Maturity Trading Strategy



Data courtesy of the Center for Research in Security Prices, University of Chicago.

Table 4 reports annual returns to this trading strategy for the 1965-1999 period, using bills with maturities up to eleven months. For comparison, a few fixed-maturity portfolios are also shown. Each month, these fixed-maturity portfolios buy bills with maturity x and sell bills with maturity y. The (x,y) combinations shown in Table 4 are (1,0), (3,1), (6,3), and (11,6).

Table 4

Comparison of Variable and Fixed Maturity Portfolios

1965-1999

Panel A: Average annual returns (standard deviations in brackets)

Portfolio	(n=35) 1965-1999	(n=18) 1965-1982	(n=17) 1983-1999
Variable Maturity	7.62% [3.17%]	8.03% [3.74%]	7.17% [2.47%]
Buy 1/Sell 0	6.39% [2.58%]	6.85% [3.06%]	5.90% [1.92%]
Buy 3/Sell 1	6.89% [2.81%]	7.38% [3.37%]	6.38% [2.06%]
Buy 6/Sell 3	7.19% [2.89%]	7.68% [3.42%]	6.66% [2.17%]
Buy 11/Sell 6	7.37% [3.10%]	7.72% [3.65%]	6.99% [2.44%]

Panel B: t-statistics on return differences: variable-fixed

Fixed Portfolio	1965-1999	1965-1982	1983-1999
Buy 1/Sell 0	5.25	2.92	5.47
Buy 3/Sell 1	3.65	1.92	3.99
Buy 6/Sell 3	3.62	1.83	3.68
Buy 11/Sell 6	4.66	3.10	6.65

Data courtesy of the Center for Research in Security Prices, University of Chicago.

Panel A of Table 4 shows that the variable maturity portfolio earns higher average returns than any of the fixed maturity portfolios. This holds for the entire 1965-1999 period as well as the two subperiods. The average return difference for the 1965-1999 period varies from 0.25% per year for the Buy 11/Sell 6 portfolio, to 1.23% per year for the Buy 1/Sell 0 portfolio. The t-statistics in Panel B show that all of the return differences for the 1965-1999 period are reliably positive, as are most of the subperiod differences. The variable maturity portfolio does allow investors to earn the premiums that are reflected in forward rates.

Conclusions

There is important information in the term structure of interest rates. There is information about what the spot rate of interest will be next month. There is also information about what next month's Treasury bill returns will be. This information can be used to buy Treasury bills that will realize higher average returns than other Treasury bills. This information has been present in the term structure for at least the past 35 years. Finally, there does not appear to be any more information revealed by an inverted yield curve than by a normal yield curve.

The helpful comments of David Booth, Truman Clark, Eugene Fama, Ken French, Dave Plecha, Eduardo Repetto, Jeanne Sinquefield, and Rex Sinquefield are gratefully acknowledged.

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