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Term Spreads and Predictions of Bond and Stock Excess Returns

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Several studies conclude that a long-short term spread, in conjunction with one or more other variables, jointly predict returns on long-term corporate bonds and stocks. We extend these studies by examining the predictive content of intermediate-short term spreads, and by examining regressions of excess returns on 1.5-year to 20-year Treasury bonds. We show that the bond market prices an intermediate-short term spread, and not a long-short spread. We believe individuals should vary their debt-equity mix with the level of a default risk premium or the stock market's dividend yield, and vary their debt portfolios' maturity with an intermediate-short term spread.

Several studies conclude that a term spread, in conjunction with one or more other variables, jointly predict returns on long-term corporate bonds and stocks. Fama (1976), Startz (1982), Shiller, Campbell, and Schoenholtz (1983), Fama (1984), Fama and French (1989), and Fraser (1995) conclude bond returns vary with a term spread. Campbell (1987), Fama and French (1989), Fama (1990a), Schwert (1990), Chen (1991), and Fraser (1995) conclude stock returns vary with a term spread. Related results are presented by Keim and Stambaugh (1986), Fama (1986), Fama and Bliss (1987), Stambaugh (1988), Hardouvelis (1994), Elton, Gruber, and Mei (1996), and Jensen, Mercer, and Johnson (1996).

Most of these studies use a long-short term spread—the spread between a long-term yield and a short-term yield—to predict returns on long-term securities. There is also a widely stated but unproven explanation about why the term spread predicts returns. "[T]he spread tracks a term or maturity risk premium in expected returns that is similar for all long-term assets. A reasonable and old hypothesis is that the premium compensates for exposure to discount-rate shocks that affect all long-term securities (stocks and bonds) in roughly the same way" (Fama & French, 1989, p. 24). In short, the term spread tracks embedded term risk premiums, which are investors' rewards to bearing interest rate or duration risk.

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We have two concerns with this literature, which provide the motivation for this paper. First, since regressions have been tested on returns on long-term assets but not returns on shorter-term bonds, no one has adequately tested the suspicion that the term spread tracks the rewards to bearing duration risk. To verify this hypothesis, one must show that the impact of the term spread varies across bond maturities. To be specific, in regressions of bond returns on forecasting variables, the slopes for the term spread should be approximately linearly related to bonds' durations.

Second and more important, we suspected that an intermediate-short spread would do a better job than a long-short spread at (1) tracking embedded term premiums and, therefore, (2) predicting bond and stock returns. A long-short term spread can be separated into a long-intermediate and an intermediate-short spread. Some prior studies support the preferred-habitat theory (e.g., Domian, Maness, & Reichenstein, 1998; McCallum, 1975, McCulloch, 1975). This theory recognizes that some investors prefer and strongly influence the short end of the bond market, while others prefer and influence the long end. It follows that an intermediate-short spread could closely track a term risk premium, while a long-intermediate spread may not.

For many investors, a bond's duration is a good measure of its risk. These investors dominate the short end of the yield curve—that is, they are the marginal price setters. So, term premiums should rise with maturity in the short end of the yield curve, and an intermediate-short term spread should proxy for the reward to bearing duration risk. In contrast, life insurance companies and defined-benefit pension plans dominate the long end of the yield curve. They do not view long-term bonds as riskier than intermediate-term bonds. In fact, they often prefer long duration bonds because they better match the durations of their liabilities. The upshot is that the long-intermediate spread may not track term risk premiums. It follows that an intermediate-short spread could be a better measure than a long-short spread of embedded term premiums and thus (if the suspected explanation is correct) a better predictor of bond returns.

We extend Fama and French (1989) and the other studies (1) by examining the predictive content of other term spreads, especially intermediate-short spreads, (2) by examining regressions of excess returns on 1.5-year to 20-year Treasury bonds, and (3) by discussing the investment implications of the research for individual investors.

I. DATA AND METHODS

We closely follow the design of Fama and French (1989)—the most widely quoted study in the area—to assure that our novel results are not due to differences in time period or variable definitions. The dependent variables are the excess returns on Treasury bonds, corporate bonds, and common stocks. The independent variables are various term spreads, a default spread, and the market's dividend yield.

We examine returns on Treasury bonds with maturities of 1.5, 2, 3, 5, 7, 10, 15, and 20 years. The corporate bond returns cover Aaa, Aa, A, Baa, and below Baa (LG, low grade) bonds. The 1.5- through 20-year Treasury bond returns rely on estimates of par-bond yields (yields on coupon-bearing bonds selling at par) across maturities that come from Ibbotson Associates (see Coleman, Fisher, & Ibbotson, 1993 and updates). The Appendix to our paper describes the return calculations. The corporate bond returns come from Ibbotson

Associates' Corporate Bond File. Each corporate bond series has an average maturity of about 20 years.

Our regressions use cumulative excess returns over one-month bills. A possible complication is the coupon effect in average returns on less than one-year Treasury securities, described by Brooks, Levy, and Livingston (1989). For 1977–1985, the average return on one-month, coupon-bearing notes exceeded the average return on one-month, zero-coupon bills. However, we define excess returns net of the bill return to maintain consistency with Fama and French (1989). We adopt the terms T1.5, T2, T3, T5, T7, T10, T15, and T20 for the Treasury excess returns and Aaa, Aa, A, Baa, and LG for the corporate bond excess returns.

The stock series are excess returns on value-weighted and equal-weighted portfolios of NYSE stocks and are available from the Center for Research in Security Prices. The excess returns are denoted VW and EW.

For the independent variables, we examine alternative term spreads, a default risk spread, and a dividend yield. We examine a long-short term spread, LONG-TB, the spread between the longest available Treasury yield and the one-month Treasury bill rate. We also examine several intermediate-short yield spreads. They include 10-TB, 5-TB, 3-TB, and 2-TB, where 10-TB denotes the spread between the 10-year Treasury yield and the one-month bill rate. Other definitions are similar. Coleman, Fisher, and Ibbotson (1993 and updates) provide the Treasury yields, including the longest available Treasury yield.

Fama and French (1989) conclude that the bond market's default yield spread and the stock market's dividend yield capture the impact of the same underlying economic factors. DEF denotes the default spread between the yield on the composite corporate bond portfolio and the Aaa yield. The dividend yield, D/P, denotes the dividend yield on the value-weighted NYSE portfolio.

The tests center on regressions of excess bond and stock returns from t to $t + T$, $r(t, t + T)$, on two independent variables, $x(t)$, known at t,

$$r(t, t + T) = \alpha(T) + \beta(T)\, x(t) + e(t, t + T).$$

The first independent variable is a term spread known at t. The second is either the default spread, DEF(t), or the market's dividend yield, D(t)/P(t). The results of regressions on a yield spread and D/P were essentially similar to the results of regressions on the same yield spread and DEF. To save space, we only report the results of regressions on DEF.

The major time period in this study is 1942–1994. In preliminary work, we began by replicating Fama and French's (1989) results for the 1941–1987 period. We then changed from Aaa-TB, their term spread, to LONG-TB. We prefer LONG to Aaa because, unlike Treasury bonds, corporate bonds have default risk and are usually callable. We also moved the starting date to 1942, since few fully-taxable Treasury bonds existed before year-end 1941. These changes did not appreciably affect the replication results. Extending the sample period through 1994 slightly weakens the statistical results and largely accounts for differences between our long-short term spread results and those of Fama and French (1989).

Our results are presented for both the full sample period, 1942–1994, and the latter half of this period, 1969–1994. We report regressions of excess returns for quarterly and one- to four-year investment horizons (i.e., T = Q, 1, 2, 3, or 4). The quarterly and annual regressions use non-overlapping returns. The two- to four-year returns are overlapping annual observations; these regressions are estimated with the Newey and West (1987) procedure to inhibit potential statistical problems associated with overlapping observations.

II. BUSINESS CONDITIONS AND BEHAVIOR OF THE FORECASTING VARIABLES

A. Autocorrelations

Table 1 presents summary statistics on one-year excess returns on bonds and stocks. The autocorrelations of the forecast variables contain information about the components of expected excess returns they track. The autocorrelations of dividend yield and the default spread are large at the first-order annual lag, and decay slowly for longer lags. This sup-

TABLE 1

Summary Statistics for Annual Observations on One-Year Excess Returns on the Bond and Stock Portfolios and Independent Variables including Several Term Spreads, 1942–1994

			n-order Autocorrelation Coefficients							
	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
T1.5	1.01	2.16	–0.02	0.26	–0.33	–0.01	–0.00	0.04	–0.03	0.05
T2	0.88	2.74	–0.03	0.20	–0.33	0.01	–0.00	0.04	0.01	0.04
T3	1.09	3.79	0.04	0.17	–0.27	–0.01	–0.04	0.00	0.02	0.06
T5	1.11	5.06	0.03	0.11	–0.19	0.01	–0.05	–0.03	0.06	0.07
T7	0.98	6.08	0.03	0.06	–0.12	0.01	–0.06	–0.05	0.09	0.06
T10	0.83	7.16	0.04	0.04	–0.07	0.03	–0.06	–0.07	0.10	0.06
T15	0.55	8.31	0.04	0.03	–0.03	0.04	–0.04	–0.08	0.11	0.06
T20	0.32	9.00	0.04	–0.01	–0.04	0.01	–0.04	–0.09	0.11	0.05
Aaa	0.36	6.98	0.19	0.01	–0.08	–0.09	–0.16	0.06	0.05	–0.09
Aa	0.50	7.05	0.20	–0.07	–0.08	–0.13	–0.10	0.04	0.08	–0.10
A	0.93	7.27	0.22	–0.07	–0.16	0.08	0.01	0.07	0.06	–0.12
Baa	1.71	7.33	0.21	–0.14	–0.14	–0.06	0.03	0.11	0.07	–0.12
LG	3.02	10.70	0.21	–0.04	–0.16	–0.05	0.12	0.17	0.04	–0.01
VW	7.23	15.60	–0.06	–0.23	0.10	0.31	0.07	–0.09	0.13	0.04
EW	9.67	21.08	0.04	–0.22	0.01	0.20	–0.04	–0.16	0.06	–0.02
D/P	4.19	1.16	0.72	0.52	0.42	0.35	0.30	0.27	0.26	0.16
DEF	0.70	0.41	0.61	0.35	0.19	0.21	0.29	0.31	0.25	0.20
LONG-TB	1.44	1.40	0.51	0.23	0.12	0.19	0.32	0.34	0.11	0.04
10-TB	1.35	1.28	0.46	0.22	0.13	0.22	0.38	0.38	0.10	0.02
5-TB	1.10	1.13	0.39	0.21	0.14	0.23	0.38	0.40	0.11	–0.01
3-TB	0.92	1.00	0.33	0.24	0.17	0.24	0.38	0.42	0.13	–0.01
2-TB	0.78	0.90	0.26	0.26	0.17	0.18	0.31	0.40	0.14	0.02
LONG-3	0.52	0.75	0.60	0.28	0.10	–0.03	–0.03	0.06	0.05	0.12

Notes: The rows are one-year excess returns on 1.5-year through 20-year Treasury securities, Aaa through low-grade (LG) corporate bonds, and value- and equal-weighted NYSE stock returns. D/P is the ratio of dividends on the value-weighted NYSE for year t to the value of the portfolio at the end of the year. DEF is the difference between the end-of-year yield on All (the portfolio of the 100 corporate bonds in the sample) and the Aaa yield. LONG-TB denotes the difference between the long-term Treasury bond yield (in Coleman, Fisher, & Ibbotson, 1993 and updates) and the one-month Treasury bill rate. 10-TB is the difference between the 10-year Treasury yield and the one-month bill. 5-TB, 3-TB, and 2-TB are similarly defined. LONG-3 is the difference between the long-term and three-year Treasury yields. The columns present mean, standard deviation, and first- through eighth-order autocorrelation coefficients.

ports Fama and French's (1989) story that D/P and DEF track a component of expected return that changes slowly and persists beyond the NBER-measured business cycles.

The first-order autocorrelations on the term spreads are usually large. Second- and third-order autocorrelations are usually close to zero. This suggests that term spreads track a component of expected excess return that persists for one year. We will see that this story receives strong support from the regression analysis.

B. Plots of Business Conditions and Term Spreads

Plots of the forecasting variables picture the components of expected returns they capture. Fama and French (1989) plot the dividend yield and default spread since 1927. They move closely together. Fama and French (1989) conclude that these variables track a common "variation in expected bond and stock returns in response to aspects of business conditions that tend to persist beyond measured business cycles" (p. 29). To save space, we do not repeat the figure here.

Figure 1 plots LONG-TB and 3-TB against business conditions. It shows that these term spreads tend to follow the NBER business cycle. They tend to be narrow near cyclical peaks and wide near troughs. The economic story is that the observable term spreads vary closely with the unobservable term premiums. Term premiums, which are the rewards to

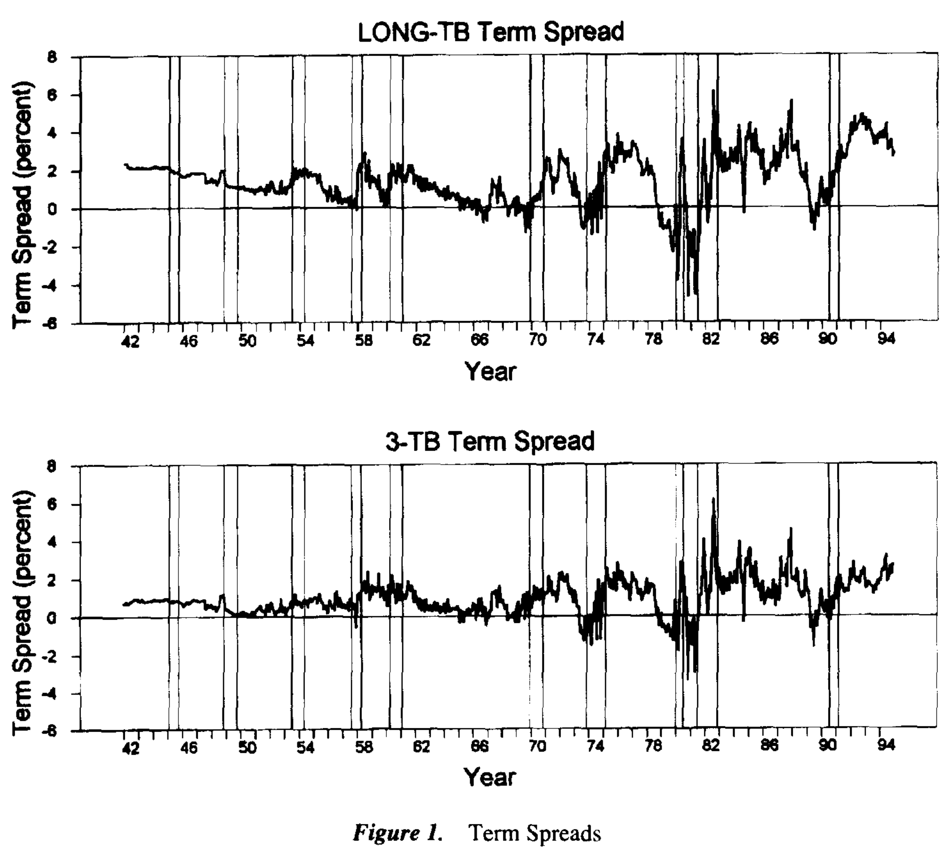

Figure 1. Term Spreads

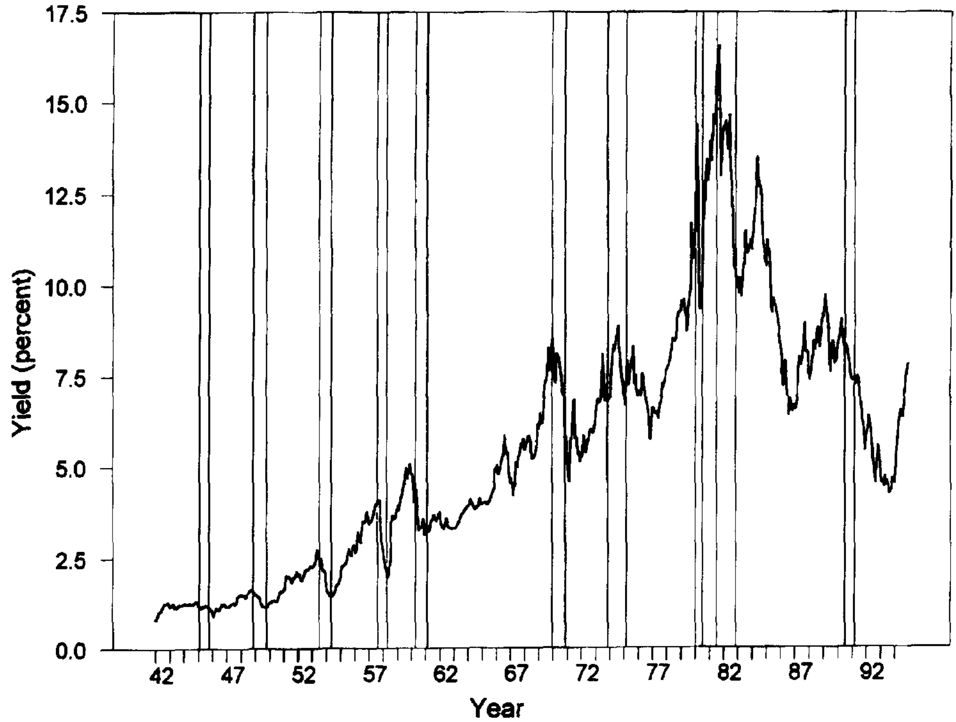

Figure 2. Yield on 3-year Treasury Bonds

extending maturity, tend to be large when business conditions are weak and small when business conditions are strong. Separate plots of each interest rate in these term spreads reveal that they tend to fall in recessions and rise in expansions, with the short-term bill yield falling and rising more than the other rates. Consequently, the term spreads follow the business cycle.

Figure 2 plots the three-year Treasury yield. It comes close to defining the NBER business cycle. Except for the 1974 recession, it peaks near the business peak and falls until near the business trough. So, it follows the business cycle. Fama and French (1989) show the one-month bill yield also comes close to defining the NBER business cycle, but only for the period since the Treasury-Federal Reserve Accord in 1951.

C. Average Excess Returns

Table 1 presents average annual excess returns on Treasury bonds, corporate bonds, and common stocks for 1942–1994. Henceforth, return means excess return. Average returns are similar on 1.5-year through 7-year Treasury bonds and then fall as maturity extends beyond seven years. Specifically, the average term premiums appear to peak at about 1 percent on 1.5-year through 7-year bonds, and to fall on longer-term Treasury bonds.

As expected, average returns rise as we go from 20-year Treasury bonds to corporate bonds, from high-grade to low-grade bonds and from bonds to stocks. Note, however, that the corporate bond and stock returns contain not only a term premium, but also default and equity risk premiums.

The message of this study, however, is less about average returns or risk premiums than it is about the variation in expected term premiums. Returns appear to be predictable and, as the next section will show, an intermediate-short spread does a better job than a long-short spread of predicting bond returns.

III. REGRESSION ANALYSIS

A. Choice of Term Spreads

Table 2 presents the adjusted coefficients of determination (also called adjusted R^2) for regressions of one-year bond and stock returns on DEF and alternative measures of a term spread for 1942–1994. The major lesson from the table is that an intermediate-short term spread does a better job of predicting bond returns than a long-short spread. For example, 3-TB and DEF explain 8 to 10 percent more of the variance of 1.5-year through 3-year Treasury returns than LONG-TB and DEF. For all Treasury returns, 5-TB and DEF consistently explain 7 to 8 percent more of the variance. This intermediate-short predictive advantage remains sizeable at 5 to 6 percent on Aaa- to A-grade corporate bonds. The intermediate-short spread, 10-TB, and LONG-TB predict similar percentages of the variances on LG, VW, and EW returns—the securities that contain equity risk. At least for 1942–1994, 5-TB and DEF usually do the best job of predicting bond returns.

TABLE 2
Predictive Content of Alternative Term Spreads, 1942–1994
(Adjusted coefficients of determination from regressions of one-year excess asset returns on DEF and alternative term spreads)

Dep. Var.	*LONG-TB*	*10-TB*	*5-TB*	*3-TB*	*2-TB*
T1.5	0.04	0.08	0.12	0.14	0.14
T2	0.02	0.05	0.09	0.12	0.12
T3	0.06	0.10	0.13	0.14	0.12
T5	0.10	0.14	0.17	0.17	0.14
T7	0.12	0.16	0.20	0.19	0.15
T10	0.15	0.19	0.23	0.22	0.17
T15	0.17	0.22	0.25	0.24	0.19
T20	0.18	0.22	0.25	0.24	0.19
Aaa	0.28	0.32	0.34	0.32	0.25
Aa	0.26	0.29	0.31	0.29	0.22
A	0.33	0.36	0.38	0.35	0.28
Baa	0.36	0.37	0.38	0.35	0.28
LG	0.40	0.39	0.37	0.33	0.30
VW	0.16	0.15	0.15	0.15	0.14
EW	0.21	0.20	0.20	0.20	0.20

Notes: The dependent variables are one-year excess returns on 1.5-year through 20-year Treasury securities, Aaa through low-grade (LG) corporate bonds, and value-weighted and equal-weighted NYSE stocks. The independent variables are DEF and one of the term spreads. DEF is the difference between the end-of-year yield on All (the portfolio of 100 corporate bonds in the sample) and the Aaa yield. LONG-TB denotes the difference between the long-term Treasury bond yield (in Coleman, Fisher, & Ibbotson, 1993 and updates) and the one-month Treasury bill yield. 10-TB is the difference between the 10-year Treasury yield and the one-month bill yield. 5-TB, 3-TB, and 2-TB are similarly defined.

TABLE 3
Regressions of One-Year Excess Returns on DEF and Two Term Spreads, 1942–1994

	DEF	*t-stat*	*INT-TB*	*t-stat*	*LONG-INT*	*t-stat*	R^2
T1.5	0.50	0.89	0.98	1.90	−0.55	−1.21	0.16
T2	0.77	1.08	1.19	1.84	−0.84	−1.43	0.15
T3	0.92	0.93	1.55	1.99	−1.52	−1.37	0.16
T5	1.39	1.06	2.20	2.13	−1.69	−1.14	0.18
T7	1.72	1.11	2.75	2.27	−1.90	−1.12	0.21
T10	2.02	1.14	3.38	2.46	−1.86	−0.99	0.23
T15	2.46	1.22	4.02	2.61	−1.89	−0.93	0.25
T20	2.84	1.30	4.26	2.54	−1.79	−0.85	0.24
Aaa	2.24	1.36	3.66	3.59	−0.46	−0.24	0.33
Aa	2.15	1.13	3.56	3.64	−0.45	−0.24	0.30
A	4.18	2.46	3.67	3.33	−0.19	−0.11	0.36
Baa	5.90	3.70	3.21	3.23	0.50	0.29	0.37
LG	12.14	5.21	2.51	2.00	3.73	1.81	0.39
VW	13.82	3.00	0.90	0.47	4.62	1.26	0.16
EW	22.06	4.39	0.06	0.03	7.34	1.79	0.22

Notes: The dependent variables are one-year excess asset returns on 1.5-year through 20-year Treasury securities, Aaa through low-grade (LG) corporate bonds, and value-weighted and equal-weighted NYSE stocks. The independent variables are the default yield spread, DEF, and the term spreads between, respectively, the n-year intermediate and one-month Treasury yields and the longest available and n-year intermediate Treasury yields. The n is set at 3 for T1.5 and T2, and 5 for T3 through EW. DEF is the difference between the end-of-year yield on All (the portfolio of the 100 corporate bonds in the sample) and the Aaa yield. R^2 denotes the adjusted coefficient of determination and t-stat denotes the t-statistic on the coefficient of the column to its left.

Table 3 presents regressions of one-year returns on DEF, a long-intermediate spread, LONG-INT, and an intermediate-short spread, INT-TB. The maturity of the intermediate rate is set based on Table 2 results. Let us first consider the results for the Treasury and investment-grade bonds. The intermediate-short spread always proves significant at the 7 percent level or better, while the long-intermediate spread never approaches significance. These results imply that the bond market prices an intermediate-short spread and not a long-intermediate spread. Statistically, these results allow us to accept the model with DEF and INT-TB as independent variables and to reject the model with DEF and LONG-INT as independent variables. They also allow us to reject Fama and French's (1989) model with DEF and a long-short spread as independent variables. We conclude that the bond market prices an intermediate-short term spread and not a long-short or long-intermediate spread.

LG, VW, and EW contain equity risk. For these regressions, the long-intermediate spread approaches significance, while the intermediate-short spread is only significant for low-grade bonds. This suggests (but nothing more) that the long end of the yield curve may contain information embedded in the prices of equities.

To consider whether the results are affected by multicollinearity, we regressed each independent variable on the others. The largest R^2 is 0.15, which suggests that multicollinearity is not a problem. An additional test is the "condition number" described by Belsley, Kuh, and Welsch (1980). For the regressions reported in Table 3, the largest condition number of 3.71 suggests a lack of multicollinearity.

In the spirit of Fama (1990b), we next present results from regressions of bond and stock returns on DEF and a common term spread. An advantage of using a common term spread is that its slope coefficients provide information about variation in expected term premiums as a function of maturity. The tests use the 5-TB term spread to track expected term premiums in bond and stock returns. Similar results prevail for other spreads.

B. Regressions on 5-TB and DEF

Table 4 presents regressions of bond and stock returns on 5-TB and DEF for investment horizons of one quarter and one year through four years. We look first at the patterns of the slopes for 5-TB. As maturity lengthens (i.e., looking across a row), the variation of expected returns increases. However, slopes remain essentially flat as we go from Aaa to Baa bonds. Surprisingly, slopes fall as we go from bonds to stocks. For a given bond (i.e., looking down a column), the slopes increase with the investment horizon through one year and, thereafter, either increase slowly or essentially flatten.

This study is the first to look at returns across bond maturities. The results imply that 5-TB captures a term premium in expected bond return that is closely related to bond duration. We calculated the Macaulay duration of Treasury bonds assuming they have a 6 percent coupon rate and are selling at par. In the one-year Treasury bond regressions, the correlation is 0.99 between slopes on 5-TB and bonds' durations. Each corporate bond series has an average maturity of about 20 years. Interestingly, their 5-TB slopes are less than the slope on 20-year Treasury bonds. Recall that corporate bonds are almost always callable while Treasuries are seldom callable. Thus, the average call-adjusted duration of corporate bonds should be less than the duration of Treasury bonds. Therefore, the pattern of slopes across maturities confirms prior scholars' suspicion that a term spread, such as 5-TB, captures variation in bond returns that is closely related to duration risk.

For a small change in bond yield, the approximate bond return, $\Delta P/P$, is: $\Delta P/P = -\Delta i \cdot$ ModD, where Δi is the change in yield and ModD, modified duration, is duration divided by 1.03 (1 plus the bond's semi-annual yield). Based on this relationship we regressed the 5-TB slopes on the bonds' ModD. The slope coefficient on ModD is 0.39, which has a useful interpretation. Suppose the term spread, 5-TB, is 1 percent above normal. During the next year, the five-year yield is expected to fall by 0.39 percent, which will narrow the spread and raise returns by Δi times ModD, that is, by the slope on 5-TB.

Two aspects of the 5-TB slopes are disappointing: the negative slopes in the multi-year stock regressions and the small slopes in the quarterly Treasury regressions. Fama and French (1989) also find the term coefficients in these stock regressions to be negative. So, this result appears to have nothing to do with the choice of term spreads. The Treasury bond returns rely on estimates of par-bond yields (yields on coupon-bearing bonds selling at par) across maturities. Coleman, Fisher, and Ibbotson (1993 and updates) estimate a different set of par yields each month. We did not calculate one-month returns because we felt the estimation errors of the month t and month $t + 1$ par yields could unduly influence the corresponding monthly return. The longer the investment horizon, the more confident we are that the pattern of bond returns reflects "true" bond returns and not estimation errors. Thus, estimation errors may partially account for the disappointing results in the quarterly Treasury regressions.

We now turn to the patterns of the slope coefficients for DEF. Looking across the rows, the slopes generally increase as we go from short-term to long-term bonds, from high-grade to low-grade bonds, and from large stocks to small stocks. Looking down the columns, the slopes generally increase with the length of the investment horizon. These patterns imply that the variation in expected returns increases as we go from short-term to

TABLE 4
Regressions of Excess Returns on 5-TB and DEF, 1942–1994

	T1.5	*T2*	*T3*	*T5*	*T7*	*T10*	*T15*	*T20*	*Aaa*	*Aa*	*A*	*Baa*	*LG*	*VW*	*EW*
Slopes on 5-TB															
Q	−0.03	−0.05	−0.03	−0.04	−0.02	0.02	0.04	0.02	0.62	0.62	0.72	0.72	0.91	1.04	1.21
1	0.73	0.84	1.34	1.97	2.49	3.12	3.76	4.01	3.60	3.50	3.65	3.28	3.02	1.54	1.07
2	0.41	0.43	0.99	1.57	2.12	2.85	3.53	3.61	4.07	4.01	3.87	3.44	2.08	−0.46	−3.33
3	0.78	0.92	1.69	2.42	3.04	3.88	4.65	4.73	4.67	4.19	3.93	2.96	0.10	−2.72	−8.75
4	0.88	1.13	2.06	2.93	3.73	4.86	5.93	6.18	5.28	4.95	4.74	3.86	2.15	−0.97	−6.89
t-statistics on 5-TB															
Q	−0.22	−0.36	−0.16	−0.14	−0.06	0.04	0.09	0.05	1.56	1.61	2.09	2.34	2.15	1.93	1.73
1	1.70	1.55	1.81	2.00	2.16	2.39	2.57	2.54	3.69	3.77	3.52	3.48	2.51	0.83	0.49
2	0.92	0.76	1.24	1.45	1.62	1.86	2.02	1.89	3.07	3.13	3.02	2.77	0.94	−0.25	−1.17
3	1.26	1.23	1.64	1.81	1.91	2.12	2.26	2.10	2.40	2.33	2.06	1.57	0.03	−1.27	−2.42
4	1.09	1.14	1.51	1.64	1.71	1.90	2.02	1.91	2.24	2.19	2.03	1.81	0.95	−0.37	−1.95
Slopes of DEF															
Q	0.11	0.14	0.20	0.35	0.43	0.54	0.72	0.75	0.72	0.90	1.15	1.56	3.53	3.94	6.20
1	0.20	0.33	0.44	0.85	1.12	1.43	1.86	2.27	2.09	2.00	4.12	6.06	13.32	15.29	24.39
2	1.20	1.63	2.40	3.91	4.79	5.64	6.50	7.41	6.56	5.58	10.04	13.25	25.55	29.21	44.19
3	1.51	2.13	3.46	6.16	8.00	9.83	11.39	13.06	9.60	8.79	13.87	17.37	33.43	37.68	53.63
4	1.50	2.22	3.91	7.27	9.44	11.74	13.43	15.21	12.95	11.13	15.80	18.88	35.91	43.19	55.21
t-statistics on DEF															
Q	0.72	0.75	0.81	1.08	1.13	1.25	1.43	1.42	1.52	1.90	2.51	3.26	4.13	3.11	3.31
1	0.38	0.50	0.50	0.74	0.83	0.93	1.05	1.18	1.48	1.15	2.71	4.20	6.21	3.63	4.83
2	0.95	1.05	1.20	1.57	1.64	1.64	1.64	1.73	2.01	1.48	3.04	5.48	6.82	4.32	5.04
3	0.85	1.00	1.19	1.72	1.93	2.04	2.03	2.26	1.80	1.49	2.80	4.79	6.11	5.16	4.22
4	0.78	0.98	1.19	1.77	1.99	2.15	2.10	2.32	1.83	1.46	2.44	3.69	6.62	4.99	3.80
R^2															
Q	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.00	−0.00	0.04	0.04	0.06	0.09	0.13	0.05	0.07
1	0.12	0.09	0.13	0.17	0.20	0.23	0.25	0.25	0.34	0.31	0.38	0.38	0.37	0.15	0.20
2	0.02	0.01	0.04	0.08	0.10	0.13	0.14	0.13	0.24	0.20	0.28	0.35	0.41	0.28	0.33
3	0.04	0.04	0.08	0.14	0.17	0.20	0.21	0.21	0.22	0.18	0.26	0.33	0.43	0.40	0.42
4	0.03	0.05	0.10	0.17	0.20	0.23	0.25	0.26	0.25	0.20	0.28	0.35	0.48	0.42	0.37

Notes: The regressions for one quarter (Q) and one year (1) use nonoverlapping returns. The regressions for two- to four-year returns use overlapping annual observations. The Newey and West (1987) method is used to estimate standard errors in the two- to four-year regressions. R^2 denotes the adjusted coefficient of determination. See Table 1 for definitions of variables.

long-term debt, from high-grade to low-grade bonds, and from large stocks to small stocks. The economic story is that the rewards for bearing the risk reflected by DEF (and dividend yield) are generous when business conditions are weak and small when business conditions are strong. Moreover, the risks reflected by DEF (and D/P) are slow to dissipate, so the expected rewards increase as the investment horizon lengthens. Mathematically, the first-order autocorrelation coefficients in Table 1 on DEF (and D/P) are large and higher-order autocorrelation coefficients decay slowly. Economically, DEF (and D/P) reflect business conditions that change slowly over time.

Finally, it is interesting to view the patterns of coefficients of determination. Recall that 5-TB (or another term spread) predicts returns out one year, but it has little impact on returns in years two, three and four. And, DEF's predictive content strengthens as we go from short-term debt through stocks and as we lengthen the investment horizon. The coefficients of determination reflect these patterns. For shorter Treasury securities, the goodness-of-fit is relatively large after one year and decreases sharply as the investment horizon lengthens. For longer-term Treasury and corporate bonds, the R^2 decreases as the horizon goes from one to two years before slowly rising to reflect the impact of DEF. For low-grade bonds and stocks, the goodness-of-fit increases with horizon since these assets benefit from the strengthening impact of DEF. Altogether, the results imply that 9 percent to 38 percent of the variation in one-year excess bond returns can be predicted by 5-TB and DEF. The predictable variation in one-year stock returns is 15 to 20 percent.

C. Regression Diagnostics

A key issue examined in this study is whether a term spread can reliably predict bond returns. This section examines whether the full period results prevail for different sub-periods and for different measures of returns. We form three checks. First, following Fama and French (1989) we regress real returns on DEF and 5-TB for the post-1953 period. Second, we examine the excess-return results for 1969–1994, the last half of the full period. Third, we examine plots of, for example, one-year actual returns on 10-year Treasury bonds versus the fitted values from the full period excess-return regressions. Comparing actual returns to the fitted values illustrates whether the full period predictive content exists over sub-periods.

Table 5 presents the real return regressions for 1953–1994. They tell much the same story as the 1942–1994 excess return regressions, but there are a few interesting differences. The slopes on 5-TB are similar in size and significance in the two sets of regressions. However, the slopes on DEF are much larger in the real return regressions. They are about ten times larger in the T1.5 and T2 regressions. They remain two to three times larger in the long-term Treasury and high-grade corporate bond regressions, and these t-statistics are, on average, perhaps 20 percent larger. Separate regressions (not shown) reveal that about half the absolute differences in DEF slopes is due to the change in time period from 1942–1994 to 1953–1994 and half to the change in dependent variable. The comparatively strong real-return results suggest that when business conditions are weak and DEF is wide, the expected risk-free real rate tends to be generous. Thus, DEF appears to track a larger fraction of the variation in assets' real returns than their excess returns.

Table 6 presents the excess-return regressions for 1969–1994. They tell essentially the same story as the 1942–1994 regressions, but the overall fit of most regressions is some-

TABLE 5
Regressions of Real Returns on 5-TB and DEF, 1953–1994

	T1.5	*T2*	*T3*	*T5*	*T7*	*T10*	*T15*	*T20*	*Aaa*	*Aa*	*A*	*Baa*	*LG*	*VW*	*EW*
Slopes on 5-TB															
Q	0.03	0.00	0.02	0.01	0.03	0.05	0.07	0.04	0.72	0.70	0.80	0.81	1.03	1.21	1.31
1	1.30	1.41	1.91	2.61	3.16	3.81	4.45	4.67	4.36	4.19	4.29	3.91	3.84	2.16	1.33
2	1.01	1.01	1.51	2.17	2.70	3.43	4.08	4.12	4.65	4.48	4.26	3.92	3.15	0.31	–3.14
3	1.27	1.37	2.02	2.82	3.38	4.14	4.79	4.84	5.02	4.39	4.09	3.34	1.56	–1.11	–7.60
4	1.36	1.56	2.33	3.28	4.01	5.07	6.02	6.33	5.47	5.03	4.85	4.24	3.96	1.47	–4.62
t-statistics on 5-TB															
Q	0.25	0.02	0.09	0.06	0.09	0.15	0.15	0.09	1.69	1.73	2.20	2.48	2.33	2.16	1.80
1	1.94	1.82	2.01	2.24	2.39	2.62	2.80	2.76	3.83	3.73	3.52	3.53	3.05	1.02	0.55
2	1.16	1.02	1.26	1.46	1.58	1.77	1.89	1.79	2.68	2.63	2.53	2.48	1.40	0.15	–0.97
3	1.00	0.98	1.25	1.47	1.56	1.73	1.82	1.73	2.03	1.86	1.65	1.40	0.50	–0.42	–1.90
4	0.88	0.92	1.18	1.35	1.43	1.60	1.70	1.66	1.86	1.80	1.68	1.57	1.46	0.52	–1.27
Slopes of DEF															
Q	1.37	1.44	1.53	1.62	1.72	1.89	2.18	2.27	1.68	2.44	2.52	2.63	3.58	4.96	6.69
1	3.70	3.88	3.69	3.16	3.08	3.22	3.67	4.29	3.79	5.40	7.27	8.66	11.82	21.66	29.49
2	11.62	12.44	13.48	14.24	15.05	16.02	17.47	18.45	18.84	19.94	24.10	24.26	25.83	40.77	50.21
3	15.79	17.09	19.53	22.11	24.62	27.59	31.23	32.90	28.02	29.79	34.14	32.48	32.80	42.02	45.79
4	18.44	19.91	23.27	26.72	29.78	33.28	37.26	38.26	37.44	37.76	41.25	38.35	37.74	48.32	42.89
t-statistics on DEF															
Q	3.14	2.69	2.23	1.77	1.58	1.50	1.52	1.49	1.16	1.89	2.05	2.06	2.64	2.13	2.15
1	2.01	1.83	1.42	0.96	0.80	0.74	0.76	0.81	1.02	1.48	1.88	2.38	2.71	2.29	2.69
2	2.74	2.60	2.36	2.06	1.90	1.80	1.76	1.77	2.54	2.69	3.32	3.64	3.17	2.81	2.76
3	2.70	2.65	2.54	2.43	2.41	2.45	2.54	2.60	2.61	2.77	3.41	3.55	2.81	2.67	2.22
4	2.82	2.80	2.79	2.73	2.72	2.78	2.88	2.83	2.95	3.05	3.65	3.59	3.36	3.12	2.12
R^2															
Q	0.06	0.04	0.02	0.01	0.01	0.01	0.01	0.00	0.05	0.07	0.09	0.11	0.11	0.06	0.05
1	0.26	0.22	0.22	0.23	0.24	0.27	0.29	0.28	0.38	0.38	0.42	0.41	0.31	0.15	0.14
2	0.29	0.26	0.22	0.20	0.19	0.19	0.20	0.19	0.33	0.33	0.38	0.40	0.26	0.24	0.20
3	0.28	0.26	0.26	0.26	0.26	0.28	0.29	0.28	0.32	0.32	0.36	0.36	0.20	0.21	0.18
4	0.25	0.24	0.26	0.27	0.28	0.29	0.31	0.31	0.36	0.36	0.39	0.40	0.29	0.28	0.10

Notes: The regressions for one quarter (Q) and one year (1) use nonoverlapping returns. The regressions for two- to four-year returns use overlapping annual observations. The Newey and West (1987) method is used to estimate standard errors in the two- to four-year regressions. R^2 denotes the adjusted coefficient of determination. T1.5 through T20 denote real returns on Treasury securities. Aaa through LG denote real returns on Aaa through low-grade (below Baa) corporate bonds. VW and EW denote value-weighted and equal-weighted NYSE stock real returns. Real returns are computed from Ibbotson Associates' CPI series.

TABLE 6
Regressions of Excess Returns on 5-TB and DEF, 1969–1994

	T1.5	*T2*	*T3*	*T5*	*T7*	*T10*	*T15*	*T20*	*Aaa*	*Aa*	*A*	*Baa*	*LG*	*VW*	*EW*
Slopes on 5-TB															
Q	−0.09	−0.12	−0.11	−0.13	−0.12	−0.10	−0.11	−0.15	0.67	0.63	0.74	0.69	0.98	1.48	1.79
1	0.59	0.71	1.26	2.00	2.58	3.26	3.93	4.11	4.04	3.72	3.90	3.50	3.65	3.77	3.35
2	−0.29	−0.38	0.05	0.56	0.99	1.58	2.09	1.91	2.93	2.68	2.50	2.26	1.59	2.78	−0.25
3	−0.14	−0.11	0.37	0.86	1.20	1.70	2.08	1.87	2.29	1.45	1.15	0.25	−1.38	0.77	−6.46
4	0.04	0.25	0.91	1.62	2.20	3.03	3.78	3.81	2.45	1.90	1.59	0.87	0.91	4.11	−2.89
t-statistics on 5-TB															
Q	−0.57	−0.63	−0.46	−0.41	−0.33	−0.24	−0.21	−0.28	1.33	1.33	1.75	1.77	1.86	2.27	2.09
1	1.11	1.06	1.43	1.79	2.01	2.25	2.42	2.34	3.49	3.23	3.23	2.95	2.75	1.56	1.19
2	−0.57	−0.60	0.05	0.46	0.67	0.92	1.08	0.91	1.62	1.45	1.48	1.27	0.70	1.11	−0.06
3	−0.21	−0.15	0.33	0.60	0.70	0.87	0.97	0.77	0.90	0.59	0.47	0.10	−0.45	0.32	−1.38
4	0.06	0.27	0.72	0.92	1.00	1.17	1.26	1.13	0.97	0.77	0.65	0.35	0.41	1.99	−0.67
Slopes of DEF															
Q	0.62	0.70	0.79	0.92	1.03	1.20	1.50	1.61	1.38	2.13	2.16	2.26	3.71	4.99	7.37
1	1.38	1.73	1.31	0.86	0.82	0.88	1.29	2.09	0.39	2.30	3.75	5.14	9.83	16.63	27.42
2	5.83	7.14	8.33	9.71	11.06	12.21	13.72	14.95	14.01	14.91	17.94	17.54	21.34	26.77	40.65
3	7.56	9.41	12.23	15.95	19.42	22.98	27.09	28.76	21.61	23.54	26.63	24.86	27.55	27.39	40.02
4	7.47	9.26	12.66	16.89	20.61	24.39	28.51	29.18	27.68	27.59	29.78	26.82	28.69	29.72	34.28
t-statistics on DEF															
Q	1.34	1.17	0.99	0.84	0.78	0.78	0.85	0.86	0.81	1.41	1.51	1.48	2.31	1.83	1.99
1	0.93	0.91	0.50	0.24	0.19	0.18	0.23	0.33	0.09	0.51	0.83	1.14	2.03	1.73	2.33
2	2.09	2.02	1.65	1.46	1.39	1.30	1.26	1.29	1.84	1.96	2.30	2.23	2.38	1.68	1.79
3	2.24	2.25	1.95	2.01	2.10	2.17	2.29	2.31	1.99	2.16	2.61	2.62	2.30	1.57	1.54
4	2.04	2.04	1.81	1.89	1.97	2.06	2.18	2.08	2.07	2.06	2.59	2.47	2.64	2.04	1.53
R^2															
Q	−0.00	−0.00	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	0.04	0.05	0.07	0.07	0.11	0.08	0.08
1	0.05	0.04	0.07	0.11	0.14	0.17	0.19	0.19	0.33	0.31	0.36	0.31	0.27	0.22	0.21
2	0.13	0.11	0.05	0.04	0.04	0.05	0.06	0.05	0.19	0.19	0.24	0.23	0.14	0.17	0.11
3	0.12	0.12	0.11	0.12	0.14	0.16	0.18	0.17	0.18	0.18	0.24	0.21	0.11	0.13	0.10
4	0.09	0.10	0.11	0.13	0.15	0.18	0.20	0.18	0.22	0.22	0.27	0.25	0.15	0.29	0.01

Notes: The regressions for one quarter (Q) and one year (1) use nonoverlapping returns. The regressions for two- to four-year returns use overlapping annual observations. The Newey and West (1987) method is used to estimate standard errors in the two- to four-year regressions. R^2 denotes the adjusted coefficient of determination. See Table 1 for definitions of variables.

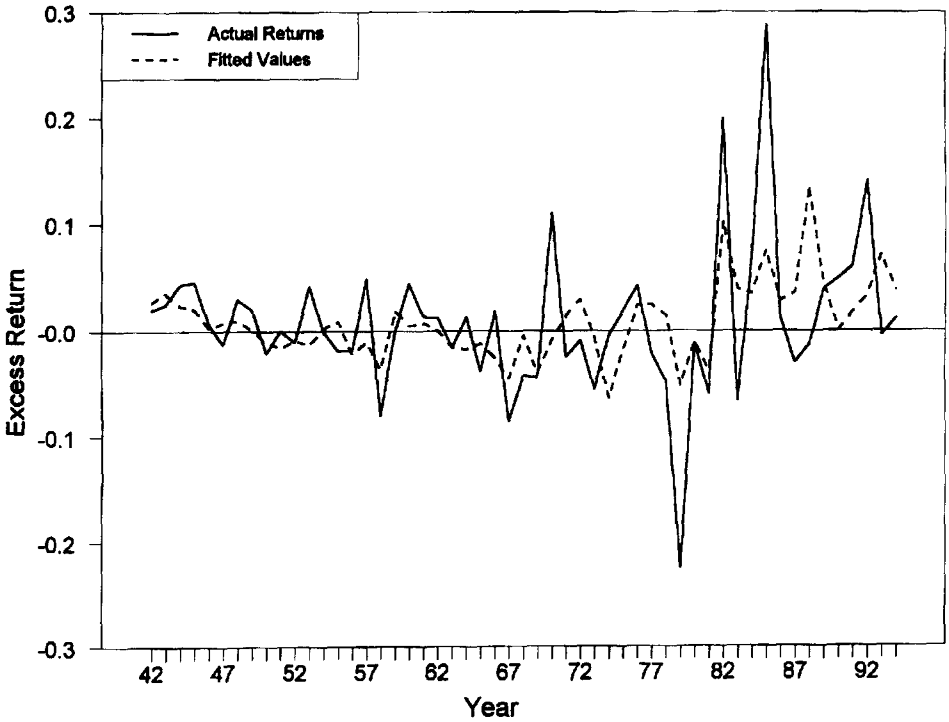

Figure 3. Excess Returns on 10-Year Treasury Bonds

what weaker. As before, the slopes of 5-TB increase with bond maturity and, looking down the columns, they peak after one year. The slopes on DEF generally increase as we go from short-term bonds to long-term bonds to common stocks and from one-year to four-year investment horizons.

Figure 3 plots actual excess returns on 10-year Treasury bonds and fitted values from the one-year regression on 5-TB and DEF for 1942–1994. The general impression is that the regression has some ability to track actual returns, but it performed poorly from about 1968–1973 and 1986–1994. Even the best of models will prove less powerful in some short periods, and this could explain the poor recent performance. However, another possible explanation of the model's poor recent performance is data mining—researchers' practice of "mining" data until they find something that would have worked in the past, but it often does not work going forward. We believe the economic story that a term spread, especially an intermediate-short term spread, tracks embedded term premiums. We, therefore, believe that a term spread will be able to predict returns going forward. Others may view Fama and French (1989) and the related research as the product of data mining and point to the disappointing post-1986 results for support. The key, in our opinion, is whether someone believes the underlying economic story.

With an appreciation of the qualifications discussed in the prior paragraph, we can discuss the investment implications and applications of the results.

IV. FINDINGS, INTERPRETATIONS, AND APPLICATIONS

In this section, we note empirical findings from this and related studies and discuss their interpretations. We also present our views of their implications and applications.

First, two factors jointly predict returns on bonds. One factor can be measured by DEF or D/P and the second by an intermediate-short term spread. The first factor also predicts year-ahead and longer returns on stocks, but term spreads do not reliably predict stock returns.

Second, the impact of a default yield spread (or the market's dividend yield) on security returns increases as we go from short-term to long-term bonds, from high-grade to low-grade bonds, and from bonds to stocks. Moreover, its impact increases as the investment horizon lengthens through four years. Economically, DEF (or D/P) appears to be associated with a business cycle that is longer than the traditional cycle defined by the NBER.

Third, the empirical evidence implies that an intermediate-short term spread can better predict bond returns than a long-short spread. We also present our interpretation of why this predictive advantage exists. Our interpretation is consistent with substantial institutional and some empirical evidence, but it remains only one possible interpretation.

For many investors including most individual investors, duration is a good measure of a bond's risk. These investors dominate the short to intermediate end of the market. So, an intermediate-short spread should closely track embedded term premiums. In contrast, life insurance companies and defined-benefit pension plans dominate the long end of the bond market. For these institutions, long-term bonds are less risky than short-term bonds because they better match their long-term liabilities. For example, a whole-life insurance policy may promise $1,000,000 at death or age 65, whichever comes first. For a large group of insured, actuarial science allows the insurance firm to closely estimate its future cash payouts, and these payouts look a lot like a long-term bond. Buying long-term bonds allows them to lock-in the projected cash flows. In addition, life insurance regulations impose the lowest reserve requirement on long-term bonds, which further strengthens the preference for long-term bonds. The cash flows of the accumulated benefit obligation (ABO), a measure of the defined-benefit pension liability, look a lot like a bond. Not surprisingly, many firms try to invest pension assets (or at least the bond portion of pension assets) in a long-term bond portfolio that matches the ABO liability. This creates a strong preference for long-term bonds.

It follows that an intermediate-short term spread should closely track embedded term premiums. Meanwhile, a long-intermediate term spread should vary primarily with factors besides term premiums. We suspect institutions' demand for long-duration bonds is one such factor, but a study of the factors is beyond the scope of this study. The intermediate-short spread is a cleaner, less noisy measure of embedded term premiums than a long-short spread precisely because it ignores these other factors that affect the long-intermediate spread.

A more rigorous explanation may help. In equation form, let the intermediate-short spread at time t, IS_t, be a function of the term premium at time t, TP_t. That is, $IS_t = f(TP_t)$. Let the long-intermediate term spread, LI_t, be a function of factors x_t, y_t, and z_t, where one of these factors may be TP_t. That is, $LI_t = f(x_t, y_t, z_t)$. The long-short spread, LS_t, thus depends on all factors: $LS_t = F(TP_t, x_t, y_t, z_t)$. Prior studies used LS_t to proxy for TP_t. We believe IS_t is a cleaner, less noisy proxy for TP_t precisely because it ignores the influence of factors x_t, y_t, and z_t, and this accounts for its better predictive performance.

Fourth, an intermediate-short spread seems to be a jack-of-all-trades. We show that it best predicts bond returns. Harvey (1989) shows that it predicts the growth in real Gross Domestic Product up to one year ahead. Fama (1990b) shows that it predicts (a) changes in inflation rates, (b) changes in real rates on short-term Treasury bills, and (c) distant changes in the level of the bill rate. These results are consistent with this paper's story. The intermediate-short spread is wide at business troughs (see Figure 1). A wide term spread predicts that investors will be generously rewarded for extending bond duration during these tough economic times. Harvey finds that it predicts fast output growth for the next year as the economy strengthens. Fama finds that a wide spread also predicts that the inflation rate will increase from its low level and that the real rate will decrease from its high level. It cannot predict changes in the bill rate one or two years ahead since the rise in inflation and fall in the real rate roughly offset each other. However, the wide term spread reliably predicts a rise in the bill rate three and four years ahead; the rise in inflation is longer lived than the fall in the real rate.

Fifth, for 1942–1994, the average term risk premium (over the one-month bill yield) peaks at about 1 percent on 1.5-year through 7-year Treasury bonds, and it falls thereafter. These results support the evidence from prior term structure studies that the average term premium peaks on intermediate bonds and then falls as maturity lengthens (see Domian, Maness, & Reichenstein, 1998; Ibbotson Associates, 1997; McCallum, 1975; and McCulloch, 1975).

The maximum average term premium of about 1 percent pales in comparison with the average equity risk premiums for the same period of 7.23 percent on value-weighted stocks and 9.67 percent on equally-weighted stocks. Historically, investors have received much larger average rewards for switching from bonds (of any maturity) to equity than from extending bond maturity. This implies that the choice of debt-equity mix is more important than the choice of bond maturity for investors who periodically rebalance their portfolios back to fixed weights. That is, the debt-equity decision is a more important strategic asset allocation decision than the bond-maturity decision.

Sixth, the empirical evidence implies that expected term premiums vary widely. Table 7 shows the expected one-year excess returns on, respectively, 1.5-year and 20-year Treasury bonds. The expectations rely on values from Tables 1 and 4. They assume DEF is at its historic average level, and 5-TB is at its mean (1.10%) or one standard deviation below (-0.03%) or above (2.23%) its mean. When the term spread exceeds its mean, the 20-year bond enjoys a 3.02 percent expected return advantage. When the term spread is below its mean, the 1.5-year bond has a 4.40 percent return advantage. This variation in expected

TABLE 7

Expected One-Year Excess Returns Across Levels of the Term Spread

assumed 5-TB	–0.03%	1.10%	2.23%
projected T1.5	0.19%	1.01%	1.83%
projected T20	–4.21%	0.32%	4.85%

Notes: The projected excess returns on T1.5 and T20 come from Table 4 parameters assuming DEF is at its historic average and 5-TB is at its mean (1.10%) or one standard deviation below (-0.03%) or above (2.23%) its mean. T1.5 and T20 denote 1.5-year and 20-year Treasury bond excess returns.

returns is large and economically significant. Historically, 5-TB and DEF predict between a fifth and two-fifths of the variance in year-ahead returns on seven-year and longer bonds.

Finally, we recommend an application of our research and related research *for individuals who believe that DEF (or D/P) and an intermediate-short spread will be able to predict security returns*. We call these individuals the Believers. The application can be explained using Sharpe's (1987) Integrated Asset Allocation framework.

Consider someone who has a stable risk tolerance. In Markowitz' mean-variance framework, he has a stable utility function. So, his optimal asset mix varies with capital market prospects—i.e., the efficient frontier. If security prices follow a random walk then market prospects never vary, returns are not predictable, and the individual should follow a constant-weight portfolio strategy with periodic rebalancing. This individual's optimal mix is called his strategic asset mix.

The empirical results in this paper and in related research imply that an intermediate-short term spread and DEF (or D/P) can partially predict security returns. It follows that Believers should consider tactical asset allocation, where the cash-bonds-stock asset mix changes with market conditions. The equity portion should vary directly with the level of DEF or D/P. The allocation of the fixed-income portfolio between short-term and long-term debt should vary primarily with the level of 5-TB or another intermediate-short spread.

How far should Believers allow their asset mix to vary? If returns were 100 percent predictable, the individual would move everything ahead of time into next period's best performing asset. If returns were not predictable, as the random walk model assumes, he or she would follow a constant-weight strategy. A few years ago, Samuelson (1990) looked at the evidence on returns' predictability, including many studies referenced herein, and concluded that it could support deviations in an asset-class weight (e.g., stocks, bonds, cash) of plus or minus 10 percent. Although his is but one opinion, and a case could be made for larger maximum deviations, it provides one estimate of how far an individual should allow his tactical asset allocation weights to vary from his strategic weights. If the 10 percent maximum deviation is applied, the recommended tactical strategy amounts to a modest deviation from a constant-weights strategy, but one that we believe is justified.

V. CONCLUSIONS

Prior studies conclude that a long-short term spread can predict returns on long-term bonds and stocks. We extend these studies (1) by examining the predictive content of other term spreads, especially intermediate-short spreads and (2) by examining regressions of excess returns on 1.5-year through 20-year Treasury bonds.

The major contributions of this study are two of its novel results. First, we show that the bond market prices an intermediate-short spread and not a long-short or a long-intermediate spread. We believe that the intermediate-short spread better tracks embedded term premiums than a long-short spread.

Second, this is the first study to examine regressions of bond returns across maturities. In regressions of 1.5-year to 20-year Treasury returns on the forecasting variable, the correlation is 0.99 between the slopes for the intermediate-short term spread and estimates of bond durations. These results confirm prior scholars' suspicion that a term spread tracks the reward to bearing duration risk.

Finally, we recommend that individual investors who want to practice tactical asset allocation strategies should vary their debt-equity mix with the level of a default risk premium or the stock market's dividend yield, while the maturity mix of the debt portfolio should vary with an intermediate-short term spread.

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APPENDIX

Coleman, Fisher, and Ibbotson (1993 and updates) estimate end-of-month spot rates and par bond yields (yields on coupon-bearing bonds selling at par) on fully taxable Treasury bonds beginning end-of-December 1940. Few fully taxable Treasury bonds existed before year-end 1941. Our data series begin December 1941 when estimated par yields on 1, 1.5, 2, 3, 4, 5, 7, 10, 15, and 20-year bonds were generally available.

We calculated quarterly returns on coupon-bearing bonds with maturities of 1.5, 2, 3, 5, 7, 10, 15, and 20 years. The calculations assume that the bond is bought at par at the beginning of the quarter and sold at the end of the quarter at a price corresponding to the then prevailing par yield. The ending par yield is the weighted average of surrounding yields.

For example, suppose the end-of-September par yield on five-year bonds is 8.44% and the end-of-December four-year and five-year par yields are 7.96% and 7.98%. The end-of-December 4.75-year par yield is taken as 7.975%, the weighted average of the four-year and five-year par yields. The end-of-December price, $P_{4.75}$, which includes accrued interest, is

$$P_{4.75} = \sum_{t=1}^{10} \frac{4.22(1.039875)^{0.5}}{(1.039875)^{t}} + \frac{100(1.039875)^{0.5}}{(1.039875)^{10}}$$

where 4.22 is the semiannual coupon and 1.039875 is 1.00 plus the December semiannual yield. The $(1.039875)^{0.5}$ in the numerator serves to move all payments forward three months (half a semiannual period). The quarterly return is $(P_{4.75} - 100)/100$, where 100 is the par price of the 5-year bond.

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