Inflation and the Holding Period Returns on Bonds*

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I. Introduction

The effect of inflation on the returns to financial assets has been an important theoretical issue for many years. Due to our recent experience with unusually high rates of inflation, this effect is now of considerable practical importance. The basic theoretical concept is usually attributed to I. Fisher [6], who posited that a one percent increase in the rate of inflation expected in the market-place should yield a corresponding one percent increase in the nominal riskless rate of interest. This relationship, known as the "Fisher effect", has received wide acceptance among economists and has played an important role in monetary theory, finance, and macroeconomics. Almost all empirical work has found that the anticipated rate of inflation and the riskless rate of interest are positively correlated.[1] Financial practitioners on Wall Street appear to believe in this relationship, though casual observation of the movement of interest rates in the last few years may be more convincing to them than the academic studies.[2]

While much research has examined the association between the riskless interest rate and inflation, the effect of inflation on the returns to risky assets has received less attention. To the authors' knowledge, no research has examined the relationship between inflation and the holding period returns to bills and bonds, while only a few papers have treated the effect of inflation on stock price movements.[3]

In addition, these works have generally failed to separate anticipated from unanticipated inflation. Though Irving Fisher considered only the effect of inflation on the riskless one-period interest rate, his arguments also imply that the expected nominal return on risky assets should be positively related to the anticipated rate of inflation. Unfortunately, this theoretical hypothesis has never been fully developed, and its empirical testing has been virtually ignored. Further relationships can be postulated and tested between the returns on risky assets and unanticipated inflation, a topic generally disregarded in the literature.

To fill the above gap in our knowledge, the present paper analyzes the association between inflation and the returns to risky assets. Because theoretical relationships can easily be developed for the holding period returns to debt owners, the only risky assets treated here will be bills, notes, and bonds. The structure of the paper is as follows. In section II, we develop the theoretical relationship between the anticipated inflation rate and the holding period returns on bonds, which we call the "generalized Fisher effect." The effect of unanticipated inflation on bond prices is also discussed in this section. A description of the data and its summary statistics are presented in section III. Empirical tests are performed in the next section. Our conclusions are discussed in section V.

II. The Model

Under Irving Fisher's assumption that a one percent increase in the expected rate of inflation should produce a one percent increase in the one-period nominal interest rate, inflation should have three effects on the holding period return of a bond:

1) Assume that the rate of inflation expected in the periods beyond date t + 1 is revised upward, as we move from date t to date t + 1. *Ceteris paribus*, this upward revision should adversely affect the holding period return on a bond over the period from date t to date t + 1.

2) If prior to date t + 1 new information is released which suggests that the expected rate of inflation from date t + 1 to date t + 2 has increased, the expected holding period return from date t + 1 to date t + 2 will increase. This is the generalized Fisher effect, with which our paper is primarily concerned.

3) An actual rate of inflation from date t to date t + 1 that is higher than the rate anticipated at date t should, ceteris paribus, have no effect on the holding period return of a bond over this same period.

To prove these propositions we initially posit that all investors are certain that, in each future period, the inflation rate will be I and that the interest rate will be ρ.[4] We assume a riskless consol bond valued according to the following formula:

$$V(t) = \frac{X}{1+\rho} + \frac{X}{(1+\rho)^2} + \ldots + \frac{X}{(1+\rho)^n} + \ldots = \frac{X}{\rho} , \tag{1}$$

where:

V(t) is the value of the bond at date t

X is the coupon payment to be made each date beginning with t + 1.

ρ is the rate of interest to occur over each future period.

Under the assumption that ρ is constant, the holding period return over the period from date t to date t + 1 will be:

$$\frac{V(t+1) - V(t) + X}{V(t)} = \frac{\frac{X}{\rho} - \frac{X}{\rho} + X}{\frac{X}{\rho}} = \rho \tag{2}$$

However, alternatively, imagine that as we move from date t to date t + 1, a never-to-be repeated situation occurs where the rate of inflation to obtain in all future periods beginning at date t + 1 increases to

I + .01. Under the Fisher effect, the one period interest rate in all future periods is now $\rho + .01$. After this unexpected change in inflation, the world reverts back to perfect certainty, i.e. the investors do not consider the possibility of additional inflation rate changes in the future. Using the left hand side of (2), we find that the holding period return from date t to date t + 1 would be:

$$3)\qquad \frac{\frac{X}{\rho + .01} - \frac{X}{\rho} + X}{\frac{X}{\rho}} = \rho - \frac{.01}{\rho + .01} < \rho$$

Thus, the holding period return decreases when the rate of inflation to occur in future periods unexpectedly increases, which establishes proposition I for our model.

However, the holding period return from date t + 1 to date t + 2 is:

$$\frac{V(t+2) - V(t+1) + X}{V(t+1)} = \frac{\frac{X}{\rho + .01} - \frac{X}{\rho + .01} + X}{\frac{X}{\rho + .01}} = \rho + .01$$

Thus, the holding period return increases when the anticipated inflation rate increases, establishing proposition 2.

To prove proposition III, we assume that the never-to-be repeated situation had occurred in a slightly different manner. The actual inflation rate from date t to date t + 1 was unexpectedly I + .01, while the inflation rate certain to occur in each future period is still I. Here the holding period return for the bond can be evaluated from the left hand side of (2). Since the discount rate for future periods is constant, V(t + 1) will not change. The value of V(t) is also not affected, since it was determined prior to the unexpected release of information. Thus, it follows that the holding period return is still ρ over the period from date t to date t + 1, and proposition 3 is established.

III. The Data

It has recently been pointed out by Fama [5] that the Consumer Price Index (CPI) was substantially upgraded at the beginning of 1953. Accordingly, our study uses monthly data from January, 1953 to December, 1971. Bildersee[5] has calculated the <u>one month</u> holding period returns for U. S. Treasury bills, notes, and bonds of different maturities. We use his data over the period January 1953 to December 1971 for Treasury issues of the following maturities:

1) two months[6]
2) three months
3) one to two years[7]
4) five to six years
5) 15 to 20 years

To measure the return of the market as a whole we employ the Fisher Index, which is an equally-weighted portfolio of all securities listed on the New York Stock Exchange (NYSE).[8] The risk-free rate for month t is the yield to maturity stated at the beginning of month t for a bill coming due at the end of month t.[9]

The means and standard deviations for these different series are presented in Table 1. The average holding-period return tends to be higher for the risky bills and bonds than for the riskless rate, though a cursory examination suggests that the mean return on a risky asset is unrelated to its length of maturity. The stock market index considerably outperforms the other assets during our sample period, although it is well known that the market index has underperformed the other assets in more recent years.

As the consumer price index increases at a less rapid rate than any of the other assets, all of these other assets earn a positive real rate of return. However, Table 1 shows that, on average, the real rate of return for the riskless asset is under one percent per year.

Our results indicate that the standard deviation of return on a treasury issue is positively related to its length of maturity. As we will show that the returns on bills and bonds are related to observable variables such as the past rates of inflation and the current riskless rate, the standard deviations of unanticipated movements in the returns on bonds are less than the figures of Table 1. The variability of the Fisher index is by far the greatest in the table, confirming the popular notion that the returns on stocks are more variable than the returns on bonds.

The serial correlation coefficients for the nominal returns on different assets are presented in panel A of Table 2. These coefficients at short lags are extremely high for the riskless asset, the two months bill, and the three months bill, and dampen only slightly as the lag increases. Much of this correlation may reflect the fact that these nominal rates track the series of consumer price changes, another autocorrelated series. As will be discussed later, the low serial correlation coefficients for the series of real returns for these bills supports this view. The coefficients on the nominal returns for the longer term bonds are much lower. Results to be presented later suggest that the returns on these bonds do not track the series of consumer price changes as well.

The returns on the stock market index show some evidence of positive autocorrelation. However, as E. Fama and L. Fisher correctly state, the observed autocorrelation in an index may merely reflect an aggregation problem.[10] The results of Fama [4] and others showing low autocorrelation coefficients for the returns of individual stocks suggest that much of the measured autocorrelation of the stockmarket index is indeed spurious. Panels B and C of Table 2 present the serial correlation coefficients for the real returns of stocks and bonds. This data will be discussed in detail in later sections.

IV. Empirical Tests of the Generalized Fisher Effect in Bonds

To test the propositions of Section II, we first measure the relationship between inflation and holding period returns. Next we demarcate inflation into its anticipated and unanticipated parts and relate each part to holding period returns.

A. Inflation and Returns on Bonds

The following regression relates the rate of inflation to bond returns:

$$R_{bxt} = a + b\, I_t + \epsilon_t \, ,$$

where:

R_{bxt} is the holding period return over month t of a bond maturing in X months.

I_t is the rate of inflation in month t, as measured by the consumer price index (CPI).

The data from these regressions are shown in Table 3. In four of the five regressions, there is a positive relationship between the holding period return and the rate of inflation. The t-values for b are significantly different than zero in three of these regressions. We find a steady decline in b, t(b), and R^2 as we move to the bonds with longer maturities, indicating that other factors besides the rate of inflation influence the returns on longer term bonds. Our results should be contrasted with those of Friend and Blume [12] who found a slightly negative relationship between long term bonds and inflation using yearly data over the period 1902-1971.

Though the results suggest a positive relationship, the coefficients in each of the 5 regressions is significantly below 1. Thus, the real returns to bond holders decline during the times of high inflation. To a large extent, the extremely low Durbin-Watson Statistics in the first two regressions reflect the high serial correlations of the dependent variables. These high correlation coefficients are presented in Table 2.

B. Anticipated Inflation and Returns on Bonds

Proposition 2, which is derived from the theoretical model of section II, states that a one percent increase in the <u>anticipated</u> rate of inflation should yield a corresponding one percent increase in the expected holding period returns on bonds. We test this proposition empirically in the present section.

For the regression of the observed rate of inflation on the contemporaneous interest rate, Fama [5] finds the slope coefficient to be insignificantly different from 1 for the period from 1953 to 1971, a result consistent with the I. Fisher effect.[11] He concludes that the "evidence is also consistent with the hypothesis that the expected real return on a one-month bill is constant during the 1953-71 period,"[12] implying that the nominal interest rate in a given month minus the average real rate over the 19 year sample period can be used as a proxy for the expected rate of inflation in that month. Previous studies[13] have attempted to estimate the rate of inflation expected by the market for an autoregressive model of past inflation rates. Fama regresses the interest rate on lagged values of the inflation rate and concludes that these lagged values explain only, perhaps, a third of the variability in the interest rate. He states that the interest rate incorporates much information concerning the current rate of inflation that is not reflected in the lagged inflation rates. Thus, the nominal interest rate for a given month minus the average real rate over the 19-year sample period appears to be not only an unbiased estimator of the rate of inflation for that month but "the evidence on market efficiency suggests that the market's prediction of $\tilde{\Delta}_t$ (the change in purchasing power) is the best that can be made on the basis of information available at time t-1."[14]

As mentioned above, the generalized Fisher effect implies that $E(R_{bxt}) = \alpha + E(I_t)$, where α is a constant and $E(I_t)$ is the inflation rate expected by the market at period t. Given the results of Fama, the generalized Fisher effect also implies that b = 1 in the following regression:

4) $$R_{bxt} = a + b\, R_{ft} + \epsilon_t ,$$

where R_{ft} is the risk-free rate of interest at time t. Similarly, we would expect that b = 0 in the regression:

5) $$r_{bxt} = a + b\, R_{ft} + \epsilon_t ,$$

where r_{bxt} is the real holding-period return, i. e. $r_{bxt} = \frac{R_{bxt}+1}{1 + I_t} - 1$. The results of regression (4) are presented in Table 4. The value of b is significantly different from zero in all but the last regression. In addition, b is greater than <u>one</u> in all but the last regression. The high values of t(b-1) in the first two regressions suggests that b is significantly greater than one here.

Similar results are obtained in the second panel of Table 4, where the results of regression (5) are presented. The value of b is greater than 0 in the first four regressions, though t(b) is insignificant in each case. The results of both panels of Table 4 are consistent with the generalized

Fisher effect. If anything, the results of the first panel (in which b is often significantly greater than 1) suggest that the holding-period returns on bonds are overresponsive to changes in expected inflation. This is in contrast to previous work on the Fisher effect for the riskless interest rate; we know of no other study showing this overresponsiveness.

The coefficients of determination are quite high in the first two regressions of panel 1, suggesting that expected inflation is a strong determining factor in the holding period yields of short term bills. However, R^2 declines in the regressions with longer term bonds. This implies that for longer term bonds other sources of variability are much more important than the expected rate of inflation. The coefficients of determinination are also quite low for all regressions in panel 2. This last fact is to be expected, as the generalized Fisher effect implies independence between r_{bxt} and R_{ft}.

As past rates of inflation are publicly available, they can be incorporated into a forecast of future inflation. Thus, the following set of regressions can serve as an additional test of the relationship between returns to bondholders and expected rates of inflation:

6) $$R_{bxt} = a + b\ I_{t-i} + \varepsilon_t, \qquad i \geq 1$$

Since the time series of inflation rates is positively serially correlated, we would expect a positive value for b. However, as we do not know precisely how past rates of inflation are incorporated into the market's forecast for inflation, the theory does not indicate an exact numerical value for b. Conversely, the generalized Fisher effect implies that b is exactly zero in the following regression:

$$7)\qquad r_{bxt} = a + b\ I_{t-i} + \epsilon_t, \qquad i \geq 1,$$

as the real returns to an asset should be unaffected by publicly available information.

The results of regression (6) are presented in Table 5. To conserve space the results of regression (7) are not presented, though they will be briefly mentioned in the following discussion. In Table 5, only one value of b is negative and most values of t(b) are significantly positive. These results confirm our previous evidence that the nominal returns to bondholders are positively related to expected inflation. In addition, the values of b in regression (7) are insignificantly different from zero in all cases. However, the generally lower values of R^2 in Table 5 suggest that there is a great deal of information used to forecast inflation which is independent of past rates of inflation. Again, the low Durbin-Watson statistics when returns on the shorter termed bills are the dependent variables is probably due to the high serial correlation of these variables.

C. Unanticipated Inflation and Returns on Bonds

It is difficult to use the propositions of the previous section to determine the theoretical relationship between unanticipated inflation and the holding period returns of bonds. On the one hand, proposition 3 states that, _ceteris paribus_, there is _no_ relationship between the amount of unanticipated inflation over a given interval and the holding-period return over that interval. On the other hand, previous researchers[15] have found that inflation rates are serially correlated, suggesting that the expected rates of inflation in future periods are related to the amount of unanticipated inflation in the present period. Thus, this fact and the result of proposition 1 allow the possibility of a negative relationship between the holding-period return on a bond in a given period and the amount of unanticipated inflation in the same period. Therefore, the results of section II do not suggest an unambiguous relationship here.

As mentioned previously, the results of Fama [5] imply that the term $(R_{ft} - \bar{r}_f)$ is a good measure of expected inflation, where $\bar{r}_f$ is the average real rate of interest over our sample period. Therefore, the term $[I_t - (R_{ft} - \bar{r}_f)]$ can be used to measure unanticipated inflation in month t. We investigate the effect of unanticipated inflation on the holding-period returns to bonds by performing the following regression:

8) $$R_{bxt} = a + b\ [I_t - R_{ft}] + \varepsilon_t \quad .$$

The results of regression (8) for bonds of different maturities are presented in Table 6. All five t-values for b are insignificant and the coefficients of determination are extremely small. Thus the data do not suggest any relationship between the returns on bonds and unanticipated inflation.

D. Serial Correlation in Bond Returns

The previous sections present evidence that the real holding-period returns on bonds are not related to the expected rate of inflation over the same period. However, inefficiencies might still arise if there are serial dependencies in certain series. For example, with positive (negative) serial correlation in the real holding-period returns on bonds, an investor might shift part of his portfolio into (out of) bonds following high real returns to bonds in the previous period.

The serial correlation coefficients for six lags for the real holding period returns of six different bonds and bills are presented in panel B of Table 2. Taken as a whole, this panel does not suggest any inefficiencies. Out of the 36 coefficients on bonds, 20 are negative and 16 are positive. Only three have a t-value above 2.0 and two have a t-value below -2.0. In addition, since the rate of inflation for month t is not published until month t + 1, only correlation in the lags greater than one would provide profitable opportunities to investors. The evidence for inefficiencies is even weaker when the correlation coefficients at lag 1 are ignored.

The term $R_{bxt} - R_{ft}$ can be viewed as a type of "risk premium", as it measures the return on a risky bond over and above the riskless rate. Any serial dependency in this risk premium suggests an inefficiency, since an investor might be able to use this dependency to periodically vary the ratio of his holdings between the riskless asset and risky bills and bonds. Panel C of Table 2 shows the serial correlation coefficients for the terms $R_{bxt} - R_{ft}$ for five different risky bills and bonds. The first two bills exhibit serial correlation as 6 out of the 12 coefficients are greater than two standard errors above zero and 10 out of these 12 values are positive. However, the coefficients are smaller for the last three bonds. Here, only 3 out of the 18 are greater than two standard errors above zero while one is greater than two standard errors below zero. Eleven out of the 18 values are positive.

Taken as a whole, panels B and C of Table 2 suggest only slight evidence for inefficiencies due to the serial correlation of bond returns. Out of a total of 66 coefficients, 37 (56%) are positive.[16] In addition, due to the delay in the release of the CPI figures, investors cannot always profit from serial correlation in the real returns at lag 1. Ignoring the six coefficients for real returns at lag 1, we find that only 32 (53%) of the remaining 60 values are positive. Taken individually, there appears to be little tendency toward positive autocorrelation in the real returns of any bill or bond or in the risk premiums of the risky bonds. Only the risk premiums in the shortest bills exhibit significant positive serial correlation.

V. Conclusions

This study examines the relationship between inflation and the holding period returns to bonds. We found a positive relationship over the period 1953-1971 between the returns to bondholders and concurrent rates of inflation, though the implications of these results were obscured until the effects of anticipated and unanticipated rates of inflation were separated. Much previous research has tested Irving Fisher's hypothesis concerning the expected rate of price change and the risk-free rate of interest. However, the relationship between the anticipated rate of inflation and the returns to risky assets has been examined in less depth. The theoretical relationship that a one percent increase in anticipated inflation should yield a one percent increase in the expected returns to bondholders was established in section II and termed the "generalized Fisher effect." The empirical evidence of section IV supports this effect. In addition, the predominant finding of no autocorrelation for the series in panel B and C of Table 2 further supports both the Fisher effect and market efficiency.

Footnotes

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1. See Roll [11] for an excellent review of empirical work.

2. This viewpoint can be found in almost any recent issues of Business Week or Fortune.

3. Some papers relating inflation to stock price movements are Body [2], Friend and Blume [12], Nelson [8], and Reilly, Johnson & Smith [9], [10].

4. This assumption of certainty is added purely for simplicity. Our three propositions could be proved under uncertainty, though the procedure would be more involved.

5. See Bildersee [1] for an explanation of the procedure used to calculate these holding period returns.

6. For example, the holding period return for a two-month bill in January 1960 is the return over the period from January 1 to January 31 for a bill maturing at the end of February.

7. Because intermediate and long term bonds of every maturity are not issued each month, the maturity of bonds examined in this category may vary from 1 to 2 years over the sample period. Bildersee contends that this variability in maturities can be ignored as the correlation between holding period returns of one-year and two-year bonds is extremely high. The above explanation also applies to category 4 (bonds with maturities of five to six years) and to category 5 (bonds with maturities of 15 to 20 years).

8. See Fisher [7].

9. See Bildersee [1].

10. See Fama [4].

11. Fama states that the CPI was substantially upgraded in 1953 so that his regressions using earlier data are not proper tests of the I. Fisher effect.

12. Fama [5, p.277].

13. Roll [11] presents a review of many of these studies.

14. Fama [5, p. 281].

15. See Fama [5] and Roll [11].

16. Because the 66 coefficients may be related to each other in a complex manner, the standard statistical tests assuming independence of different figures could not be applied. However, the "eyeball" method used here does not detect possibilities of serial correlations strong enough to warrant the use of involved statistical procedures.

TABLE 1

Sample Means and Standard Deviations for one Month Holding Period Returns of Different Assets over the period January 1953 to December 1971

Series	Mean	Standard Deviation
Riskless Interest Rate	.002621	.001259
2 Month Bill	.002886	.001378
3 Month Bill	.003092	.001545
1-2 Year Note	.003239	.004478
5-6 Year Bond	.003001	.01141
15-20 Year Bond	.002269	.01891
Fisher Index of Common Stocks	.011070	.04239
Consumer Price Index	.001895	.002307

Table 2

Serial Correlation Coefficients for Selected Series

Series	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
Panel A -Nominal Holding Period Returns						
Consumer Price Index	.3573*	.3698*	.2615*	.2898*	.2780*	.2757*
Riskless Rate	.9647*	.9426*	.9183*	.8933*	.8621*	.8332*
Two Month Bill	.8483*	.8568*	.8265*	.7762*	.7681*	.7395*
Three Month Bill	.7707*	.7427*	.7291*	.6759*	.6707*	.6500*
1-2 Year Note	.2457*	.0808	.1219	.0634	.0869	.0583
5-6 Year Bond	.0187*	-.0526	.0587	.1529*	-.1289	-.0326
15-20 Year Bond	-.0722	-.0035	-.1423*	.2051*	-.0120	-.0119
L. Fisher Stock Index	.1683*	.0611	-.0179	.1246	.0474	.0293
Panel B -Real Holding Period Returns						
Riskless Rate	.1056	.1268	-.0321	-.0248	-.0356	-.0384
Two Month Bill	.1168	.1625*	-.0267	-.0318	.0072	-.0917
Three Month Bill	.1151	.1223	-.0547	-.0867	-.0155	-.1219
1-2 Year Note	.1810*	.0486	.0287	-.0474	.0217	-.0165
5-6 Year Bond	.0158	-.0393	.0486	.1262	-.1372*	-.0346
15-20 Year Bond	-.0736	.0156	-.1452*	.1991*	-.0076	-.0059
L. Fisher Stock Index	.1883*	.0681	-.0030	.1264	.0566	.0300
Panel C - Nominal Holding Period Returns minus the Riskless Rate (Risk Premiums)						
Two Month Bill	-.0063	.0994	.1921*	-.0740	.1350*	.1681*
Three Month Bill	.1464*	.1197	.1710*	.0064	.1254	.1473*
1-2 Year Note	.1823*	.0097	.0668	.0037	.0372	.0143
5-6 Year Bond	.0060	-.0604	.0561	.1527*	-.1314	-.0306
15-20 Year Bond	-.0716	.0005	-.1369*	.2086*	-.0058	-.0037

* - Indicates that the value is at least two standard errors away from zero.

TABLE 3

Summary Statistics of Regressions Between the Holding Period Return on Bonds, R_{bxt}, and the Rate of Inflation, I_t

$$(R_{bxt} = a + b\,I_t + \epsilon_t)$$

Type of Bond	a	b	t(b)	Coeff. of Determination	DW
Two Month Bill	.00231	.306	8.98	.2629	.77
Three Month Bill	.00246	.334	8.65	.2488	.92
1 - 2 Year Note	.00273	.266	2.08	.0188	1.81
5 - 6 Year Bond	.00298	.012	.04	.00005	1.93
15 - 20 Year Bond	.00271	-.233	- .43	.0008	2.12

TABLE 4

Summary Statistics of Regressions Between the Holding Period Return on Bonds and the Riskfree Rate of Interest

Type of Bond	a	b	t(b)	t(b-1)[1/]	Coeff. of Determination	DW
Regression: $R_{bxt} = a + b R_{ft} + \epsilon_t$						
Two Month Bill	.00016	1.039	45.32	1.80	.9009	2.01
Three Month Bill	.00018	1.113	32.30	3.50	.8219	1.72
One-Two Year Bond	.00001	1.234	5.56	1.26	.1203	1.57
Five-Six Year Bond	-.00081	1.452	2.44	1.10	.0257	1.94
15-20 Year Bond	.00023	.776	.78	- .23	.0027	2.13
Regression: $r_{bxt} = a + b R_{ft} + \epsilon_t$						
Two Month Bill	.00086	.052	.50	Not relevant	.0011	1.73
Three Month Bill	.00087	.126	1.17	"	.0060	1.76
One-Two Year Bond	.00070	.247	.99	"	.0043	1.60
Five-Six Year Bond	.00011	.466	.76	"	.0026	1.94
15-20 Year Bond	.00093	-.208	-.21	"	.0002	2.14

[1/] This statistic indicates whether b is significantly different from one.

TABLE 5

Summary Statistics of Regressions Between the Holding Period Return on Bonds and Past Rates of Inflation

Type of Bond	a	b	t(b)	Coeff. of Determinination	DW
Regression: $R_{bxt} = a + b\ I_{t-1} + \epsilon_t$					
Two Month Bill	.002	.291	8.365	.2364	.80
Three Month Bill	.003	.313	7.95	.2187	.94
One-Two Year Bond	.003	.258	2.01	.0176	1.51
Five-Six Year Bond	.003	.175	.53	.0013	1.93
15-20 Year Bond	.001	.528	.96	.0041	2.12
Regression: $R_{bxt} = a + b\ I_{t-2} + \epsilon_t$					
Two Month Bill	.002	.288	8.27	.2323	.78
Three Month Bill	.003	.315	8.01	.2212	.94
One-Two Year Bond	.003	.286	2.24	.0218	1.54
Five-Six Year Bond	.003	.281	.86	.0032	1.94
15-20 Year Bond	.003	-.428	-.79	.0027	2.11
Regression: $R_{bxt} = a + b\ I_{t-3} + \epsilon_t$					
Two Month Bill	.002	.297	8.63	.2480	.79
Three Month Bill	.002	.330	8.55	.2446	.96
One-Two Year Bond	.002	.467	3.73	.0581	1.85
Five-Six Year Bond	.002	.654	2.01	.0176	1.95
15-20 Year Bond	.001	.913	1.69	.0125	2.12

TABLE 6

Summary Statistics for Regression: $R_{bxt} = a + b\,[I_t - R_{ft}] + \epsilon_t$

Type of Bond	a	b	t(b)	Coeff. of Determination	DW
Two Month Bill	.0029	-.0044	- .0929	.0000	.29
Three Month Bill	.0031	.0039	.0735	.0000	.44
1 to 2 Year Bond	.0031	-.1423	- .931	.0038	1.45
5 to 6 Year Bond	.0026	-.5907	-1.523	.0102	1.93
15 to 20 Year Bond	.0018	-.652	-1.011	.0045	2.12

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