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INFLATION, RESOURCE UTILIZATION, AND DEBT AND EQUITY RETURNS

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THE CHANGING ROLES OF DEBT AND EQUITY
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Inflation, Resource Utilization, and Debt and Equity Returns

ABSTRACT

Enormously diverse real and nominal ex post returns on equity and short and long term debt securities have accompanied substantial variations in inflation and resource utilization during the past half century. This paper contains an examination of the relationships among these security returns and an analysis of the effects of inflation and resource utilization on the relationships.

The three major results are the following. First, prior to the Treasury-Federal Reserve Accord in 1951, nominal yields on one-month Treasury bills were reasonably stable, while real bill rates were incredibly volatile. Since 1952, the reverse has been true. Nominal bill rates have cycled around a rising trend, and real bill rates have stayed near zero. Second, changes in yields on new-issue, long-term bonds have been largely unanticipated, and these changes have dominated the realized returns on bonds relative to Treasury bills. Because bond rates have risen with (unexpected) inflation during the last fifteen years, bonds have earned negative real returns. Third, the relative returns on equities and bonds are greatly affected by the business cycle with equities performing very well around troughs and very poorly around peaks. This has been true for all ten troughs since 1926 and all six peaks since 1946.

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Introduction

During the last half century, the American economy has been subjected to numerous shocks. The greatest of these were the depression and World War II, but there were also other wars, OPEC and "regular" business cycles. As a result, both resource utilization and inflation have varied widely, and enormously diverse real and nominal ex post returns on equity and short and long-term debt securities have accompanied these variations.

This paper contains an examination of the relationships among these security returns and an analysis of the effects of inflation and resource utilization on the relationships. More specifically, I will report on the impact of inflation on: Treasury bill rates, the realized returns on Treasury bonds versus bills, and realized returns on equities versus corporate bonds. Further, I will discuss the relationship between the business cycle and realized returns on equities versus bonds. Thus, the analysis provides a background for the fundamental portfolio decision regarding the broad division of investable funds into equities, long-term debt and short-term debt.

Before turning to the analysis, a few words about the data are in order. First, all of the underlying yield data -- equities, corporate

bonds, Treasury bonds and Treasury bills -- are those compiled by Ibbotson and Sinquefield (1979, 1980). These are roughly representative of returns on economy-wide "market" portfolios and are available monthly for the 1926-78 period. Second, these yields are realized, rather than expected returns, except for those on Treasury bills which are both expected and realized because their one-month maturity equals the period over which the returns are calculated. Third, the returns -- income plus capital gains (except for bills) -- are before-tax returns. They are not truly representative of what either highly-taxed or tax-exempt investors actually earned after tax (both investor groups presumably would have opted for portfolios with different relative income and capital gains components than the market average, and the former, of course, paid taxes). Hopefully differential returns, at least, are roughly representative of those earned by most investors.

Inflation and Treasury Bill Returns

During the 1926-80 period there was a single episode of significant deflation, 1930-32. In those three years the inflation rate ranged from -6 to -10 percent. Modest deflation also occurred in 1926-27, 1938, and 1949. In contrast, there have been three significant bursts of inflation -- the beginning of World War II (9 percent in 1941 and 1942), the postwar surge (18 percent in 1946 and 9 percent

in 1947) and the Korean War scare (6 percent in 1950 and 1951) -- and the prolonged post-1967 inflationary era. The current inflation has ranged from slightly over 4 percent (adjusting for the impact of price controls in 1971-72) to double digit inflation in 1974 and again in 1979-80.

The above overview of the 1926-80 period suggests that division of these years into four subperiods might be useful. These are 1926-1940 (which includes the depression and all years of even modest deflation except 1949), 1941-51 (which includes the inflationary spurts of World War II, its aftermath, and the outbreak of the Korean conflict), 1952-67 (the era of stable prices), and 1968-80 (the present inflationary period). The first two columns of Table 1 present the mean and standard deviations for the annual inflation rate for these and overlapping periods. The great differences in the mean inflation rate and its variability are obvious.

The next four columns list means and standard deviations for both the nominal and real one-month Treasury bill rate.[2] As can be seen, there is an enormous difference in the variability of the real bill rate between 1926-51 and 1952-80. In the latter period the standard deviation of the real bill rate, 1.5 percent, is only three-fifths of that of the nominal bill rate, 2.6 percent; in the earlier period the former, 6.4 percent, is over five times the latter, 1.2 percent. Division of the earlier interval into 1926-40 and 1941-51 reveals enormous variability in the real bill rate (and stability in the nominal rate). The mean real bill was a full 2.8 percent in 1926-40 and an incredible -5.4 percent in 1941-51. The negative real rate in the 1940s

Table 1: Annual Inflation and Nominal and Real-One Month Treasury Bill Rates

	Inflation Rate		Nominal Bill Rate		Real Bill Rate	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1926-40	-1.5	4.0	1.3	1.5	2.8	4.5
1941-51	6.0	5.3	0.6	0.4	-5.4	5.5
1952-67	1.5	1.2	2.7	1.0	1.2	0.8
1968-80	7.1	3.1	6.7	2.2	-0.4	1.8
1926-51	1.7	5.9	1.0	1.2	-0.6	6.4
1952-80	4.0	3.6	4.5	2.6	0.5	1.5

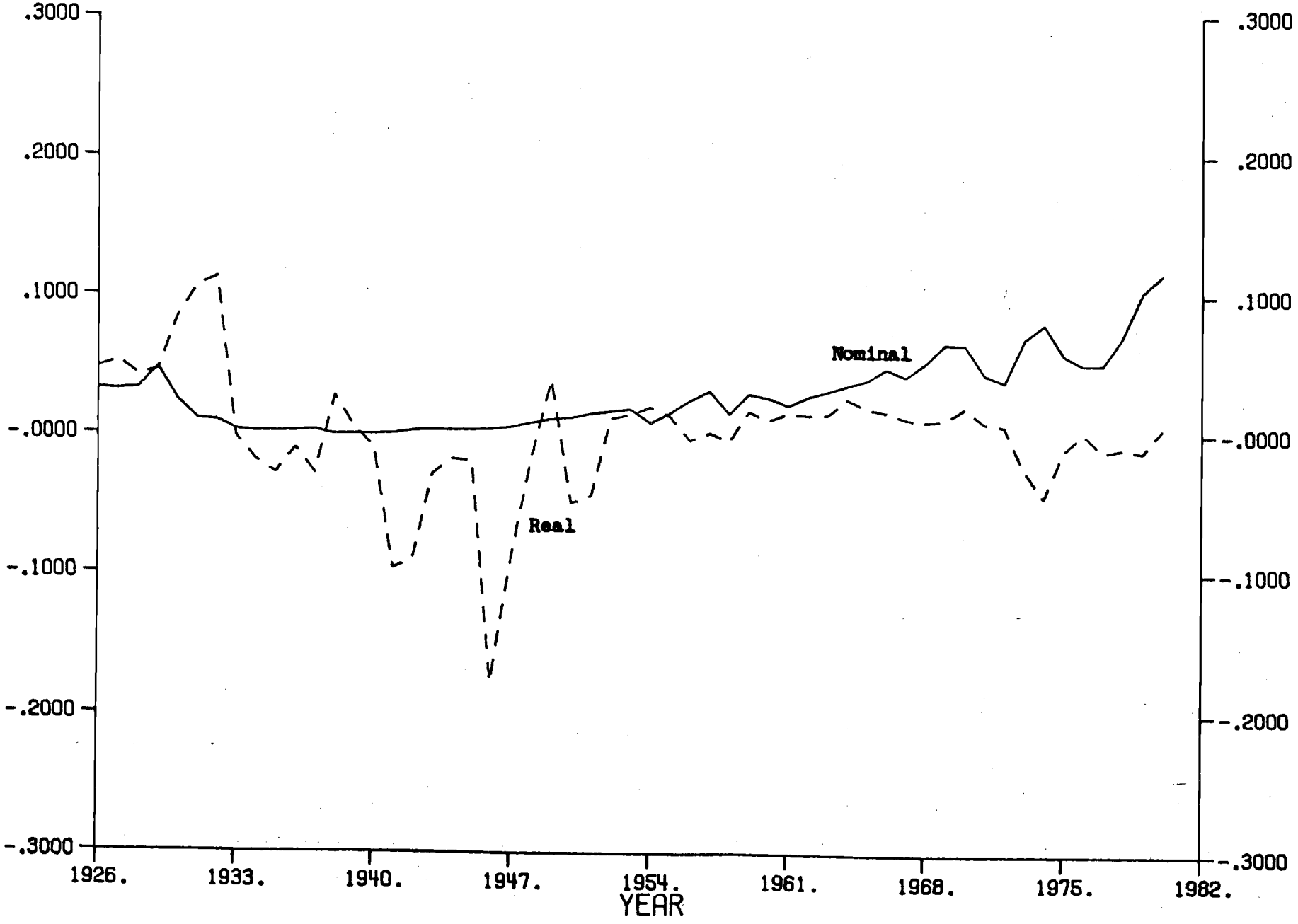
Sources: The inflation rate is the rate of change in the consumer price index for the 1926-46 period and the rate of change in the consumer price index net of the shelter component (to exclude the impact of changes in mortgage rates) after 1946. The nominal bill rate is from Ibbotson and Sinquefield for 1926-78 and McCulloch for 1979-80. The real rate is the nominal rate less the inflation rate. Annual rates are geometric averages of the twelve monthly rates during calendar years.

was due to the monetary authorities' policy of pegging nominal interest rates at low levels during a period of significant inflation. The high real rate in the 1930s is largely attributable to the combination of the general nonnegativity constraint on the nominal rate and the existence of significant deflation. However, it is noteworthy that the real bill rate exceeded 4 percent in all years in the 1926-30 period during which the nonnegativity constraint was not binding (the nominal bill rate ranged from 2.4 to 4.7 percent).

Figure 1 illustrates the enormous difference between the 1926-51 and 1952-80 periods in the volatility of both the nominal and real bill rates. In the former period the nominal rate declines in the early 1930s and is then flat; in the latter period this rate cycles around a sharply rising trend (the 1980 average bill rate of 11 percent disguises variations in monthly rates between less than 7 percent and over 16½ percent). In contrast, the real bill rate varied between a plus 12 percent in 1931 and 1932 to a minus 15 percent in 1946. Its often cited stability clearly refers to the post 1951 period only.

Even the reduced variability of the real bill rate in the 1952-80 period (plus 2 to minus 4 percent) is possibly an overstatement of future variability because the sharply negative rates of 1973 and especially 1974 are unlikely to recur. Short-term bill rates became "out of line" relative to short-term rates on large CDs, commercial paper, and bankers acceptances in 1973, and especially 1974. To illustrate, the spread between yields on 6 month CDs and bills increased in 1974 relative to normal years by about 110 basis points and the spread between yields on 3 month maturities jumped by 155 basis points. According to Cook (1981), the bill market was

Figure 1: Real and Nominal Treasury Bill Rates, 1926-80



segmented from markets for private short-term securities during this period of disintermediation. Because only bills were available in smaller denominations, households were able to shift deposit funds only into bills. Because corporations did not have sufficient bill holdings to arbitrage between the bill and private security markets and commercial banks and municipalities had nonyield reasons for maintaining bill holdings, bill rates fell relative to other yields. As a result, expected inflation was not fully reflected in bill rates. In fact, the enormous disparity between private and U.S. short-term yields in 1974 was the driving force behind the creation of the money market fund, an entity that will prevent such disparities from recurring.

Inflation and Relative Returns on Equities, Bonds and Bills

The first two columns in Table 2 repeat the same columns in Table 1 (except that 1979 and 1980 are excluded). The third and fourth columns record the mean and standard deviation of the difference between the annual returns earned on equities and corporate bonds. Equities earned a 7 percentage point premium over both the 1926-51 and 1952-78 subperiods. However, when these periods are further subdivided, the enormous variability of this premium becomes apparent. The premium was much greater in the 1940s, 1950s and 1960s than in the 1930s and 1970s.[3] It would appear from these data that there is no simple relationship between the premium and either the mean or standard deviation of the inflation rate.

Nonetheless, two of my co-authors in this volume have argued that the increased inflation (combined with the excessive taxation of corporate income - Feldstein) and the increased uncertainty regarding inflation (and the economy generally - Malkiel) are causes of the relatively poor performance of equities during the past fifteen years. My own view is that these phenomena explain the relatively modest rise in promised new-issue debt yields (decline in real after-tax yields), but not the sharp decline in share values (Hendershott 1981).

The last two columns in Table 2 report the mean and standard deviation of the difference between the annual returns earned on U.S. government bonds and one-month bills. The difference was extraordinarily

Table 2: Annual Inflation and the Returns on Equities (Relative to Bonds) and Bonds (Relative to Bills)

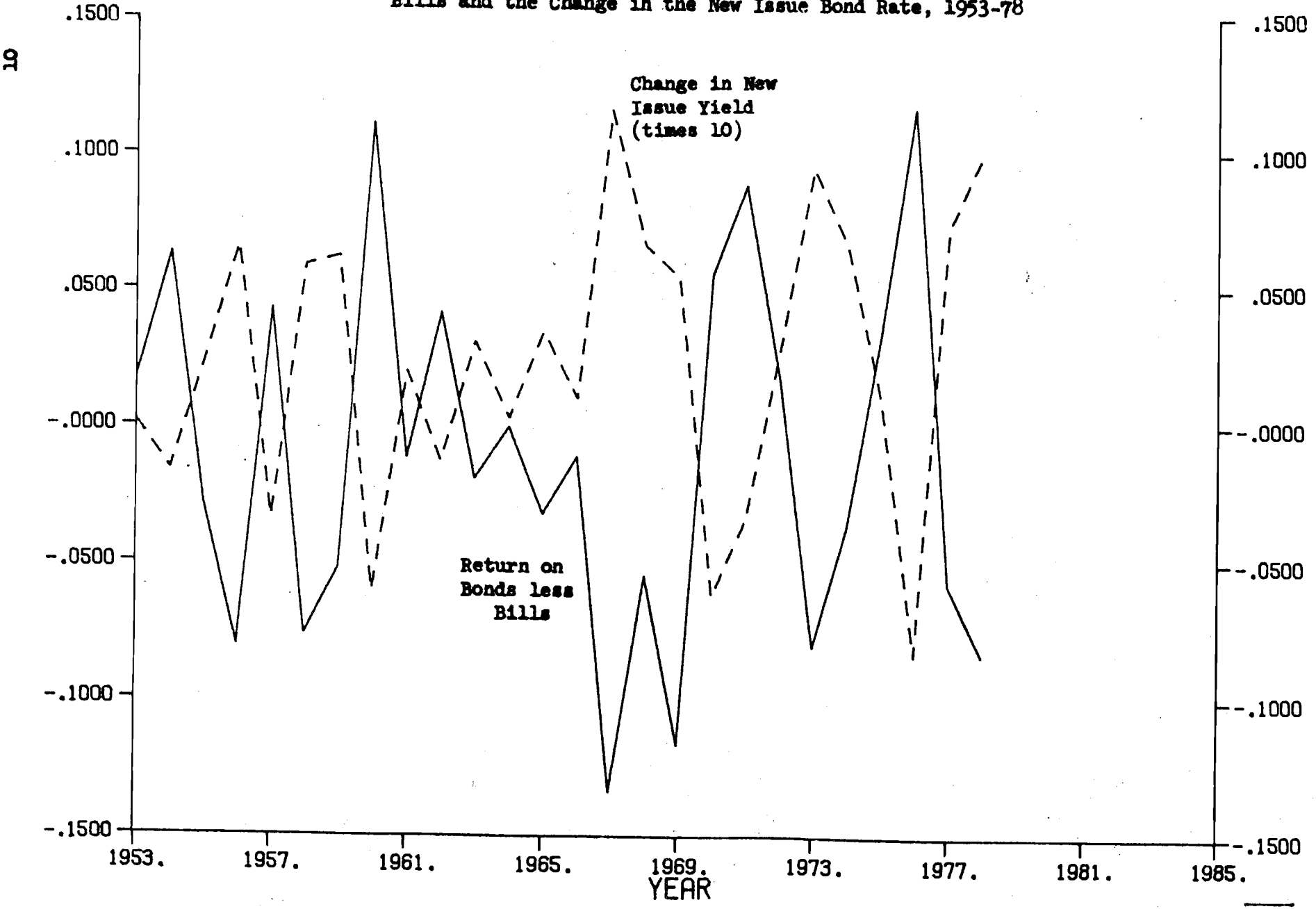
	Inflation Rate		Corporate Equities less Bonds		Treasury Bonds less Bills	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1926-40	-1.5	4.0	2.2	28.7	3.8	5.3
1941-51	6.0	5.3	13.2	14.8	1.5	4.0
1952-67	1.5	1.2	12.6	19.7	-1.1	5.8
1968-78	7.1	3.1	-0.5	13.1	-1.1	7.4
1926-51	1.7	5.9	6.9	24.4	2.8	5.0
1952-78	4.0	3.6	7.3	18.5	-1.1	6.5

Sources: The inflation rate is the rate of change in the consumer price index prior to 1947 and of the consumer price index net of shelter (to exclude the effect of changes in mortgage rates) after 1946. The other series are from Ibbotson and Sinquefield.

large, 3.8 percent, in the 1926-40 period, and it was a negative one percent in the 1952-67 and 1968-78 periods. The reason for these differences is apparently unanticipated movements in interest rates. To illustrate, if yields fall unexpectedly, then prices of long-term bonds will rise unexpectedly and the one year return on bonds will be large. This was apparently the case in the 1930s (the one month bill rate declined from an average of over 3 percent in 1926-30 to less than ½ percent in the 1933-40 period). In contrast, if yields rise unexpectedly, then prices of long-term bonds will fall unexpectedly and the one year return on bonds will be low. This apparently has happened in the post 1952 period (the one-month bill rate rose from 1½ percent in 1952-55 to 4 percent in 1964-67 to over 6 percent in 1973-78).

It is important to note that only unanticipated movements in interest rates have such impacts on the difference in realized returns on bonds and bills. For example, if long-term bond rates were expected to rise during the year, then bonds would be priced at the beginning of the year such that a high income return would offset the anticipated capital loss. In this case, the difference in ex post returns on bonds and bills would be independent of observed changes in new issue bond yields. To determine whether changes in bond yields have been anticipated or unanticipated, yield data on new-issue equivalent 20 year U.S. government bonds were collected.[4] Figure 2 contains plots of the difference in ex post annual yields on bonds and bills (the "maturity" premium of Ibbotson and Sinquefield) for the 1953-78 period and the change in the new issue bond yield (scaled by a factor of 10) between the beginning and end of the same year. The striking negative correlation implies that the

Figure 2: The Difference Between Realized Annual Returns on Bonds and Bills and the Change in the New Issue Bond Rate, 1953-78



changes in bond yields were unanticipated and have been the primary determinant of differences in the realized yields on bonds and bills.

The Business Cycle and Returns on Equities and Bonds

Our next effort is to determine whether the performance of equity investments is particularly superior or inferior to that of bond investments during any stage of the business cycle. The National Bureau's reference dates, which are employed as a general guide to the stages of the business cycle, are listed in Table 3. In the 1926-78 period, ten full cycles have occurred. Excluding the 43 month depression, contractions have ranged from 8 to 16 months and have had an average duration of 11 months. Excluding the 80 and 106 month wartime (World War II and Vietnam) expansions, upswings have varied from 21 to 58 months in duration and have averaged 39 months.

Annualized differences in equity and bond returns over different phases of the cycle have been compared. For contractions, the first and last 5 months (which overlap for the two 8 month contractions) were examined. For expansions, the first, second, third, and last six months were studied (the last two periods overlap during the 21 month upswing in the late 1920s). The cycles were divided into the 1926-52 and 1953-78 subperiods, and means and standard deviations of the differences in equity and bond returns were calculated for the 5 prel953 cycles, the 5 postl952 cycles, and all 10 cycles. A quick examination of the data revealed that equities tend to earn a relatively superior return (recall that on average the annualized return on equities exceeds that on bonds by

Table 3: Business Cycle Reference Dates: 1926 to 1980

Business cycle reference dates		Duration in months: Contraction (trough from previous peak)	Duration in months: Expansion (trough to peak)
Trough	Peak		
November 1927.....	August 1929.....	13	21
March 1933.....	May 1937.....	43	50
June 1938.....	February 1945.....	13	80
October 1945.....	November 1948.....	8	37
October 1949.....	July 1953.....	11	45
May 1954.....	August 1957.....	10	39
April 1958.....	April 1960.....	8	24
February 1961.....	December 1969.....	10	106
November 1970.....	November 1973.....	11	36
March 1975.....	(January 1980).....	16	58
Average, all cycles:			
10 cycles, 1926-1978.....		14[a]	50[b]
5 cycles, 1926-1953.....		18[a]	47[b]
5 cycles, 1953-1978.....		11	53[b]

a. 11 months, excluding the great depression
b. 39 months, excluding the World War II and Vietnam cycles

Source: National Bureau of Economic Research, Inc.

7 percent) late in contractions and early in expansions and a relatively inferior return late in expansions and early in contractions.

Table 4 has been constructed to highlight this results. The means (and standard deviations) over all 10 cycles in the 1926-78 period are listed at the bottom of the table. The mean net return on equities is 20 percent in the last five months of contractions (column 1) and 38 percent in the first six months of expansions (column 2). On the other hand, this net return is -20 percent in the first five months of contractions (column 5). (The mean net return during the other six month phases of the expansions was around the normal 6 percent.) While the mean net equity returns are large (in absolute value) during these periods, their variability is also large. Statistically, this is revealed by the fact that none of these means is twice the size of its standard error. Inspection of the individual cycle datum also indicates numerous "outliers."

The most pronounced outlier is the net equity return in the recovery of 1933, 125 percent; the other net returns in the first six months of upswings in the prel952 period vary within the narrow 23 to 36 percent band. Interestingly, the second most pronounced outlier appears to be the return in the immediately preceding period, the end of the 1932-33 contraction. Rather than the normally high return, -37 percent was earned. Thus, the incredibly high return in the middle of 1933 is largely a catch up for or offset to the low return in late 1932 and early 1933. The return over the full late contraction-early expansion period seems to be roughly in line with those around other lower turning points.

Table 4: The Annualized Difference Between Returns on Equities and Bonds Over Various Stages of the Business Cycle (in percent)

	Returns Around Troughs			Returns Around Peaks		
1926-52	Last 5 Months of Contraction	First 6 Months of Expansion	Last 6 Months of Contraction and First 6 Months of Expansion	Last 6 Months of Expansion	First 5 Months of Contraction	Last 6 Months of Expansion and First 6 Months of Next Contraction
Apr 26-Feb 29	38	34	35	22	16	21
Feb 29-Nov 36	-37	125	16	53	-73	-9
Nov 36-Aug 44	22	25	25	-8	-58	-34
Aug 44-May 48	28	23	28	21	9	23
May 48-Jan 52	30	36	29	-19	0	-12
Mean	16	48	27	14	-21	-3
Standard Dev.	27	38	6	25	37	22
1953-78						
Jan 53-Feb 57	42	36	39	-5	-5	-1
Feb 57-Oct 59	-8	50	23	24	-46	-8
Oct 59-June 69	39	21	22	-17	-11	-13
June 69-May 73	21	25	17	6	-39	-16
May 73-Dec 78	24	5	23	-17	7	-9
Mean	24	27	25	-2	-18	-9
Standard Dev.	18	15	7	15	20	5
Total Period						
Mean	20	38	26	6	-20	-6
Standard Dev.	23	39	7	22	30	16

Moreover, the same pattern occurs in 1957, when the highest post1952 excess return early in the upswing, 50 percent, is preceded by the only negative excess return in the late contraction months. It would appear that the variance in net equity returns over the full late contraction-early expansion period would be considerably less than the variance in returns in either the late contraction or early upswing months. The third column in Table 4 indicates that this is indeed the case. The mean net return on equities for the last six months of a contraction and first six months of the following expansion over all cycles is 26 percent, and it has a standard deviation of only 7 percent. Moreover, this is also roughly the case for both the first and last five cycles. Thus, the net equity returns are significantly positive at the 0.05 level, and this is even true if the "normal" net return of 6 percent is taken into account.

A somewhat similar pattern appears in late expansions and early contractions during the post1953 period. The two largest negative net equity returns in early recession months (column 5), -46 percent in late 1957 and -39 percent in early 1970, were preceded by the only positive net equity returns in late expansions (column 4), 24 percent and 6 percent, respectively. The last column in Table 4 reports the net equity return over the last six months of an expansion and the first six months of the following recession; all are negative in the 1953-78 period. Moreover, the mean net extraordinary return (the -9 percent return less the normal 6 percent) for these 5 cycles is -15 percent with a 5 percent standard deviation. Thus, the net extraordinary returns are significantly

negative in the late stages of the expansion and the early stages of the contraction. (This is not true, however, for cycles prior to 1953).

A possible problem with the above calculations is the comparison of the net returns around turning points with a constant "normal" 6 percent return. The mean net annual return on equities was shown in Table 2 to vary widely between different "eras;" the net return was only 2 percent in the 1926-40 period, about 13 percent in the 1941-67 span, and actually negative in the recent 1968-78 years. This suggests that net returns around turning points should be compared with the average net returns in surrounding years, rather than over the entire half century. To accomplish this, we have first divided the months between January 1926 and December 1978 into three types of periods: those around troughs in which equity returns appear to be superior, those around peaks in which equity returns appear to be relatively inferior, and the remainder. The inferior periods are defined as the last six months of every expansion and the first half (dropping fractions) or first six months, whichever is less, of every contraction. The superior periods are defined as the last half (dropping fractions) or last six months, whichever is less, of every contraction and the first six months of every expansion. The second step in this comparison is to divide the total 1926-78 period into ten overlapping intervals that contain single adjoining peaks and troughs and all the surrounding months that do not overlap with adjacent superior and inferior periods. That is, the intervals extend from 6 months after a trough to 6 months before the second following peak. These ten overlapping intervals are listed at the left in Table 5.

Table 5: The Annualized Difference Between Returns on Equities and Bonds Near Troughs, Near Peaks, and in other Periods (in percent)

	Near Troughs	Near Peaks	Other Months	Excess Near Troughs	Excess Near Peaks
Jan 26-Feb 29	41	-8	3	38	-11
June 28-Nov 36	37	18	25	13	-7
Oct 33-Aug 44	35	-42	10	25	-51
Jan 39-May 48	32	17	3	29	14
May 46-Jan 53	34	-10	13	21	-22
May 50-Feb 57	41	-4	21	20	-26
Dec 54-Oct 59	49	-10	17	32	-27
Nov 58-June 69	32	-14	9	23	-22
Sept 61-May 73	23	-13	5	17	-30
June 71-Dec 78	27	-11	3	24	-14
Mean	35	-8	11	24	-20
Standard Dev.	8	17	8	7	17

Also listed are the arithmetic means (anmualized) during: the superior periods within the interval, the inferior periods, and all months excluding such periods. The mean in the latter months is the "normal" return to which the mean returns around the trough and peak are compared.

The comparison is made in columns 4 and 5, where the normal return has been subtracted from the superior and inferior returns, respectively. These results are even more striking than those in Table 4. The extraordinary net returns on equities around troughs average 24 percent, and no net return is less than 13 percent. In contrast, the extraordinary net returns on equities are negative around all peaks except that at the end of World War II. The average net return around peaks is -20 percent. If the analysis is restricted to the last 6 cycles, then the average extraordinary net return on equities around peaks is -24 percent and the standard deviation is only 6 percent.

Summary

The results of our investigation of the impacts over the past half century of inflation and the business cycle on realized yields on equities, long-term debt and short-term debt can be summarized in terms of three relationships. Each is presented in turn.

First, prior to the Treasury-Federal Reserve Accord in 1951, nominal yields on one-month Treasury bills were reasonably stable while real bill rates were incredibly volatile. This was largely due to the nonnegativity constraint on nominal bill rates during the rapid deflation

in the early 1930s (and 1938 and 1949, to a lesser extent) and the pegging (at low levels) of nominal interest rates during the rapid inflation early in World War II and in the Korean Conflict and following the former. Since 1952, the reverse has been true. Nominal bill rate have cycled around a rising trend, and real bill rates have stayed near zero. Short term bills have been a hedge against inflation during the last thirty years.

Second, changes in long-term new-issue bond yields have been largely unanticipated, and these changes have dominated the realized returns on bonds relative to Treasury bills. Because bond rates have risen with (unexpected) inflation during the last fifteen years, bonds have earned negative real returns.

Third, the relative returns on equities and bonds are greatly affected by the business cycle with equities performing very well around troughs and very poorly around peaks. Extraordinary net (of bond returns) equity returns have averaged 24 percent per annum in the (roughly) year surrounding troughs over the ten cycles since 1926 and have never been less than 13 percent. In contrast, these returns have averaged -24 percent in the (roughly) year surrounding peaks over the six cycles since 1946 and have never been higher than -14 percent.

Footnotes

[1]This paper is based upon a larger ongoing study by Roger D. Huang and myself (1982). The underlying study provides econometric support for many of the propositions advanced in this paper.

[2]Data for nominal bill rates in 1979 and 1980 have been computed from the one-month tax-adjusted bill rates calculated by Huston McCulloch, whom I thank for making them available to me. To check the comparability of these rates with those of Ibbotson and Sinquefield, I computed the annual return on one month bills from McCulloch's data, 7.23 percent, and found that it differed little from that based on the I-S data, 7.18 percent. The method for calculating tax-adjusted yields is presented in J. Huston McCulloch (1975).

[3]The premium equities earned over Treasury bills is very similar except for the 1926-40 interval. As is indicated in the last column of Table 2, government bonds outperformed government bills by nearly 4 percentage points per annum in this period, resulting in the equity premium over bills being much larger than that over bonds.

[4]The data were kindly supplied by Huston McCulloch. See footnote 2 for a reference describing construction of the data.

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