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The Interest Rate Roller Coaster: Factors that Influence Interest Rate Fluctuations

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THE INTEREST RATE ROLLER COASTER:

FACTORS THAT INFLUENCE INTEREST RATE FLUCTUATIONS

By Ken Meyer

Introduction

Millions of people are affected by interest rates each day. Whether obtaining a car loan, a mortgage loan, or any other type of loan, the price one pays for this loan is ultimately the interest rate charged. Interest rates are also a factor for investors. The return (income) one receives from investing in bonds, stocks, and mutual funds will be determined by the interest rate or yield of these securities. In turn, interest rates will affect people's decisions in choosing the right opportunity (borrowing vs. investing) that will minimize costs or maximize returns.

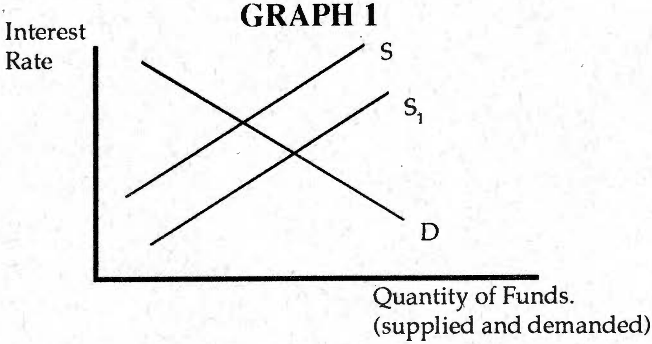
What many people do not realize, however, is how changes in the stock market or the money supply can affect the interest rate they will be charged on a loan, or receive on a particular security. This essay will examine these and other factors that influence interest rate fluctuations. Although much research has been done in this area, my goal is to provide a current assessment of factors that affect interest rates. In addition, this essay will reinforce previous conclusions and offer insight into recent fluctuations.

Factors Influencing Interest Rates

Extensive theory lies behind interest rates and their determination. Much of this work examines interest rates in relation to other variables. One area that received enormous attention during the 1970s and early 1980s is the effect that the inflation rate has on interest rates. Generally, a positive relationship will exist between interest rates and the inflation rate because investors who expect increases in the rate of inflation will demand more compensation to cover their loss of purchasing power. In other words, investors who expect a higher rate of inflation will demand a higher yield on securities. It is important to note, however, that a potential problem in establishing a relationship between the inflation rate and interest rates is that it is often "the *expected* rate of inflation that affects interest rates over the short term rather than the reported figures" (Pring 1981, p. 126). This means that there may not be as powerful a relationship between interest rates and the inflation rate as some would predict, particularly in the short run.

Another area that has received considerable attention is the impact of changes in the money supply upon interest rates. The effect of money supply changes has become increasingly noticeable in the 1980s due to the dominant role of the Federal Reserve in conducting monetary policy to influence economic activity. Strictly speaking, the larger the percentage increase in the money supply the more interest rates will fall (i.e., there is a negative relationship between the percentage change in the money supply and interest rates). To further emphasize this negative relationship, the graph below shows the quantities supplied and demanded for funds at different interest rates. An increase in the money supply will cause a shift to the right in the supply of funds to S_1 since more funds are now available. As this occurs, more funds are being supplied than are demanded at the higher interest rate so the interest rate will fall to a new level. (The reverse of this can be seen by simply shifting the supply curve to the left to reflect a decrease in money supply).

GRAPH 1



In addition to the emphasis placed on the money supply as a determinant of interest rates, other studies have attempted to establish a relationship between stock market prices and interest rates. An empirical study by Peter Spiro (1989) suggests that changes in the stock market are explainable, in part, by real interest rates. Spiro also found that other empirical evidence indicates a profound negative relationship between interest rates and stock prices. While this evidence generally concludes that interest rate changes negatively impact stock prices, the impact of changes in stock prices on interest rates is not as well defined as the impact of other variables. Although Spiro suggests there is a positive impact of rapid gains in the stock market on real interest rates, this hypothesis remains to be supported by empirical evidence (Spiro 1981, p. 188).

Other factors that may influence interest rates are personal income, investment spending, and government deficits. Personal income would be expected to have a negative relationship to interest rates based on the assumption that as income rises more money will be available in the economy from which to draw funds, causing interest rates to go down. Income, then, should have the same effect as the money supply on interest rates. Investments, on the other hand, would be expected to have a positive relationship to investment rates since increased investment spending will lead to a shortage of funds and, in turn, higher interest rates. Finally, the traditional Keynesian model would suggest that an increased government deficit would also raise interest rates (assuming supply is constant). Spiro denies this claim, however, by pointing to empirical evidence which suggests that no relationship exists between government deficits and short-term interest rates (1988, p. 40). Furthermore, Spiro insists that it is almost impossible to establish a relationship between deficits and interest rates because of the continual fluctuations in other economic activities. This is further reinforced by Alan Blinder's work (1985) which indicates that the Federal Reserve will usually help to mitigate the deficit through "monetization" (i.e., by increasing the money supply). If Blinder is correct, one would expect no statistically reliable correlation to exist between interest rates and government deficits.

Building the Model

Economists use models to explain relationships between variables. These models are often developed using an econometric technique known as multiple regression analysis. Multiple regression analysis, among other things, establishes a relationship between a dependent variable and independent variables (those that affect the dependent variable). The model presented below is a multiple regression analysis using quarterly data from 1980 to 1988 collected for the variables used in this model.[1] Where necessary, some quarterly information has been calculated by taking the mean monthly figures for the quarter and then averaging these figures to arrive at the average for the quarter. For instance, the Treasury-bill yield (discussed below) was found by adding the monthly data for the quarter and then dividing by three to arrive at the quarterly average.

Since interest rates vary depending on the length to maturity (long-term vs. short-term) and on the various markets that these interest rates represent, it was determined that the best interest rate to use is the yield on three-month Treasury bills. This is due to the fact that the T-bill yield will generally not have a default risk premium (risk of non-payment) or a market risk premium (risk of unexpected changes in market activity) built in. As a result, the T-bill yield will give a clearer picture of how various factors affect interest rates than will corporate bond yields or other yields that include these risk premiums.

While the dependent variable for this model is the three-month T-bill yield, the independent variables, those that may impact the dependent variable, are shown in functional notation below:

$$Y=F(X_1, X_2, X_3, X_4, X_5, X_6)$$

where: Y = Three-month Treasury bill yield
X_1 = Percentage change in consumer prices
X_2 = Percentage change in money supply
X_3 = Stock market average
X_4 = Amount of investment spending (in billions of dollars)
X_5 = Income (in billions of dollars)
X_6 = Amount of deficit spending (in billions of dollars)

X_1: The percentage change in consumer prices (%CHCP) was found by using the consumer price index (CPI), a statistical estimate of the general consumer price of a market basket of goods. The %CHCP was calculated by taking the ending CPI, dividing it by the beginning CPI, and then subtracting one [(ending CPI / beginning CPI)-1]. Because the Treasury bill yield is annualized, it was also necessary to annualize the quarterly %CHCP. The following formula was used for this calculation: $(\text{Quarterly \%CHCP} + 1)^4-1$. Finally, note that the %CHCP is used as a proxy for the inflation rate.

X_2: The percentage change in the money supply (%CHMS1) was found by using the M_1 money supply. The M_1 data is used because it is assumed that short-term fluctuations in the money supply (primarily in M_1) would have the most impact on short-term interest rates. The %CHMS1 was calculated in the same way as the %CHCP.

X_3: The stock market average used in this analysis is the Dow Jones Industrial Average (DJIA). This DJIA for the quarter was calculated by summing the monthly averages and then dividing by three.

X_4: The investment data used for this study was the quarterly Gross Private Domestic Investment (GPDI).

X_5: The income measurement selected was quarterly total personal income (TPINC).

X_6: The amount of deficit spending (DEF) was found by subtracting the monthly government outlays (e.g., national defense, income security) from the monthly government receipts (e.g., income tax, corporate income tax), adding these differences together for the quarter, and then averaging this amount over the quarter.

Finally, it is important to note that gross private domestic investment, total personal income, and deficit spending have all been adjusted to real terms in order to account for the impact of inflation on each of these variables over time. For instance, real gross private domestic income (GPDI) was calculated by dividing each quarterly GPDI by a general price index for the quarter.

Results of the Model

In developing a formal equation for this study, it was necessary to look at the type of relationship that might exist between the independent variables and the dependent variable: that is, whether the estimated line would be linear (a straight line) or curvilinear (a rounded shape). I concluded that a curvilinear line would provide the best fit for the thirty-five observations in this model since the concept of diminishing marginal returns on investment (i.e., investment returns increasing at a decreasing rate) will set in as interest rates move upward. Other concepts such as the liquidity preference curve suggest a curvilinear relationship between interest rates and factors such as income. In accounting for these curvilinear relationships, the regression equation was formalized by taking the log of the T-bill yield (LOGTBILLY). Also noteworthy is that the Dow Jones Industrial Average (DJIA) was logged partially due to multicolinearity (i.e., interdependence) between the DJIA and income, and also because there is a double-logarithmic relationship between interest rates and the stock market. In other words, at higher stock prices interest rates will be low, while at lower stock prices interest rates will be high (see graph below).

Graph 2

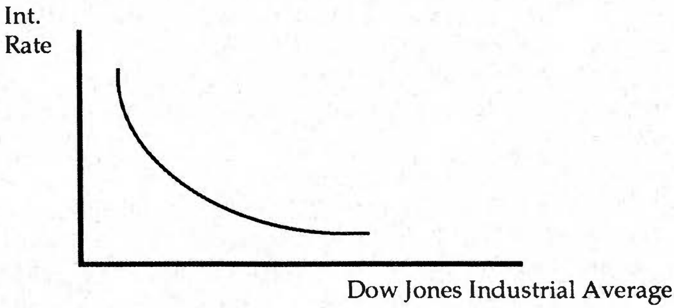


Table of Results

LOGTBILLY	Intercept	%CHCP	%CHMS1	Log DJIA	GPDI	TPINC	DEF
$\hat{Y}$ =	6.7556	+ 0.00014	- 0.04416	- 0.448	+ 0.4626	- 0.21996	- 0.00072
	(10.037)	(1.0927)	(-2.8548)	(-2.6824)	(3.2748)	(-3.049)	(-0.861)

number of observations = 35 $R^2 = 0.8972$ Adjusted $R^2 = 0.8752$

F-ratio = 40.751
Critical value = 3.73

Durbin-Watson = 1.4950

The results of the regression analysis given above show that there are four variables that significantly affect Treasury bill yields. These findings were based on t-values (given in parentheses) used to test for significant variables. With a t-value of 1.98 and above being significant, the four variables found to have an impact on interest rates are: the percentage change in the money supply, the log of the Dow Jones Industrial Average (DJIA), real gross private domestic investment, and real total personal income. A problem occurs, however, when looking at the t-value for the intercept. This unusually large value suggests that a large portion of the yield on T-bills is determined by the intercept value, and that other factors affecting interest rates may have been left out. Although this is a serious implication, the significance of the regression analysis (discussed below) should outweigh this potential problem.

As previously noted, theory would predict that the percentage change in the money supply and income will have a negative impact on interest rates. The results of this regression analysis also found this to be true for the percentage change in M_1 money supply and total personal income over the thirty-five quarters (from 1980 to 1988). Likewise, real gross private domestic investment was found to be positively related to interest rates as theory predicts. Regarding the relationship between interest rates and the stock market, however, this analysis found that a negative relationship exists. That is, as stock prices move up in the short run, interest rates move down. This diverges from the positive relationship that Spiro suggested.

Other results of the regression analysis are the coefficients of determination (R^2 and adjusted R^2) used to show how well the independent variables in the equation explain variations in the dependent variable. In this analysis, an adjusted R^2 of 0.878 suggests that 87.8 percent of the variation in T-bill yields is explained by the independent variables used in this model. Furthermore, the statistical test used to determine the reliability of the R^2 is significant at the 95% level. That is, since the F ratio of 40.751 exceeds the critical value of 3.73, there is a 95% certainty that the independent variable influences the dependent variable. Finally, in testing the Durbin-Watson statistic, which checks for auto-correlation between residual variables (unexplained variations) in time series data, the existence of auto-correlation was found to be inconclusive.

Summary and Conclusions

The goal of this essay has been to provide a current assessment of the factors affecting interest rates. To achieve this goal, a multiple regression analysis was conducted to find which factors significantly affect interest rate fluctuations in comparison to what previous studies and past theory would predict. For instance, theory suggests that both changes in the money supply and income will have a negative relationship to interest rates, while investment spending will have a positive relationship. These relationships were all found to exist in the model presented. The results of the multiple regression analysis also offer insight into deviations from previous studies or past theory. Peter

Spiro, for example, suggested that there is a positive feedback of rapid gains in the stock market on real interest rates. Instead, this analysis found a negative relationship to exist between the stock market and interest rates. Theory would also predict that the inflation rate will have a positive impact on interest rates. The results of this analysis, however, found no significant relationship to exist between the inflation rate and interest rates. One explanation for the inflation rate's insignificance may be that the relatively short-term nature of T-bill yields will not include adjustments for inflation. Moreover, Martin Pring noted that short-term interest rates are often based on expectations of the inflation rate rather than the reported figures. Therefore, the inflation rate may be reflected more in long-term rates than in short-term rates. Finally, this model reinforces Alan Blinder's work which suggests that no significant correlation will exist between interest rates and government deficits.

With the affect that interest rates have on millions of people every day, underlying factors such as changes in the money supply or income should continue to impact individual decisions in choosing the right opportunity that will minimize costs or maximize returns. By being aware of how these underlying factors affect the interest rate they will be charged on a loan or receive on an investment, individuals will be able to choose the opportunity that is right for them.

Note

[1] The information for this model was found in two primary sources: *Economic Indicators* published by the Council of Economic Advisors (U.S. Government Printing Office, Washington, D.C., 1980-1989) and the *Federal Reserve Bulletin* (U.S. Government Printing Office, Washington, D.C.), volumes 66-74.

References

Blinder, Alan S. "Comment of Federal Deficits, Interest Rates and Monetary Policy," *Journal of Money, Credit and Banking,* Nov. 1985, 17(4), pp. 685-89.

Laderman, Jeffrey M. "What will the market do for an encore?" *Business Week,* Aug. 14, 1989, pp. 98-9.

Pring, Martin J. *How to Forecast Interest Rates: A Guide to Profits for Consumers, Managers and Investors.* New York: McGraw-Hill, 1981.

Spiro, Peter S. "The Effects of Government Debt and Deficits on Interest Rates," *Business Economics,* Oct. 1988, pp. 39-46.

_____. *Real Interest Rates and Investment and Borrowing Strategy.* New York: Quorum Books, 1989.