THE BUDGET DEFICIT DEBATE: A REVIEW AND FURTHER ANALYSIS

Demetrios S. Giannaros, Economics, University of Hartford
Bharat R. Kolluri, Economics, University of Hartford

Abstract

This article presents a review of the results of some recent econometric studies, including our own, on the controversial issue regarding the budget deficit-interest rate relationship. The conclusions reached by the authors of these studies are mixed and sometimes contradictory. Differences in data bases, model specification, sample used, and variable definitions are some possible reasons for these varying conclusions.

INTRODUCTION

The impact of the federal budget deficits on interest rates and other macroeconomic aggregates has become the primary issue concerning policy makers in both government and business and has significantly affected the behavior of the financial markets. Given the relative importance of this issue, this project seeks to evaluate and present the results of recent empirical studies with different views and conclusions on this issue. According to one of these hypotheses, government deficits are financed primarily by the sale of government bonds and treasury bills in the private financial markets. This naturally creates an upward pressure on interest rates due to the increased demand for loanable funds. As the government increases its borrowing in the private markets, it competes for the available funds with the private industry. This results in a "crowding-out effect", meaning that there is less money available for consumer and investment loans at relatively higher interest rates. Thus, the budget deficits have a significant positive effect on interest rates.

On the other hand, some propose that changes in the budget deficit have a neutral effect on the level of interest rates rejecting the "crowding-out ef-

fect" theory. According to them, interest rates are affected by a multiple of factors, in the context of a multi-sector macroeconomic model, representing the complex economic system. Some suggest that the primary factors influencing the interest rates are expected inflation, inflation uncertainty, monetary policy, government policy on spending and taxation and portfolio shifts.

Finally, some recent studies indicate a negative effect of the growth in the budget deficits on interest rates. According to these studies, this effect is possible since deficit increases are countercyclical and changes in interest rates are procyclical. The actual effect depends on the relative changes of the total demand components for loanable funds and the change in total demand itself relative to total supply for funds.

It is obvious, therefore, that the results reported so far on the deficit-interest rate linkage are mixed. Differences in data bases, model specification, and variable definitions (changes vs. levels, for example) are possible reasons for some of these mixed results. The purpose of this paper is to present and evaluate the results of some of the most recent studies, in-

cluding our own, on the subject. Hopefully, this survey will enable one to recognize and appreciate the problems and limitations of the budget deficit-interest rate linkage. Section II presents the results of some of the most recent studies. Section III presents the empirical results of some of our own empirical analysis and Section IV presents conclusions and further suggestions.

A REVIEW OF THE RECENT EMPIRICAL STUDIES

Economists have investigated thoroughly the relationship between the nominal interest rate and the expected rate of inflation known as the "Fisher effect", both on theoretical and empirical grounds and have generally accepted it, with the exception of the constancy of the anticipated real interest rate. Nelson and Schwert (1977), Levi and Makin (1979) and others rejected Fama's (1975) hypothesis of a constant real rate of interest. In the U.S., the annual rate of inflation measured by the C.P.I. fell from 12.5% in 1980 to 3.9% in 1984. It is also interesting to note that over this period the government budget deficit as a percentage of the GNP has increased from 2.26% in 1980 to 5.06% in 1984 while unemployment changed from 7% in 1980 to 7.5% in 1984. The same phenomenon was observed in some of the other industrialized economies - although not necessarily to the same degree. Based on these facts, a number of economists now believe that the federal budget deficits affect the real interest rates significantly while others reject any such relationship. In what follows, we present an update on the conclusions reached in some of the recent empirical studies on this issue.

A number of different approaches are used to study the deficit-interest rate linkage. Among the most common are the Fisher equation approach, the reduced form interest rate equation derived from the IS/LM general equi-

librium model and the portfolio choice approach of lenders and borrowers in the bond market. Furthermore, various definitions and measurements of the budget deficit and debt are used to study their impact on interest rates. Most often the results and conclusions on this issue are highly sensitive to the model specification, methods of estimation, data measures and other factors. These conflicting conclusions are evident from the results of the various recent empirical studies presented in Table I. Some studies indicate a definitive positive deficit-interest rate linkage, others show a negative relationship and a large number show a neutral effect. These apparent conflicts are evident either in the short-term or long-term analysis and also in the real or nominal interest rates. In what follows is a brief discussion and analysis of a few selected studies.

Gregory Hoelscher (1983, 1986) has carried out two independent studies testing the nominal interest rate-deficit linkage. In the first empirical study (1983) he tested for the period 1952:3 to 1976:2 the effects of federal government borrowing on the short-term nominal interest rates (using the 3-month Treasury Bill rate as the dependent variable). The interest rate is expressed as a function of the expected rate of inflation, the unemployment rate, federal government borrowing, purchases of securities by the Central Bank, and the lagged dependent variable. Hoelscher used four different measures of government borrowing and concluded that there is no statistically significant relationship between the short-term nominal interest rates and federal government borrowing. On the other hand, though, Hoelscher (1986) studied the deficit long-term nominal interest rate linkage and reported exactly the opposite results. In this study, he found consistently that there is a positive and significant relationship between government deficits and the long-term nominal interest rates. The estimations were carried out using

TABLE I

EMPIRICAL RESULTS OF SOME RECENT BUDGET DEFICIT-INTEREST RATE LINKAGE STUDIES

<u>Date & Author/Source</u>	<u>Sample Period</u>	<u>Dependent Variable Nominal or Real Interest Rate</u>	<u>Short-Term or Long-Term Analysis</u>	<u>Deficit/Debt Measure</u>	<u>Model Specified</u>	<u>Conclusions Reached on Deficit-Interest Linkage (Positive, Negative or Neutral</u>
1. GIANNAROS 3/1985 <u>Journal of Economics</u>	Annual 1953-83	Real	Long-Term	Govt. Deficit as a percent- age of GNP	Single Equation	Negative
2. EVANS 3/1985, <u>American Economic Review</u>	Annual/ Monthly Various samples for the period 1858-1984	Nominal and Real	Short-Term and Long-Term	The ratio of real deficit to trend real GNP	Single Equation	Negative
3. GIROLA 12/1984, Conference	Quarterly 1965Q1- 1983Q4	Nominal	Long-Term	Real per capita federal deficit or growth in the real per capita public debt	Single Equation	Neutral
4. GIANNAROS & KOLLURI 12/1984 Conference	Quarterly 1965Q1 1983Q4 Annual 1950-1983 Six indus- trialized countries	Real	Short-Term Long-Term	Govt. Deficit as a percentage of GNP	Single Equation	Neutral

TABLE I (continued)

EMPIRICAL RESULTS OF SOME RECENT BUDGET DEFICIT-INTEREST RATE LINKAGE STUDIES

Date & Author/Source	Sample Period	Dependent Variable	Short-Term or		Deficit/Debt Measure	Model Specified	Conclusions Reached on Deficit-Interest Linkage (Positive, Negative or Neutral
			Nominal or Real Interest Rate	Long-Term Analysis			
5. HUTCHINSON & PYLE Fall/1984, <u>Economic Review</u>	Annual 1973-82 Seven industrial- ized countries data pooled	Real		Short-Term	Govt. Deficit as a percentage of GNP	Single Equation	Positive
6. TATOM 6-7/1984, <u>Review</u>	Quarterly 1955Q2- 1983Q3, Various Subperiods	Nominal		Short-Term & Long-Term	Change in Govt. def- icit - GNP ratio & change in high employ- ment deficit Potential GNP ratio	Single Equation	Negative for Short- Term Neutral for Long- Term
7. BARTH et al Fall/84-84, <u>Contemporary Policy Issues</u>	Survey and re-estimations of some recent empirical studies						The results are sensitive to the measures of deficit and debt, but generally positive.
8. KOLLURI and GIANNAROS Winter/1987, <u>Journal of Macro- economics</u>	Quarterly 1966Q1- 1983Q4	Real		Short-Term	Real govt. deficit	Single Equation	Negative

TABLE I (continued)

EMPIRICAL RESULTS OF SOME RECENT BUDGET DEFICIT-INTEREST RATE LINKAGE STUDIES

Date & Author/Source	Sample Period	Dependent Variable Nominal or Real Interest Rate	Short-Term or Long-Term Analysis	Deficit/Debt Measure	Model Specified	Conclusions Reached on Deficit-Interest Linkage (Positive, Negative or Neutral)
9. HOELSCHER 2/1986, <u>Journal of</u> <u>Money,</u> <u>Credit, and</u> <u>Banking</u>	Annual 1953- 1984	Nominal	Long-Term	Real federal govt. per capita deficit and aggregate (Federal, state, local) deficit	Single Equation	Positive
10. HOELSCHER 10/1983, <u>Southern</u> <u>Economic</u> <u>Journal</u>	Quarterly 1952Q3 1976Q2	Nominal	Short-Term	Real govt. borrowing & deficit - GNP ratio	Single Equation	Neutral
11. MAKIN 8/1983, <u>Review of</u> <u>Economics &</u> <u>Statistics</u>	Quarterly 1959Q2- 1981Q4	Nominal	Short-Term	Govt. deficit	Single Equation	Neutral
12. MAKIN & TANZI 7/1983, NBER	Quarterly 1960Q1- 1981Q4	Nominal	Short-Term	Surprise deficits	Single Equation	Positive
13. MOTLEY <u>Summer/</u> <u>1983,</u> <u>Economic</u> <u>Review</u>	Quarterly Subsamples of 1958Q2- 1982Q1 period	Real	Short-Term	Govt. deficit & total govt. & agency securities issued to the public	Single Equation	Neutral

TABLE I (continued)

EMPIRICAL RESULTS OF SOME RECENT BUDGET DEFICIT-INTEREST RATE LINKAGE STUDIES

Date & Author/Source	Sample Period	Dependent Variable Nominal or Real Interest Rate	Short-Term or Long-Term Analysis	Deficit/Debt Measure	Model Specified	Conclusions Reached on Deficit-Interest Linkage (Positive, Negative or Neutral)
14. DEWALD 1/1983, Economic <u>Review</u>	Quarterly 1953Q3- 1981Q3	Real	Short-Term & Long-Term	Real deficit & also adjusted for cyclical effects	Single Equation	Mixed results Conclusion is Neutral
15. MAKIN 6/1982, IMF Staff <u>Papers</u>	Quarterly 1959Q1 1980QIV	Nominal	Short-Term	Total govt. borrowing relative to GNP and deficit - GNP ratio	Single Equation	Positive when debt issued Negative when deficit issued

annual data for the 1953-84 period with the 10-year treasury bond yield as the dependent variable, and using the loanable funds approach to derive a reduced form single equation. He expressed the long-term nominal interest rate as a function of the expected inflation, the expected real short-term interest rate, the change in real per capita GNP and the deficit (various definitions tested). It is obvious, therefore, that his conclusions differ depending on whether the dependent variable is the shortterm or long-term interest rate.

The conclusions reached by Makin (1982, 1984) and Makin and Tanzi (1983) on the short-term interest rate--deficit linkage also vary depending on the model and type of measure used for the deficit. Makin (1982) used a reduced form single equation approach to test the relationship using quarterly data for the period 1959I-1980IV and the 3-month treasury bill rate as the dependent variable. He expressed the short-term nominal rate as a function of money surprises, anticipated inflation, and net government borrowing relative to GNP. In this empirical study, Makin observed a positive significant relationship regarding the deficit-interest rate linkage. It is interesting to note that, in the same study, he stated that a negative relationship exists if instead budget deficit relative to GNP is used rather than net government borrowing. The conflicting results are also evident when one examines Makin's (1984) interest rate study and that of Makin and Tanzi (1983). In both of these empirical studies, the 3-month Treasury Bill rate is used as the dependent variable and the reduced form single equation approach is applied for model specification. In the Makin and Tanzi (1983) analysis, the surprise deficit (measured as residuals from a univariate time-series model of the government financed deficit) is used as an explanatory variable. Their regression results indicate a positive relationship regarding the short-term interest rate-deficit linkage. On the other

hand, when instead the actual deficit is applied, the effect is neutral. This neutrality effect is also reported in Makin (1983). It is important to note here that the empirical findings of these three studies are mixed (positive, negative, neutral) depending primarily on the measure of deficit used and structure of equation tested.

In another recent empirical study, Hutchinson and Pyle (1984) applied a different technique - "pooling" of annual time series data (1973-82) across seven industrialized countries (U.S., U.K., France, Japan, Italy, Canada, and Germany) - to test the deficit effects on real interest rates. They used the single equation approach and expressed the short-term real rate as a function of the budget deficit relative to GNP, money growth, the unemployment rate, and a dummy for each country. The dummy variables are used to take into account the different countries' structural and institutional differences. Hutchinson and Pyle claim that using the 1973-82 data is more relevant because this period represents a substantially different economic environment than that of the 1950's and 1960's. In addition, they also state that pooling of observations increase the data variability, both over time and across countries, making the real interest rate--deficit study more effective. Hutchinson and Pyle conclude that there is a positive deficit-short term real interest rate linkage across seven countries and across time.

In a recent article, Paul Evans (1985) tested the conventional paradigm that large deficits produce higher interest rates. He used various sample periods covering a century of the U.S. history (1858-1983). Evans presented results for the Civil War period 1858-69 (annual data), the World War I period Jan. 1914-Dec. 1920, the World War II period Oct. 1942-Dec. 1947, and the post war period Oct. 1979-Dec. 1983. He derived a reduced form type interest rate equation from the traditional IS-LM model.

He tests empirically the effects of budget deficit, government spending, and money supply on both the short-term as well as the long-term nominal and real interest rates. Evans' findings consistently indicate that federal spending has a positive and significant effect on interest rates, supporting the conventional paradigm. In contrast, real deficit relative to GNP did not show any positive effect on interest rates but rather the results show a significant negative effect.

Barth et al (1984-85) reviewed several articles on the effects of federal deficits on interest rates and other economic variables. According to them, the concept of deficit is ambiguous and the economic effects of budget deficits are highly sensitive to the way deficit or debt is measured, time period chosen, and other factors. They are able to present some evidence on the positive effects of deficits on interest rates by modifying the existing studies somewhat.

More specifically, Barth et al reestimated four interest rate studies with different measures of deficit and debt and updated the results through the end of 1983. First, they replicated Hoelscher's (1983) results by decomposing the deficit into structural and cyclical components and concluded that the former had a significant and positive effect on interest rates, while the latter had a significant and negative effect. These contradict the results reported by Hoelscher. Second, they examined Carlson's (1983) study and found that the results on the effects of federal debt on interest rates are most sensitive to even a modest change in the sample period. The third study they examined was by Girola (1984). In this study, Barth et al applied correction for the first-order serial correlation based on a low Durbin-Watson statistic and used two separate components of debt, namely, domestically held federal debt and foreign held federal debt. They reported results

that are totally mixed. The last study they replicated and updated was that of Deleeuw and Holloway (1983). Thus, the overall results from these four interest rate studies and their replications by Barth et al indicate how sensitive they are to such factors as the type of deficit or debt measure, sample period chosen, statistical technique employed, model specification and the like.

REVIEW OF OUR OWN EMPIRICAL STUDIES

In this section we present a brief review of our three recent empirical findings on the budget deficit-interest rate relationship. The purpose of these studies, in order to get more insights on the propositions, is to further examine the effects of budget deficits and the effects of inflation uncertainty on interest rates by taking into account the model stability and by extending the analysis to six industrialized countries.

First we discuss our paper, Kolluri and Giannaros (1987). A reduced form short-term real interest rate equation was derived from the standard IS/LM model. A dummy and an interaction variable were introduced into the model in order to take into account the observed structural break during the post-1979 period.{1}

Unlike the commonly held belief, our empirical analysis shows a depressing effect of an increase in the budget deficit on the short-term real rate of interest. This is conceivable as it is generally believed that deficit increases are counter-cyclical and real interest rate increases are procyclical.{2} The introduction of a measure of inflation uncertainty variable in the real interest models has substantially improved the overall results. The coefficient of the inflation uncertainty was consistently significant in all the seven models with an estimated coefficient of about 1.45 percentage points. This should not be

surprising if we take into account the increased uncertainty of the expectations of inflation resulting from an upward shift in the unpredictability of the money growth and other factors in recent years.

In order to examine the impact of budget deficits on the long-term real interest rates, Giannaros (1985) estimated a modified interest rate model with annual data for the period of 1953-83. The real interest rate equation is expressed as a function of the expected inflation, a measure of uncertainty, and the budget deficit relative to GNP. This equation is estimated using the 3-year Treasury Bill rate and alternatively the 10-year Treasury Bill rate, the Long-Term Government Bonds and the AAA Corporate Bond Rate. Alternative measures of the deficit were also used in these estimations. The empirical results show that the relative budget deficit coefficient is negative and statistically significant in explaining the variation of long-term real interest rates. This result prevails in all the measures of the long-term interest rates used. The coefficient of the relative inflation uncertainty for the overall period is positive and, in general, statistically significant. This observation suggests that inflation uncertainty plays an important role in explaining the variation in long-term real interest rates.

Finally, as a next logical step we (Giannaros and Kolluri 1984) attempted to reexamine the experience of other countries (Canada, France, Japan, United Kingdom, and West Germany), besides the U.S., on this issue.^{3} The estimates of the basic model and its variants for the period 1965Q1 - 1983Q4 are obtained using a Fisherian type reduced form model. Contrary to the conventional paradigm, our empirical analysis does not show any significant direct relationship between budget deficit and the short-term real interest rate in the great majority of the countries examined. Only in the case of

Japan does the budget deficit show a significant depressing effect on the dependent variable. It should be pointed out here that the sample for Japan (1965Q1 - 1980Q2) excludes the more recent volatile period of the industrialized nations and also, that a relatively closer institutional relationship has been maintained between the banking industry and the government. These factors may partially explain the different response of the short-term real interest rates to changes in the relative budget deficit in this country. The results for Canada and U.K. do show some of the estimates of the deficit coefficient with negative signs, although insignificant. An attempt is also made, in this study, to extend this cross-country analysis to the behavior of the long-term real interest rates using annual data for the period 1950-1983 (with the exception of Japan with 1964-81 as the sample period) and the same reduced form type models. The dependent variable is the real long-term interest rate derived from the longterm government bond yield and the inflation rate. This extension of the study is important in view of the contention by some that the variations in the long-term interest rate are independent of the changes in short-term interest rates. Moreover, it is believed that the public policy effects are felt by the real sector of the economy through the long-term interest rates.

The overall results (in testing the significant effect of deficit spending on the long-term real rate) do not alter the conclusions reached in the short-term multi-country analysis. They confirm the lack of a direct significant deficit-real interest rate linkage, in the five out of six countries tested. It is only in the case of Canada that a significant negative relationship between budget deficit and the real rate is observed. It is also interesting to note that the negative significant relationship observed in the short-term real rate analysis disappeared in the long-term estimations in the case of Japan.

Therefore, the overall results of the major industrialized countries examined reinforce the argument that the direct impact of deficits on real interest rates is neutral, contrary to the popular belief that budget deficits increase the real interest rates.

CONCLUSIONS AND FURTHER SUGGESTIONS

This paper presented a review of some important empirical studies, including some of our own, on the controversial issue of the budget-deficit interest rate linkage. The popular belief is that higher deficits cause higher interest rates. However, some economists state that there is no such cause and effect relationship while others, in fact, suggest a depressing effect of budget deficits on interest rates. Of the twelve studies (besides our own) presented in Table I, four suggest a positive linkage, three suggest neutrality, two suggest a negative relationship, and three show mixed results. The conclusions obtained from these studies are thus mixed and contradictory. Differences in data bases, model specification, sample used, and variable definitions are some possible reasons for these varying conclusions. In our own studies, we attempted to improve upon these problems somewhat by examining the stability of the model,

incorporating the appropriate modifications, and testing the propositions on a multi-country basis. Even among these, the conclusions arrived seem to be somewhat conflicting. However, based on the overall results of our own studies, one can conclude that budget deficits do not positively affect real interest rates.

Obviously, based on this review, we can suggest that more theoretical as well as empirical work is required before one attains strong convictions on the propositions regarding the budget deficit effects on interest rates. For example, one could conduct a causality test between budget deficits and interest rates. Alternatively, the estimation techniques could be improved by applying, for example, the random coefficients regression model. Other various missing factors, like net capital flows from abroad, should be incorporated into the interest rate models. More important, one should consider specifying a simultaneous larger scale econometric model in testing the budget deficit-interest rate linkage in order to take into account the simultaneity effects and the interrelationships that exist between the various money markets. Given the relative importance of this public policy issue, we hope that this review will facilitate further work both by ourselves and others.

FOOTNOTES

- 1 For more details on model structure, estimations and analysis see our articles in the *Journal of Macroeconomics* (1987) and *Journal of Economics* (1985).
- 2 Paul Evans (1985) attributes this behavior to an increase in private savings that depresses the aggregate demand and hence interest rates.
- 3 A more detailed discussion of the models and results are available from authors at request.

REFERENCES

- Barth, J.; Iden, G.; and Russek, F.S. "Do Federal Deficits Really Matter," *Contemporary Policy Issues*, Vol. 3, (Fall, 1984-85).
- Carlson, Jack, "The Relationship Between Federal Deficits and Interest Rates," statement before the Joint Economic Committee, October 21, 1983.
- DeLeeuw, Frank, and Holloway, Thomas M., "Cyclical Adjustment of the Federal Budget and Federal Debt," *Survey of Current Business*, December 1983, Vol. 63, pp. 25-40.
- Dewald, William G., "Federal Deficits and Real Interest Rates: Theory and Evidence," *Economic Review*, Federal Reserve Bank of Atlanta (January 1983), pp. 20-29.
- Evans, Paul, "Do Large Deficits Produce High Interest Rates?" *American Economic Review*, Vol. 75, No. 1, (March 1985), pp. 68-87.
- Fama, Eugene R., "Short-Term Interest Rates as Predictors of Inflation," *American Economic Review*, No. 65 (June 1975), pp. 269-282.
- Giannaros, Demetrios S., "Inflation Uncertainty, Budget Deficits and the Long-Term Real Interest Rates," *The Journal of Economics*, Vol. XI, 1985, pp. 111-117.
- Giannaros, Demetrios, and Kolluri, Bharat, "Deficit Spending, Money and Inflation: Some International Empirical Evidence," *Journal of Macroeconomics*, Vol. 7, No. 3, (Summer 1985).
- Giannaros, Demetrios, and Kolluri, Bharat, "The Impact of Budget Deficits on Real Interest Rates: An International Empirical Investigation," presented at the *Ninety-Seventh Annual Meeting of the American Economics Association*, Dallas, Texas (December 28-30, 1984).
- Girola, James A., "Federal Deficits and Interest Rates," paper presented at the Annual Meeting of the Society of Government Economists, Washington, D.C., March 1984.
- Hoelscher, Gregory P., "Federal Borrowing and Short Term Interest Rates," *Southern Economic Journal*, Vol. 50, (October, 1983), pp. 219-333.

Hoelscher, Gregory, "New Evidence on Deficits and Interest Rates," *Journal of Money, Credit, and Banking*, Vol. 18, No. 1, (February, 1986), pp. 1-17.

Hutchinson, Michael, and Pyle, David H., "The Real Interest Rate/Budget Deficit Link: International Evidence, 1973-82" *Economic Review*, Federal Reserve Bank of San Francisco, (Fall 1984).

Kolluri, Bharat R., and Giannaros, Demetrios S., "Budget Deficits and Short-Term Real Interest Rate Forecasting," *Journal of Macroeconomics*, Vol. 9, No. 1, Winter, 1987.

Kolluri, Bharat R., and Giannaros, Demetrios S., "Deficit and External Debt Effects on Money and Inflation in Brazil and Mexico: Some Evidence," *Eastern Economic Journal*, Vol. XIII, No. 3, (July-September, 1987), pp. 243-248.

Levi, M. D., and Makin, J. H., "Fisher, Phillips, Friedman and the Measured Impact of Inflation on Interest," *The Journal of Finance*, Vol. 34, (March 1979), pp. 35-52.

Makin, John H., "Real Interest, Money Surprises, Anticipated Inflation and Fiscal Deficits," *The Review of Economics and Statistics*, Vol. 65, No. 3, (August 1983), pp. 374-384.

Makin, John H., "Effects of Inflation Control Programs on Expected Real Interest Rates," *Staff Papers*, International Monetary Fund, (June 1982), pp. 204-232.

Makin, John H., and Tanzi, Vito, "The Level and Volatility of Interest Rates in the United States: The Role of Expected Inflation, Real Rates, and Taxes," Working Paper No. 1167, National Bureau of Economic Research, Inc., 1950, Massachusetts Avenue, Cambridge, Massachusetts 02138, (July 1983).

Motley, Brian, "Real Interest Rates, Money and Government Deficits," *Economic Review*, Federal Reserve Bank of San Francisco, Vol. 3 (Summer 1983), pp. 31-45.

Nelson, Charles R., and Schwert, G. William, "On Testing the Hypothesis That the Real Rate of Interest is Constant," *American Economic Review*, Vol. 67, (June 1977) pp. 478-486.

Tatom, John A., "A Perspective on the Federal Deficit Problem," *Federal Reserve Bank of St. Louis Review*, Vol. 66, No. 6 (June/July 1984), pp. 5-17.