Kaleidoscope

Volume 3 Article 12

October 2015

The Consequences of the Federal Deficit: An Empirical Analysis

John T. Knadler
University of Kentucky

AUTHOR

John T. Knadler

I am an economics and history senior in the College of Arts and Sciences. I am a second year Gaines Fellow, and a recipient of the English Speaking Union Scholarship for summer study at Oxford University, and a National Merit Scholar. On campus, I am the co-founder and Chairman of the Moderates, Vice President of Phi Alpha Theta History honorary fraternity, and a member of Kappa Alpha Order social fraternity. My goal is to work as an attorney in some issue of domestic or foreign policy, hopefully with an economic orientation. This paper discusses a major issue within macroeconomic policy circles and is the type of work I hope to do as a consultant or government official in the future. My work for this paper was part of a semester long term paper for Economics 491G.

The Consequences of the Federal Deficit: An Empirical Analysis

Abstract

One of the major issues of political debate in the United States during the past 20 years has been the potential consequences of rising federal deficits. Some politicians and economists argue for the traditional view that deficits increase interest rates and erode private savings, while those who hold the Ricardian equivalence view believe that economic agents are forward looking and will realize that a tax cut today will cause a future deficit, thus they will not change their behavior in response to the increase in wealth from the tax cut. My research was designed to determine through econometric regression analysis whether deficits cause an increase in interest rates and or a reduction in private saving. When I used a standard, two stage, least squares regression, I found deficits a significant factor only in decreasing savings; however, when I used an instrumental variable regression, I found that deficits were significant in increasing interest rates and had no impact on private savings. Thus, I conclude that both the Ricardian and the traditional view of deficits may be valid, depending upon one's methodology.

One of the clearest economic results of the Great Depression that crippled the economies of the United States and the world in the first half of the 20th century was the coming to fashion of Keynesian economics. The basic thrust of that theory, from a policy perspective, was an intense focus on the short-run business cycle, with little attention paid to the long run because, as Keynes stated, "in the long run we are all dead." Keynesians advocated low taxes and large increases in spending to stimulate the demand for goods. The corollary of this theory is that large deficits are given little attention; however, the experience of the United States in the 1970s of high unemployment, high inflation, and increasing interest rates made many economists rethink the Keynesian system. Beginning in the 1980s, the deficit began to become an intense political issue that led to various movements toward a balanced budget amendment, which never passed. The common fear of the deficit is that it leads to high interest rates; however, presently we are experiencing ever-increasing deficits, yet our interest rates remain at historical lows.

Mentors:
Chris R. Bollinger, Associate Professor, and James S. Fackler, Professor, Department of Economics

In fiscal year 2004, the United States budget deficit is expected to exceed $477 billion and be 4.2% of the Gross Domestic Product. As J. T. Knadler explains in his introduction, the impact of deficits on the overall economy is still a matter of debate in economics. J. T.'s paper carefully reviews this debate and proposes a model and estimation approach to test the implications therein. The two most important questions are whether increased deficits lead to higher interest rates, and if these deficits have an impact on private savings. Using standard macro-economic variables and models, J. T. estimates a three equation system that models the deficit, interest rates, and savings. His creative use of Military personnel as an instrument of the deficit, combined with the standard use of currency in circulation as an instrument for the interest rate, make this paper an interesting contribution to a long and important literature on this topic. J. T. finds support for the traditional view that increasing deficits raise the interest rate, and little support for the view that savings is simply adjusted by perfectly forward-looking consumers. This paper represents a contribution to an important question in the macroeconomic literature.

Background

Research in the area of deficits and interest rates is not an especially new topic; indeed, some of the most famous macroeconomic thinkers, including David Ricardo, Martin Feldstein, Robert Barro, and Milton Freidman, have considered this issue. However, what has not been a constant in this debate is the context in which government deficits are discussed. Edward Nelson points out, "During the 1970s emphasis was on the inflationary consequences of deficits. By contrast, the concern voiced since the 1980s about deficits rests on the argument that they put upward pressure on real interest rates." (Nelson, 2004, p.1)

Before I discuss the recent literature and the empirical study of the consequences of the deficit, I feel it is relevant to note the macroeconomic theory debate that underlies and motivates work on this topic. Essentially, the debate is between two schools of thought: the traditional view and the Ricardian view. The traditional view holds that deficits have real consequences in that they produce high interest rates, reduce private savings, and "crowd out" capital accumulation, thus inhibiting long run economic growth. The Ricardian view assumes agents are forward-looking and, as Greg Mankiw states, "The forward looking consumer understands that the government borrowing today means higher taxes in the future. A tax cut financed by government debt does not reduce the tax burden; it merely reschedules it. It therefore should not encourage the consumer to spend more." (Mankiw, 2003, p. 416)

One of the most noteworthy articles advocating the traditional view was a 1970 paper by Feldstein and Eckstein that examined the relationship between deficits, interest rates, and private savings during the period from 1954 to 1969 on a quarterly basis. Although the authors found that the federal deficit was not significant in explaining interest rates, they did find that "the decline in the real per capita publicly held Federal debt put downward pressure on interest rates." (Office of the Assistant Secretary for Economic Policy, 1984, p. 37)

However, Feldstein and Eckstein's conclusion "is weak in that it is only of marginal statistical significance." (Office of the Assistant Secretary for Economic Policy, 1984, p. 37) Since its publication, the Feldstein and Eckstein paper has been the subject of much debate. One noteworthy criticism, and the work that has since become one of the most widely cited Ricardian papers, is a 1985 article by Paul Evans, an economist at Ohio State University. Evans examined the period between October 1979 and December 1983, because "the Federal Reserve stabilized interest rates over most of the postwar period, perhaps hiding the true relationship." Furthermore, "Prior to the 1980s the deficit was rarely large and did not vary much and during this period the Federal Reserve largely freed interest rates to seek their own levels." (Evans, 1985, p. 83) From his regressions, Evans concludes "Not that the large deficits in 1982 and 1983 lowered interest rates, but rather that there is no evidence that they produced the high interest rates that have prevailed since October 1979." (Evans, 1985, p. 85)

Evans offers two explanations for his findings. He cites the work in a 1983 paper by University of Michigan economist Roger Kormendi who "suggests that changes in the deficit have been offset by essentially equal changes in private saving, thereby removing the need for interest rates to change." (Evans, 1985, p. 85) Evans's second explanation comes from a theory of Harvard economist Robert Barro that refutes the standard notion that government deficits are essentially taxes on future generations. Barro states that most intergenerational transfers are among family members. Barro then concludes, "The shift from taxes to deficits does not offer the typical person a new opportunity to extract funds from his or her descendants. Rather, the response to higher deficits would be a shift in the private transfers by an amount sufficient to restore the balance of income across generations that was previously deemed optimal. In this case, the shift from taxes to deficits has no aggregate wealth effect." (Barro 1990, p. 360)

Given the research cited, it is evident that there are no definitive conclusions to the question of the economic consequences of deficits; rather, many of the conclusions lie in the type of methodology employed by the researcher. However, overall, it would be a disservice not to note that the Ricardian view is the conclusion of the majority of empirical evidence for the United States that was presented in the 1984 Treasury report for the period we are discussing.

Therefore, the basic questions my research sought to answer are: first, are deficits responsible for high interest rates or is it the reverse; and, second, if not, what can explain high interest rates. A secondary question was to examine the effect of deficits on private savings to see if deficits erode private savings. Given that there are a multitude of interest rates, I chose to use the secondary market rate on three month treasury bills (a standard nominal interest rate) as my dependent variable. The time period of my data was in quarterly sets beginning in 1948, because this was the first post-World War II year that contained all the data for the independent variables I wanted to use. The data ends with the third quarter of 2003. I began

by running some simple single variable regressions that include interest rates, deficits, and savings relationships. Then I ran regressions with almost all of my independent variables to capture the impacts of multiple variables. From there, I went on to show some of the regressions used in previous empirical work that pertain to the data sets that I am using. Finally, I used a series of instrumental variable regressions to see if that makes a difference in the relationships I was attempting to capture.

Methodology

My independent variables (the parenthesis are how the variable appears in the output tables) are the following:

currency in circulation (currency)
civilian labor force participation rate (civilian)
current government expenditure (currente)
current government receipts (currentr)
fixed private investment (fixedpri)
GDP deflator measured in 2000 dollars (gdpdefla)
net exports (netexpor)
real GDP measured in 2000 dollars (realgdp)
West Texas spot oil prices per barrel of oil (spottexa)
federal non-defense investment (federaln)
industrial production (with 1997 = 100) (industri)
federal national defense investment (var1)
real disposable personal income (realdisp)
the number of United States active military (activemi)
gross private savings (grosspri)
the deficit (deficit)
The interest rate notation is nominali.

All of the independent variables that are in dollars are measured in billions of dollars.

I wanted to include some type of exchange rate; however, I could not find data available for some of the beginning years of my data set. For the interest rate I would have preferred the federal funds rate, because it is more closely tied to policies of the Federal Reserve, however, it was not available prior to 1959; therefore, I chose to capture more data by using the three month Treasury note rate. Furthermore, M2 would have been a better monetary aggregate, but it also was not available prior to 1959, so I used currency in circulation. All of the data that I used came from the FRED II section of the Saint Louis Federal Reserve's website database. All of the variables I used, with the exception of the nominal interest rate, currency in circulation, civilian participation rate, spot oil prices, and industrial production, were given quarterly. I took those monthly sets and calculated a quarterly average for the three months of the respective quarters so that all data was in quarterly form.

Results

Please note that for the sake of brevity only the special interest variables are discussed in detail for the rest of this paper. For the summary statistics of each independent variable and the regression results of all variables included in a particular regression, please see the on-line version of this paper available at www.uky.edu/kaleidoscope/fall2004, which includes complete output tables and a more detailed and technical discussion of all variables used.

Most of the independent variables, shown in Appendix 1 in the on-line version of this paper, had sample sizes of 223 or 222 (the number of quarters from 1948 to 2003), depending on the data available from the FRED database. The mean of the nominal interest rate was 4.89% with the minimum being an astounding .79% and the maximum making it to 15.05%. The average current expenditure was $681 billion and the average receipts were $619 billion, which means that the United States government, on average, ran a deficit in the years for which I have data.

Over the period, the United States did average a deficit, yet it was only a small one compared to recent numbers, at about $62 billion. The minima and maxima of this variable are quite interesting because the maximum surplus was $212 billion and our largest deficit was $506 billion. What is even more interesting about these numbers is that both of them are within the past decade. The GDP deflator was around 50 in 2000 dollars; therefore, this is the weighted average of various goods over the period measured in 2000 dollars. Gross private savings for the country had a mean of $537 billion.

Before I formally discuss the regressions that are the basis for the conclusion of this paper, I think it is appropriate to spend a moment discussing some statistical terminology. The coefficient value is the change in the dependent variable that would result from a one unit increase in that particular independent variable. The "t" statistic and the P value are both measures of statistical significance; however, all discussions of significance in this paper will use the P value in the $P > |t|$ column. Given that this paper will use the standard 5% significance level, any independent variable with a P value of .05 or less indicates a statistically significant independent variable.

Because the goal of my work was to see if deficits raise interest rates and erode private savings, the three variables of special interest were the deficit, the interest rate, and gross private savings. The logical point

of departure for me was to regress each of these on each other to obtain a possible relationship among these variables. I first regressed the interest rate on the deficit (which was calculated from a comparison of the expenditure and receipts variables). The result of this showed that there was a negative relationship, although it was statistically insignificant. When I did the reverse and regressed the deficit on the interest rate, I found a negative correlation, but it was also statistically insignificant. The lack of statistical significance would seem again to demonstrate Ricardian equivalence.

Second, both of my regressions involving gross private savings and the deficit showed a negative relationship that was highly statistically significant with P values of 0. I was also interested in the role inflation plays in deficits and regressed the deficit on the GDP deflator and the reverse. What I found was that there is a high amount of statistical evidence that the two have a negative relationship; however, because both regressions were statistically significant, I could not prove causation either way.

Therefore, after having tried these simple regressions, I decided to go to the opposite extreme in regression six and run a regression that regressed nearly every variable on the interest rate (see Appendix 2 in the on-line paper). For the sake of brevity, I will discuss only the variables that are of special interest to the project or results that are especially intriguing. What is significant to note is that the deficit did not have a statistically significant impact upon the nominal interest rate. Given the lack of a statistically significant value for the deficit, it would seem again that Ricardian equivalence would hold.

I next decided to regress my entire data series on the deficit in order to see which factors were statistically significant (see regression seven). It is noteworthy that the nominal interest rate was not significant at the five percent level, which again would buttress the Ricardian equivalence argument.

My next two regressions were similar to regressions six and seven, except with fewer variables. Regression eight is a regression of various factors on the interest rate (shown in Appendix 4 in the on-line paper). It can be seen that the deficit is significant in this regression with a coefficient of .007. This result indicates that for a one billion dollar increase in the deficit, we will see interest rates rise by .007.

In regression nine I regressed a series of variables on the deficit (shown in Appendix 5 in the on-line paper). The nominal interest rate was significant in this regression with a coefficient of 18.604, indicating that a 1% increase in the nominal interest rate will increase the deficit by $18.6 billion. This increase actually is quite small, unless interest rates increase by large amounts as we saw in the 1970s and early 1980s.

In regression ten, I tried to replicate the Evans' equation, in which Paul Evans regressed the interest rate on government spending, the deficit, the money supply, and inflation. I used current expenditure, the deficit, currency in circulation, and the GDP deflator in my regression, so I do have silightly different measures than Evans. However, what is important is that my regression (shown in the table below) did reach the same conclusion as Evans: that the deficit does not have a statistically significant effect on the interest rate; my t statistic on the deficit was only 1.122. Therefore, using the variables that Evans used, I have shown Ricardian equivalence; however, I have also run a regression in which the deficit had a significant effect.

Regression 10: Regression Modeling the Evans Equation

nominali	Coef.	Std. Err.	t	P > |t|	[95% Confidence Interval]
deficit	0.0026655	0.0023753	1.122	0.263	-0.0020159–0.007347
currente	-0.0282032	0.0056795	-4.966	0	-0.0393969–0.0170095
currency	0.0148534	0.0096351	1.542	0.125	-0.0041364–0.0338432
gdpdefla	0.5536981	0.0680048	8.142	0	0.4196671–0.6877291
_cons	-6.244723	1.228341	-5.084	0	-8.665668 – 3.823778

My final regressions were an attempt to confront the relationships of deficits, interest rates, and private savings through the use of an instrumental variables approach. First, for my two-stage least squares interest rate regression, I used a series of variables and regressed them on the interest rate. The variable that is of special importance is the currency in circulation variable because it impacts the interest rate but not the deficit. After running this regression, I obtained a predicted value denoted as "n" that will be the instrumental variable that I will later regress on the deficit. For my two-stage deficit regression, I used a series of variables and regressed them on the deficit. Similar to my interest rate equation, I took this regression and obtained a predicted value denoted "d." The variable of special importance in regression 13 was the active military variable, because it impacts the deficit but not the interest rate. In regression 15, I used all of the previous

variables that impact the interest rate and the instrumental variable "d" for the deficit.

I found that the deficit has a statistically significant positive effect of .0111 on the interest rate. Essentially, a $1 billion increase in the deficit will increase interest rates by just over one tenth of a percentage point. Furthermore it should be noted that our regression model is fairly accurate, in that the value of R squared is .823. In regression 16, I regressed variables that impact the deficit and the instrumental variable "n" for the interest rate on the deficit.

I found that there was a highly statistically significant positive relationship again of 31.77. This means that for a 1 percent increase in the interest rate, the deficit will increase by $31.77 billion. In my final regression (regression 17) I wanted to find a relationship among deficits and private savings. I regressed various factors that impact private savings plus my two instrumental variables, "n" and "d."

I found that deficits do not have a statistically significant impact upon private savings. One interesting finding from this regression was the statistical significance of the inflation variable. For a one dollar increase in the GDP deflator, gross private savings increased by $12.645 billion, which makes sense because people have to save more to make up for the lost value of their money due to inflation.

My instrumental variable regressions have proven only one of the traditional view's propositions. Indeed, there was no impact on private savings; however, we have learned that deficits do indeed raise interest rates. Nonetheless, we must also remember that some of the earlier regressions, including the Evans' equation, did not show a statistically significant relationship between deficits and interest rates. Therefore, the conclusion of this paper must be that, similar to the finding of the 1984 Treasury Report, the empirical proof of the relationship between deficits and interest rates is very much a question of econonometric methodology, with different methods that can each prove either the Ricardian or the traditional view of deficits.

Acknowledgements

I would like to thank Professor Chris Bollinger, my able and knowledgeable econometrics professor, and Professor Jim Fackler, who was always willing to provide macroeconomic expertise and to discuss policy implications of macroeconomic policy. I would also like to thank Professor Dick Gift for stimulating my interest in economics.

Regression 15: Various Factors on the Interest Rate Using 2-Stage Least Squares

nominali	Coef.	Std. Err.	t	P > |t|
d	0.011	0.003	3.637	0.000

Regression 16: Various Factors on the Deficit Using Two-Stage Least Squares

deficit	Coef.	Std. Err.	t	P > |t|
n	31.774	6.195	5.129	0.000

Regression 17: Various Factors on Private Saving Using Two-Stage Least Squares

deficit	Coef.	Std. Err.	t	P > |t|
d	-0.190	0.105	-1.807	0.072

Works Cited

Barro, Robert. *Macroeconomics*. New York: John Wiley and Sons, 1990.

Evans, Paul. "Do Large Deficits Produce High Interest Rates?" *American Economic Review*. March, 1985.

Mankiw, N. Gregory. *Macroeconomics*. New York: Worth, 2003.

Nelson, Edward. "Budget Deficits and Interest Rates." *Monetary Trends*. March, 2004.

Office of the Assistant Secretary for Economic Policy. "The Effect of Deficits on Prices of Financial Assets: Theory and Evidence." Department of the Treasury Report. March 1984.