Government Inside Information and Debt Signaling:

Evidence from Consumer and Business Confidence

An Honors Thesis for the Department of Economics

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1. Introduction

A central feature of modern fiscal theory and policy analysis is recognition of the government's inter-temporal budget constraint. In words, this constraint simply implies that any debt financing of government expenditures must ultimately be covered by tax revenues. Thus, the present value of outstanding debt must be equal to the present value of future net tax receipts. Recognition of this constraint underlies key results such as Ricardian Equivalence emphasized by Barro (1974) and the fiscal theory of the price level [Leeper (1991), Cochrane (2000), and Woodford (2001),] among others.

One implication of the long-run budget balance implication of the government's inter-temporal budget constraint has gone largely unnoticed. This is the fact that the anticipation of long-run budget balance must reflect expectations of future tax receipts and expenditure flows. In turn, such expectations must partially reflect forecasts of the level and composition of economic activity. That is, debt issuance today can only be tolerated if the future economy is capable of generating the net tax revenue required to service that debt. Specifically, a government that runs a deficit in the current period must forecast gdp, spending and tax revenues sufficient to permit covering that debt if it is committed to avoiding default as the inter-temporal budget constraint requires. It therefore follows immediately that the government's current debt policy implicitly reveals something about the future economy that the government foresees.

If the government is perceived to have superior information regarding the economy's future state then, to the extent that its fiscal posture reveals that

information, that policy will have real effects on current economic outcomes. This is the question that I explore in this paper. To be specific, I examine the role of federal deficits and debt issuance in altering private expectations about the future economy. In the next section, I build a simple model that illustrates this point. The model is fully consistent with rational expectations and exhibits Ricardian Equivalence—an absence of any difference between tax-financing and debt-financing—in the absence of a governmental information advantage. Yet once such an advantage is allowed, government debt policy has real effects. In particular, since debt can only be issued by a government confident of sufficient future output capable of meeting the future demands for private and public consumption *plus* debt service, the level of debt issuance can be rationally interpreted as indicating the government's superior information about future gdp.

In section five, I then test this model with time series data from the US. For this purpose, I analyze a two-variable Vector Auto Regression (VAR) in which the two variables are the debt-to-gdp ratio and a measure of either consumer or business confidence. In both cases, I find evidence in support of the basic model. Specifically, there appears to be a causal link by which increases in the debt-to-gdp ratio lead to subsequent increases in both consumer and business confidence. This is consistent with the view that consumers understand that only a government confident of high economic activity in the future can issue debt today if it is committed to inter-temporal budget balance. An alternative measure of optimism in the form of the percentage of negative words in the New York Times financial column is explored in section seven. Having a much longer time frame, I am able to compare different time

periods with this data. I find that it is not affected by debt in the way that consumer and business confidence are, but that it has impact on debt in the more recent time periods. A summary and conclusion follow in section eight.

2. A Simple Model

The model is a simple, two-period representative agent model with storable output. The only productive input is labor. There is no capital and the interest rate is set to 0. Therefore, every unit of output not consumed in period 1 can and will be consumed in period 2. The representative agent supplies labor inelastically in each period. The output that results in period 1 is known and equal to Y_1. The output in period 2 is stochastic and distributed uniformly between Y_2^L and Y_2^H. Consistent with the zero interest rate and to rule out any desire to ship consumption from the future to the present, I constrain $Y_2^H \leq Y_1$, i.e., there is no growth. This is just a convenience that does not affect the main point of the analysis.

The representative agent's utility in any period depends on its consumption of a private good C_i and a public good G_i as follows:

$$U_i(C_i,G_i) = (1-\alpha)\ln C_i + \alpha \ln G_i \qquad (1)$$

Without loss of generality, I assume that the agent has no time preference so it follows that expected lifetime utility for the representative agent is:

$$= (1-\alpha)\ln C_1 + \alpha \ln G_1 + E[(1-\alpha)\ln C_2 + \alpha \ln G_2] \qquad (2)$$

This must be maximized subject to the constraint that $C_2 + G_2 = Y_1 - C_1 - G_1 + Y_2$. With E as the expectations operator, the standard first-order conditions include:

$$\frac{(1-\alpha)}{C_1} = \frac{\alpha}{G_1};$$

$$\frac{(1-\alpha)}{C_1} = E\left[\frac{(1-\alpha)}{C_2}\right] \tag{3}$$

$$\frac{\alpha}{G_1} = E\left[\frac{\alpha}{G_2}\right]$$

The optimal values C_1^* and G_1^* are solutions to the equations:

$$\frac{2}{C_1^*} = \left[\frac{1}{(1-\alpha)Y_1 - C_1^* + (1-\alpha)Y_L} + \frac{1}{(1-\alpha)Y_1 - C_1^* + (1-\alpha)Y_H}\right]$$

$$\frac{2}{G_1^*} = \left[\frac{1}{\alpha Y_1 - G_1^* + \alpha Y_L} + \frac{1}{\alpha Y_1 - G_1^* + \alpha Y_H}\right] \tag{4}$$

Within the above framework, it is clear that whether the government uses bond or tax financing of G_1 has no effect on the level of C_1. In particular, defining the first period defect (or debt at the start of period 2) as $D_1 = G_1 - T_1$ and first-period private savings as $S_1 = Y_1 - C_1 - T_1$, it is clear that, holding G_1 constant, any fall in T_1 (and therefore any rise in D_1) will simply lead to an exactly equal rise S_1. Thus, in this simple model Ricardian Equivalence fully holds.

I now introduce a self-interested government into the model. This government can be one of two types, D or R. The key difference between the two types is that type D governments favor public spending for G^D public sector goods while type R

governments favor G^R public spending. However, the public or representative private regards the two types of public goods as perfect substitutes and is therefore indifferent to this distinction. In particular, the public spending that enters that agent's utility function in any period *i* is the sum of the total spending $G_i = G_i^D + G_i^R$.

Expected utility for either type of government V^I, *i* = D,R is given by:

$$V^i = \ln G_1^i + \pi E[\ln G_2^i] + \pi F_2 \qquad (5)$$

Here $E[\ln G_2^i]$ is, as in equation (2), the expected value of $\ln G_2^i$ given what is known about the distribution of Y_2. In turn, π is the incumbent government's subject probability of being in office in period 2. Alternatively, π is the government's subjective discount factor. In either case, we have: $0 < \pi \leq 1$. Finally, F_2 is a second-period dummy variable = to zero if the budget is in balance but $-\infty$, if it is in deficit. It is this element that insures intertemporal budget balance. Without some such mechanism one cannot be sure that the government will pay off its debts. Yet it is the assumption of intertemporal budget balance that lies at the heart of Ricardian equivalence.

With the addition of a formal government sector I now include a budget process. This process is one in which the incumbent government in period 1 proposes a level of spending G_1 and a level of taxes T_1—and hence a budget deficit $D_1 = G_1 - T_1$. In so doing, I now assume that the incumbent government has inside information regarding distribution of Y_2. In particular, I assume that while the range of this distribution $Y_H - Y_L$ is unchanged, the government now has better (more up-to-date) information about the center or mean of that distribution $(Y_L + Y_H)/2$.

Thus, the government has two pieces of private information unavailable to the public. First, it knows its subject probability or discount factor π. Second, it has better information on the expected value of Y_2.

Note that apart from its lower discount factor π, the government's intertemporal preferences for public spending matches the preferences of the public. However, because $\pi \leq 1$, the current incumbent government will generally have a preference for more public spending G_1 now when it is in power than will the public for any given distribution of Y_2. This potentially creates a difficulty for the public in interpreting the government's proposed spending level G_1 by itself. If this is high, the public cannot easily know the extent to which it is because the government now has information that the expected value of Y_2 is high or the extent to which it reflects a low probability/discount factor π applied to next period's public spending G_2.

However, the budget process does allow some sorting out of these effects. Because the government must propose a tax and implicit deficit as well as a spending level, and because it will never propose a deficit that risks any default, the budget process can be manipulated to reveal the government's specific information regarding Y_2. The large negative payoff associated with a default means that the current government will always set first-period taxes T_1 high enough relative to first-period spending G_1 such that even in the worst case scenario with $Y_2 = Y_L$, no default will occur.

I assume that in any period, the maximum tax revenue T_i that can be collected is a positive fraction μ of the available output in the period, with $1 > \mu \geq \alpha$. Here, the second inequality is necessary if the government is to be able to run a surplus.

From the public's viewpoint, the optimal amount of first-period government spending G_1^* (independent of type D or R) depends only on first-period income Y_1 and the expected value of second-period income $E(Y_2)$. Given that the range of Y_2 outcomes or $Y_H - Y_L$ is known, $E(Y_2)$ maps one for one into Y_L, i.e., a one-unit increase in Y_L is also a one-unit increase in $E(Y_2)$. Hence, we may write $G_1^* = G_1^*(Y_L)$. Assume for the moment that both the public and the current government have the same estimate of Y_L. Then the minimum first-period tax revenue T_1^{Min} that the government must collect is:

$$T_1^{Min} = G_1^*(Y_L) + \alpha[Y_1 - C_1 - G_1^*(Y_L) + Y_L] - \mu[Y_1 - C_1 - G_1^*(Y_L) + Y_L] \quad (6)$$

Here, the second right-hand-side term is the level of period-two government spending in the worst-case scenario that $Y_2 = Y_L$ while the third right-hand-side term is (the negative of) the maximum tax collection possible in period 2 in that same worst-case scenario. Using the first-order conditions from equation (3), we may simplify equation (6) as follows:

$$T_1^{Min} = G_1^*(Y_L) - (\mu - \alpha[Y_1 - \frac{G_1^*(Y_L)}{\alpha} + Y_L] \quad (7)$$

Or, in deficit terms

$$G_1^*(Y_L) - T_1^{Min} = G_1^*(Y_L) = (\mu - \alpha[Y_1 - \frac{G_1^*(Y_L)}{\alpha} + Y_L] \quad (8)$$

Equation (8) gives the maximum deficit perceived to be possible in period 1, given the range (and mean) of values deemed possible in period 2. The key element in this paper is that this maximum expected deficit as Y_L, and therefore the mean expected value of Y_2, rises. To see why this is so, first differentiate equation (7) with respect to Y_L to obtain:

$$\frac{dT_1^{Min}}{dY_L} = \left[1 - \frac{(\mu - \alpha)}{\alpha}\right]\frac{dG_1^*}{dY_L} - (\mu - \alpha) < \frac{dG_1^*}{dY_L} \qquad (9)$$

Since $\mu > \alpha$, the term in brackets is less than one and the last term, $-(\mu - \alpha)$ is definitely negative. From this it is clear that as Y_L rises the increase in G_1^* that this induces must always exceed any induced increase in T_1^{Min}.

Define the maximum first-period deficit for any value of Y_L consistent with first-period government expenditures being as $D^*(Y_L) = G_1^*(Y_L) - T_1^{Min}(Y_L)$. The inequality in (9) implies that this maximum deficit is monotonically increasing in Y_L. This yields a simple policy result. We know that for any value of Y_L—for a given $E(Y_2)$—the government's preferred value of G_1 will exceed the public's because the government's re-election probability or discount factor $\pi < 1$. We also know that the true optimality of any spending proposal G_1^* the government makes depends monotonically on Y_L, i.e., $G_1^* = G_1^*(Y_L)$. Hence, we can write the inverse relation: $Y_L = G_1^{*-1}(Y_L)$. The public can insure that the government's spending proposal will accurately reflect its knowledge of Y_L by setting first-period taxes according to a tax policy rule $T_1 = T_1^{Min}\left[G_1^{*-1}(Y_L)\right]$. This tax rule results in a deficit that is only just

feasible if the value of Y_L implicit in the government's budget proposal is accurate. Since the government will never report a lower value of Y_L that would imply less period-one public spending, this tax rule implies that the government will always report a Y_L or equivalently, propose first-period public spending of $G_1^*(Y_L)$ consistent with the true value of Y_L that it knows.

In short, the tax policy rule suggested here will force the government to propose a first-period public spending level that fully reveals its inside information regarding the distribution of second-period income even though the public does not know the government's re-election probability or discount factor π. Note that a key feature of this tax policy is that it will imply a first-period deficit $D^*(Y_L)$ that is the maximum deficit consistent with intertemporal budget balance. Further, as shown above, $D^*(Y_L)$ is monotonically increasing in Y_L. Thus, the government's willingness to take on a deficit in period 1 is a direct measure of its estimate of the expected value of national income in period 2. In this sense, a larger public deficit in period 1 signals a more optimistic view of period 2 gdp and thereby induces more spending—both public (G_1) and private (C_1)—in the first period. Ricardian Equivalence does not hold. It fails because satisfying the key requirement that the government's budget be balanced over time that is critical for Ricardian Equivalence also permits deficit policy to be a credible way of transmitting the government's inside information. While I have illustrated this in a simple model it also holds in a more general case. Debt policy is not neutral when it serves as a credible information signal.

3. Literature Review

In 2012, Barsky and Sims looked at whether consumer confidence followed the two theories of animal spirits or information. In the animal spirits theory, autonomous changes in consumer confidence would have a causal effect on consumption and income. This goes along with the idea that a pessimistic outlook during a recession can actually prolong the recession and vice versa. In the information theory, instead of affecting the economy, changes in consumer confidence reflect news regarding changes in technology and productivity.

They begin with a bivariate VAR taken from Cochrane (1994), consisting of the log of real GDP and the log of real consumption. They find that the variables are cointegrated with a cointegrating vector of [1, -1]. The results of the model suggest that consumption innovations lead to permanent increases in GDP. He explains that having news regarding future income might affect current consumption. Barksy and Sims augment the VAR with a measure of consumer confidence called E5Y, which is a single question from the University of Michigan survey that asks about the economic condition of the country in the next five years. They find that E5Y innovations lead to small, but permanent increases in both income and consumption. Furthermore, E5Y is slightly affected by a consumption innovation, but it is only statistically significant for a few quarters. When including labor hours, interest rates, and inflation to the model, E5Y still affects consumption and income positively in the long-run with a positive innovation to E5Y also leading to a permanent increase in real rates and hours of work and decrease in inflation.

When looking at a bivariate VAR of E5Y and TFP, a measure of productivity, they find that an innovation in E5Y acts very similarly on TFP as TFP does on itself. Both result in a significant permanent increase of roughly .7 percent. These results along with the results of their structural estimation model suggest that consumer confidence is mostly explained by increases in productivity and don't have an effect on macroeconomic variables by itself.

In 2011, Bachmann and Sims researched the effect of confidence in transmitting government spending. They estimate a VAR with government spending, confidence, and output; all in levels with four lags. They find that a shock to government spending causes both consumer and CEO confidence to drop initially and then rise, but it is not statistically significant. However, when they looked at just recessions, a government spending shock has a much greater impact. Output has a much larger and longer response, and confidence also increases and stays positive instead of declining. It is noted that there are fewer observations for the recessions, so the confidence bands are much wider. Another important observation is that shutting down the response of confidence turns the output to essentially zero at all periods, suggesting that confidence, or confidence simply as a measure of future productivity, is necessary to the transmission of government spending shocks to output.

Diego Garcia (2012) used a different measure in looking at sentiment. Instead of using a survey, such as the University of Michigan, he looked at the number of positive and negative words in the financial news section of the New York Times. His research looked into the effect of this sentiment on predicting stock

returns, finding that it made a far stronger impact during recessions than expansions. At the end of my paper, I explore the relationships between Garcia's measure of sentiment and my measures of consumer and business confidence, as well as test it's relationship with debt in various time periods.

Ludvigson (2004) looks at the two popular measures of consumer confidence and their effectiveness in projecting consumer expenditure growth. The two measures are surveys from the University of Michigan and from the Conference Board, the same sources of my two measures. However, I am only looking at the CEO confidence survey from the Conference Board. She finds that consumer confidence has both a statistically and economically significant predictive power for consumption growth. Further, her results show that confidence explains about 15 percent of the variance of consumer expenditure growth one quarter in the future. She then estimates the effect of confidence on consumption by augmenting a baseline regression for consumer expenditure growth with the two measures of confidence, finding that they increase the adjusted R^2 by between 5 and 10 percent.

Souleles (2003) uses the household level data behind the University of Michigan Consumer Sentiment surveys, called the Michigan Survey of Consumer Attitudes and Behaviors (CAB). He matches this with the Consumer Expenditure Survey, a comprehensive household level dataset that contains many demographic factors. By imputing the sentiment data from the Michigan Survey of Consumer Attitudes and Behaviors onto demographically similar households from the Consumer Expenditure Survey, he finds that higher confidence in households is correlated with less saving.

In 2010, Kumar and Woo looked at the effects of initial debt on GDP growth. They consider a variety of estimation methods, including pooled OLS, robust regression, between estimator, fixed effects panel estimator, and system GMM dynamic panel regression. In order to combat endogeneity problems, they use suitable lagged levels and lagged differences of the regressors as their instruments. They find that on average, a ten percent increase in the initial debt-GDP ratio is associated with a slowdown of annual real GDP per capita growth of .2 percentage points per year. This slowdown is more pronounced in less developed countries with the impact being around .15 percentage points in advanced economies.

4. Data

For the primary portion of this research, I am looking at quarterly data from the first quarter of 1978 to the third quarter of 2011. The measure of debt that I choose to use is the ratio of U.S. national public debt to the national gross domestic product, in order to take into account inflation. Both the debt and GDP data is available from the Federal Reserve Bank of St. Louis.

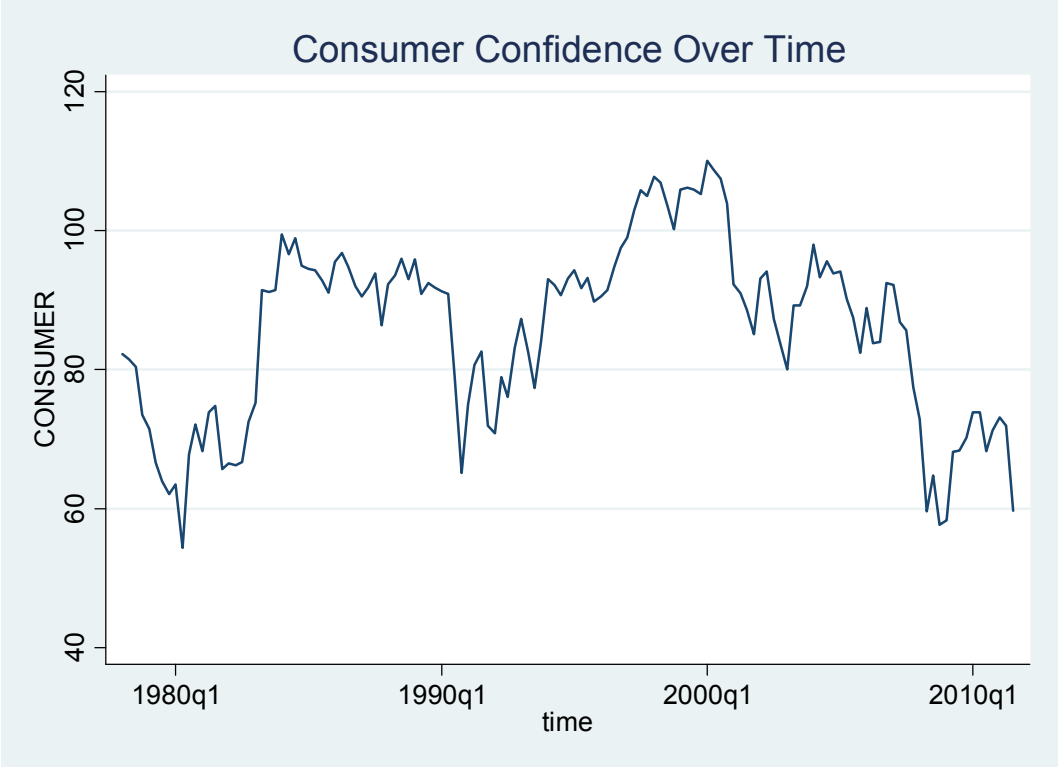
For my measures of sentiment, I use consumer confidence survey data from Thomson Reuters and the University of Michigan and CEO confidence survey data from The Conference Board, and both surveys are to people in the U.S. The questions involved in the consumer confidence surveys ask consumers about their views on three topics: their personal financial situation, the short-term general economy, and the long-term general economy, and convert their answers into a numerical score, with higher number corresponding to higher confidence. The mean

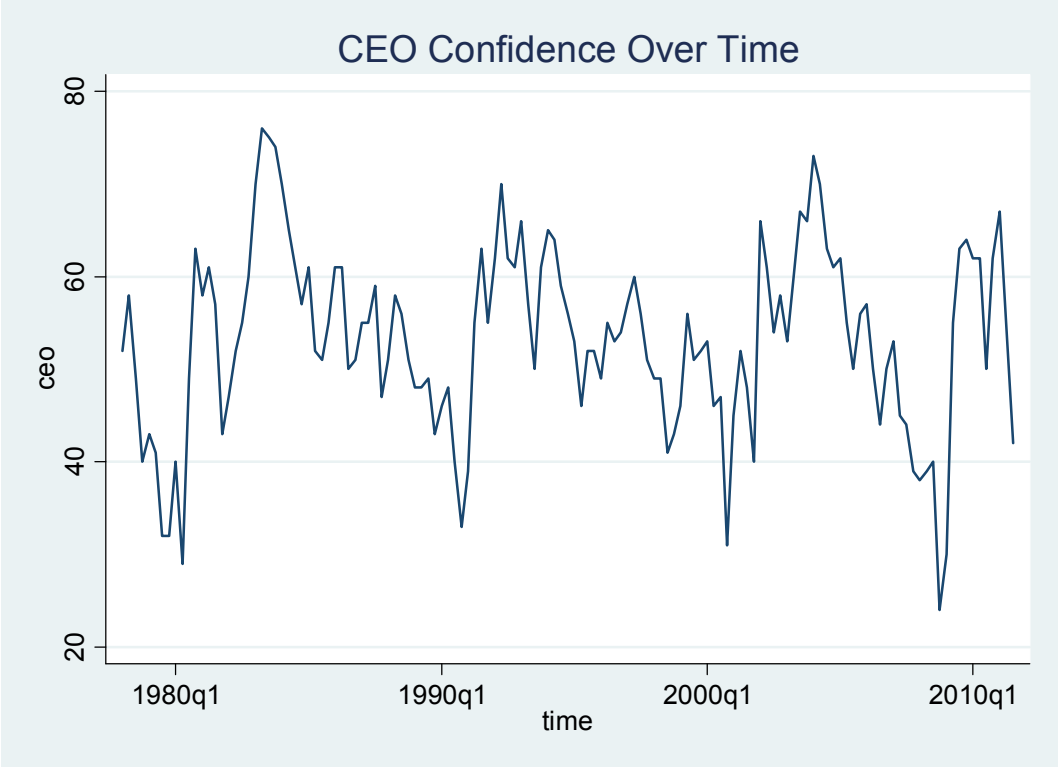
of this variable over my time period is 85.7, with a standard deviation of 13.0. The minimum is 54.4 in the second quarter of 1980 and the maximum is 110.1 in the first quarter of 2000.

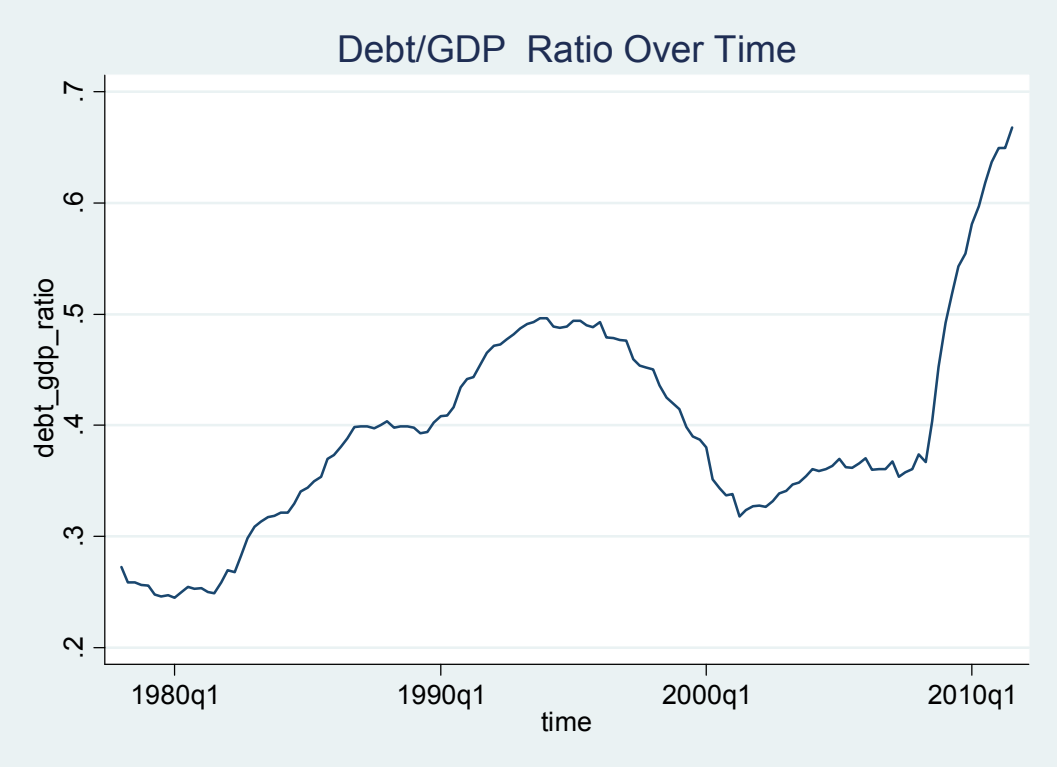
The CEO confidence survey is given to approximately 100 CEOs in a variety of industries and asks forward-looking questions regarding their particular industry, as well as the general economy, and similarly converts the answers to a numerical score. The mean of this score over the time period is 53.2, with a standard deviation of 10.0. The minimum is 24 in the fourth quarter of 2008 and the maximum is 76 in the second quarter of 1983. The CEO confidence is positively correlated to consumer confidence with a p-value of .0006.

Summary: Consumer and Ceo Confidence and Debt/GDP ratio; 1978-2011				
Variable	Mean	Std. Dev.	Min	Max
consumer	85.7237	13.00192	54.4	110.1
ceo	53.18519	10.01356	24	76
debt_gdp_ratio	0.393893	0.093381	0.244897	0.667631

Correlation: Consumer/CEO Confidence	
	ceo
consumer	0.2929
Significance	0.0006


Consumer Confidence Over Time
CONSUMER
120
100
80
60
40
1980q1
1990q1
2000q1
2010q1
time


CEO Confidence Over Time
ceo
80
60
40
20
1980q1
1990q1
2000q1
2010q1
time



5. Empirical Analysis

The key prediction of the simple model above is that an increase in public deficit will be taken by the public as a sign of better times ahead and thereby induce more current spending (less saving). The most straightforward way to test this would be to look at links between public deficits and private spending but this runs into familiar problems of measuring spending (e.g., consumer spending on durables or nondurables) and endogeneity. Therefore, I instead look for a connection between the government's deficit and the public's optimism about the future as indicated by measures of consumer and business confidence.

(i.) Consumer Confidence

By applying the Dickey-Fuller test for a unit root, it is clear that the debt to GDP ratio is non-stationary, so I proceed using it differenced once. However with logged consumer confidence, there is some doubt regarding its stationarity. The p-value for the Dickey-Fuller test is around .30, so we do not reject that there is no unit root, but regressing it on its first lag results in a coefficient of only .928. I decide to be cautious and use its first difference anyways. So both variables are differenced once, and four lags will be used due to the data being quarterly and being in line with the lag order selection criteria. Because both variables are differenced, I tested for cointegration using Johansen's test, but found that there was none at four lags. With this model, I am looking at the impulse response of consumer confidence on a shock to the debt level, but since both of the variables are differenced, only short-run effects will be seen.

$$Y_t = \beta_0 + \sum_{i=1}^{4} \beta_i Y_{t-i} + \sum_{i=1}^{4} \beta_{i+4} X_{t-i} + \varepsilon_t$$

In this model, Y, the dependent variable is the measure of confidence, X is the measure of debt, and ε is the error term, with t indicating the time period for these variables. The measure of confidence is the once-differenced log of consumer confidence and the measure of debt is the once-difference debt to gdp ratio.

Johansen tests for cointegration

Trend: constant — Number of obs = 131
Sample: 1979q1 - 2011q3 — Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	14	626.23692	.	8.8866*	15.41
1	17	630.62896	0.06486	0.1025	3.76
2	18	630.68024	0.00078		

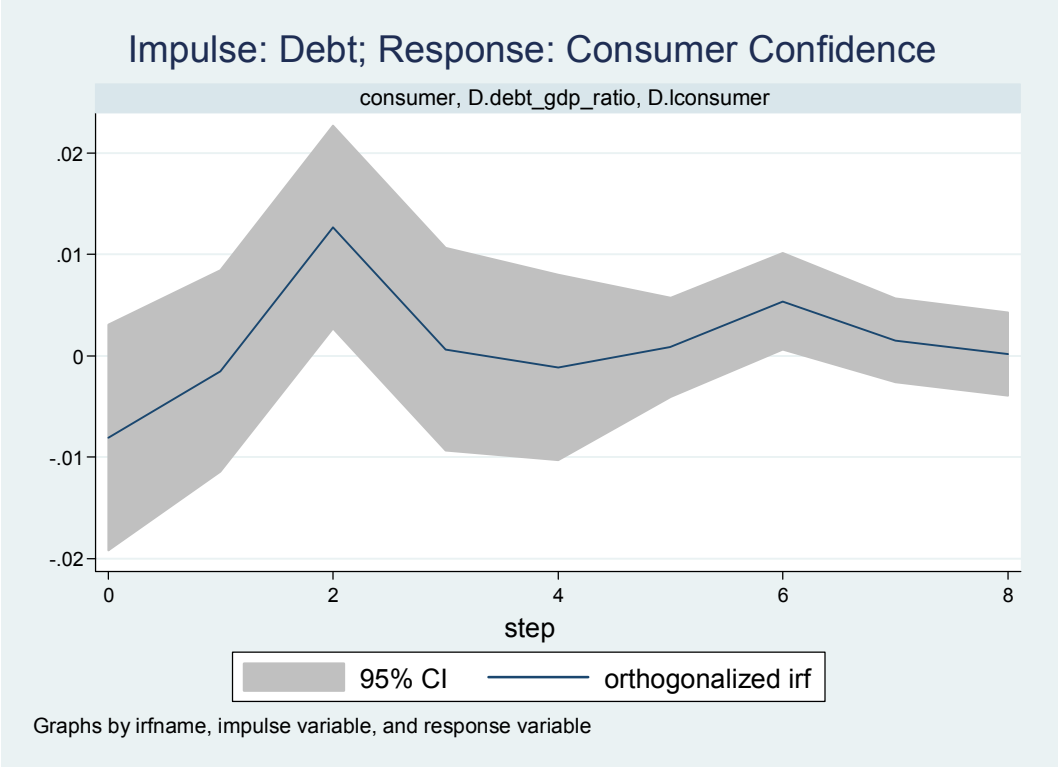
(ii.) Business Confidence

Along with testing consumer confidence, I also wanted to look at business confidence to see if there was any difference. However, unlike consumer confidence, business confidence is clearly stationary so I keep it in levels, still with four lags. The model is the same as before, except with the measure of confidence being the log of CEO confidence.

In an attempt to augment these VAR models, I decided to try adding other variables, including real income, real consumption, and total factor productivity. Real income and real consumption were chosen because of Barsky and Sims' use of them in their VAR model. Total factor productivity was selected because Barsky and Sim's finding that consumer confidence was a portrayal of news about changes in productivity. However, the inclusion of any of these variables did not result in any significant change in the relationship between the debt level and consumer or CEO confidence. Therefore, they were disregarded in my final models.

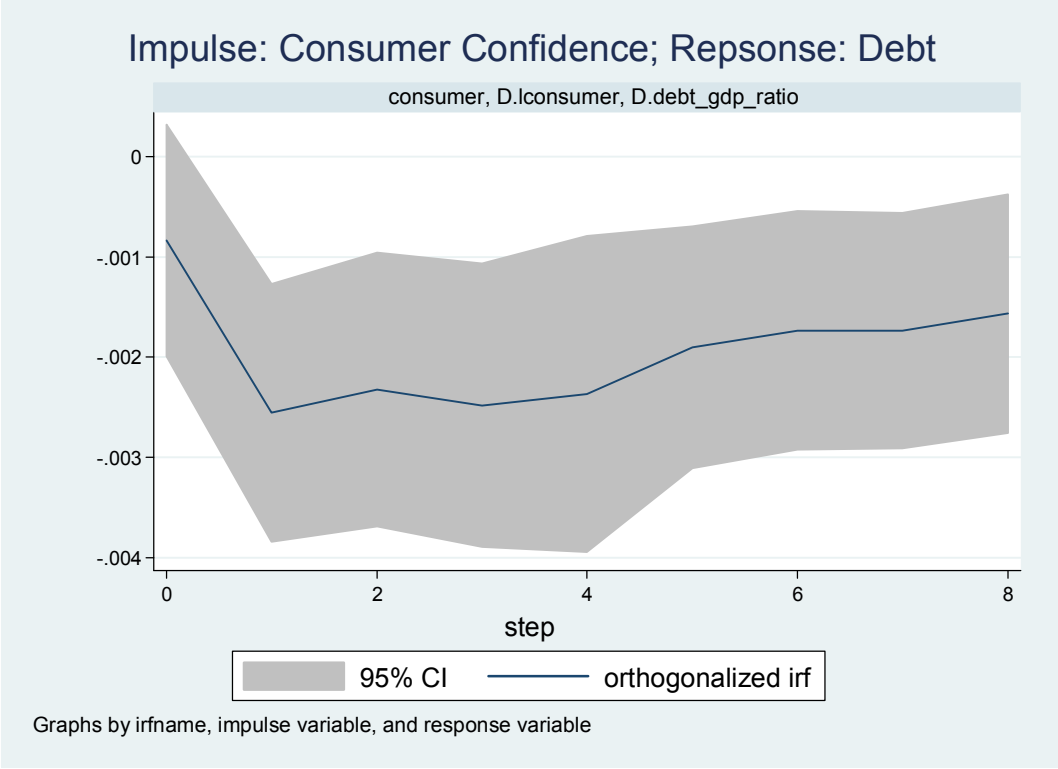
6. Results

The results of the VAR that I am most interested in is the impact of the debt/gdp ratio on the measure of confidence. In looking at the consumer confidence model, it can be seen from the orthogonalized impulse response function graph that the entirety of the confidence band is above zero at the second step and again at the sixth step. The coefficients of these two steps are .013 and .005. This result is in line with the theoretical model, which suggested that rational citizens would see an increase in national debt as an indicator of future economic growth. Another interesting result is that a shock to consumer confidence leads to a negative response in the change of the debt/gdp ratio. In all steps after step zero, the confidence band is negative with the largest coefficient being -.00255 at step one. There appears to be mutual Granger causality between consumer confidence and the debt/gdp ratio. Debt Granger-causes consumer confidence at two lags with a p-value of .03 and the reverse is true at four lags with a p-value of .0001. The result of this mutual causality is that there is dynamic feedback in the model, making the effect of debt on confidence somewhat unclear. A shock to debt would lead to an increase in confidence, which would lead to a decrease in debt, and so on.



Impulse: Debt; Response: Consumer Confidence

step	(1) oirf	(1) Lower	(1) Upper
0	-.008053	-.019177	.003072
1	-.001493	-.011454	.008467
2	.012688	.002679	.022697
3	.000649	-.009338	.010636
4	-.001143	-.0103	.008014
5	.000847	-.00406	.005754
6	.00536	.000598	.010123
7	.001531	-.002623	.005684
8	.000182	-.003926	.004289



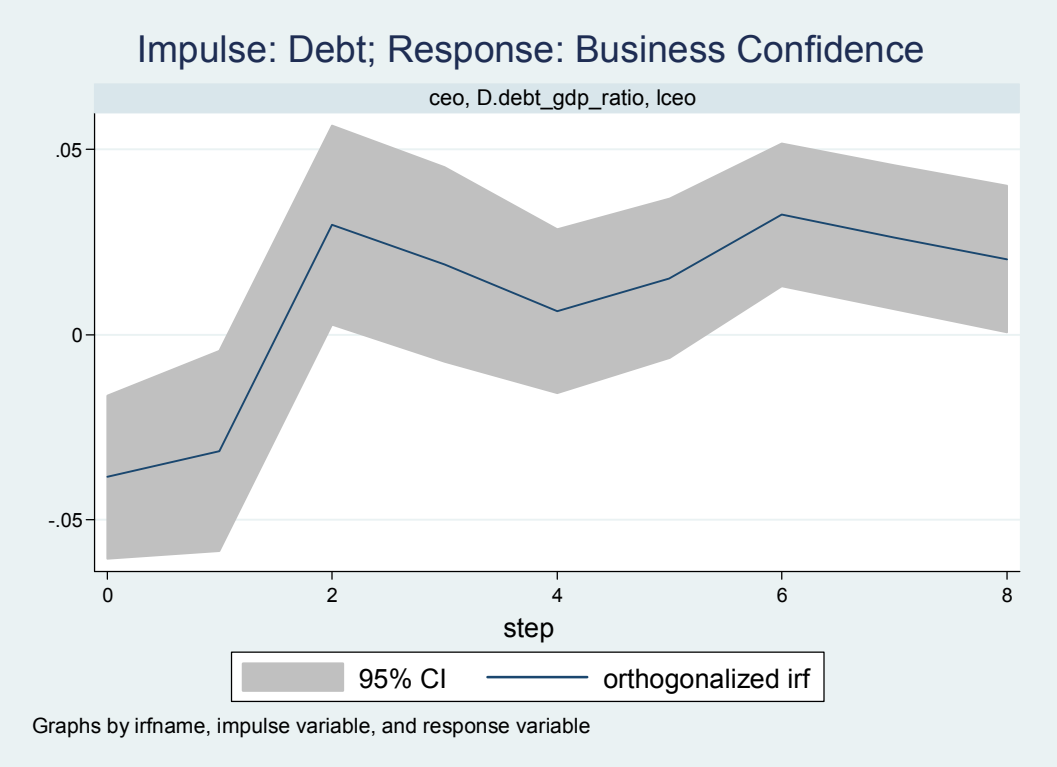
Impulse: Consumer Confidence; Response: Debt

step	(1) oirf	(1) Lower	(1) Upper
0	-.000836	-.001991	.000319
1	-.002555	-.003838	-.001272
2	-.002323	-.003687	-.00096
3	-.002479	-.00389	-.001068
4	-.00237	-.003945	-.000794
5	-.001899	-.003104	-.000693
6	-.001733	-.002923	-.000544
7	-.001735	-.002909	-.000561
8	-.001565	-.002755	-.000376

The results of the business confidence model are quite similar to the consumer confidence model. The orthogonalized impulse response function graph shows that business confidence actually has an initial significant negative response to an increase in the debt level, but then similarly to consumer confidence, has a positive response at steps two and again from steps six to eight. Consumer confidence has the same initial negative response, but not quite pronounced enough to push the confidence band below zero. The important coefficients are -.038 at step zero, .030 at step two, and .032 at step six. The response seems to trail off after step six, but the confidence band remains just above zero through step eight.

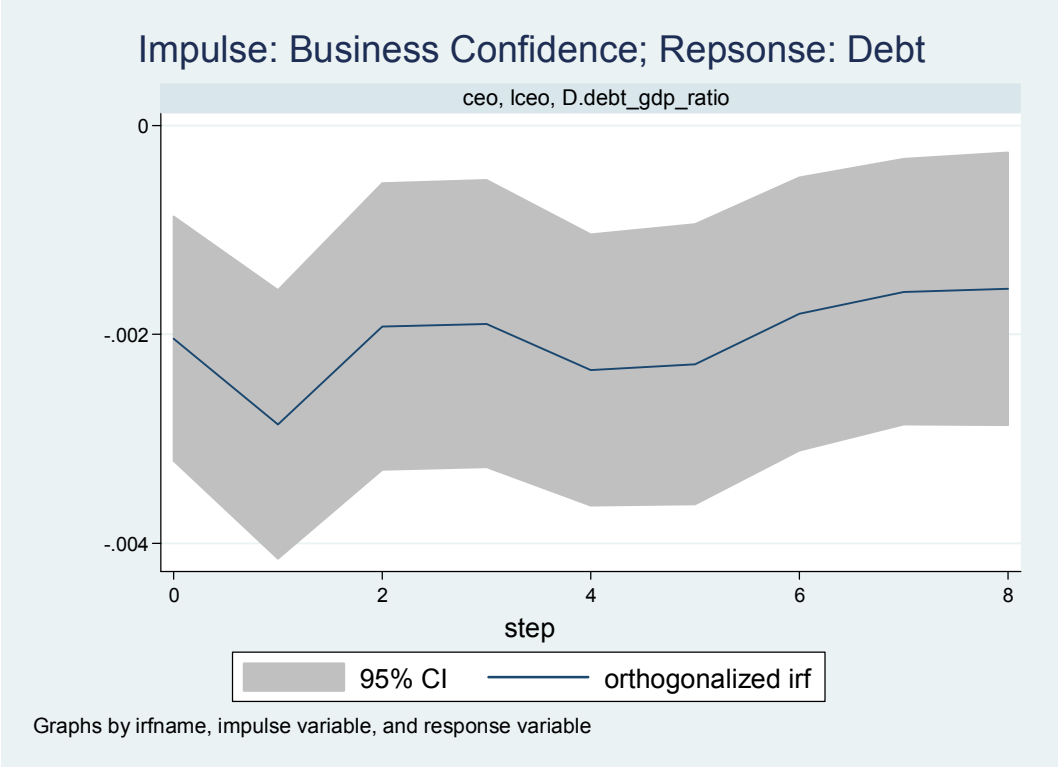
Again, the debt level has a negative response to a shock to business confidence, with almost the exact same magnitude and shape as from the shock to consumer confidence. The largest coefficient is -.00286 at step one. Granger causality is also mutual between debt and business confidence. Business confidence Granger-causes debt at two lags with a p-value of .0091 and debt granger-causes business confidence at four lags with a p-value of .0001.

It seems as if an increase in either measure of confidence causes the government to lower the debt level. This is consistent with the theory of having a surplus during good times and incurring a debt during worse times, with the good times corresponding to times of high confidence. The mutual causality again causes the same dynamic feedback problem as mentioned in the consumer confidence section.



Impulse: Debt; Response: Business Confidence

step	(1) oirf	(1) Lower	(1) Upper
0	-.038459	-.060519	-.016398
1	-.031485	-.058503	-.004466
2	.029594	.002764	.056424
3	.018934	-.007294	.045162
4	.006366	-.015701	.028433
5	.015214	-.00629	.036719
6	.032365	.013128	.051602
7	.026218	.006801	.045635
8	.020377	.000582	.040172

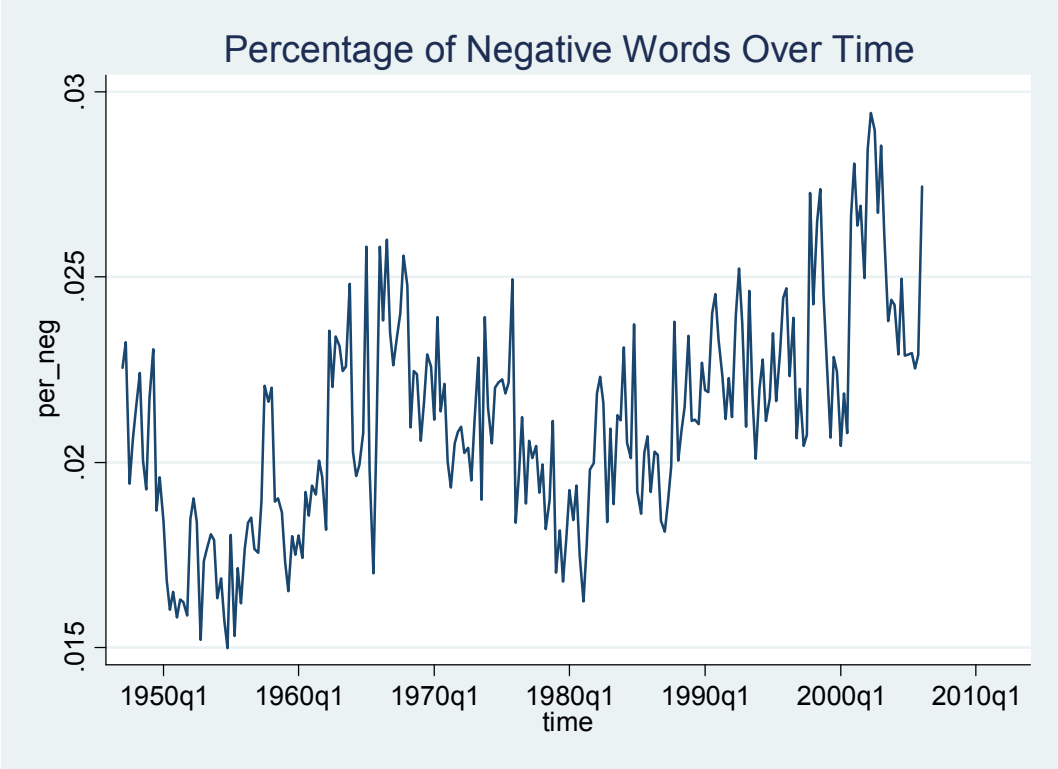


Impulse: Business Confidence; Response: Debt

step	(1) oirf	(1) Lower	(1) Upper
0	-.002042	-.003213	-.000871
1	-.002861	-.004148	-.001575
2	-.001925	-.003297	-.000554
3	-.001897	-.003272	-.000521
4	-.002341	-.003639	-.001043
5	-.002285	-.003627	-.000942
6	-.001804	-.003113	-.000494
7	-.001591	-.002864	-.000319
8	-.001563	-.00287	-.000256

7. Alternative Measure of Optimism

Having been allowed access to the New York Times data used by Diego Garcia, I wanted to compare his measure of sentiment to my two measures of sentiment. I began by converting his daily data into quarterly data and looking at the average percent of the total words that were categorized as negative. I then looked at the correlation between this variable and my two measures of sentiment. I predicted that there would be negative correlations because this variable assessed the number of negative words, but its correlation with both consumer confidence and CEO confidence were both positive. However, while the correlation with the CEO confidence was insignificant, there was statistical significance between the New York Times data and my consumer confidence data, albeit in the opposite direction than my prediction. Further, I find that consumer confidence Granger-causes the percentage of negative words in the New York Times data at one lag with a p-value of 0.03.



Summary: Percentage of Negative Words and Debt/GDP ratio; 1947-2006				
Variable	Mean	Std. Dev.	Min	Max
per_neg	0.0211	0.002892	0.01498	0.029432
debt_gdp	0.569105	0.18995	0.314087	1.093196

Correlation: Differenced Percentage of Negative Words	
	D.per_neg
D.lconsumer	-0.1154
Significance	0.2257
lceo	-0.0814
Significance	0.3938

Correlation: Percentage of Negative Words/Measures of Confidence	
	per_neg
consumer	0.3106
Significance	0.0008
ceo	0.0161
Significance	0.8655

This seems to be an odd result at first glance, but there are possible explanations. One is that periods of high consumer confidence exhibit overconfidence, which then leads to an economic downturn and more negative words in the next quarter. I decided to run the same correlation and Granger tests using the percentage of negative words and consumer confidence in differences, as they are both slightly non-stationary. I found that differenced percentage of negative words is negatively correlated with both measures of confidence, but not significantly so. Further, there is no Granger causality between differenced consumer confidence and differenced percentage of negative words.

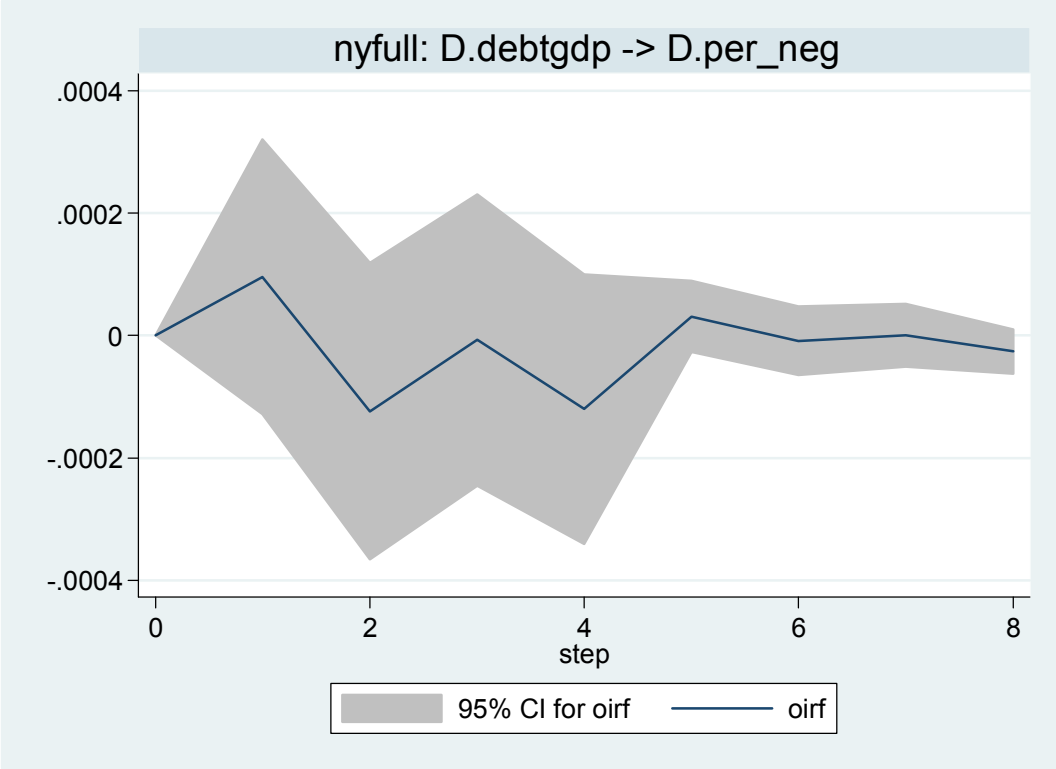
Since this data went back much further than my measures of consumer and business confidence, I decided to check for patterns in different time windows. Starting in 1947, the first year with recorded quarterly gdp, I tested four 30-year windows, each overlapping by ten years. That is: 1947-1978, 1957-1988, 1967-1998, and 1977-2006. In each period, I tested for a unit root, lag selection, granger causality, and the orthogonalized impulse response functions between the percentage of negative words and the debt/gdp ratio.

There appeared to be a unit root in each window when using the Schwartz criteria for lag-selection, though the most recent window was the closest to being stationary. I proceeded to use the percentage of negative words in differenced form. The first, third, and fourth windows had five lags chosen as the most appropriate, while the second window had four chosen.

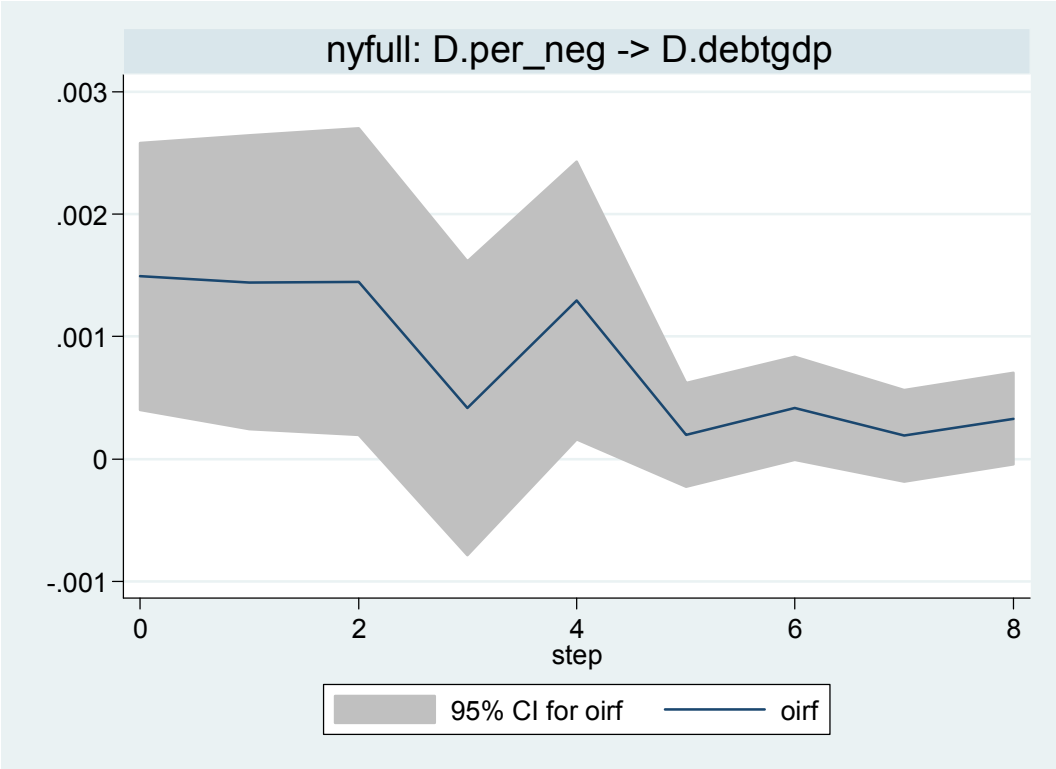
In none of the time windows did a shock to the debt level have a significant effect on the percentage of negative words as can be seen in the orthogonalized impulse response function graphs. However, a shock to the percentage of negative did result in a positive effect in debt in the three most recent periods. In the time period from 1957 to 1988, there were significant coefficients of .0015 and .0012 at steps zero and two. In the periods 1967 to 1998 and 1977 to 2006, there were very significant coefficients of .0021 and .0019 and step four. Further, in these last two periods, debt Granger-causes the percentage of negative words at five lags with p-values of .02 in 1967-1998 and .03 in 1977-2006.

When looking at entire time period from 1947-2006, I find similar a response from debt from a shock to the percentage of negative words, but no granger causality. Is seems that the government may have begun to respond to this measure of confidence more in more recent time periods. It is still hard to categorize this measure of confidence however, due to it not being correlated with consumer or business confidence and not responding to a shock in debt as consumer and business confidence did. Coming from a newspaper column, it would make sense for it to be more current and less forward-looking than the other measures, which both ask some forward-looking questions.

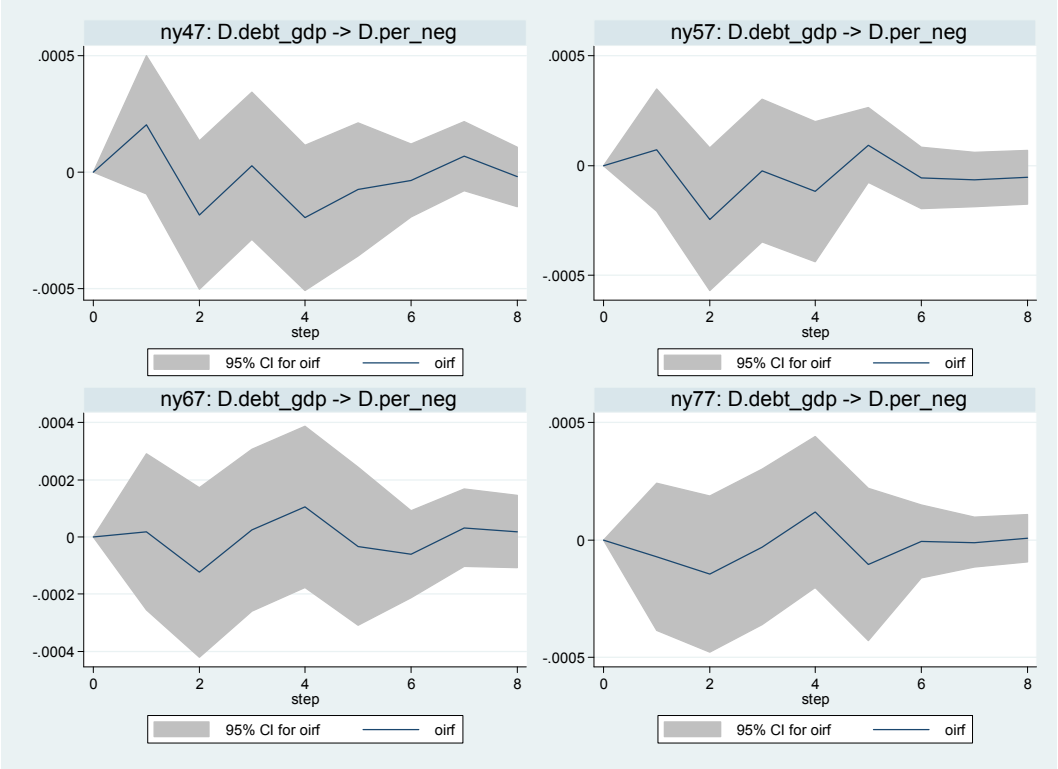
Impulse: Debt; Response: Percentage of Negative Words; 1947-2006



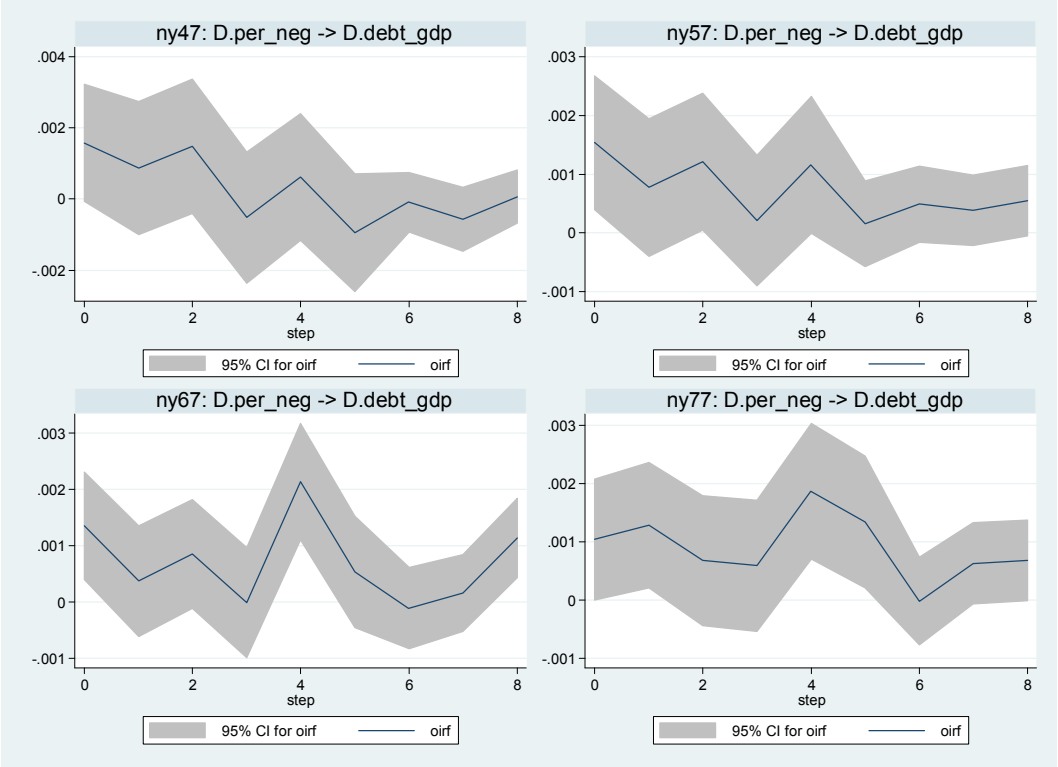
Impulse: Percentage of Negative Words; Response: Debt; 1947-2006



Impulse: Debt; Response: Percentage of Negative Words; All Time Periods
(Number corresponds to starting year)



Impulse: Debt; Response: Percentage of Negative Words; All Time Periods
(Number corresponds to starting year)



8. Conclusion

While a high level of national debt is often regarded with a negative connotation, my results show that an increase in the debt level may lead to an increase in both consumer and business confidence two quarters in the future. These results are somewhat consistent with the expectations of the simple model discussed earlier, though it is hard to tell with the mutual causality. One of the interesting results is that business confidence and consumer confidence to a lesser degree actually drop initially upon an increase in the debt level. It may be that the case that people have conflicting responses to the notion of debt, which may change over time. On one hand is the positive notion that debt is a signal for future growth, but it could also be interpreted as a looming indicator that higher taxes will be necessary in the future to pay off the higher level of debt.

The other interesting result is that not only does an increased change in debt lead to higher confidence, but a shock to confidence also has a significant effect on the change in debt, as evidenced by the mutual Granger causality. The impact of an increase in confidence on debt is negative, which as mentioned before, follows the Keynesian view of deficit spending. This view believes that the government should increase deficit spending, incurring a higher level of debt, when the economy is in a recession and confidence would be low, in order to bring the economy out of its downturn. A shock that increases confidence would therefore cause the government to feel comfortable reducing spending or increasing taxes, resulting in lower levels of debt. Due to this mutual causality, there is dynamic feedback in my model, which makes it unclear how much true effect debt has on confidence.

However, the impact of debt appears to have a lasting effect on confidence in my impulse response functions, particularly on business confidence, suggesting that the effect of debt on confidence may outweigh the effect of confidence on debt.

One important link unanswered is the relationship between confidence and consumer spending. Looking at the correlation between consumer confidence and real consumption in my dataset results in a slightly positive but statistically insignificant correlation. It is even more insignificant when replacing consumer confidence with business confidence. However, when looking at granger causality, it becomes clear that confidence has a definite impact on consumption. At one lag, consumer confidence Granger-causes real consumption with a p-value less than .0001. The results show that confidence is not a perfect substitute for consumer spending, but that it is a strong forecaster of it. In the literature I've discussed, there are mixed results of whether or not higher confidence is correlated with increased spending in the same period. Ludvigson (2004) found similar results to mine, with confidence being a strong predictor of consumption growth one lag in the future. However, Souleles (2004) found slightly different results at the household level with higher confidence correlated with higher household spending and lower saving. In either case, it appears that a higher level of confidence is associated with higher consumption at some time point.

As the theoretical model is quite simple, as the name suggests, I do not claim to attribute the empirical results to the reasoning stated in the model. There are many ways in which a consumer may view the debt level and in which that may affect consumer spending. Kumar and Woo (2010) found that higher debt may lead

to a slowdown of GDP growth and there is likely a negative connotation associated to high levels of national debt without necessarily having a rational basis. I believe that this makes it even more interesting that both consumers and CEOs were found to have higher confidence following increases to the debt level. I would think that most people would a high level of national debt as a problem, but the opposite opinion occurs in my results. The key result of my research is the existence of a significant relationship between confidence and debt, though it is still a bit unclear what the impact of this relationship is.

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