

MEASURING THE OPTIMAL FEDERAL TAX BURDEN

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George W. Bush, in his final *Economic Report of the President* (January 2009), estimates a federal tax burden of 17.9 percent of GDP for both fiscal year 2008 and 2009. Based on the econometric models used in this paper, a 17.9% tax burden (federal tax receipts as a percent of GDP) translates into a trend growth rate in real GDP of 2.8% annually. Thus, the current 2009 economic downturn is being caused by a financial shock to the American economy, not by any increase in tax burden. In fact, George Bush leaves office with a lower tax burden than in the fiscal year 2000, when the federal tax burden was 20.9% of GDP. But what if President Obama decides to raise taxes during his term in office? What do the models in this paper have to say about such a plan?

Using this updated information, if President Obama raises tax burdens, trend growth in real GDP will fall further in the U.S. economy – to no more than 2.5% annually. This is less than the 3.2% trend rate in GDP growth over the second half of the 21st century. To return to such a growth rate, President Obama would have to actually LOWER current Bush tax burdens to 17.4% of GDP. This is unlikely to happen given Obama's 2010-2014 spending plans of 22-27% of GDP and the ensuing federal deficits.

The entire working paper (33 pages) is available in PDF format.

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TOPIC AREA: TAXATION AND PUBLIC FINANCE

PAPER TITLE:

MEASURING THE OPTIMAL FEDERAL TAX BURDEN 1960 TO 2005 and Beyond

Economic Report of the President, January 2009

Published January 2009

"The Economic Report of the President is an annual report written by the Chairman of the Council of Economic Advisors. It overviews the nation's economic progress using text and extensive data appendices."

The January 2009 report states,

"The U.S. economy has proven itself remarkably resilient over the past 8 years, having withstood a number of major shocks throughout the period. During the last few months of 2008, however, the economy encountered major shocks in the financial sector that it could not shake off. Those financial shocks combined with other factors—record high commodity prices earlier in the year, natural disasters, and continued weakness in the housing market—to cause the economy to contract modestly in the third quarter and what appears to be a sharp decline in the fourth quarter (see Chapters 1 and 2). The contraction will likely last into early- or mid-2009. Despite rapid fiscal and monetary policy action in response to weakening economic conditions, the economy entered into recession at the end of 2007, ending 6 years of expansion and a record 52 months of uninterrupted job growth. Several factors contributed over many years to create the credit difficulties that reached crisis proportions late in the year. The magnitude of the crisis required unprecedented policy responses to reduce the extent of the damage to the economy. These policy actions have laid a foundation for a strong economic recovery early in the term of the next Administration. Most market forecasts suggest the weakness will continue in the first half of 2009, followed by a recovery beginning in the second half of 2009 that will gain momentum in 2010 and beyond."

George W Bush, January 2009

Lessons for the Obama Era, 2010-2014
Updated Summary -- March 10, 2009

George W. Bush, in his final *Economic Report of the President* (January 2009), estimates a federal tax burden of 17.9 percent of GDP for both fiscal year 2008 and 2009. Based on the econometric models used in this paper, a 17.9% tax burden (federal tax receipts as a percent of GDP) translates into a trend growth rate in real GDP of 2.8% annually. Thus, the current 2009 economic downturn is being caused by a financial shock to the American economy, not by any increase in tax burden. In fact, George Bush leaves office with a lower tax burden than in the fiscal year 2000, when the federal tax burden was 20.9% of GDP. But what if President Obama decides to raise taxes during his term in office? What do the models in this paper have to say about such a plan?

Given the techniques used, the ‘optimal tax burden’ in the United States appears to be close to 18% of GDP today. At that level, real GDP is estimated to increase 2.8% (trend) for the year. Lower burdens will lead to higher economic growth. The non-linear econometric model (in the paper) places a kink at 17.9%, so higher levels of tax burdens will not decrease economic growth further than 2.5%. This fact has specific policy implications in that recessions are “shock oriented” and would not be directly induced by a higher tax burden. But, lower tax burdens could lead to higher growth.

Using this updated information, if President Obama raises tax burdens, trend growth in real GDP will fall further in the U.S. economy – to no more than 2.5% annually. This is less than the 3.2% trend rate in GDP growth over the second half of the 21st century. To return to such a growth rate, President Obama would have to actually LOWER current Bush tax burdens to 17.4% of GDP. This is unlikely to happen given Obama’s 2010-2014 spending plans of 22-27% of GDP and the ensuing federal deficits.

Measuring the Optimal Federal Tax Burden: 1960 to 2005 and Beyond

By John W. Skorburg

With Obama Era Update 2009

Introduction: What Tax Burden is Best?

Professor George Karras notes in *Macroeconomic Theory* (2001) that a Laffer curve relationship exists between tax rates and tax revenue. This relationship is interesting from the point of view of fiscal policy because “it helps evaluate the trade off between the distortions caused by taxation and the revenue that can be raised by it.” This paper will build on such theory to help measure the relationship between tax burdens and economic growth -- based on time series analysis and techniques. Specifically this paper will build upon past research on the negative relationship between the federal tax burden in the United States and the change in real GDP -- to see if an optimal federal tax burden for the United States can be accurately measured and forecast with data from 1960 to 2010 (45-50 years including projections). This paper looks at OLS, ARIMA, VAR and MARS models to discover an optimal tax burden. The summary results follow.

Table 1: Summary of Optimal Tax Burden using Various Time Series Techniques*

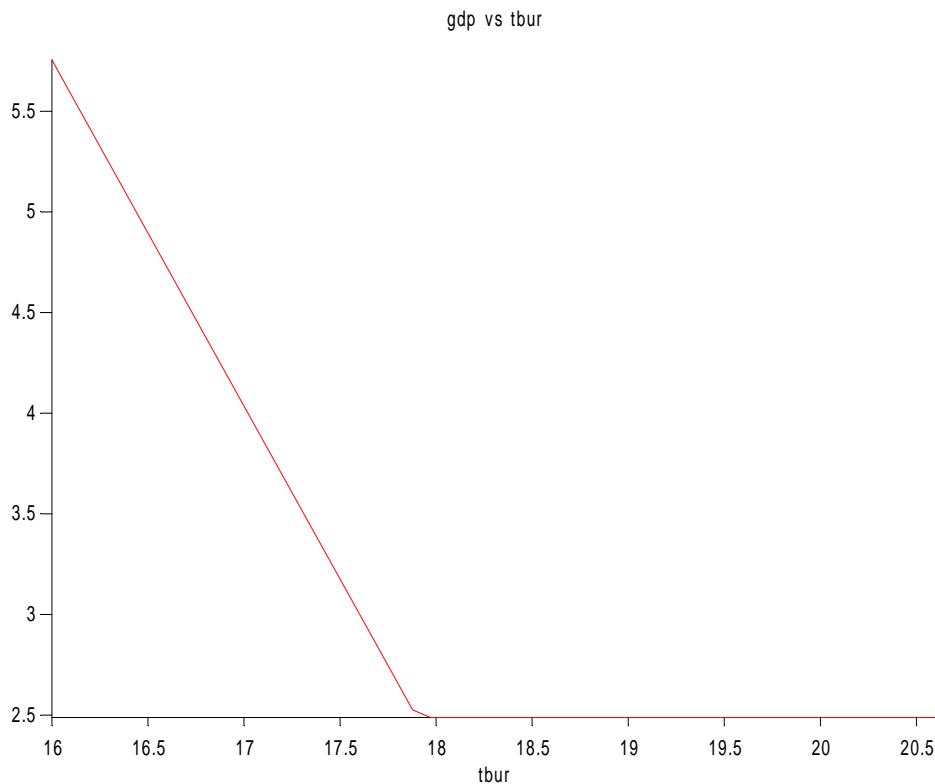
Technique	Tax Burden	Economic Growth
OLS	19.0%	2.8%
ARIMA	17.9%	2.8%
VAR	17.7%	3.0%
MARS	17.9%	2.5%
Average	18.1%	2.8%

*Data 1960 to 2004 (45 data points)

Based on the techniques used, the optimal tax burden in the United States appears to be close to 18% of GDP today. At that level, real GDP is estimated to increase 2.8% (trend) for the year. Lower burdens will lead to higher economic growth in all techniques. The MARS model adds the most to our analysis based on the lowest SSR

and gives a kink at 17.9%, so higher levels of tax burdens will not decrease economic growth further than 2.5% as shown in the figure below. This would have specific policy implications, in that recessions are “shock oriented” and would not be directly induced by a higher tax burden. But, lower tax burdens could lead to higher economic growth.

Figure 1: Taxes vs. Economic Growth (MARS result)



Bush, Obama and Deficits:

George W. Bush, in his final *Economic Report of the President* (January 2009), estimates a federal tax burden of 17.9 percent of GDP for both fiscal year 2008 and 2009. Based on the econometric models used in this paper, a 17.9% tax burden (federal tax receipts as a percent of GDP) translates into a tend growth rate in real GDP of 2.8% annually. Thus, the current 2009 economic downturn is being caused by a financial shock to the American economy, not by any increase in tax burden. In fact, George Bush

leaves office with a lower tax burden than in the fiscal year 2000, when the federal tax burden was a revised 20.9% of GDP. But what if President Obama decides to raise tax burdens during his term in office? What do the models in this paper have to say about such a plan?

Using Figure #1, if President Obama raises tax burdens, trend growth in real GDP will fall further in the U.S. economy – to no more than 2.5% annually. This is less than the 3.2% trend rate in GDP growth over the second half of the 21st century. To return to such a growth rate, President Obama would have to actually LOWER current Bush tax burdens to 17.4% of GDP. This is unlikely to happen given Obama's 2010-2014 spending plans of 22-27% of GDP and the ensuing federal deficits.

Obama's recently released document, entitled *A New Era of Responsibility: Renewing America's Promise*, is a "summary version of the more detailed proposal that Obama will put out in April." In the 134-page summary, the president forecasts a budget deficit of \$1.75 trillion in fiscal year 2009. That represents 12.3 percent of gross domestic product (GDP), making it the "highest deficit as a share of the economy since World War II," according to economist Veronique de Rugy of George Mason University.

Obama's budget proposes boosting tax collections to 19 percent of GDP by 2013. At the same time, federal spending would decline from 27.7 percent of GDP in 2009-2010; to 22-24% by 2013. This would still leave a federal budget deficit of 3-5 percent of GDP by the end of Obama's (first) term as President. De Rugy states "it's the era of even bigger government."

A look at the econometric models in this paper will help to support such statements.

Discussion of Taxes and Economic Growth:

As increasing amounts of taxes are collected, they will almost assuredly be used by government to finance projects that offer declining social returns. The MARS model appears to verify this result. Another study (Scully 2000) has found that taxes deter economic growth if they are above a certain minimum threshold of about 12 percent of GDP. Scully also discovered that most nations--including the United States--impose taxes that are well above the rate at which economic growth is maximized.

The World Bank helped fund a ground-breaking international study (Marsden 1983). The Marsden study compared 20 high tax countries around the world to 20 low tax countries and found consistently that, those countries with a “low tax environment” grew much faster than those with high taxes during the 1970’s. The converse was also true; the high tax nations grew much slower than those with lower taxes. This research implies that there is a threshold tax burden for each country, that when exceeded causes economic growth to decline.

Skorburg and Dunkelberg (<http://www.heartland.org/Article.cfm?artId=15874>) originally ran an OLS model for the Heartland Institute (Chicago) in November 1988. That OLS econometric model looked at the change in real GDP from 1960-1987 relative to the federal tax burden with a lag. The 1988 study was replicated and then updated through 2004 (Skorburg 2005), using various econometric packages and techniques.

In (Skorburg 2005) the use of a recursive residual (RR) technique was used to reveal that coefficient stability of the tax burden variable has shifted over time. The results are shown below and will be analyzed further later in the paper.

Table 2: Recursive Residual Results (2005)

Variable		Coefficient	Std. Error	t
Tax Burden	X- 1	-0.50150391	0.20443980	-2.4530640
Oil Dummy	X- 3	-2.3508867	0.69710009	-3.3723805
T-BILL	X- 4	0.66196661	0.13945749	4.7467269
TBILL LAG1	X- 5	-0.69358915	0.14862597	-4.6666754
CONSTANT	X- 6	12.506206	3.6415939	3.4342670

Based on the recursive residual (RR) results, the tax burden coefficient has shifted over time from -1.7 (1960's) to -0.5 today (2000's). This helps to econometrically verify that the initial Kennedy tax cut (1960's) had a much different impact on the macro economy than the current Bush (2000's) cut. In short, according to the RR analysis, the Kennedy tax cut had more impact on the economy than the Bush cut, by over a full percentage point. It also appears from the RR analysis that the Reagan tax cut was much closer to the Kennedy tax cut in sensitivity to the macro economy than the current Bush cuts. The logic behind this fact might be that the Kennedy budget began from a lower level, making fiscal policy more sensitive in the 1960's.

With an enhanced Bush tax cut dummy for 2002 and 2003 and using GLS(1), the actual tax variable remains significant with a t-stat of 2.7 and a coefficient of -0.67. This tells us that a 1% increase in the tax burden will decrease growth by 0.67% and a tax cut of 1% will enhance growth by 0.67% -- with a 3 month lag. See the results below:

Table 3: Enhanced GLS(1) Results (2005)

Variable		Coefficient	Std. Error	T Val.
TBUR	X- 1	-0.6694422	0.2445727	-2.737
ODUM	X- 3	-2.332514	0.7003751	-3.330
TBILL	X- 4	0.6677325	0.1251763	5.334
TBILL1	X- 5	-0.5913060	0.1416816	-4.173
CONSTANT	X- 6	15.46499	4.353483	3.552
Adjusted R Square		0.6739450338023569		
Von Neumann Ratio 1 ...		2.01134		
Durbin-Watson TEST.....		1.96563		
Von Neumann Ratio 2 ...		2.01134		

Also if we assume stable interest rates, a federal tax burden of 20% should lead to an economic growth rate of 2.1% -- a full percentage point under the long-term growth rate of 3.1%. A federal tax burden of 19% would lead to economic growth of 2.8%. This appears to be close to the optimum federal tax burden over time (19% of GDP). A federal tax burden of 18% would lead to higher than trend economic growth of 3.4%.

However, the use of other time series techniques, especially ARIMA, VAR and MARS will be used to indicate comparative results to the OLS findings in this paper shown below:

Table 4: Ordinary Least Squares Estimation

Variable	Coefficient	T-Stat
TBUR	-0.5015	2.45
TBILL	0.6620	4.74
TBILL1	-0.6936	4.66
Constant	12.5	3.43

Note: $R^2 = .64$ and $SSR = 65.37$

This OLS model assumes a (negative and significant) linear relationship between the federal tax burden (TBUR) and economic growth (GDP). A concurrent treasury bill (TBILL) and the same variable lagged one period (TBILL1) have also been added to pick up the effect of monetary policy on economic growth. Finally and oil price dummy (ODUM) has been added to adjust for the oil crisis of the mid-1970's. Each coefficient is significant at the 95% level. This paper will compare the residual sum of squares of this model (65.37) with the result of other time series approaches including non-linear modeling -- to help measure the optimal tax burden.

The MARS model appears to be the best with a SSR of 39 or only 60% of the OLS result. This reveals that the model is non-linear as well. See table below:

Table 5: MARS Results

<u>MARS Model</u>	<u>Coefficients</u>	<u>SE</u>	<u>t-stat</u>
GDP =	2.6539534	0.57522171	4.614
-5.7067468 * max(TBILL1{ 0} - 0.50000000E-01, 0.0)		1.2226676	-4.667
+ 0.74235319 * max(0.50000000E-01 - TBILL1{ 0} , 0.0)		0.32037906	2.317
-0.85165767 * max(0.40500000 - TBILL{ 0} , 0.0)		0.16809807	-5.066
+ 3.8954222 * max(TBILL1{ 0} - -0.61000000 , 0.0)		1.0698379	3.641
+ 1.0878802 * max(17.900000 - TBUR{ 0} , 0.0)		0.30930613	3.517
-0.84897205 * max(0.27600000 - TBILL{ 0} , 0.0)		0.32642634	-2.601
* max(TBILL1{ 0} - -0.61000000 , 0.0)			
* max(ODUM{ 0} - 0.00000000 , 0.0)			

Note the MARS model hits a key threshold when the tax burden (TBUR) is 17.9 percent and interest rates (TBILL) need to rise by 27-61 basis points to enter the model.

A Brief Survey of the Literature:

Growth can occur with a primary dependence on man-made capital and human resources – with a dash of technology, as the Japanese so effectively revealed and passed on to the rest of Asia in the last century. But, the mere presence of these resources does not ensure growth. These resources must also be managed and well utilized. This fact is the central issue in the historical debate over taxes, growth, and the size of government in the United States economy. Government uses resources to produce certain goods and services and to attain certain social objectives (namely the redistribution of income). Once taken by government, these resources are not available to the private sector. If the resources are not used efficiently (producing services or goods not desired or in a wasteful way), then overall economic growth is diminished.

In 1991, William Dunkelberg and John Skorburg extended the Heartland study for the Cato Institute (Washington DC) to help answer the question: Do rising tax burdens produce recession? At that time, Dunkelberg and Skorburg updated the econometric

model (OLS) that revealed that the federal tax burden is a statistically significant indicator in explaining economic growth in the United States measured from 1960-1987.

Specifically the Dunkelberg-Skorburg model noted:

“The study presented solid statistical evidence demonstrating that taxes do harm the economy in a significant and consistent way. Since 1960 tax increases (measured by total tax receipts as a percentage of gross national product) have led to slowdowns in economic growth, and often to recessions. Likewise, when Washington has reduced federal tax burdens over the past 28 years, there has been a statistically significant positive economic and employment stimulus in the following year.”

Most static economic models ignore completely the negative economic effects of taxation. In fact, it was not until the 1980s, when the election of President Ronald Reagan brought supply-side economists into ascendance, that the importance of marginal tax rates gained the attention of federal policymakers and some feedback models were put into use.

Most economists now acknowledge that punitive marginal income tax rates of 90 or 70 or (even) 50 percent can stifle economic activity and growth. Indeed, a wealth of economic literature on the subject of taxes and economic growth now verifies that contention.

The emphasis that supply-side economics places on the incentive effects of marginal tax rates has led some economists to conclude that only marginal income tax rates have negative economic effects. Hence policymakers have attempted to raise revenues by increasing consumption and sin taxes, as was done in the early 1990's budget packages. Because those taxes do not directly influence people's work effort or investment behavior, many analysts argue that their economic effect is fundamentally benign. Some even argue that taxing consumption has a positive effect; it may encourage people to consume less and save more.

Examples of government projects with low social returns abound in the federal budget. One need only look at the “24-volume” 1982 Grace Commission report and periodic updates from Citizens Against Government Waste (CAGW), which still identify tens of billions of dollars of potential savings that could be realized by eliminating unnecessary government programs. In such cases greater economic efficiency would be achieved by keeping in the hands of the private sector the tax dollars that are used to finance those activities. Of course, some functions that are carried out by government may add to our future growth potential--such as law enforcement and national defense. Modest taxes to pay for those essential government services may promote economic growth.

As stated in the introduction, as increasing amounts of taxes are collected, they will almost assuredly be used by government to finance projects that offer declining social returns. The study by economist Gerald Scully of the University of Texas in Dallas found that taxes deter economic growth if they are above a certain minimum threshold of about 12 percent of GNP. Scully also discovered that most nations--including the United States--impose taxes that are well above the rate at which economic growth is maximized.

The following table indicates that this threshold has been surpassed in the United States over our entire model horizon (low burden = 1965 and 2003, high burden = 2000). From 1960-2005, the federal tax burden has averaged close to 18 percent of GDP, with a high of 20.6 percent and a low of 16.2 percent. They are all higher than the “Scully threshold”.

Year	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005
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Burden	17.6	16.2	18.6	17.0	18.5	17.4	17.8	18.3	20.6	17.5
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Table 6 – Federal Tax Burden in the United States (As a Percent of GDP) -- Selected Years. Source: Economic Report of the President, 2006.

The World Bank (Marsden 1983) study found consistently that, those countries with a “low tax environment” grew much faster than those with high taxes during the 1970’s. The converse was also true; the high tax nations grew much slower than those with lower taxes. Once again, it has been shown clearly that taxes do matter.

Refinements to studies show certain taxes and business burdens can have a negative impact on economic growth and population, jobs and migration.

Academic L. Jay Helms (1985) showed in the Review of Economics and Statistics that the “impact of taxes depends on how they are used.” In particular, some expenditure on welfare payments can have a negative impact on overall growth. Similar conclusions were found in a study by Mofidi and Stone (1990) in the same publication. Paul Cashin (1995 IMF working paper) found that each one percent increase in taxes as a percent of total output lowers per worker output by about two percent. Genetski and Skorburg (1990) found that a one-percent change in state taxes (relative to other states) will lead to a 0.6 percent change in state personal income. Specifically, a lowering in taxes, relative to other states, will lead to a gain in state personal income growth.

Other studies have been done that demonstrate that “high taxes reduce in-migration and spawn out-migration.” Including the National Tax Journal (2001) where Conway, Smith and Houtenville suggest that the elderly are influenced by low personal income and death taxes and prefer states that exempt food from sales taxes. Afsanch Assadian (1995) found that the elderly in Florida were less likely to migrate into counties

with high taxes. The National Bureau of Economic Research (NBER) found that “the burden caused by incremental taxation may exceed one dollar per dollar of revenue raised” when taxes are too high. And NBER found that “raising income tax rates (can) discourage the growth of small businesses.” The first finding was from Martin Feldstein (1997) and the second from a study by Carrol (2000) et al.

International Tax and Growth studies became even more refined and extended in the 1990’s reaching similar conclusions on the damaging power of high taxation. Such studies were led by Engen and Skinner (1999), and Newell & Symons (1993).

A review of the literature on the negative effects of taxation was prepared by the Buckeye Institute for Public Policy Solutions (2002), and first appeared in “Grinding to a Halt.” This survey of the literature was able to reference over 40 studies in the report. The first review of the literature on taxes and economic was done for the Heartland Institute (1990) and the Illinois Retail Merchants Association (1992). The initial review was published by Dr. John Beck (Gonzaga University) in “Coming Out of the Ice” (1990) and included over 25 studies.

Now that numerous studies have been shown that document that state and federal tax policy does matter, *how do these tax policies relate to a statistical analysis?* This paper will help to answer that question.

George Karras has also been able to show that the Laffer curve does exist and that raising the tax rate beyond a tax rate maximum reduces revenue. “The intuition behind the result is that, beyond tax rate maximum, the tax base declines faster than the tax rate increases. Equivalently, if the tax rate exceeds the tax rate maximum, reducing the tax

rate will actually raise revenue.” This is a similar conclusion to those found in this paper concerning the relationship between taxes and economic growth.

The Impact of Taxes

Taxes have at least two major impacts on economic growth. First, taxes simply transfer resources from the private sector to the public sector. Second, and perhaps more important, the way taxes are utilized affects economic activity in the private sector. A tax transfer of resources from the private to the public sector can actually reduce overall growth – if the resources transferred are used in activities that will add less to productive capacity. If resources, in the future, would have been more productive in the private sector (than in the public sector) – the entire economy has lost out. For example, if tax dollars are used for a project that makes no contribution to productive capacity and the tax dollars raised prevented the construction of a new plant that would have provided products and jobs for many future years – growth has been diminished.

However, the issue is not quite that simple. Not every tax dollar would be more productive in the private sector. We also know that many government expenditures do add to our future growth potential (good roads, ample sewers, quality education). Defense expenditures are very productive if they insure the future of our system. Parks are valued projects that produce improvements in the quality of life in future periods.

The critical question becomes, would the taxes/resources have been more productively used by the private sector (created more jobs and products) than by the public sector (based on the value of the improved quality of life). This question becomes even more difficult to deal with when the people who enjoy the tax benefits are different than the people who would have benefited from the additional private sector jobs.

Forgetting about this “redistribution” question for the moment, we do know this – if you evaluate all the public sector activities and the private sector activities and rank them from high to low – at some point public projects produce less value than projects in the private sector that would use the same resources. Since resources are fixed at any point in time, we must choose which sector will have them.

Many informed observers have their own feelings as to how large government should be. These views can be popularly expressed as a percentage of GDP. But, as noted above, the issues can be complex and hard to evaluate. Perhaps a more direct way to get an insight into the location of a point A (optimum tax burden) is to directly examine the relationship between growth and the share of resources taken by the public sector and try to find the optimal tax burden using various time series techniques.

What does the OLS/RR Model tell us today?

The Federal Tax Burden (unrevised) peaked in 2000 at 20.6 percent of GDP – perhaps leading to the 2001 slowdown of real GDP to a growth rate of 0.3 percent. The OLS Model (Skorburg 2005) actually projected that real GDP would decline in 2001 – perhaps increased government spending due to 9/11 concerns kept this from happening.

Since 2000, the Tax Burden has declined to 16.2 percent of GDP in 2003 and has been rising since then. Thus the RR Model predicted that 2004 would be a relatively good year for the economy – and it was (up 4.9% actual)! The Model is (of course) not 100% accurate, but can be a good indicator of “turning points” when large changes in either tax burdens or interest rates.

Recursive Residual Findings in 2005:

The tax burden coefficient has shifted over time from -1.7 (1960's) to -0.5 today (2000's). This helps to econometrically verify that the initial Kennedy tax cut (1960's) had a much different impact on the macro economy than the current Bush (2000's) cut. In short, according to the RR analysis, the Kennedy tax cut had more impact on the economy than the Bush cut, by over a full percentage point.

The RR technique should be used to test for coefficient stability. In this case the RR technique verifies that the tax burden coefficient has indeed changed over time. And it verifies exactly where this change has taken place. The results are shown below:

Table 7: Recursive Residual Results -- Shifting of Tax Burden Variable over Time

OBS	TBUR	ODUM	TBILL	TBILL1	CONSTANT
1975	-1.674	-3.626	0.6574	-0.2031	32.93
76	-1.675	-3.650	0.6619	-0.1809	32.94
77	-1.606	-3.572	0.6726	-0.2391	31.78
78	-1.597	-3.562	0.7057	-0.2445	31.65
79	-1.611	-3.470	0.6454	-0.2974	31.86
80	-1.636	-3.004	0.6568	-0.4947	32.21
81	-1.520	-2.920	0.6866	-0.5366	30.22
82	-1.501	-2.997	0.6538	-0.5165	29.92
83	-1.529	-3.037	0.6590	-0.4864	30.39
84	-1.489	-2.939	0.6833	-0.5495	29.74
85	-1.581	-3.281	0.5897	-0.4611	31.44
86	-1.626	-3.324	0.6028	-0.4184	32.18
87	-1.630	-3.329	0.6026	-0.4157	32.26
88	-1.621	-3.325	0.6060	-0.4206	32.10
89	-1.614	-3.327	0.6098	-0.4210	31.98
90	-1.608	-3.286	0.6166	-0.4326	31.87
91	-1.674	-3.209	0.6952	-0.4038	32.93
92	-1.683	-3.217	0.7007	-0.3936	33.08
93	-1.743	-3.308	0.6956	-0.3290	34.07
94	-1.746	-3.311	0.6943	-0.3274	34.12
95	-1.749	-3.308	0.6933	-0.3278	34.17
96	-1.609	-3.385	0.6611	-0.3193	31.80
97	-1.290	-3.116	0.6728	-0.4428	26.27
98	-0.9189	-2.848	0.6678	-0.5564	19.81
99	-0.6792	-2.647	0.6711	-0.6406	15.64
2000	-0.5766	-2.537	0.6875	-0.6789	13.84
01	-0.5457	-2.569	0.6635	-0.6713	13.31
02	-0.5333	-2.416	0.6637	-0.6878	13.09
03	-0.5344	-2.390	0.6645	-0.6896	13.11
04	-0.5015	-2.351	0.6620	-0.6936	12.51

Use of the RR technique confirms that the tax burden coefficient has indeed changed over time. Specifically, the tax burden coefficient is relatively stable from the 16th observation (1975) at -1.6 through the 37th observation (1996). At the 38th observation, the coefficient begins to change and by the 41st observation (2000) the coefficient has again stabilized around -.55 (plus or minus 0.05).

It also appears from the RR analysis that the Reagan tax cut was much closer to the Kennedy tax cut in sensitivity to the macro economy than the current Bush cuts. This paper will explain what non-linearity might exist.

Based on this initial modeling, if we assume stable interest rates, a federal tax burden of 20% should lead to an economic growth rate of 2.1% -- a full percentage point under the long-term growth rate of 3.1%. A federal tax burden of 19% would lead to economic growth of 2.8%. This appears to be close to the optimum federal tax burden over time (19% of GDP) based on linear modeling techniques. A federal tax burden of 18% would lead to higher than trend economic growth of 3.4%.

This paper will use non-linear techniques to measure this same concept. Based on the non-linear results, a tax burden of 17.9% appears to be the optimal figure -- a bit lower than the optimal linear results. Any tax burden rate higher than 17.9%, according to the MARS analysis, will lead to only 2.5% real economic growth. Thus recessions are not caused by higher taxes in this non-linear model, higher taxes just lead to slower economic growth. Thus, recessions in the non-linear model would rely on additional demand or supply shocks to send the economy into recession.

Time Series Analysis:

This paper will use B34S to model various forecasts of the federal tax burden. Initially an OLS model will be structured and compared to an ARIMA model as well as a VAR model of the federal tax burden. The final stage will look at non-linear analysis (MARS, ACE, and GAM) relative to OLS techniques to see if this will help our analysis in finding the optimal tax burden rate.

Table 8 -- Data for Analysis from the Economic Report of the President (2005)

Variable	#	Cases	Mean	Std Deviation	Variance	Maximum	Minimum
TBUR	1	45	17.72000000	1.057999828	1.119363636	20.60000000	16.00000000
GDP	2	45	3.393333333	2.045216148	4.182909091	7.200000000	-1.900000000
ODUM	3	45	0.888888E-01	0.2877990320	0.8282828283E-01	1.000000000	0.000000000
TBILL	4	45	-0.450666E-01	1.457772607	2.125100973	2.970000000	-3.340000000
TBILL1	5	45	-0.181333E-01	1.476332289	2.179557027	2.970000000	-3.340000000
CONSTANT	6	45	1.000000000	0.000000000	0.000000000	1.000000000	1.000000000

TBUR measures the federal tax burden as a percent of GDP. GDP measures the percent change in real GDP. ODUM is an oil dummy variable for the 1970's. TBILL is the 3-month treasury bill and TBILL1 is the same variable lagged one period. These are the same variables that were used in the original and updated Skorburg-Dunkelberg analysis.

Economic theory would dictate that the TBUR variable should enter our model with a negative sign. Hence, higher tax burdens lead to lower economic growth. The TBILL and TBILL1 variables then enter our model with different effects. TBILL should enter our model with a positive sign. Thus, rising interest rates initially correlate with stronger economic growth (TBILL), but at some future moment, rising interest rates will shift to a negative sign (TBILL1). In this case, higher interest rates (just as the FED would predict) will tend to slow economic growth. Finally, the ODUM variable is a dummy variable that picks up the effect of the price surge in oil prices caused by OPEC in the mid-1970's.

ARIMA Modeling:

This initial analysis will look at ARIMA time series techniques to see how they compare to the original OLS analysis of the federal tax burden. It will also see if ARIMA can project an optimal tax burden similar to either the OLS or MARS models.

To assist in the proper model identification and appropriate model selection, Box and Jenkins (1976) recommend that the calculation of the autocorrelation (ACF) and partial autocorrelation (PACF) functions be used. Thus, the ACF and PACF are used in a four step procedure to help identify an appropriate ARIMA model that can then be used in short-term forecasting.

Initially this paper looks at the estimation of the federal tax burden using such an ARIMA model. If ARIMA techniques can be used to forecast the tax burden, we will have a better idea of where taxes are heading. For example, if tax burdens are heading up, this would indicate from the OLS and RR analysis that real economic growth rates are heading down.

Table 9 -- ARIMA Model

Summary of model 1 Data - Z = VAR=TBUR Observations 45 Differencing on Z - None

Univariate Model Parameters.

Parameter			Estimated		95 Per Cent	
# Type	Order	Value	Lower Limit	t	Upper Limit	Std. Error
1 Mean		17.72	17.31	85.65	18.14	0.2069
2 Autoregressive 1	1	0.8119	0.5450	6.084	1.079	0.1335
3 Autoregressive 1	4	-0.2718	-0.5122	-2.261	-0.3141E-01	0.1202
4 Moving average 1	2	0.2480	-0.1519	1.240	0.6479	0.1999

Residual Sum of Squares 23.339247 37 D.F.

Residual Mean Square 0.6307904461040980

Number of residuals 41

Residual Standard error 0.7942231714726649

Given that this model is based on annual data, the data is relatively clean using the ACF and PACF for the first 6 lags. This makes economic sense since the U.S. House of

Representatives is elected every 2 years, the U.S. President is elected each 4 years and the U.S. Senate has each Senator up for re-election every 6 years.

The mean of 17.72 would appear to indicate that a federal tax burden of 17.7 percent might be ideal this is lower than the OLS projection of 19%.

The MA(2) and AR(4) appear to equate to our USA election cycle. Does the President try to hold down tax burdens to be elected (negative sign) and do U.S. Representatives make promises in spending that might increase the tax burden to be elected (positive sign)? This hypothesis appears to make economic sense too, even though the AR(4) is not significant at the 90% confidence level.

The forecast is also very interesting. Based on this ARIMA model, government has a proclivity to continue to tax and spend. Beginning with a 2005 tax burden (Period 46) around 16% of GDP, our ARIMA model suggests that this burden will rise to over 18% in the next 5 years. Given our current spending desires this forecast could turn out to be very accurate. (See Table below.)

Table 10 ARIMA Forecasts

REGULAR Forecast results in terms of THE ORIGINAL DATA

Model 1 Forecasts at base period 45 with 95 per cent confidence limits						
Period	L. Conf.	Forecast	U. Conf.	Actual	% Error	
05	14.460287	16.016875	17.573464			
06	14.305677	16.310723	18.315770			
07	14.885554	16.990284	19.095014			
08	15.428459	17.596397	19.764334			
09	15.915985	18.083923	20.251860			
10	16.204737	18.399877	20.595018			

According to the 2008 (February) Economic Report of the President, the 2007 federal tax burden is 18.8 percent of GDP as follows:

“The ratio of federal taxation in the United States to gross domestic product (GDP) has fluctuated around an average value of 18.3 percent over the past 40 years;

despite the President's 2001 and 2003 tax relief, this ratio was 18.8 percent in 2007, above the 40-year average. Under current law revenues are predicted to grow faster than the economy in coming years, raising the level of taxation well above its historical average.” In the Obama era, to 19 percent and perhaps beyond.

In summary, this ARIMA analysis has concluded that we are “in the game” when trying to find an optimal tax burden in the United States. Thus the optimal tax burden appears to be between OLS (19%) and ARIMA (17.7%) with MARS, as we will see in the final section, at a critical point of 17.9%.

VAR Modeling:

Vector autoregression (VAR) will now be used as another time series technique to shed light on the relationship between taxes and economic growth. We will use the same variables as the other models, TBUR and GDP to test for common results.

VAR models can be used to test Granger Causality – whether the lags of one variable enter into the equation for another variable. In a two-equation model with p lags based on (7), $\{y_t\}$ does not *Granger Cause* $\{z_t\}$ if and only if all of the coefficients of $A_{21}(L)$ are equal to zero.

VAR modeling is used to test for Granger causality of the tax burden on economic growth. As expected, the tax burden negatively impacts the economic growth rate with a one period lag and is significant at the 90%+ level.

The VAR model of series1 (TBUR) and series 2 (GDP) was estimated by starting with 2 lags. The results are shown below for lag one. We can see that at lag one, TBUR positively causes TBUR, GDP positively causes TBUR, TBUR negatively causes GDP and GDP is neutral on GDP. The key finding here is that the tax burden is negatively

related to GDP. (Series 2, Series 1) is negative, just as our theory and previous models would suggest with significance at the 90% level. This indicates that higher numbers of TBUR last year lead to lower numbers of GDP this year. This makes economic sense, since we have suggested that TBUR is a predator of GDP. One would expect that a higher tax burden would lead to lower GDP growth.

Table 11 -- VAR Modeling

```

-----
Series 1:      VAR=      tbur
Series 2:      VAR=      gdp

Series 1 has sample mean = 17.720000      and sample Std. Dev. = 1.0461782
Series 2 has sample mean = 3.3933333      and sample Std. Dev. = 2.0223639

***** PHI( 1) *****      ***** Std. Errors *****      ** Significance **
0.924E+00 0.281E+00      0.143E+00 0.511E-01      + +
-0.148E+01 0.184E+00      0.419E+00 0.150E+00      - .
-----

```

The causality test by Granger and the nonlinearity test by Hinich were also performed in this model. Granger causality tests were used to test whether TBUR causes GDP or there is feedback from GDP to TBUR.

Table 12 -- Granger Cause

```

-----
Granger Test for Causality. F(i,j) tests whether jth series Granger causes ith series.

Granger Causality F(i,j)
      1      2
1      12.2924      4.79192
2      2.14766      0.972533
Significance of F(i,j)
      1      2
1      0.999998      0.997944
2      0.918330      0.536820
-----

```

According to Granger causality test, there is a bivariate relationship between TBUR and GDP because GDP is causing TBUR at 99.79% while TBUR is causing GDP at 91.83%. Higher lags (2 and 3) are not as significant. GDP causing TBUR can be explained since TBUR is a function of GDP (federal tax receipts/GDP).

We can relax the assumption and test for nonlinearity with the Hinich test. If the test indicates nonlinearity, we are led to question the validity of the linear assumption

inherent in the estimated VARMA model. Then MARS, ACE and GAM are appropriate models to try.

From the previous assignment we selected the appropriate VAR model with 2 lags for TBUR and GDP series. The result of this model is shown below and has been estimated automatically in B34S. Note the key negative estimate on AR(1,2,1).

Table 13 -- VAR Model

Final model summary with conditional likelihood parameter estimates				
Parameter Number	Parameter Description	Final Estimate	Estimated Std. Error	t Stat
1	Constant(1)	1.47213	1.94817	0.7556
2	Constant(2)	16.9431	4.97362	3.407
3	Reg Autoregressive (1, 1, 1)	0.870001	0.105657	8.23416
4	Reg Autoregressive (1, 1, 2)	0.237577	0.512019E-01	4.64001
5	Reg Autoregressive (1, 2, 1)	-.760167	0.279527	-2.71948

We will use this model to forecast using the B34S FORECAST command. We forecast both in and out of sample starting from observation 41. The results are shown next and look very encouraging.

Table 14 -- VAR Forecasts

10 Forecasts, beginning at origin = 40 (1999)

T	K	Forecast	Standard Error	Actual Value
01	1	19.4787	0.622259	20.6000
	2	2.78730	1.75313	3.70000
02	1	18.6160	0.928916	19.7000
	2	2.54473	1.95153	0.800000
03	1	17.8930	1.03562	17.7000
	2	3.01716	1.97704	1.90000
04	1	17.3864	1.07929	16.2000
	2	3.45418	2.00759	3.00000
05	1	17.1827	1.08195	16.0000
	2	3.76738	2.02685	4.40000
06	1	17.2384	1.08456	
	2	3.70242	2.02971	
07	1	17.3940	1.09133	
	2	3.52907	2.03382	
08	1	17.5662	1.09792	
	2	3.38858	2.03614	
09	1	17.6945	1.10098	
	2	3.32430	2.03640	
10	1	17.7653	1.10183	
	2	3.33011	2.03650	

Based on these projections, the tax burden is again on the rise after observation 45 (2005). This model, too, indicates that government tends to positively tax and spend.

Additionally, this model keeps the optimum tax burden close to the historical mean, ending up at 17.8% -- very close to the ARIMA results. At this level of tax burden the VARMA model predicts that GDP would increase by 3.3% annually in the forecast horizon ending with the 50th observation (2010). Thus based on the VAR, feedback is intertwined. GDP can move the tax burden and the tax burden moves GDP. This makes economic sense, based on the definitions of the variables.

But is this model linear and would a non-linear model give better results? This will be checked in the next section.

Is the Model Linear?

In many situations linear models are often considered a good approximation of the actual model. But, if no tests are made for linearity, the researcher may never know the properties of the underlying data and may not be able to test for alternative modeling techniques. By using the Hinrich test, linearity can be verified or nonlinearity can be added into the mix for further testing.

Table 15: Hinich bispectrum summary table.

M	G	L	BICOH	Lamda
3	-3.4820478	-0.75645558	0.93380436	0.10000000E-15
4	-1.1799698	-1.4445458	1.1785364	0.10000000E-15
5	-0.85349987	-1.2430466	1.2055756	0.10000000E-15
6	-0.72083991	-1.0530542	1.1960776	0.10000000E-15
7	-0.72083991	-1.0530542	1.1960776	0.10000000E-15
Mean for G = -1.3914395				
Mean for L = -1.1100313				

The z values of the G test are a mean of -1.39 and the z values of L are a mean of -1.11. This indicates that the assumption of linearity cannot yet be rejected. Nonlinearity has not (yet) been found in this model according to this test.

Non-Linear Techniques: (MARS, ACE, GAM vs. OLS)

B34S is used to check for non-linear models by adding one variable at a time. A summary of these results are included in the next several tables.

Table 16: Model Comparisons

Model	OLS	MARS	ACE	GAM
GDP = f(TBUR)				
R2	.12	.22	.42	.26
SSR	158	141	133*	135
GDP = f(TBUR, TBILL)				
SSR	126	141	75*	89
GDP = f(TBUR, TBILL, TBILL1)				
SSR	83	41	35*	50
GDP = F(TBUR, TBILL, TBILL1, ODUM)				
SSR	65	39	30*	50
R2	.64	.79	.83	.73

* Indicates smallest SSR for specific model equation

Based on these models, the SSR is lowest in the final ACE model (30) and highest in the final OLS base model (65). The second best model indicated by the SSR would be the final MARS model (39), followed by final GAM (50). The R2 follows a similar pattern.

Table 17 – MARS vs. OLS

Ordinary Least Squares Estimation				
Dependent variable			GDP	
Centered R**2	0.6448223739907933			
Residual Sum of Squares	65.36973171174247			
Variable	Lag	Coefficient	SE	t
TBUR	0	-0.50150391	0.20443980	-2.4530640
TBILL	0	0.66196661	0.13945749	4.7467269
TBILL1	0	-0.69358915	0.14862597	-4.6666754
ODUM	0	-2.3508867	0.69710009	-3.3723805
CONSTANT0		12.506206	3.6415939	3.4342670

MARS Results

GCV with only the constant	4.277975206611569
Total sum of squares	184.04799999999999
Final gcv	1.722356613877533
Variance of Y Variable	4.182909090909091
R**2 (1 - (var(res)/var(y)))	0.7870491305878426
Residual Sum of Squares	39.19318161356874
# of coefficients after last fwd step	7

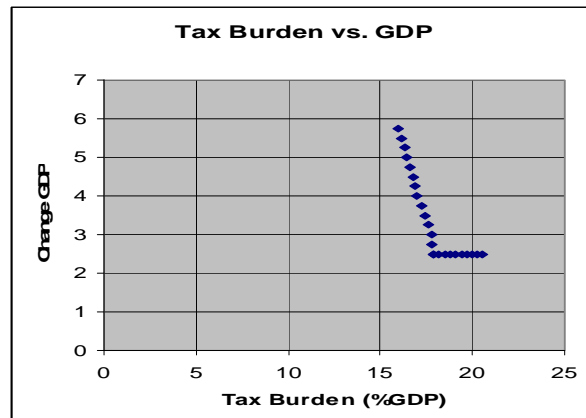
MARS Model	Coefficients	SE	t
GDP =	2.6539534	0.57522171	4.614
-5.7067468	* max(TBILL1{ 0} - 0.50000000E-01, 0.0)	1.2226676	-4.667
+ 0.74235319	* max(0.50000000E-01 - TBILL1{ 0} , 0.0)	0.32037906	2.317
-0.85165767	* max(0.40500000 - TBILL{ 0} , 0.0)	0.16809807	-5.066
+ 3.8954222	* max(TBILL1{ 0} - -0.61000000 , 0.0)	1.0698379	3.641
+ 1.0878802	* max(17.900000 - TBUR{ 0} , 0.0)	0.30930613	3.517
-0.84897205	* max(0.27600000 - TBILL{ 0} , 0.0)	0.32642634	-2.601
	* max(TBILL1{ 0} - -0.61000000 , 0.0)		
	* max(ODUM{ 0} - 0.0000000 , 0.0)		

Non-Linear Analysis:

Most analysts would be very pleased with the results of the OLS model (as well as the ARIMA and VAR models). The OLS R2 is .64, all variables are significant at the 95% level (with the expected signs based on economic theory) and the SSR is 65. However, the MARS model indicates that a non-linear assumption increases the R2 to .78 and lowers the RSS to 39. MARS indicates that a 17.9 (%GDP) tax burden is critical. Above that amount it enters our equation with a negative sign. The MARS model also reveals that a 25 to 61 basis point change in the TBILL is needed to enter our model. These are significant results.

Perhaps the most significant result is a graph, showing the non-linearity between taxes and economic growth as a result of the MARS model.

Figure 2 -- MARS Model similar to B34S Chart



Based on the figure, a tax burden of 17.9 is the pivotal point. When tax burdens are lower than 17.9%, real economic activity will rise. There will be no change in real GDP when tax burdens exceed 17.9%. Economic growth will stay at 2.5% under this circumstance. Thus in this non-linear model, only tax burdens below 17.9% will kick into our analysis. If tax burdens and changes in interest rates are all “turned off” a mean rate of GDP will occur (2.65%) -- the constant in the MARS model.

Looking at this model with the axis interchanged gives a chart similar to that found in B34S. The tax burden variable ranges from a low of 16% to a high of 20.5%. This non-linear MARS model reveals that 17.9% is once again the pivotal point. After this point, the change in real GDP growth remains at 2.5%. If the tax burden is lowered, the change in GDP increases. At a 16% tax burden, the model would predict slightly less than 6% GDP growth.

ACE and GAM:

The results for ACE and GAM are also shown in the next table. Both are clearly better than the initial OLS results, when measured by the SSR.

Table 18: ACE and GAM results

Alternating Conditional Estimation Model (ACE)

Summary Data For ACE Model

Model	R**2	Residual Sumsq	Residual SE
1	0.8355	30.03	2.451
2	0.8040	136.6	5.227
3	0.4454	171.7	5.860

Generalized Additive Models (GAM) Analysis

Model	df	coef	st err	z score	nl pval	lin_res	Name	Lag
3.00	-	-.4306	0.1871	-2.301	0.8212	57.09	TBUR	0
3.00	-	0.6975	0.1278	5.458	0.5776	54.08	TBILL	0
3.00	-	-.6494	0.1382	-4.700	0.9969	69.94	TBILL1	0

Based on these models a non-linear technique can be used to measure the optimal tax burden. While OLS gives a burden of 19%, these other time series techniques show that a burden closer to 18% is optimal. This is a critical finding.

Time Series and Forecast Summary:

Given the non-linear results, a tax burden of 17.9% appears to be the optimal figure -- a bit lower than the optimal linear results. Any tax burden rate higher than 17.9%, according to the MARS analysis, will lead to only 2.5% real economic growth. Thus recessions are not caused by higher taxes in this non-linear model, higher taxes just lead to slower economic growth. Recessions in the non-linear model would rely on additional demand or supply shocks to send the economy into recession, like 2009.

Based on the techniques used in this paper, the optimal tax burden in the United States appears to be close to 18% of GDP. At that level, real GDP is estimated to increase 2.8% (trend) for the year. Lower burdens will lead to higher economic growth in all techniques. The MARS model adds the most to our analysis based on the lowest SSR and gives a kink at 17.9%, so higher levels of tax burdens will not decrease economic growth further than 2.5% as shown in the figure below. This would have specific policy implications, in that recessions are “shock oriented” and would not be directly induced by a higher tax burden. But, lower tax burdens could lead to higher economic growth.

Policy Implications for 2010-2014:

George W. Bush, in his final *Economic Report of the President* (January 2009), estimates a federal tax burden of 17.9 percent of GDP for both fiscal year 2008 and 2009. Based on the econometric models used in this paper, a 17.9% tax burden (federal tax

receipts as a percent of GDP) translates into a trend growth rate in real GDP of 2.8% annually. Thus, the current 2009 economic downturn is being caused by a financial shock to the American economy, not by any increase in tax burden. In fact, George Bush leaves office with a lower tax burden than in the fiscal year 2000, when the federal tax burden was 20.9% of GDP. But what if President Obama decides to raise taxes during his term in office? What do the models in this paper have to say about such a plan?

Using the above information, if President Obama and Congress raise future tax burdens, trend growth in real GDP will fall further in the U.S. economy – to no more than 2.5% annually. This is less than the 3.2% trend rate in GDP growth over the second half of the 21st century. To return to such a stronger growth rate, President Obama and Congress would have to actually LOWER current Bush tax burdens to 17.4% of GDP.

This is unlikely to happen given the Obama administration's 2010-2014 spending plans of 22-27% of GDP and the ensuing federal deficits. If Obama and Congress raise the future tax burden (in 2010 and beyond) to over 21% of GDP, it will be the HIGHEST tax burden measured on our economy during the past 50 years. The 2000 revised tax burden of 20.9% (See Table B-79, Economic Report of the President 2009) is currently the highest recorded, over this half-century horizon, which was followed by a mere 0.75% real GDP growth rate (BEA revised) in the national economy over the 12 months in 2001.

If Obama would raise the tax burden to just 19 percent of GDP as currently planned, a federal deficit of 3-5 percent of GDP would still be in the cards for fiscal year 2013 – the final year of his (first) term.

If Congress continues to spend (federal outlays), these models indicate that federal tax receipts as a percent of GDP are extremely important too. If these tax burdens rise during the next four calendar years (2010-2014), the trend economic growth rate in the real economy is predicted to slow to well below the average trend rate of the past 50 years. Thus, any future economic 'shocks' to our economy would 'compound the problem of slower economic growth' leading to potential recessions down the economic time horizon.

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Data Appendix:

B34S 8.10Z (D:M:Y) 28/ 6/05 (H:M:S) 13:27: 5 LIST STEP
 PAGE 2

Listing for observation 1 to observation 45.

Obs	GDP	TBUR	ODUM	TBILL	TBILL1
1	2.5000000	17.600000	0.000000	-0.4770000	1.5660000
2	2.3000000	17.300000	0.000000	-0.5500000	-0.4770000
3	6.1000000	17.000000	0.000000	0.4000000	-0.5500000
4	4.4000000	17.300000	0.000000	0.3790000	0.4000000
5	5.8000000	17.000000	0.000000	0.3920000	0.3790000
6	6.4000000	16.200000	0.000000	0.4050000	0.3920000
7	6.5000000	16.600000	0.000000	0.9270000	0.4050000
8	2.5000000	17.900000	0.000000	-0.5600000	0.9270000
9	4.8000000	16.800000	0.000000	1.0180000	-0.5600000
10	3.1000000	19.000000	0.000000	1.3380000	1.0180000
11	0.2000000	18.600000	0.000000	-0.2190000	1.3380000
12	3.4000000	16.600000	0.000000	-2.1100000	-0.2190000
13	5.3000000	16.700000	0.000000	-0.2770000	-2.1100000
14	5.8000000	16.700000	0.000000	2.9700000	-0.2770000
15	-0.5000000	17.500000	1.000000	0.8450000	2.9700000
16	-0.2000000	17.000000	1.000000	-2.0500000	0.8450000
17	5.3000000	16.300000	0.000000	-0.8490000	-2.0500000
18	4.6000000	17.500000	0.000000	0.2760000	-0.8490000
19	5.6000000	17.400000	0.000000	1.9560000	0.2760000
20	3.2000000	18.100000	0.000000	2.8200000	1.9560000
21	-0.2000000	18.500000	0.000000	1.4650000	2.8200000
22	2.5000000	19.200000	0.000000	2.5230000	1.4650000
23	-1.9000000	19.000000	0.000000	-3.3400000	2.5230000
24	4.5000000	17.000000	0.000000	-2.0600000	-3.3400000
25	7.2000000	16.900000	0.000000	0.9500000	-2.0600000
26	4.1000000	17.400000	0.000000	-2.1000000	0.9500000
27	3.5000000	17.200000	0.000000	-1.5000000	-2.1000000
28	3.4000000	18.000000	0.000000	-0.1600000	-1.5000000
29	4.1000000	17.800000	0.000000	0.8700000	-0.1600000
30	3.5000000	18.100000	0.000000	1.4300000	0.8700000
31	1.9000000	17.800000	0.000000	-0.6100000	1.4300000
32	-0.2000000	17.600000	0.000000	-2.0900000	-0.6100000
33	3.3000000	17.200000	0.000000	-1.9700000	-2.0900000
34	2.7000000	17.300000	0.000000	-0.4300000	-1.9700000
35	4.0000000	17.800000	0.000000	1.2700000	-0.4300000
36	2.5000000	18.300000	0.000000	1.2200000	1.2700000
37	3.7000000	18.600000	0.000000	-0.4900000	1.2200000
38	4.5000000	19.000000	0.000000	0.5000000E-01	-0.4900000
39	4.2000000	19.700000	0.000000	-0.2600000	0.5000000E-01
40	4.5000000	19.700000	0.000000	-0.1500000	-0.2600000
41	3.7000000	20.600000	0.000000	1.1900000	-0.1500000
42	0.8000000	19.700000	0.000000	-2.4000000	1.1900000
43	1.9000000	17.700000	1.000000	-1.8300000	-2.4000000
44	3.0000000	16.200000	1.000000	-0.6000000	-1.8300000
45	4.4000000	16.000000	0.000000	0.3600000	-0.6000000

Source: Economic Report of the President 2005

Table B-79.—*Federal tax receipts as percent of gross domestic product, Fiscal years 1960–2009* [Percent; fiscal years]

1960	17.9
1961	17.8
1962	17.6
1963	17.8
1964	17.6
1965	17.0
1966	17.4
1967	18.3
1968	17.7
1969	19.7
1970	19.0
1971	17.3
1972	17.6
1973	17.7
1974	18.3
1975	17.9
1976	17.2
<i>Transition quarter</i> □□□□	17.8
1977	18.0
1978	18.0
1979	18.5
1980	19.0
1981	19.6
1982	19.1
1983	17.5
1984	17.4
1985	17.7
1986	17.4
1987	18.4
1988	18.2
1989	18.4
1990	18.0
1991	17.8
1992	17.5
1993	17.6
1994	18.1
1995	18.5
1996	18.9
1997	19.3
1998	20.0
1999	20.0
2000	20.9
2001	19.8
2002	17.9
2003	16.5
2004	16.4
2005	17.6
2006	18.5
2007	18.8
2008 (estimates)	17.9
2009 (estimates)	17.9

Source: Economic Report of the President, January 2009