STRATEGIES FOR REMOVAL OF THE FEDERAL BUDGET DEFICIT AND PAYOFF OF THE NATIONAL DEBT: ANALYTICAL AND SIMULATION STUDIES

James R. Burns, Ph.D., P.E., CIRM[1]
Rawls College of Business Administration, Texas Tech University
ISQS area, P.O.Box 42101, Lubbock, Texas 79409-2101
(806)742-1547 Fax-(806)742-3193, Email: jburns@ba.ttu.edu

Balaji Janamanchi Ph.D.
A.R. Sanchez School of Business, Texas A&M Int'l University,
DIBTS, 5201 University Boulevard, Laredo, Texas 78041,
(956)326-2537 Fax : (956)326-2494, Email: bjanamanchi@tamiu.edu

Andrew Wolfe
Rawls College of Business Administration, Texas Tech University
ISQS area, P.O.Box 42101, Lubbock, Texas 79409-2101, Email: andwolfe@gmail.com

ABSTRACT

The issue of how the U.S. national debt would be reduced is addressed. Can the U.S. federal government continue to expect its revenues to rise to the occasion? Will the retirement of seventy million baby-boomers result in diminished federal revenue and increased federal expenditures? Will the changing tax structure increase federal revenues? Will these circumstances lead to incapacity of our federal government to service its burgeoning national debt? Are there probable disaster scenarios that policymakers must navigate around through judicious policy choices? Is it time to start drastically cutting the federal budget? These are the questions addressed by the analytical and simulation models.

INTRODUCTION

Few economic issues have such far-reaching implications as excessive government budget deficits and debt. In this paper we shall endeavor to use arguments involving analytics and simulation to address a rather important question: what is the best way to retard our burgeoning national debt? The basic formulas regarding Federal Revenue, Federal Debt, Federal Deficit, Gross Domestic Product are given below, but first, we must define terms:

G = Government Expenditures
I = Domestic Investment
E = Exports
R = Federal Revenues
D = National Debt
X = Domestic Consumption
GDP = Gross Domestic Product
M = Imports
B = Borrowing

The following relationships apply:

$$GDP = X + I + G + E - M \quad (1)$$

GDP = Dom Consumption + Dom Investment + Government Expenditures + Exports – Imports.

[1] Author for correspondence

The next relationship posits that Government Expenditures = Federal Revenues + Borrowing, or

$G = R + B$ (2)

Stated another way,

$B = G - R$ (3)

When borrowing is negative, there is a budget surplus and the Federal Government is actually paying off the federal debt. The next relation asserts that the National Debt in year i+1 is equal to the current year's national debt + borrowing B in the current year.

$D_{i+1} = D_i + B$ (4)

In other words, the national debt is an accumulation of the annual deficits and surpluses run up by the federal government. For the past 50 years, roughly, taken as an average, Federal Revenues R is equal to 19% of GDP, Gross Domestic Product. Thus

$R = .19*GDP$ (5)

From these relationships, we can learn a lot about what our country needs to do to overcome its deficits and begin the process of paying off its debt. We focus on Eq. (3) first. We want B, Borrowing, to be negative. To do that the government must either increase the revenue R and/or decrease the government spending, G. To increase Revenue, R, the government must either increase the aggregate tax rate from .19 to higher, or it must encourage growth in GDP.

The other strategy at the Federal Government's disposal is to reduce expenditures G. This will be very difficult to do as the Government prepares for the retirement of 80 million baby boomers. These retirements will place huge burdens upon Social Security, Medicare and Medicaid. It would appear that our Federal Government is totally unprepared to accommodate the retirement of millions of baby boomers that begins January 1, 2008.

In what follows we address these issues in greater detail.

Increasing Federal Revenues: From Eq. (5) to increase Federal revenues R while holding the tax rate constant, GDP needs to increase. For one, we can buy less foreign product and more US product.

Raising taxes to pay off debt: Should the Federal Government raise taxes and use that increase to pay off the debt? Increasing the aggregate tax rate to something larger than .19 and using this money to pay down the debt will most certainly have a slowing effect on the economy. A fundamental solution would have been to aggressively grow the economy, but the effect of the tax rate increase here has been to shrink the economy and diminish its ability to outgrow the debt

Other alternatives: There is yet another away to compensate for a shrinking economy resulting from an increase in taxes to pay down the national debt. That is through monetary policy. The prospect of a shrinking economy encourages the Fed to lower interest rates and to increase the money supply. Inflation is closely monitored; so long as the measures of inflation do not indicate high level, the Fed gets away with this form of monetary stimulation to the economy without significant deleterious side effects. The result is, the economy does not shrink even with the increase in taxes as the lowered interest rate encourages borrowing for the purpose of investment. But what if Americans are already maxed out relative to borrowing? Then the lowered interest rates will have little effect; the increased money supply does not stimulate the economy. And the economy slips into a recession.

Will America be able to service its burgeoning national debt after the year 2010? Currently, our national debt stands at 9.395 trillion dollars. Congress, in February 2006, recently passed a bill raising the debt ceiling. Our national debt increases at an average rate of $2.21 billion per day and has done so since September 30, 2005 (The National Debt Clock). After the year 2010, we expect the beginnings of 80 million baby-boomers to retire in substantial numbers, leaving good paying jobs that were a substantial source of tax revenue. It is expected that baby boomers will be completely retired over the ten-year period that begins in the year 2010.

Here is how the doomsday scenario might play out. As debt service becomes more and more arduous, the federal government cuts its services to patrons like the elderly through cuts in Medicaid, Medicare and eventually social security. Raising taxes actually erodes the tax base while it diminishes the economy. According to Kirchhoff (2003), "When deficits started taking off 20 years ago, the retirement of the baby boom generation was just a distant worry." Now, as the nation faces years of red ink, including at least a $400 billion shortfall in 2003 alone, the graying population is fast-approaching a reality that will put unprecedented strains on Medicare, Social Security and the economy starting around 2010." Bonner and Wiggin (2006) assert that, although the U.S. federal debt was about $7 trillion at the time of their writing their book, that number did not include "the gap between the government's Social Security and Medicare commitments and the money put aside to pay for them." That takes the total real federal debt to nearly $30 trillion or $100,000 for every man, woman and child in the country.

A SYSTEM DYNAMICS MODEL TO STUDY THIS PROBLEM

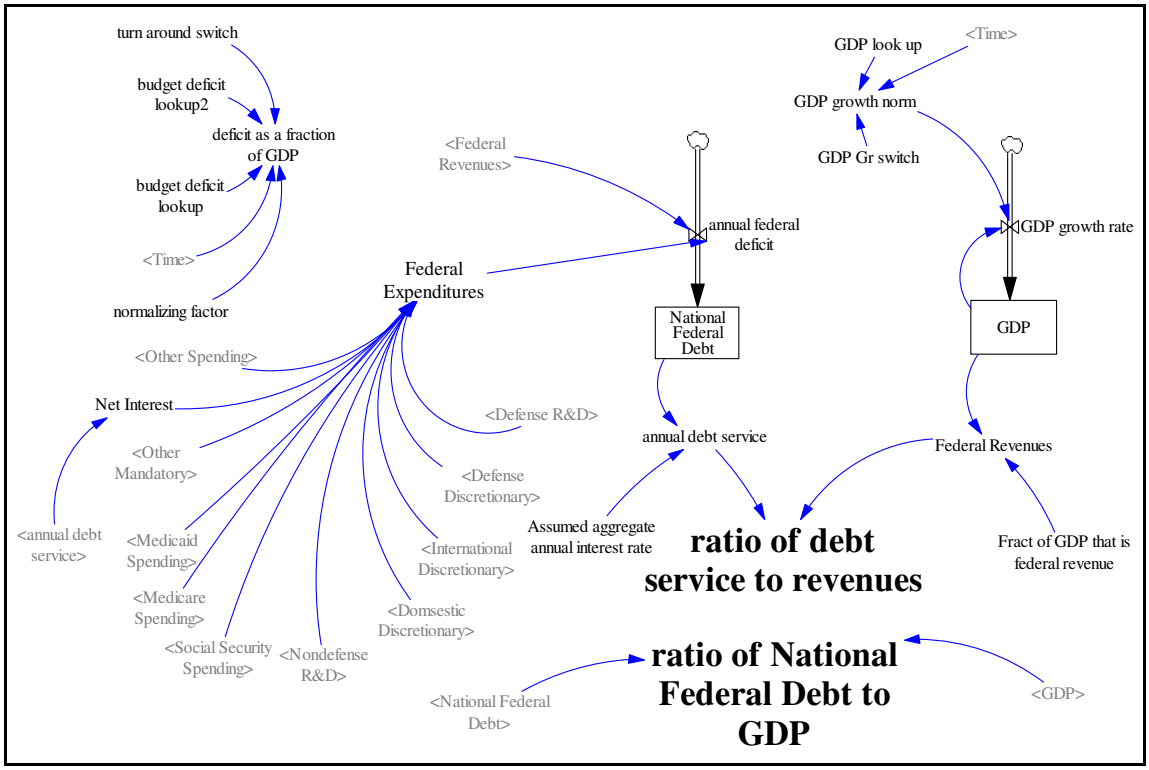

Figure 1: Basic Simplified Structure of the growth in Federal Debt taken in relation to Growth in GDP

To address the questions raised in previous section, we have taken the numbers and used them as parameters in a rather simple System Dynamics model that captures the basic structure of the underlying problem. The intent here is to capture the dynamic complexity of the problem with as parsimonious a structure as possible. Rather than focusing in on the detail complexity of the problem, this study endeavors to take a very aggregated look that is intent on capturing the dynamic complexity. The basic structure is exhibited in Figure 1. This figure exhibits the basic simplified structure of the growth in federal debt taken in relation to growth in GDP.

GDP experiences increase or decrease depending upon the attendant factors. However, based on the past history and more particularly, the growth rate experienced in the period 1994 to 2003 (IMF, 2004), a steady growth rate of 3% p.a. is incorporated as a 'base-case' setting (i.e. GDP growth norm =0.03). As per Jones (2003), Federal revenues have averaged 18% to 19% since 1950 and Jones (2003) predicts that the Federal revenues will stabilize at 19% of the GDP in the future. Accordingly, the 'Fraction of GDP that is Federal revenue' is set at 0.19 in the model as the base-case setting. Jones (2003) also asserted that the Federal deficit would rise over the next few years to reach a level of 20% of the GDP by year 2075. Accordingly, gradual rise in the deficit from current level of, 3% to 20% in the year 2075 is incorporated (as base-case setting).

Obviously, persistent Federal budget deficits are accumulated within the National debt and this logic is captured by modeling the annual federal deficits as an inflow into the National Federal Debt stock. National Federal Debt as on January 1, 2005 was $7.596 Trillions (Bureau of Public Debt, 2006) and accordingly, the initial value of the National Federal Debt in the model is set at this number. It is a well known fact, that the National debt needs to be serviced by payment of annual interest and the current average interest on the national Debt is at 4.8% p.a. (Bureau of Public Debt, 2006). Based on the debt and the applicable interest rate, one can calculate the annual interest burden of the National Debt, and compute what percentage of the federal revenues does this interest burden constitute. Simulation results based on the structure show that debt service will consume an ever greater proportion of federal revenues at least if the current levels of GDP and budget deficits persist, all the way through the year 2050.

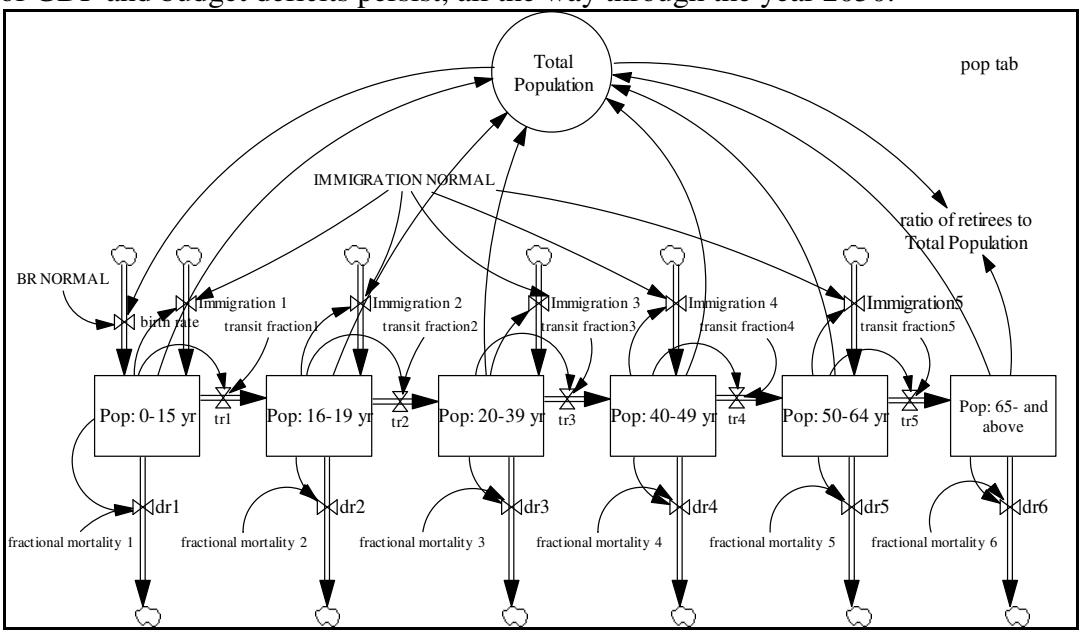

Figure 2: Basic Structure of the U.S. Population Demographics

Figure 2 is the basic demographics sector, from which the overall age-structure of the workforce can be determined. Figure 2, represents the disaggregated U.S. population, created to watch how the population will age over time. they are the following:

1) Pop: 0-15 yr a.k.a. Youthful Dependent
2) Pop: 16-19 yr a.k.a. Beginner Earners
3) Pop: 20-39 yr a.k.a. Early earners
4) Pop: 40-49 yr a.k.a. Early Savers
5) Pop: 50-64 yr a.k.a. Peak Savers
6) Pop: 65- and above a.k.a. Dissavers

Transition of population stock from cohorts to the successive cohorts is, determined based on the cohort span. Fractional mortalities from each age cohort are modeled based on the death rates reported in National Vital Statistic Reports (2004) suitably adjusted for the modeled cohort spans. The immigration rate into the US population is modeled based on the net migration projections forecast by the Population projection Branch of US census Bureau (2000) mid series projections. The in migration rate represented by the IMMIGRATION NORMAL has also been fine-tuned under a calibration process.

Behavior over time charts of population cohorts reveals very good news. There is good growth in the youngest cohort, Pop: Youthful Dependent 0-15 yr, and these will become taxpayers in the next decade. Further, the demographics are very balanced, each roughly 50+ million. Simulation results reveal that the ratio of retirees to total population is not getting out of hand and is actually stabilizing after the year 2035. The stabilization occurs around the number .175, suggesting that there will be 1 retiree for every 6 persons in the rest of the population.

Why the Interest in GDP? "Gross Domestic Product (GDP) is the market value of all final goods and services produced within a country in a given period of time," (Mankiw, 1998; Ch 22, p 480). In this study, no attempt is made to estimate the GDP but rather, effect of changes in GDP, on other dependent variables is studied. Our effort under this section is limited to studying the effect of the various scenarios, in so far as they affect the GDP and the behavior of dependent variables. The primary reason for the interest in the U.S. GDP is because; it is a good measure of the overall health of the U.S. economy. For obvious reasons, a healthy and growing level of workforce ensures steady growth in the GDP (assuming steady productivity rates). The participation fractions for each age cohort has been calculated based on the civilian workforce data provided on the Department of Labor, Bureau of Labor Statistics website resources. These fractions are compared with the workforce participation fractions reported by the RAND Corporation (2004). The current participation fractions are adopted as a base case setting.

The behavior-over-time charts show how the workforce-to-retirements ratio is likely to decline over the next fifty years. This chart suggests that the number of workers to retirees will number approximately 3 in the year 2030 and increase slowly after that. This puts the U.S. in a better position than most of Europe and Japan, whose workers to retiree ratios are going to approach 2. Results obtained are in agreement with the RAND (2004) report in this respect.

Metrics for judging the effectiveness of any policy were determined to be avg Debt per capita, avg Debt Service to revenue ratio and avg Workforce to retirees ratio. These metrics were calculated in the model. Results show how debt service would vary as a function of interest rate and other factors (see table 1 below for a definition of what these other factors were for the

exhibited scenario runs). The worst case scenario is the one in which the Assumed aggregate annual interest rate is constant at 8% (giving the curved labeled with a '2' above). This scenario suggests that the debt service to revenue ratio could approach .5 by the year 2055.

WHAT IF ANALYSIS

Table 1 shows the results for two alternate scenarios.

	Settings					Key metrics		
Dataset	Interest	GDP Growth rate	Federal Deficit % assumed	retirement age	Avg. workforce participation rate	debt service to revenues ratio in 2055	National debt per capita	workforce - to-retirees ratio
basecase	4.80	at 3.1%	Inc-sing	65	0.7	0.3045	$94,320.00	2.993
GDPDNG	4.80	3.1% => 1% by year 2025	Inc-sing	65	0.7	0.3841	$73,139.00	2.993
FDTRND	4.80	at 3.1%	turned around	65	0.7	0.1239	$31,053.00	2.993
HI INTR	8.00	at 3.1%	Inc-ing	65	.7	0.5076		2.993
GDPDNG= GDP does not continue to grow								
FDTRND=Fed deficit turned around								

As can be seen from the above, steady growth in the GDP at the current rate coupled with steady increases in the Federal Deficit lead to undesirable levels of National Debt, causing a more than acceptable level of debt service to revenues ratio.

CONCLUSIONS

Workforce is in decline; retirements are on the rise. Revenues are flat; the debt is soaring; something has to give. The purpose of this model is to raise awareness of the problem, to ascertain to what extent this is a pervasive problem and to suggest possible ways to ameliorate it. First, while the growing deficits are a cause for concern, it does not appear that this is the 'beginning of the end.' However, there are 'things' we should do now to help alleviate this growing problem. First baby boomers should be allowed to work for as long as they wish, extending the average retirement age to age 70 or 75. One way to do this is to provide them with flexible work hours, allow them to telecommute, etc. There must be continued growth in Gross Domestic Product. The Rand Corporation (2004) informs us that to sustain GDP growth, we must allow many more people to enter to workforce. Increases in immigration normal can be encouraged to accommodate this. Subsequent studies will investigate this possibility. As citizens of this great country we must begin now to encourage our federal government to reign in its spending and to do everything it can to balance the federal budget.

-o0o-

References: available upon request from the authors