Government Debt[1]

We take a break from straight theory to look at governmental debt, obviously a relevant issue in the United States. We begin by looking at the mechanics of deficits and debt. The *budget deficit* is simply the difference between what the government spends versus what it collects in revenue, mostly from taxes. Government spending notably includes interest payments on existingd ebt. Our focus is on the United States Federal government. The basic story, however, applies to other economies as well.

The Federal government finances its debt by issuing bonds, almost always either Treasury Bills (short-term) or Treasury Bonds (longer-term). So for a $1 trillion deficit, the government must issue $1 trillion in new bonds. In addition, existing Treasuries are constantly maturing. In order to pay the holders of these bonds, the government issues more new bonds. This is known as rolling over the debt.

Denote the price of a $100 1 year Treasury Bond as P_b. This means that the holder of the bond pays this price and receives payment of $100 when the bond matures in one year. Treasuries may, however, have terms as short as 30 days or as long as 30 years. The *bond yield* represents the rate of return on the bond. For the example bond it equals:

$$i_t = \frac{\$100}{P_b} - 1 \tag{1}$$

The bond yield is an interest rate. Because Treasuries are low risk[2], we expect that the associated bond yield will match other low risk rates in the economy. I have hence denoted the yield as i_t. Note that the bond price and yield are inversely related. This is generally true. The exact form of the yield, however, depends on the details of the bond. So (1) is not a universal formula.

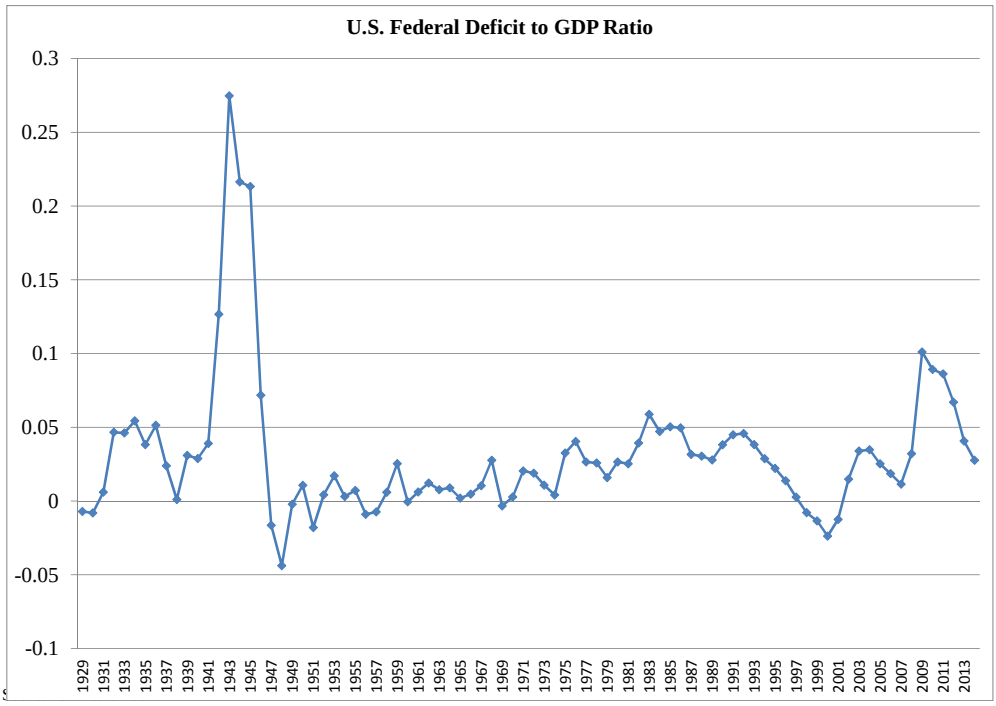
For this example, the government collects $P_b < \$100$ when issuing the bond, but must pay back $100 when it matures. This is the process whereby interest accumulates on the debt. The *national debt* is simply the sum of all the debt that the government has issued. It thus consists of the sum of past budget deficits, along with the accumulated interest.

Like many macroeconomic variables, it is important to distinguish between nominal and real variables. Nominal deficits and debt are converted into real terms by dividing by GDP. Figure 1 plots the real surplus, the opposite of the deficit:

[1]These are undergraduate lecture notes. They do not represent academic work. Expect typos, sloppy formatting, and occasional (possibly stupefying) errors.

[2]Not to say zero risk.

Figure 1: U.S. Federal Surplus to GDP Ratio



Between 2009 and 2014, the budget deficit equaled 9.8%, 8.7%, 8.4%, 6.7%, 4.0%, and 2.8% of GDP ($1.4, $1.3, $1.3, $1.1, $0.68, and $0.49 trillion). These are some of the the largest deficits since the Second World War when the deficit peaked at 27.5% of GDP in 1943. As expected, these have led to an increased debt burden as shown in Figure 2.

The top line shows the total amount of debt outstanding. In 2Q2015, this equaled $18.2 trillion or 101% of GDP.

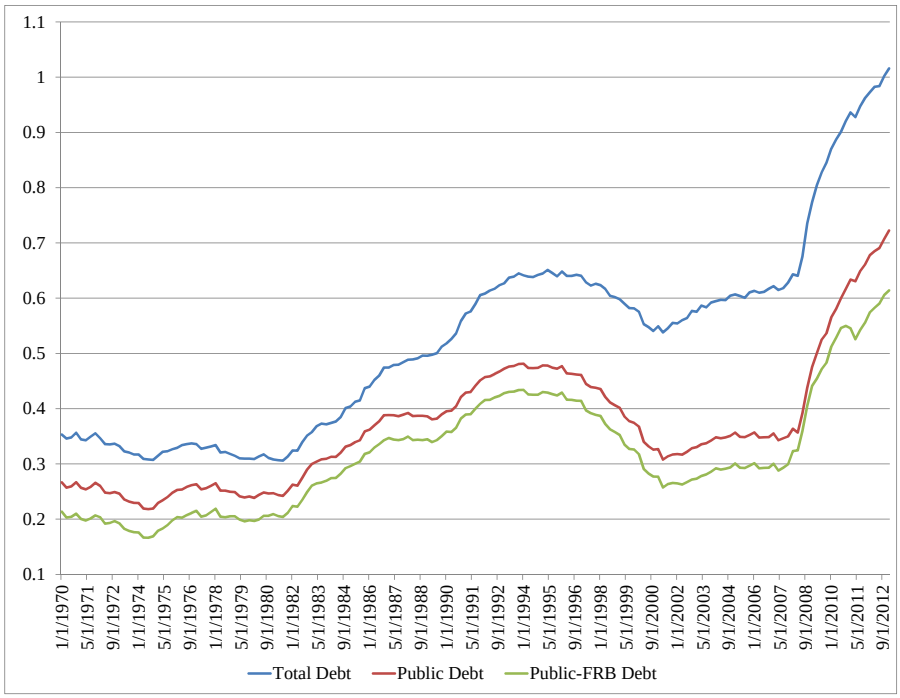
The top line is not particularly interesting. One of the largest holders of U.S. government debt is the U.S. government itself. Economically, this should be excluded. Doing so yields the public debt (middle line) which is the figure that most economists care about. In 2Q2015, this equaled $13.1 trillion or 72% of GDP. By historical standards this is high, although the figure exceeded 100% of GDP shortly after the Second World War.

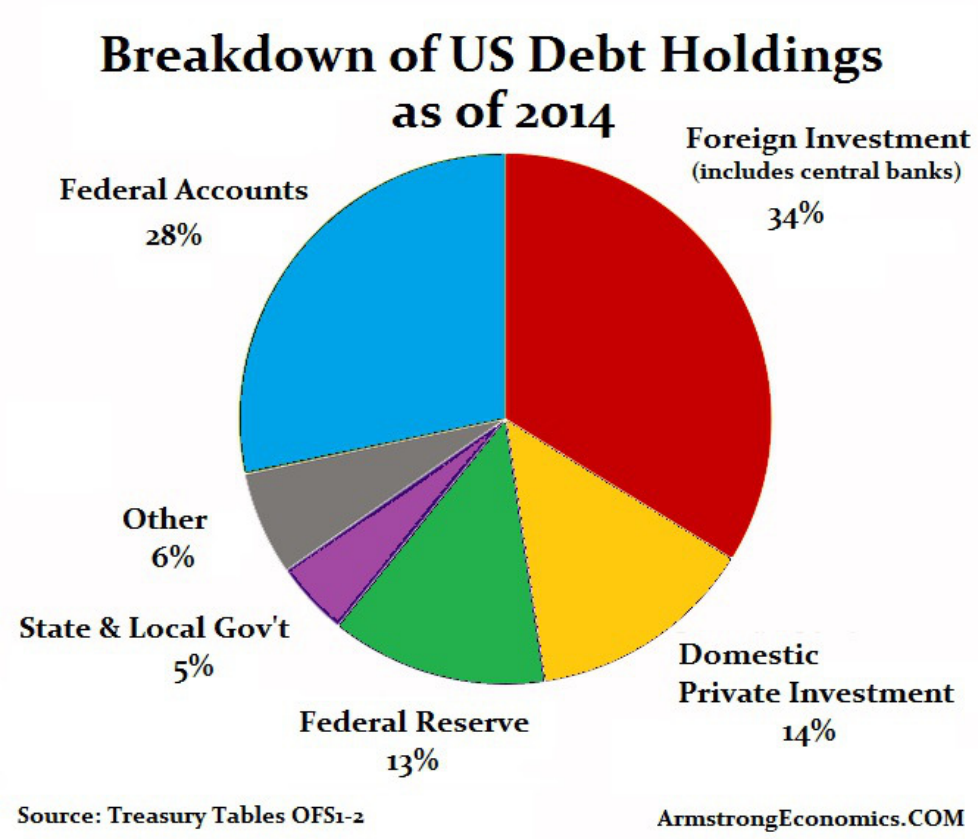
The government owns about $5.1 trillion of its own debt. Of this, 57% is held by the Social Security Trust Fund, 7% by the Medicare Trust Fund, 10% by military retirement and health care trusts, and 17% by civil service retirement and disability trusts.

Figure 3 illustrates ownership of the debt in 2014.[3]

[3]Source: Armstrong Economics.com

Figure 2: U.S. Federal Debt to GDP Ratio





As of October 2015, 43% of the det held by the public is held by foreigners with China and Japan being the largest creditors at over $1 trillion each.[4]

It is not clear whether the Fed's share should be included in the relevant measure of the debt. On the one-hand, despite its independence, the Fed is still part of the government. The Fed can and often does monetize (forgive) some of the bonds that it holds. On the other hand, the Fed may have to sell many of these bonds to prevent inflation when the economic recovery gains steam.[5] The third line on the debt chart shows the public debt excluding the Fed's part. In 2Q2015, this was 57% of GDP.

Consequences of Large Debt

In the short and intermediate run, most macroeconomists worry about excessive public debt *crowding out* private investment. Recall from our study of growth that reduced investment lessens the capital stock which reduces output in the long run. When we examine short-run models, we will see similar effects.

The economic intuition for crowding out may be seen in a simple graph of supply and demand for credit. Suppose that demand for credit initially consists only of the private sector seeking funds for investment. Now suppose that the government suddenly increases supply by running a budget deficit.

Graph: Crowding Out

Basic supply and demand illustrates that the budget deficit lowers bond prices. Recall from (1)

[4]Source: "Foreign investors can't get enough of the U.S." 10/1/2015. *CNNMoney*.

[5]The Fed has more than tripled the monetary base since the crisis began. Because of the recession and slow recovery, this has led to a much smaller increase in the money supply. But a stronger recovery may change this relationship requiring that the Fed sell assets to prevent a large increase in the money supply.

that bond prices are inversely related to interest rates. In the graph, higher interest rates reduce private investment.

Crowding out is a concern down the road. Currently, however, interest rates (both short and long run) are very low. It is thus highly unlikely that this effect is a major cause of the current unsatisfactory U.S. macroeconomic condition. In our analysis of business cycles, we will attempt to quantify this effect.

There are a pair of other reasons why budget deficits may reduce output.

1. Later in the term, we will study the *Life-Cycle Hypothesis*. This theory of consumption predicts that household consumption depends on lifetime wealth. Lifetime wealth includes not only current income and assets, but also the stream of expected future disposable income. If the budget deficit causes households to expect higher taxes in the future, necessary to pay off the increased debt, then they may respond by lowering their current consumption. Because deficit spending (increased government spending or lower taxes) is usually stimulative, this effect is best seen as reducing the ability of fiscal policy to stabilize the economy.

2. If the budget deficit results from inefficiently high public spending, then it may reduce economic growth through resource misallocation.

In the long run, large government debt may lead to *sovereign debt crises*. Recall that governments typically pay off their maturing bonds by issuing new debt. This process is possible if and only if there exist willing purchasers of the new debt. If debt becomes too high, then this may no longer be the case. It is not obvious how high U.S. debt would have to become for this to occur. The following comparison of debt levels across Europe is, however, instructive:[6]

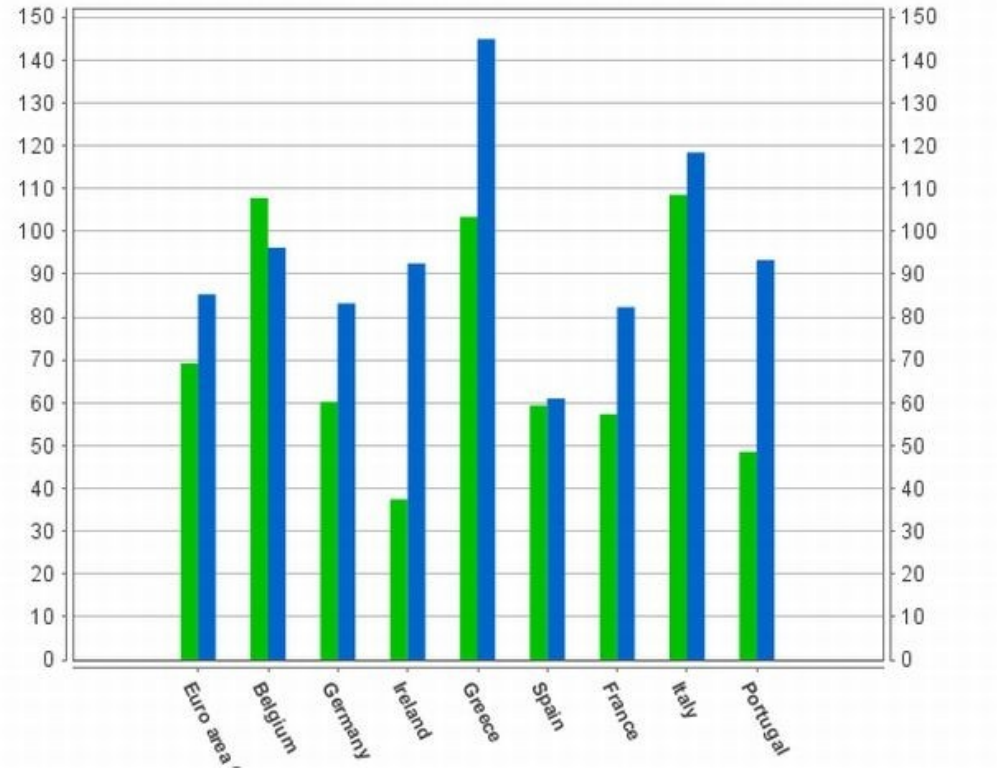
Greece, with a debt above 140%, is in the midst of a sovereign debt crisis and has partially defaulted on its debt. Japan, however, has debt above 200% of its GDP and has not had a crisis. Ireland, with debt above 90%, is emerging from such a crisis while Italy and Belgium have so far avoided a crisis. Spain, with a debt level similar to the U.S., however, is viewed as being at risk of a crisis. So there is no obvious level above which a developed country enters a crisis.

When a country is unable to roll over its debt, it must choose among the following options:

1. Default. In this case, the country will have to pay higher interest rates in the future to compensate lenders for the risk of additional default. Furthermore, the loss of wealth among holders of the

[6]Taken from: Ezra Klein's *Wonk Blog*, "The European debt crisis in eight graphs". 12/1/2011.

Figure 3: EU Debt Levels in 2010 (blue) and 2000 (green).



debt may adversely affect the economy both domestically and in foreign countries with significant exposure.

2. Reduce the deficit through tax increases or lower spending. Because sovereign debt crises usually occur during economic downturns, these types of austerity measures risk making the short run situation worse.

3. Inflate the debt away. Expansionary monetary policy allows the Central Bank to purchase the existing debt with new money. Such a policy may be highly inflationary.

Sovereign debt crises are fairly common. Examples include many U.S. state governments into the nineteenth century, and several European countries today. The most famous example, however, is Germany in 1920s. The German republic was saddled with a large debt due to war reparations required in the Treaty of Versailles. They tried default but it resulted in France invading and occupying one of the most productive regions of the country. The government was under pressure from Communists on the left and fascists (Nazis) on the right so tax increases or spending cuts risked political overthrow. So the German government printed money, resulting in the world's most famous hyperinflation and awesome money forts.

Figure 4: Good Times With Devalued Marks

Looking Backward

It is of interest to consider the shocks and policies that have led to the recent large. The budget deficit for FY09 (October 08- November 09) was about $1.4 trillion. For FY10, the deficit equaled about $1.3 trillion. The CBO's January 2010 numbers (reported by the Center for Budget Policies and Priorities) break down the sources of these two deficits. The estimates for FY10 were made during that fiscal year and are thus noisier:

1. The economic downturn: $418 billion for FY09, and $455 billion for FY10. Because tax rates (including corporate tax rates) are proportional, a reduction in economic activity reduces tax revenue. This is especially noticeable with corporate tax revenue, which falls dramatically as many firms report losses. These figures represent the loss in tax revenue, and resulting increase in the deficit, relative to an economy that had maintained normal economic growth.

2. Bailouts (TARP, and the GSEs): In September 2008, the Federal government implemented TARP (Troubled Asset Relief Program), a bailout of financial institutions which was later expanded to include GM and Chrysler . It also bailed out Fannie Mae and Freddie Mac, two quasi-public

institutions which encourage home ownership by buying qualified loans from lenders. These bailouts increased the deficit by$245 billion for FY09, and -$32 billion for FY2010. Most of this comes from the bailout of Fannie and Freddie, for whom the Treasury is bearing the losses. Even though Congress allocated $700 billion for TARP, most of this has been or will be paid back, with the government currently expecting about a $50 billion loss.

3. Economic recovery measures (mostly the stimulus package): $200 billion for FY09, and $412 billion for FY2010. Unlike TARP, most (there is some self-financing) of the stimulus package will be passed on to the debt.

4. Tax cuts from 2001-03: $364 billion for FY09, and $336 billion for FY2010. These are the tax cuts that Congress is currently debating extending or allowing to expire. The ten year cost, in terms of additional debt is usually estimated between $3-4 trillion.

5. Iraq and Afghanistan: $178 billion for FY09, and $191 billion for FY2010.

Looking Forward

The Congressional Budget Office periodically forecasts the expected budget deficit and debt ten years out. They expect the 2015 deficit to be 2.6% of GDP. Note that if GDP is expected to grow at about 3% per year in the long run, then a 3% budget deficit will cause the debt to remain the same as a share of GDP. The CBO expects the deficit to gradually rise to 4.0% by 2025, causing a small increase in debt.