Discussion of Engen and Hubbard

“Federal Government Debt and Interest Rates”

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by

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Are cookies fattening? For every 2,850 calories one eats in excess of the steady state caloric requirement for maintaining weight, one gains a pound. Suppose a cookie has 100 calories. So eating a cookie, all other things equal, leads to a weight gain of 0.035 pound, a positive, but small effect on weight. The 0.035 is the marginal effect of a cookie on weight. Engen and Hubbard's aim in this paper is to estimate a similar parameter, the marginal effect of Federal debt on long-term interest rates. They survey the evidence and present new empirical estimates and theoretical calculations. Based on their analysis, they conclude, according to their preferred metric, that increasing the ratio of Federal debt to GDP by 1 percentage point will increase long-term real interest rates by 0.035 percentage point or 3.5 basis points. Hence, they characterize their results as showing that the marginal effect of Federal debt on long-term interest rates is small, but positive.

There is little to quarrel with in this estimate. It is in line with results found in a recent careful study by Thomas Laubach (2003) of the Federal Reserve Board. Nonetheless, the paper does not tell the full story about the impact of Federal debt on the interest rates and the economy in general. The main message of the paper is changes in the Federal debt have statistically significant but very small effects on real interest rates and by extension, to the real economy. Though the authors are careful not to say so explicitly, the implication is that the public and policy makers should not be unduly concerned about the recent and projected increases in Federal debt since 2001. Notwithstanding qualifications inserted in the paper, by focusing on the marginal effect of increasing debt they leave the impression that the effects of Federal debt are so small that the recent and persistent fiscal imbalances—from the tax cuts in each of the last three years, from the slow down in economic growth, from the increase in military spending after

9/11, and from the general abandonment of fiscal restraint in the rest of the budget (e.g., the agriculture bill of 2001 and the Medicare prescription drug bill) are of no concern, at least insofar as they might impact borrowing costs and therefore investment. Likewise, the paper could be read to imply that the substantial progress made in reducing deficits and debt during the 1990s was of little consequence for economic performance.

What does the positive, but small effect identified by Engen and Hubbard imply in practice about the effect of Federal borrowing on interest rates? To answer this question, I return to the question, “Are cookies fattening?” As I just noted, if I eat a cookie, I gain 0.035 pound. That is only a very small fraction of my body weight, so I might conclude that cookies are not fattening. Yet, eating one cookie is not really the issue if I am trying to watch my weight. My experience with cookies suggests that the right question is, what if I eat a cookie a day for a year in addition my normal caloric intake? In that case, I will gain 365 times 0.035 pounds per day, which equals 12.8 pounds in a year. If I do this for 10 years.... Well, let’s not go there. Based on these considerations, I would say that cookies are fattening.

Federal deficits have a similar implication for the Federal debt as eating cookies does for weigh gain. They are persistent, so nibbles tend to cumulate. Consider the increase in the debt/GDP ratio in the 1980s. It rose from roughly one-quarter to one-half of GDP, an increase of 25 percentage points. Using the preferred estimate of Engen and Hubbard, this would increase long-term real interest rates by 25 times 3.5 basis points, which equals 87.5 basis points. Such an increase in interest rates will have major implications for accumulation of capital and housing, for financial markets, and for the cost of financing the federal debt. With current policy, we appear to be repeating the experiment of the 1980s, that is, cutting taxes, increasing defense spending, and not restraining non-defense spending. The authors' estimates thus imply that current policy will lead to a noticeable, sustained increase in real interest rates.

Engen and Hubbard's estimates for the effect of borrowing on interest rates are very close to those found in several recent papers that carefully study the relationship between interest rates and Federal borrowing. In particular, estimates by Thomas Laubach (2003) of the Federal Reserve Board point to only slightly higher marginal effects of debt on real long-term interest rates. Laubach finds large effects on interest rates of a percentage point increase in the *deficit*/GDP ratio, results which Engen and Hubbard confirm in their regressions. Engen and Hubbard, however, downplay these larger point estimates for the deficit. Yet, as the authors hint in their discussion of the evidence, the big coefficient on the deficit is not inconsistent with the smaller coefficient on the debt. Deficits are persistent, so a current deficit implies increases debt in the medium run. Taking into account the persistence of the deficit and the difference in units, the estimates based on deficits and debt tell similar stories.

So the estimates presented by Engen and Hubbard are in line with those found in the literature. Why then is there the Fed/Brookings consensus that the recent shift in fiscal policy pushed long-term rates up by 50 to 100 basis points (see Gale and Potter (2002)), which is surely a substantial number that has noticeable real effects? As Gale and Orszag (2003) observe, this magnitude of increase in borrowing costs more than offsets the reductions in marginal rates in the 2001 bill in the cost of capital. What accounts for the difference in interpretation of the evidence is Engen and Hubbard's focus on percentage point movements in the debt/GDP ratio and inferred moves in the capital/GDP ratio are very misleading. I will show you this by taking the ingredients of Engen and Hubbard's analysis and embedding it in the Solow growth model, which for this application, is a good approximation to what one would find with a DGE model.

Using the Solow model will link the analysis to the national saving and investment rates, which, rather than debt *per se* are a better way to understand and quantify the economics.

In implementing these calculations, I will embrace the details of Engen and Hubbard's analysis. I agree with them that modeling the saving rate is a good way to summarize the effects on capital accumulation of changes in government saving even if the changes in national saving are not identical to the changes in government saving. That is, a one percent increase in the Federal deficit might reduce national saving by less than one percent because of foreign capital flows or Ricardian increases in private saving. The current paper does not have anything new to say about these effects. To approximate them, consider, a 2 percentage point drop in national saving, which may arise, for example, from a 4 percentage point drop in Federal saving that is partially offset by an increase in private saving. The purpose of using the Solow model is to get the stock-flow identities right and to calculate the dynamic general equilibrium effects of the change in the capital stock from the change in saving.

Let me start by considering steady state changes in the saving rate. The Solow model is so familiar that I will not rehearse its equations for you. Let me tell you, however, what parameter values that I use. The growth rate (n+g) is 4 percent per year, the rate of depreciation (δ) is 4 percent per year, the investment rate (s) is 20 percent of income, and the capital share (α) is 0.33. These parameters are totally conventional. The warranted growth rate of 4 percent, 1 percent for labor force and 3 percent for technology, is in line with most estimates. The depreciation rate of 4 percent matches BEA aggregates for the total net capital stock. (Like Engen and Hubbard, this capital stock and depreciation rate includes residential and non-residential structures as well as business equipment.) The investment rate is a little high, but call me an optimist. These parameters loosely replicate U.S. aggregates. That is, they generate a capital/output ratio of 2.5 and a gross marginal product of capital of 13.2 percent. The capital/output ratio in the data is 2.7. The MPK of 13.2 is in line with estimates of the pre-tax gross return to capital.[1]

Now let's run several policy experiments through the Solow model. Consider economies where the steady-state saving rate (taken equal to the investment rate) was lower by 1, 2, or 4 percentage points. Table 1 shows the steady state effects of these changes in the saving rate. Such permanent reductions of the saving rate have very large impacts on the steady-state marginal product of capital (these are percentage points, not basis points) and on the capital stock itself. For a one percent permanent cut in the saving rate, the marginal product would increase 70 basis points and the capital stock would fall 7.4 percent. Because of diminishing marginal product of capital, the effects of larger drops in saving are more than proportional. These effects are very large and would correspond to significant decreases in consumption per capita on a permanent basis, though there would be increases in consumption along the transition path. In thinking about the prospect of fiscal deficits for "as far as the eye can see," these calculations give an estimate of the permanent effects.

Why are Engen and Hubbard less concerned? First, their static, partial equilibrium calculation significantly understates the steady state effects. Second, the perturbations they consider lead to only very small changes in national saving in a steady state analysis. Let me

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[1] The empirical analysis of the paper concerns the Treasury bond rate, which is riskless except for inflation risk. The theoretical model of the paper and this discussion concerns the return to capital, which earns a substantial risk premium. An implicit assumption of the paper is that changes in the capital/output ratio in the range considered do not affect the risk premium, so that changes in marginal product of capital map one-for-one into the interest rate.

illustrate these points by asking what change in saving in steady state would generate results that Engen and Hubbard highlight. First, what change in saving would generate the steady state change in MPK of 2.4 basis points that they feature in their discussion? This calculation is shown in Table 2. To get this change, the saving rate would have to fall by 36/100,000. First, this is a very small change in the saving rate. Second, note that the capital stock does not fall by nearly 1 percent. To get the capital stock to fall by 1 percent, the drop in the saving rate must be larger, 136/100,000, but still very small. Finally, to get the capital/output ratio to fall by 1 percent, the saving rate has to fall by 2/1,000. This is the experiment that Engen and Hubbard have in mind in column 1 of Table 1. Note two points. First, again this drop in the capital stock is generated by a very small decline in saving. Second, dynamic general equilibrium effects of this drop leading to a 1 percent drop in the K/Y ratio lead to a 13.5 basis point increase in the MPK, not a 2.4 increase.

Now the steady state calculations of the Solow model likely overstate the effect of fiscal deficits because they are based on permanent changes in national saving and investment. Also, they refer to effects long in the future that may have little relevance even for current long-term interest rates. I will address both these points later in this discussion by considering the dynamic response to a realistic path of deficits in the Solow model. Nonetheless, these calculations are the right theoretical benchmark for starting the discussion of persistent Federal dissaving, and tell a much different story from that of the authors' static calculations.

Before returning to the dynamic general equilibrium impact of a realistic path for deficits, let me raise some further issues about the paper. There are other factors, hard to control for in regressions that affect the relationship between debt or deficits and interest rates. One of the most important ones is monetary policy. Much *Macro Annual* ink has been spilled in the past and will continue to be spilled in the future about how monetary policy affects the real interest rate. But it is pretty clear that when the Fed changes nominal short rates, the real short rate moves almost one-for-one. And these changes in the short rates have a surprisingly strong impact on longer term rates. Hence, whether the Fed is accommodating a fiscal expansion or leaning against it will have a significant effect on the interest rate/deficit linkage. The Fed will behave differently given different circumstances, so this effect is not systematic. For example, in 1993, we had tightening fiscal policy and accommodative monetary policy. In 2003, we had loosening fiscal policy and accommodative monetary policy. Perhaps these effects could be controlled for in the regressions by including a variable that indicated the deviation of the Federal funds rate from its long term target. Doing so would be hard, however, because it is hard to imagine a variable that is more endogenous. Nonetheless, the point that the stance of monetary policy has an important impact on the real rate and that monetary policy and fiscal policy are not unrelated should not be lost.

The long-term stance of monetary policy is also important for fiscal policy and its link to the real interest rate. Around the world, it is fairly clear the Central Banks have new and firm commitments to low inflation. For fiscal policy, this means that there is little prospect for inflating away accumulated debt in the future. This places an added constraint on fiscal authorities such that, if we are to stay out of scary regions predicted by the fiscal theory of the price level, the fiscal balance must be achieved in the future by raising taxes or lowering spending.

This point about monetary policy disciplining fiscal policy leads to more general point about deficits: They might be persistent, but they are not permanent. Though the debt/GDP ratio in the U.S. has some important low-frequency swings, it has stayed under control because we have been willing to pay off the debt we have accumulated by fighting wars and have corrected previous fiscal imbalances. For example, a combination of higher tax rates and stronger-then-expected economic growth during the Clinton administration brought the debt/GDP ratio down (see figures in the paper). It has started to rise again since 2001, but if previous experience repeats itself, some future administration will tackle the fiscal imbalances that we see currently. At some point, presumably when the economy is stronger, political attention will shift to the deficit, as it did in the mid-1980s to 1990s.

Or maybe not. If it becomes clear that the nation does not have the will to pay its bills over the long haul, interest rates are likely to rise sharply. With the looming liabilities associated with aging of the population, it is an open question how this will play out. But for now, financial markets are telling us they do expect the fiscal problems to be addressed.

The data bear out the point that the deficits are persistent, but not permanent. Using annual data, I estimated a simple AR(4) model of the deficit/GDP ratio. Figure 1 presents the dynamic response to a 0.02 of GDP drop in Federal saving. (Controlling for the cycle does not affect the picture much.) This shows persistent deficits, but ones that correct themselves over a decade or so. (These estimates perhaps somewhat understate the persistence of deficits because I have not corrected the AR coefficients for the downward bias. The quarterly largest autoregressive root is 0.93.) Hence, the time series evidence is consistent with a view that deficits, though persistent are not permanent. What if we run this path through the Solow model? I think it corresponds well to what might be expected from the current fiscal imbalances. The impulse is a drop in saving of 0.02 of GDP. This is less than half the size of current deficits, so it allows for some private response to damp the effect on the deficit on national saving.

Figure 2 shows the MPK implications for this dynamic change in the saving rate in the previous graph. The solid line is the one-period MPK. The dashed line is the 10-year forward average—a simple way to approximate the 10-year interest rate that features in the paper. These calculations show that the 10-year rate increases by about 17 basis points on impact. The capital stock is maximally affected in year 8; the 10-year rate peaks somewhat earlier at about an increase of 22 basis points.

Note how much smaller these effects are than a permanent reduction in the saving rate shown in Table 2. That deficits typically self-correct substantially damps their effect. Yet, I view the simulation in Figure 2 as somewhat conservative. It assumes that fiscal discipline will be restored at the historical rate. Given that there is no prospect in the near run for cutting spending, especially with growing national security concerns, and little willingness either to pay for our increased defense, increased drug benefits, or future liability to retirees, a more realistic path of deficits would show higher interest rates.

Finally, I want to conclude by saying that the tight focus on the link between interest rates and Federal saving of this paper misses the larger picture. First, even if there were no interest rate effects, e.g., because foreigners elastically supplied saving to finance our deficit, these loans will have to be repaid. We are simply borrowing from the future. Engen and Hubbard know this point well. That they do not make it, however, testifies to the very narrow focus of this paper and its very narrow implications for the economic effects of debt.

Second, calculations based on the Cobb-Douglas production function and disembodied technology, such as the paper does and I have mirrored, probably understate the cost of squeezing current investment. If there are growth rate effects of capital accumulation or technology is embodied in new capital, the cost of deferring investment could be very much higher than in standard estimates.

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Table 1

Steady State Effect of Changing Saving on MPK: Solow Model

Change in saving rate (fraction)	Change in MPK (percentage points)	Change in K (percent)
-0.01	0.7	-7.4
-0.02	1.5	-14.6
-0.04	3.3	-28.4

Table 2

Steady State Effect of Changing Saving on MPK: Solow Model

Change in saving rate (fraction)	Change in MPK (percentage points)	Change in K (percent)
-0.00036	0.024	-0.27
-0.00134	0.090	-1.0
-0.00200	0.135	-1.5

Figure 1. Dynamics of a Shock to Saving

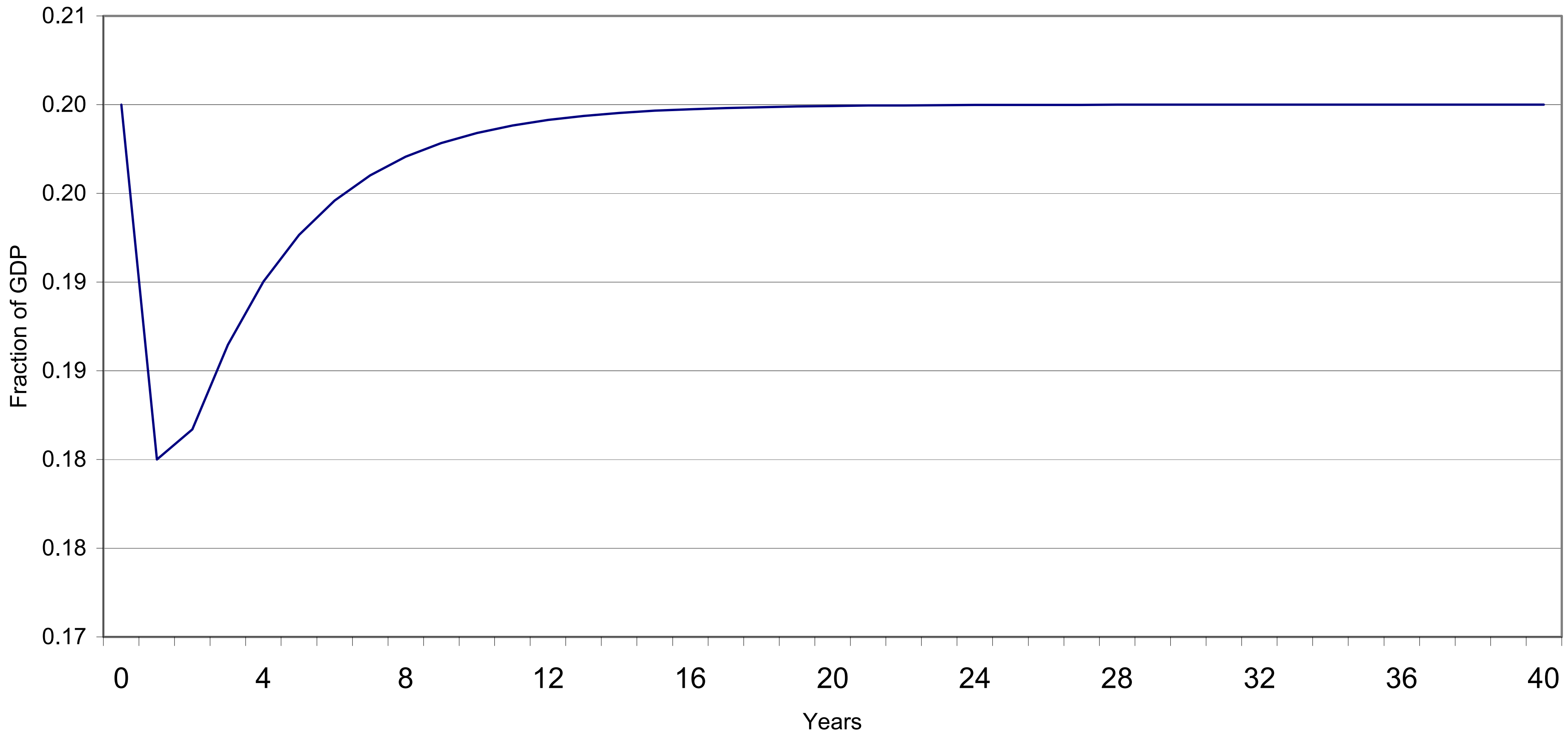

Figure 2. Response of MPK to Shock to Saving, Solow Model