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# INTEREST RATE IMPLICATIONS FOR FISCAL AND MONETARY POLICIES: A POSTSCRIPT ON THE GOVERNMENT BUDGET CONSTRAINT

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Abstract

An earlier paper by the author investigated the quantitative implications, for the effectiveness of fiscal and monetary policies, of a model treating the determination of long-term interest rates by explicitly imposing the market clearing equilibrium condition that the quantity of bonds issued by private borrowers equal the quantity purchased by lenders. One incomplete aspect of that investigation, however, was the failure to allow explicitly for the government budget constraint. This paper reports results based on an expanded model that also imposes an analogous market clearing condition in the U.S. government securities market.

The explicit imposition of the government budget constraint makes a major difference for the simulated effectiveness of both fiscal and monetary policies — indeed, a greater difference than that due simply to using the supply-demand representation of the determination of the private bond rate in the earlier paper. As is to be expected on the basis of familiar economic theory, the effect of imposing the government budget constraint is to make the real-sector effects of fiscal policy appear smaller and the real-sector effects of monetary policy appear greater.

The main message of these results is that, when relative asset stock effects are the heart of the issue — as is the case in analyzing the implications of the government budget constraint — models that are implicitly consistent with the relevant economic behavior are not the same as models that explicitly represent it.

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# INTEREST RATE IMPLICATIONS FOR FISCAL AND MONETARY POLICIES: A POSTSCRIPT ON THE GOVERNMENT BUDGET CONSTRAINT

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An earlier paper by the author [8] investigated the quantitative implications, for the effectiveness of fiscal and monetary policies, of a model treating the determination of long-term interest rates by explicitly imposing the market clearing equilibrium condition that the quantity of bonds issued by private borrowers equal the quantity purchased by lenders. The objective of this structural representation of the corporate bond market was to capture a richer set of financial-nonfinancial interactions, including portfolio-theoretic constraints on the behavior of borrowers and lenders, than are typically found in the more conventional unrestricted reduced-form equations estimated directly with the long-term interest rate as the dependent variable. Apart from the treatment of the determination of long-term interest rates, the model used to simulate the effectiveness of selected policy actions was identical in all respects to the familiar MIT-Penn-SSRC (henceforth MPS) model. The result of that exercise, in brief, was that allowing for a richer set of financial-nonfinancial interactions in this way made the real-sector effects of fiscal policy appear greater, and the real-sector effects of monetary policy appear smaller, than analogous simulations of the unaltered MPS model implied.

One incomplete aspect of that investigation, emphasized in the paper's concluding section (see pp. 350-351), was the failure of either the unaltered MPS model or the combined MPS and corporate bond market model to allow explicitly for the government budget constraint. Although Ando [1] has pointed out that the MPS model does implicitly include the government budget constraint (and Christ [3] has agreed with this proposition), even Ando has acknowledged that the model excludes the financial market relationships necessary to explore fully the relative asset stock effects emphasized by Blinder and Solow [2] and numerous subsequent researchers. Moreover, at the very least the absence of any explicit treatment of the government budget constraint is inconsistent with the spirit of the earlier exercise, the whole point of which was the value of representing financial-nonfinancial interactions explicitly.

Tables 1 and 2 present the results of simulating the effects of one fiscal policy action and one monetary policy action in three separate versions of the MPS model: the unaltered model and the model (denoted MPS-CB) including the supply-demand representation of the determination of the corporate bond rate, both just as in the earlier paper, plus a further expanded model (denoted MPS-CGB) incorporating also an explicit supply-demand representation of the determination of interest rates in four separate maturity sub-markets of the U.S. government securities market due to Roley [10]. Roley's government securities market model and the expanded version of the MPS model incorporating it were developed primarily for the purpose of analyzing debt management policy,[1] and hence both include substantial detail that is unnecessary for evaluating fiscal and monetary policies. What matters here, however, is that the fully combined model does explicitly impose the market clearing equilibrium condition that the quantity of securities sold by the Treasury to finance the government's deficit, less the quantity purchased by the Federal Reserve System in the course of providing the banking system with nonborrowed reserves and accommodating the public's demand for currency, equal the quantity purchased by

TABLE 1

COMPARISONS OF SIMULATED FISCAL POLICY EFFECTS

| Variable | 1974:IV - 1977:I Mean Values | | | | Values in 1975:IV | | | |
|---|---|---|---|---|---|---|---|---|
| | Historical | MPS Model | MPS-CB Model | MPS-CGB Model | Historical | MPS Model | MPS-CB Model | MPS-CGB Model |
| G | 96.6 | 106.6 | 106.6 | 106.6 | 97.4 | 107.4 | 107.4 | 107.4 |
| M | 299.4 | 299.4 | 299.4 | 299.4 | 295.2 | 295.2 | 295.2 | 295.2 |
| $r_{TB}$ | 5.50 | 6.35 | 6.49 | 5.95 | 5.63 | 6.52 | 6.62 | 6.16 |
| $r_{TL}$ | 6.91 | — | — | 7.51 | 7.22 | — | — | 7.88 |
| $r_{AA}$ | 9.10 | — | 9.31 | 9.47 | 9.58 | — | 9.73 | 9.99 |
| $r_{CB}$ | 8.61 | 8.85 | 8.73 | 9.08 | 8.81 | 8.99 | 8.90 | 9.32 |
| $r_{DP}$ | 4.18 | 4.24 | 4.19 | 4.35 | 4.14 | 4.19 | 4.14 | 4.37 |
| S | 954.8 | 954.8 | 970.8 | 917.5 | 900.7 | 903.3 | 915.6 | 856.7 |
| X | 1,241.8 | 1,256.7 | 1,259.9 | 1,247.7 | 1,229.8 | 1,246.1 | 1,248.6 | 1,236.7 |
| IPE | 116.6 | 119.0 | 119.6 | 117.2 | 111.3 | 114.0 | 114.4 | 112.4 |
| IH | 43.8 | 43.3 | 44.2 | 41.2 | 42.5 | 42.0 | 42.8 | 39.1 |
| C | 798.9 | 802.1 | 803.6 | 797.8 | 792.8 | 796.7 | 797.9 | 792.6 |
| P | 130.3 | 130.8 | 130.9 | 130.7 | 130.2 | 130.5 | 130.5 | 130.5 |
| GNP | 1,620.5 | 1,646.5 | 1,651.1 | 1,633.4 | 1,600.8 | 1,626.5 | 1,629.8 | 1,614.5 |
| PRO | 111.2 | 118.1 | 119.7 | 113.9 | 114.7 | 121.6 | 123.0 | 116.2 |
| WH | 174.3 | — | 178.8 | 174.5 | 186.4 | — | 191.8 | 186.8 |
| BC | 28.1 | — | 28.2 | 26.1 | 22.9 | — | 22.3 | 20.4 |
| DF | 57.5 | 63.5 | 61.9 | 67.7 | 69.0 | 74.8 | 73.6 | 79.0 |
| RNB | 34.7 | 33.8 | 33.6 | 34.2 | 35.2 | 34.3 | 34.2 | 34.6 |
| STS | 206.3 | — | — | 219.6 | 207.7 | — | — | 219.0 |

(Table 1 continued on the following page)

(TABLE 1 continued)

Variable Symbols:

G = real federal government purchases ($ 1972 billion)
M = currency plus demand deposits ($ billion)

$r_{TB}$ = 3-month Treasury bill yield (%)
$r_{TL}$ = 10-year-and-over Treasury bond yield (%)
$r_{AA}$ = new-issue Aa utility bond yield (%)
$r_{CB}$ = seasoned Aaa corporate bond yield (%)
$r_{DP}$ = dividend-price yield (%)
S = market value of common stock ($ billion)

X = real gross national product ($ 1972 billion)
IPE = real investment in plant and equipment ($ 1972 billion)
IH = real residential investment ($ 1972 billion)
C = real consumer expenditures ($ 1972 billion)
P = implicit price deflator (index, 1972 = 100)
GNP = gross national product ($ billion)

PRO = corporate profits ($ billion)
WH = households' net accumulation of financial assets ($ billion)
BC = total net new issues and purchases of corporate bonds ($ billion)
DF = federal government deficit ($ billion)
RNB = nonborrowed reserves ($ billion)
STS = supply of Treasury securities held by public investors ($ billion)

TABLE 2

COMPARISON OF SIMULATED MONETARY POLICY EFFECTS

| | 1974:IV - 1977:I Mean Values | | | | Values in 1975:IV | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Historical | MPS Model | MPS-CB Model | MPS-CGB Model | Historical | MPS Model | MPS-CB Model | MPS-CGB Model |
| G | 96.6 | 96.6 | 96.6 | 96.6 | 97.4 | 97.4 | 97.4 | 97.4 |
| M | 5.5* | 7.5* | 7.5* | 7.5* | 295.2 | 302.7 | 302.7 | 302.7 |
| $r_{TB}$ | 5.50 | 3.80 | 3.72 | 4.46 | 5.63 | 3.73 | 3.66 | 4.15 |
| $r_{TL}$ | 6.91 | — | — | 5.88 | 7.22 | — | — | 6.12 |
| $r_{AA}$ | 9.10 | — | 8.54 | 8.13 | 9.58 | — | 9.18 | 8.62 |
| $r_{CB}$ | 8.61 | 8.18 | 8.28 | 7.62 | 8.81 | 8.49 | 8.58 | 7.79 |
| $r_{DP}$ | 4.18 | 4.00 | 4.04 | 3.73 | 4.14 | 4.00 | 4.04 | 3.65 |
| S | 954.8 | 1,027.2 | 1,010.3 | 1,153.5 | 900.7 | 943.4 | 930.7 | 1,054.3 |
| X | 3.0* | 4.3* | 4.1* | 6.1* | 1,229.8 | 1,241.0 | 1,238.1 | 1,259.9 |
| IPE | 116.6 | 119.3 | 118.6 | 123.6 | 111.3 | 112.9 | 112.4 | 115.6 |
| IH | 43.8 | 48.7 | 47.6 | 57.2 | 42.5 | 46.0 | 45.1 | 53.3 |
| C | 798.9 | 805.8 | 804.3 | 817.3 | 792.8 | 797.2 | 795.9 | 804.9 |
| P | 6.7* | 6.9* | 6.9* | 7.4* | 130.2 | 130.2 | 130.2 | 130.2 |
| GNP | 9.9* | 11.6* | 11.3* | 14.0* | 1,600.8 | 1,616.2 | 1,612.4 | 1,640.4 |
| PRO | 111.2 | 120.6 | 118.8 | 134.6 | 114.7 | 121.4 | 119.7 | 132.9 |
| WH | 174.3 | — | 181.5 | 195.2 | 186.4 | — | 191.0 | 202.3 |
| BC | 28.1 | — | 28.1 | 31.6 | 22.9 | — | 26.0 | 30.2 |
| DF | 57.5 | 50.1 | 51.7 | 37.6 | 69.0 | 64.4 | 65.7 | 56.0 |
| RNB | 34.7 | 37.3 | 37.4 | 36.6 | 35.2 | 37.7 | 37.8 | 37.3 |
| STS | 206.3 | — | — | 188.1 | 207.7 | — | — | 198.3 |

Notes: See Table 1 for definitions of variable symbols.
* Indicates value reported is a growth rate, in per cent per annum.

investors.[2]

The results in Tables 1 and 2 show that the explicit imposition of the government budget constraint makes a major difference for the simulated effectiveness of both fiscal and monetary policies — indeed, a greater difference than that due simply to using the supply-demand representation of the determination of the corporate bond rate in the earlier paper. As is to be expected on the basis of familiar economic theory, the effect of imposing the government budget constraint is to make the real-sector effects of fiscal policy appear smaller and the real-sector effects of monetary policy appear greater.

Table 1 shows the three sets of simulated effects of a $10 billion per annum increase in real government purchases, sustained over ten quarters beginning in 1974:IV and ending in 1977:I. As in the earlier paper, each simulation relies on historical values of all exogenous variables other than government purchases. Moreover, each equation in each model is adjusted by adding back the corresponding historical single-equation residuals so that, given historical values for all exogenous variables (including government purchases), each model would exactly reproduce the historical values for all endogenous variables. Hence the differences between the historical and simulated values shown in the table are attributable entirely to the three models' respective representations of the effects of the fiscal stimulus, rather than to any underlying inability to reproduce the historical record. The table provides comparisons of the simulated ten-quarter mean values, as well as the simulated single-quarter values for 1975:IV (the half-way mark), for each of a set of key financial and nonfinancial variables.

In comparison with either of the earlier models' results, explicitly allowing for the government budget constraint more than halves the average stimulative effect on total real income due to the additional government purchases. The mechanism underlying this change is easy enough to see from the bottom three lines in the table. The enlarged government deficit increases the total quantity of government securities outstanding, and the slight reduction in nonborrowed reserves increases yet further the quantity that private-sector investors must hold.[3] Hence long-term interest rates rise much more sharply than in the other two models. (By contrast, short-term interest rates rise less because, with less stimulus to nominal income, there is less pressure of additional money demand against the fixed historical money supply.) The dividend-price yield also rises sharply, thereby depressing equity prices. The higher long-term interest rates "crowd out" investment in housing and, in comparison to the two other models, restrain the accelerator-induced increase in business fixed investment. The lower equity values also crowd out a small amount of consumer spending. Overall, the simulated ten-quarter average "multiplier" of government purchases on total real income is only 0.6, rather than either 1.5 or 1.8 as in the two models studied in the earlier paper.

Table 2 shows three analogous sets of simulated effects of a 2% per annum increase in the growth rate of the money stock, sustained over the same ten-quarter interval. Here the mechanism is reversed, with corresponding but opposite effects. With government purchases held fixed,[4] the monetary policy stimulus to economic activity raises tax revenues and hence sharply reduces the government deficit, and hence also reduces the total quantity of government securities outstanding. Open market purchases by the Federal Reserve, needed to increase nonborrowed reserves (and also to accommodate a small increase in currency demand not shown in the table) further reduce the quantity that private-sector investors must hold. Long-term interest rates and the dividend-price yield therefore fall much further than in the other two models, and equity prices rise further (although short-term interest rates fall less, because of the increased demand for money). The end result is a large stimulus to nearly all components of real spending, especially homebuilding, that more than doubles the simulated effects of faster money growth in comparison with either of the two earlier models.

Although the results of explicitly imposing the government financing constraint on the analysis of both fiscal and monetary policies are qualitatively consistent with the implications of standard economic theory, the magnitudes involved are surprisingly large — in the case of monetary policy so much so as to strain credulity. Instead of the less-than-unit-elasticity response of nominal income to money as in either of the two earlier models, or even a unit-elasticity response as in a simple constant-velocity model, the fully combined model indicates that a 2.0% per annum increase in the growth rate of the money stock leads to a 4.1% per annum increase in the growth rate of nominal income. Further, more than three-fourths of this simulated stimulus to nominal income consists of an increase in the growth rate of real income. To be sure, most of the familiar theoretical propositions about the relationship among money, income and prices presumably do not refer to very short time intervals, but results of this magnitude are startling for an interval of two-and-a-half years.

Although speculating about why a large-scale empirical model delivers a specific set of quantitative results is at best a highly tentative endeavor, the simulated behavior of prices and interest rates shown in Table 2 suggests a possible explanation for these extreme results. First, as is well known, price behavior in the MPS model is very sluggish.[5] Even the increase in the economy's real growth rate from 3.0% to 6.1% per annum, on average over ten quarters, increases the average inflation rate from 6.7% to only 7.4% per annum. Second, in the fully combined model long-term interest rates fall surprisingly low in comparison to even this relatively modest inflation rate. The average after-inflation (before tax) yield on seasoned high-grade corporate bonds is barely positive at 7.62%, while that on long-term Treasury bonds is substantially negative at 5.88%. The model's bond demand and supply equations incorporate some portfolio responses to expected price inflation, but expectations are represented autoregressively and the modeled responses are incomplete.[6] The compounding effect of the interaction between a sluggish inflation response to economic growth and an incomplete portfolio response to inflation represents a plausible explanation for the extreme properties of the monetary policy simulation.

Apart from such specifics, however, the main message of these results is that explicitly allowing for the government budget constraint makes an important difference in judging the effectiveness of both fiscal and monetary policies. When relative asset stock effects are the heart of the issue, as is the case in analyzing the implications of the government budget constraint, models that are implicitly consistent with the relevant economic behavior are not the same as models that explicitly represent it.

## Footnotes

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1. See Roley [11] and Friedman [9].

2. There is no need to repeat here the descriptions already available elsewhere. The basic sources are Ando [1] for the MPS model, Friedman [4, 6] for the corporate bond market model, and Roley [10, 11] for the government securities model. See Friedman [8] for a description of the MPS-CB model and Friedman [9] for a description of the MPS-CGB model.

3. The monetary policy assumption underlying these simulations is that the Federal Reserve System holds the money stock (currency plus demand deposits) to its historical path. The fall in nonborrowed reserves is due mostly to a fall in net free reserves induced by the rise in short-term interest rates.

4. In fact the fiscal policy assumption underlying these simulations is that real government purchases are fixed, so that there is some rise in nominal purchases as prices rise more than historically. The induced price rise is small, however.

5. To recall, even in the MPS-CB and MPS-CGB models all aspects of economic behavior other than the determination of interest rates are exactly as in the unaltered MPS model.

6. See Friedman [5, 7] and Roley [10].

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