An Estimated Fiscal Taylor Rule for the Postwar United States

by Christopher Phillip Reicher

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This paper documents the systematic response of postwar U.S. fiscal policy to fiscal imbalances and the business cycle using a multivariate Fiscal Taylor Rule. Adjustments to taxes and purchases both account for a large portion of the fiscal response to debt, while authorities seem reluctant to adjust transfers. As expected, taxes are highly procyclical; purchases are acyclical; and transfers are countercyclical. Neither pattern has changed much over time, except that adjustment happens more slowly after 1981 than before 1980. The role of adjustments to purchases in stabilizing the debt indicates that the recent discussion about spending reversals is highly relevant.

Keywords: Spending reversals, Fiscal Taylor Rule, deficits, fiscal policy, taxes, spending, transfer payments.

JEL classification: E62, E63, H20, H62.

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Abstract

This paper documents the systematic response of postwar U.S. fiscal policy to fiscal imbalances and the business cycle using a multivariate Fiscal Taylor Rule. Adjustments to taxes and purchases both account for a large portion of the fiscal response to debt, while authorities seem reluctant to adjust transfers. As expected, taxes are highly procyclical; purchases are acyclical; and transfers are countercyclical. Neither pattern has changed much over time, except that adjustment happens more slowly after 1981 than before 1980. The role of adjustments to purchases in stabilizing the debt indicates that the recent discussion about spending reversals is highly relevant.

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1. Introduction

This paper outlines the ways that the U.S. government sector has adjusted taxes, purchases, and transfers to stabilize the public debt since the Second World War using an estimated multivariate Fiscal Taylor Rule. The manner by which fiscal authorities consolidate their fiscal position may affect the size of the fiscal multiplier, and the systematic behavior of fiscal policy is interesting in its own right. This paper finds that fiscal authorities have adjusted taxes and purchases in about equal measure in response to fiscal imbalances during the entire postwar period, while they have not tended to adjust transfers. If the United States behaves as it has previously, it will slowly consolidate its fiscal position coming out of the Great Recession through a combination of tax increases and reductions in purchases, not through cuts in transfer payments.

The manner of stabilization is interesting because government spending reversals can break Ricardian Equivalence. If the government can be expected to consolidate its fiscal position by reducing its amount of purchases in the future, then a debt-financed tax cut or spending increase could have positive real effects since the present value of taxes rises by less than the amount of the intervention. Bohn (1992) shows how an optimizing government might actually wish to reduce real spending in response to fiscal imbalances. More recently, Corsetti, Kuester, Meier, and Müller (2010) and Corsetti, Meier, and Müller (2009) show how expected spending reversals can affect the size of the fiscal multiplier through the "crowding in" of consumption. Corsetti et al. (2009) present some VAR evidence that spending reversals are empirically relevant; this paper directly adopts a structural approach in order to quantify the size of spending reversals.

This paper expands upon the approach of Taylor (2000), with an additional allowance for a feedback from debt into fiscal policy.[1] It extends Taylor's rule to a multivariate setting

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[1] Taylor (2000) models a fiscal reaction function, where fiscal deficits respond to the output gap with a coefficient of 0.5. Galí and Perotti (2003) extend Taylor's framework to discuss debt stabilization.

and looks at the entire government sector, since the line between federal and state and local revenue and spending is not always sharp. Taxes, other net revenue, purchases, and transfers depend systematically on the output gap and on the level of the public debt. These instruments may adjust slowly toward their new targets. As with a monetary Taylor rule, the advantage of a fiscal Taylor rule over a full-scale VECM or VAR is that it is possible to include a fiscal Taylor rule tractably in a dynamic general equilibrium model; the coefficients have a structural interpretation.

The results complement the findings of Bohn (1991) who looks at the entire historical path of federal fiscal policy. Fiscal authorities in the United States have adjusted taxes and purchases about equally during the postwar period, while they are highly reluctant to adjust transfers in response to fiscal imbalances. A one percent rise in the debt-potential GDP ratio results in a 0.19% fall in purchases. Taxes are highly procyclical; purchases are acyclical; and transfers are countercyclical. This rough pattern of response is stable over time, with the only difference being that fiscal consolidation occurs more slowly after 1981 than before. Since fiscal consolidation shows up strongly as a reduction in purchases, it is especially important to take spending reversals into account when talking about multipliers associated with fiscal policy.

2. A multivariate Fiscal Taylor Rule with slow adjustment

The setup is simple. Each fiscal instrument i as a share of potential GDP has two components—a component $\alpha_{y,i} y_t$ which varies according to the output gap and a structural component $\bar{x}_{it}$ which varies over the medium to long run:

$$x_{it} = \alpha_{y,i} y_t + \bar{x}_{it}. \tag{1}$$

The structural component consists of a response to the ratio of debt to potential GDP given by $\alpha_{b,i} b_t$ and a long-run component z_{it} which follows an exogenous random walk

with a drift parameter μ. If the structural component of x_{it} adjusts toward its long-run level at a rate ρ_i then it is possible to write the system (1) in first differences:

$$\bar{x}_{it} = (1 - \rho_i)(z_{it} + \alpha_{b,i}b_t) + \rho_i(\bar{x}_{it-1}),\qquad(2)$$

so:

$$\Delta x_{it} = (1 - \rho_i)(\mu + \alpha_{b,i}\Delta b_t) + \alpha_{y,i}\Delta y_t + \rho_i\left(\Delta x_{it-1} - \alpha_{y,i}\Delta y_{t-1}\right) + \varepsilon_{it}.\qquad(3)$$

If fiscal policy has a systematic effect on output, then a nonlinear OLS estimation of (3) is invalid. However, it is possible to instrument for output growth using debt growth, lagged output, lagged output growth, and the lagged fiscal instruments in growth rates. Equation (3) can then be estimated using nonlinear two-stage least squares. It is necessary to account for the autocorrelation term ρ_i since debt is endogenous.

The data are annual and run from 1946 to 2007. They come from NIPA Table 3.1 and are broken out into taxes (current taxes plus contributions for government social insurance less subsidies, with subsidies extrapolated before 1960 using state data on the current surplus of government enterprises), purchases (consumption and net investment), transfers (government social benefits to persons), and other net revenue (a balancing item). Debt equals the previous year's end of year liabilities of the consolidated government sector given by Flow of Funds Table L.106.c. Log real GDP is detrended by an HP filter ($\lambda = 10$). All variables are divided by trend nominal GDP.

3. Results
3.1 The full sample

Table 1 shows the estimates for the instrumental variables system for the whole sample and estimates for the periods ending in 1980 and beginning in 1981. The overall response of the primary surplus to debt is 0.327, which shows that the government sector

has undertaken a large amount of consolidation in response to fiscal imbalances. Taxes have accounted for about 40% of consolidation and purchases for about 60%, with other net revenue accounting for very little. The government has been very reluctant to adjust transfers in response to the debt; the point estimate for the response of transfers to debt is in fact slightly positive. Bohn (1991) looks at the behavior of total federal government spending (including transfers) and revenue beginning in 1792 using a VECM, and Auerbach (2002) looks at the period since 1984 using simpler regression methods. They both find that adjustments to total spending and revenue both account for a substantial portion of fiscal consolidation. The results in this paper indicate that this result holds as well for the postwar period for the entire government sector, with no role for transfers. If the government behaves in the future as it has in the past, future fiscal adjustments will come to a large extent through reductions in purchases.

As one might expect, taxes are highly procyclical. Given an average tax rate of 25.4% in the data, the point estimate suggests an average macroeconomic tax elasticity of just over one, though this elasticity is estimated with a wide degree of error. Other net revenue is acyclical. Purchases are acyclical, while transfers are highly countercyclical. The government sector appears extremely reluctant to undertake large real spending adjustments in response to cyclical conditions. It prefers to let taxes and transfers vary automatically. Overall primary surpluses have an output coefficient of about 0.40, slightly less than the coefficient of 0.5 suggested by Taylor (2000).

3.2 Stability over time

Table 1 also reports coefficients based on the subsamples from 1946 to 1980 and from 1981 to 2007. Both periods show a similar degree of total fiscal response to the public debt. What has changed is the speed of adjustment. For the three major tax and spending categories, adjustment is much slower post-1981 than pre-1980. This is particularly true for transfers. Before 1980, changes in transfer payments were actually negatively autocorrelated, while after 1981, they show a persistence of 0.58. Taxes, other net revenue, and purchases are about as procyclical or acyclical, respectively, as before.

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Transfers have become somewhat less countercyclical, while the procyclicality of the primary surplus has remained about the same. In general, the systematic behavior of fiscal policy has not changed radically over the postwar period except that adjustment now occurs more slowly.

4. Conclusion

Based on an estimated multivariate fiscal Taylor rule, the entire government sector for the United States has consolidated its fiscal position through about a mix of adjustments to purchases and taxes during the postwar period. Interestingly, it has not adjusted transfers in response to the level of the debt. Neither the response of fiscal policy to the debt nor the cyclical response of fiscal policy has changed much over time. What has changed is the speed of adjustment of fiscal policy. Adjustment has occurred much more slowly since 1981 than before. Spending reversals are a robust feature of the U.S. data, and it is worth looking more closely into the quantitative effect that such reversals may have on tax, spending, and transfer multipliers in a structural model.

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Table 1: Estimates of fiscal responses by instrument (Nonlinear two-stage least squares)

Period	Revenue						Expenditure						Primary surplus	
	Taxes			Other net revenue			Purchases			Transfers				
	α_b	α_y	ρ	α_b	α_y	ρ	α_b	α_y	ρ	α_b	α_y	ρ	α_b	α_y
1946-2007	0.132	0.306	0.262	0.027	-0.019	0.226	-0.191	0.071	0.264	0.022	-0.187	-0.234	0.327	0.403
	0.054	0.063	0.131	0.012	0.016	0.126	0.058	0.069	0.109	0.013	0.038	0.130	0.081	0.102
1946-1980	0.166	0.329	0.124	0.052	-0.015	0.202	-0.300	0.068	0.243	0.052	-0.198	-0.496	0.467	0.442
	0.068	0.071	0.168	0.020	0.017	0.157	0.106	0.090	0.144	0.017	0.040	0.171	0.128	0.122
1981-2007	0.259	0.306	0.565	-0.004	0.036	0.138	-0.113	0.007	0.705	-0.031	-0.068	0.581	0.398	0.403
	0.183	0.102	0.193	0.017	0.034	0.210	0.114	0.039	0.163	0.056	0.037	0.190	0.223	0.120
Change	0.093	-0.023	0.441	-0.057	0.052	-0.064	0.187	-0.061	0.462	-0.083	0.130	1.077	-0.069	-0.040
	0.195	0.124	0.256	0.026	0.038	0.262	0.156	0.098	0.217	0.058	0.054	0.255	0.257	0.171

Source: Data from NIPA and Flow of Funds, regressions based on author's calculations as described in text. The section marked "change" compares the 1981-2007 estimates with the 1955-1980 estimates. Coefficient estimates are presented above standard errors.