Dynamic Scoring: An Assessment of Fiscal Closing Assumptions

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Abstract

Analysis of fiscal policy changes using general equilibrium models with forward-looking agents typically requires the modeler to assume a counterfactual adjustment to some fiscal instrument in order to achieve the debt sustainability implied by the government's intertemporal budget constraint. Since the fiscal instrument chosen to close the model can induce economic behavior unrelated to the policy change in models where Ricardian Equivalence does not hold, noise may be introduced into the analysis. In this paper we use such an overlapping generations framework to examine the impact of alternative fiscal closing assumptions on projected changes to economic aggregates over the ten-year 'budget window' following a change in tax policy, assessing the extent to which the noise associated with a particular fiscal instrument can be mitigated. We find that while quantitative differences in projected macroeconomic activity can be observed across alternative fiscal instruments, these differences tend to shrink as the date that fiscal instruments begin to adjust is delayed into the future. Since the particular fiscal instrument chosen to achieve debt sustainability can then become relatively unimportant, the reliability of policy analysis obtained using this class of models may be improved.

JEL Codes: C63, E62, H63
Keywords: dynamic scoring; fiscal closing assumptions; sustainable fiscal policy

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1 Introduction

General-equilibrium models with forward-looking, rational agents have become a workhorse for analyzing the macroeconomic effects of federal fiscal policy proposals over the 'budget window' both within government and private research institutions.[1] Obtaining a solution to these models, however, typically requires the modeler to assume adjustments to fiscal policy counterfactual to the proposal in order to keep public debt on the sustainable path implied by the government's intertemporal budget constraint. Auerbach (2005), Gale and Samwick (2014), Elmendorf (2015), and Auerbach et al. (2017) emphasize that these fiscal closing assumptions may induce economic behavior unrelated to the policy proposal, as the models typically used for policy analysis do not exhibit the Ricardian Equivalence property. While Diamond and Moomau (2003), Altshuler et al. (2005), CBO (2005), JCT (2006a), and JCT (2006b) provide evidence that budget-window projections of macroeconomic activity following a tax policy change are sensitive to alternative fiscal instruments used for the closing assumption, there is little evidence that exists to show how well the the within-budget-window noise associated with a particular fiscal instrument can be mitigated.

The purpose of this paper is both to provide a quantitative assessment of the within-budget-window effects associated with alternative fiscal instruments used in practice, and to explore the extent to which the associated noise can be mitigated. We examine the effects associated with choosing lump-sum transfer payments as the fiscal instrument for adjustment as in Zodrow and Diamond (2013), non-valued government consumption as in DeBacker et al. (2018) and Page and Smetters (2016), or a combination of both as in Moore and Pecoraro (2018). We do so using the overlapping generations model of Moore and Pecoraro (2018) (MP-OLG), a framework which shares core properties common to other models used for policy analysis, including the absence of Ricardian Equivalence.

In our analysis, we repeatedly simulate a tax policy change, each time varying only the fiscal instrument and implementation timing of the closing assumption. We find that while quantitative differences in key macroeconomic aggregates and prices projected over the budget window can be observed across alternative fiscal instruments, these differences tend to shrink as the closing date is delayed. The choice of a fiscal instrument to be used for adjustment therefore becomes less important for the analysis, given that debt is on a sustainable path, because forward-looking agents discount the future when making current decisions. To the extent that the counterfactual effects associated with the particular fiscal instruments used in the closing assumption are mitigated in practice, the reliability of policy analysis obtained using this class of models may be improved.

2 Fiscal Sustainability

2.1 The Government's Budget Constraint

In the class of dynamic general equilibrium models with rational, forward-looking agents, the government typically faces a recursive budget constraint of the form:

$$TR_t + G_t = T_t + B_{t+1} - (1 + \rho_t)B_t \tag{2.1}$$

[1] The 'budget window' is the immediate ten-year period over which budgetary effects of United States federal policy changes are currently measured. For analyses of the recently enacted PL 115-97 'Tax Cuts and Jobs Act' using such models, see JCT (2017), PWBM (2017), and DeBacker et al. (2018).

where TR_t denotes net transfers to households, G_t is government consumption expenditures, T_t is tax revenue, and B_t is the stock of public debt which is serviced at rate of interest ρ_t. Equation (2.1) determines the path of debt for a given sequence of $\{TR_{t+i}, G_{t+i}, T_{t+i}, \rho_{t+i}\}_{i=0}^{\infty}$. Since forward-looking agents condition on this information when making current decisions, public debt must be on 'sustainable' path such that the sequence of revenues and outlays allow for the debt to be serviced over an infinite horizon.

Budgetary implications associated with a sustainable debt path can be shown by performing recursive substitutions of equation (2.1) and allowing time to approach infinity:

$$\lim_{k\to\infty}\sum_{i=0}^{k-1}\left(\frac{TR_{t+i}+G_{t+i}}{\prod_{s=0}^{i}(1+\rho_{t+s})}\right)=\lim_{k\to\infty}\sum_{i=0}^{k-1}\left(\frac{T_{t+i}}{\prod_{s=0}^{i}(1+\rho_{t+s})}\right)-B_t+\lim_{k\to\infty}\frac{B_{t+k}}{\prod_{s=0}^{k-1}(1+\rho_{t+s})}$$

Ruling out explosive debt paths requires:

$$\lim_{k\to\infty}\frac{B_{t+k}}{\prod_{s=0}^{k-1}(1+\rho_{t+s})}=0 \tag{2.2}$$

so that debt cannot indefinitely grow at rate larger than its rate of interest along any sustainable debt path. Satisfaction of the no-Ponzi condition (2.2) implies the following intertemporal government budget constraint:

$$\sum_{i=0}^{\infty}\left(\frac{TR_{t+i}+G_{t+i}}{\prod_{s=0}^{i}(1+\rho_{t+s})}\right)=\sum_{i=0}^{\infty}\left(\frac{T_{t+i}}{\prod_{s=0}^{i}(1+\rho_{t+s})}\right)-B_t \tag{2.3}$$

Although the government's budget can be in total deficit or surplus in any given period post-reform, equation (2.3) implies that the present discounted value of tax receipts net of the debt position at time t must be sufficient to finance the present discounted value of outlays in any feasible equilibrium.

2.2 The Fiscal Closing Assumption

A non-revenue-neutral tax policy change will alter the present discounted value of receipts on the right-hand side of equation (2.3). If the policy-induced change to cumulative deficits implies that debt will indefinitely grow at a rate larger than its rate of interest and therefore violate equation (2.2), there must be a compensating adjustment to some fiscal instrument so that equation (2.3) holds. While this adjustment may in principle occur through any fiscal instrument available to the government, it is common in practice for the modeler to choose either lump-sum transfers, non-valued government consumption expenditures, or some combination of the two. This involves the re-specification of $\{TR_{t+i}, G_{t+i}\}_{i=0}^{\infty}$ post-reform in some fashion not specified in the actual policy proposal under analysis.

A change to either fiscal instrument for purposes of achieving debt sustainability will be internalized by all agents either directly through their individual budget constraint, or indirectly through general equilibrium, and thereby introduce counterfactual behavior into the analysis: A change in transfer payments will alter the present discounted value of lifetime net income expected by those households receiving them in the initial equilibrium. This may introduce a non-negligible income effect to these households, who would respond by altering their savings or labor supply plans. A change in government expenditures, on the other hand, will alter the quantity of final goods purchased. This may induce a

non-negligible change in the rate of capital accumulation, as firms would desire to use a different quantity of capital in combination with labor when production levels change in response to the change in government expenditures. Thus, the projected macroeconomic activity over the budget window will therefore depend not only on the tax policy being modeled, but also on the counterfactual fiscal closing assumption chosen.

3 Simulations

3.1 Model and Policy Experiment

The MP-OLG model is a large-scale overlapping generations model developed specifically for the macroeconomic analysis of tax policy proposals.[2] It shares characteristics common to general equilibrium models of this class: Finitely-lived corhots households make labor supply, saving, and consumption choices, discounting utility generated by future choices relative to current choices. Firms demand labor and business capital each period for production and sale of an output good that can be transformed by households into a consumable good or a financial asset. Taxes are collected on income by a government and, along with public bond issues, are used to finance expenditures and transfer payments.

Using the MP-OLG model, we repeat a tax policy change performed in Moore and Pecoraro (2018): We simulate a permanent ten-percent reduction in the United States federal statutory tax rates applied to ordinary income —which includes wage income, interest income, short-term capital gains, nonqualified dividends, and pass-through business income —relative to 2018 present tax law, assuming that any expiring tax provisions in our baseline are permanent. The conventional revenue effect amounts to slightly less than 0.8% per year over 2019-2028.[3] The policy change is unanticipated by agents, after which time all agents are assumed to have perfect foresight regarding both future fiscal policy and economic conditions. We repeatedly simulate this reform, varying only the fiscal instrument and implementation timing of the closing assumption imposed: Adjustments using 100% lump-sum transfer payments and 100% non-valued government consumption expenditures are made in turn contemporaneously with reform in year 1, as well as in post-reform years 11, 21, and 31. In each case, we allow adjustment to occur in a linearly decreasing fashion over ten years following the specified closing date.

3.2 Results and Discussion

Tables 1 and 2 show the responses of key macroeconomic variables due to the tax policy change where lump-sum transfer payments and non-valued government consumption expenditures are used in turn as the fiscal instrument for adjustment. These responses are expressed as average annual percent changes relative to the present-law baseline over the ten-year budget window. For ease of comparison, we highlight cases where these absolute differences are greater than 0.1 percentage points.

We note two important patterns: First, the response of aggregates are qualitatively consistent across all eight fiscal closing assumptions. In each case, the policy change is shown to increase economic activity in labor, capital, and product markets while generating a large revenue loss. Second, there are large quantitative differences in the response of

[2]See Moore and Pecoraro (2018) for a detailed description of the model and calibration.

[3]The conventional revenue effect is the estimated change in tax receipts from those projected under a present law baseline forecast, holding constant gross national product. See JCT (2011) for more details.

aggregates across fiscal instruments when the fiscal closing assumption is imposed shortly after the policy change, such as in years 1 and 11.

The substantial quantitative differences across fiscal instruments described above arise because each particular fiscal instrument introduces counterfactual behavior into the analysis. Consider the results in Table 1 where transfer payments to households decrease to stabilize the path of debt: Effective labor supply is relatively high due to an income effect as there is an expected reduction in households' present discounted value of lifetime net income. Since this raises the marginal product of capital, more business capital investment occurs. As a result, aggregate output increases by relatively more when fiscal closing is imposed in earlier years than in later years. Similarly, consider the results in Table 2 where government consumption expenditures decrease to achieve fiscal sustainability: The increase in business capital is relatively smaller, which reflects the reduction in expected production in response to less government purchases of final goods.

Our main finding, evident from a comparison of Tables 1 and 2, is that the different effects associated with each fiscal instrument tend to weaken within the ten-year budget window the further that the fiscal closing date is pushed into the future. This result occurs because households who discount future utility give less weight to the effects of future fiscal policy when making current decisions, and zero weight to effects occurring after their lifetime. As the fiscal closing date is delayed, provided debt remains on a sustainable path, the effects idiosyncratic to each particular fiscal instrument are quantitatively mitigated over the budget window.

There are limitations to the length of time that the fiscal closing date can be delayed, thereby mitigating the noise associated with the closing assumption, as there must be sufficient resources available to return debt to a sustainable path. For example, using the MP-OLG model, we cannot simulate the policy analyzed here while imposing fiscal closing in year 41 with either fiscal instrument. As the model is calibrated to target the relative size of present-law U.S. federal tax revenues, net transfer payments, public investment, as well as public debt and debt servicing costs in the initial baseline, there is not a sufficient level of transfers or government consumption expenditures available to return public debt to a sustainable path following four decades of debt financing for this particularly large policy change. For this reason, the extent to which fiscal closing can be delayed is both model- and policy-specific.

Finally, as an alternative to using 100% transfer payments or government consumption as the fiscal instrument for adjustment, we also report results using both fiscal instruments simultaneously in Table 3 where each instrument finances half of the necessary adjustment. Cases where the absolute difference from the corresponding average of the two previous alternatives is greater than 0.1 percentage points are highlighted in gray. Our results show that, when imposed at a given time after the budget window, this hybrid fiscal closing assumption generates aggregate responses that are good approximations of a simple average of the alternative two assumptions. Since the fiscal instrument to be used in the future to maintain debt sustainability is often unknown a priori when policy changes are analyzed, this relationship provides support for use of the hybrid fiscal closing assumption as a reasonable alternative in practice.

4 Conclusion

This paper has examined the effects of different fiscal closing assumptions on budget-window projections of macroeconomic activity following a change in tax policy, assessing the effects to which the noise associated with the particular fiscal instrument chosen for adjustment to maintain a sustainable debt path can be mitigated. Focusing on two fiscal instruments commonly-used to balance the government's budget in the long run, lump-sum transfer payments and government consumption expenditures, we have found that quantitative differences in projected aggregates across instruments tend to shrink as the fiscal closing date is delayed. This result implies that the choice of fiscal instrument used to achieve the debt sustainability implied by the government's intertemporal budget constraint becomes less important for the quantitative analysis as the closing date is pushed further into the future.

The mechanism which underlies our findings depends on the behavior of forward-looking, rational agents who discount future utility. Since agents with these characteristics are typically present in other macroeconomic models used for policy analysis that require a fiscal closing assumption, we expect these findings to generalize. To the extent that the counterfactual effects associated with the choice of a particular fiscal instrument used to close the model are mitigated, the reliability of budget-window analyses produced by this class of models may be improved.

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Table 1: Fiscal Closing with Lump-Sum Transfers

10-year Average Annual Percent Change Relative to Present-Law Baseline	Year Fiscal Closing Imposed			
	1	11	21	31
Aggregates				
Output	1.6	1.5	1.4	1.3
Business Capital Stock	1.4	1.1	0.8	0.7
Effective Labor Supply	1.7	1.7	1.6	1.6
Market Consumption	-0.1	-0.0	-0.1	-0.1
Housing Capital Stock	-0.5	-0.3	-0.4	-0.4
Federal Tax Revenue	-2.7	-2.9	-3.0	-3.1
Prices				
Real Return to Capital	-0.1	0.2	0.3	0.4
Real Wage Rate	-0.1	-0.3	-0.3	-0.3

Table 2: Fiscal Closing with Government Expenditures

10-year Average Annual Percent Change Relative to Present-Law Baseline	Year Fiscal Closing Imposed			
	1	11	21	31
Aggregates				
Output	1.3	1.3	1.2	1.3
Business Capital Stock	1.3	0.7	0.7	0.7
Effective Labor Supply	1.4	1.6	1.5	1.5
Market Consumption	-0.0	-0.3	-0.1	-0.2
Housing Capital Stock	-0.3	-0.4	-0.4	-0.5
Federal Tax Revenue	-3.0	-3.0	-3.1	-3.0
Prices				
Real Return to Capital	-0.1	0.4	0.4	0.3
Real Wage Rate	-0.1	-0.3	-0.3	-0.3

Table 3: Fiscal Closing with 50% Lump-Sum Transfers and 50% Government Expenditures

10-year Average Annual Percent Change Relative to Present-Law Baseline	Year Fiscal Closing Imposed			
	1	11	21	31
Aggregates				
Output	1.7	1.4	1.3	1.3
Business Capital Stock	1.4	0.9	0.8	0.8
Effective Labor Supply	1.8	1.6	1.6	1.6
Market Consumption	-0.1	-0.0	-0.1	-0.2
Housing Capital Stock	-0.5	-0.3	-0.4	-0.4
Federal Tax Revenue	-2.6	-3.1	-3.0	-3.0
Prices				
Real Return to Capital	-0.0	0.3	0.4	0.4
Real Wage Rate	-0.2	-0.3	-0.3	-0.3

Highlighted cells indicate an absolute difference greater than 0.1% from the corresponding average of the two alternatives