Discussion of "Optimal Monetary Policy and Fiscal Policy Interaction in a Non-Ricardian Economy"

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1. Introduction

Markets are incomplete. In recent years, much progress has been made in understanding the positive implications of market incompleteness (e.g., Auclert 2017; Kaplan, Moll, and Violante 2016; McKay, Nakamura, and Steinsson 2016; McKay and Reis 2016b). However, because models with incomplete markets tend to be quite intractable, relatively little work has explored their normative implications (notable exceptions are McKay and Reis 2016a; Sheedy 2014).

This paper by Rigon and Zanetti (this issue) represents progress on that front. They embed a Blanchard-Yari overlapping-generations (OLG) structure in an otherwise standard New Keynesian model. Markets are incomplete because generations yet to be born cannot trade claims with those that are alive today. But the degree of market incompleteness is limited and tightly controlled by the birth/death rate in the economy. This keeps the model tractable and allows them to study the implications for optimal monetary policy. The key result is that market incompleteness introduces a motive for the central bank to stabilize debt.

In my view, this paper presents a very useful and very interesting analysis. However, it is only a first step toward exploring the vast, complex problem of optimal monetary policy under incomplete markets.

In my discussion I focus on highlighting the key elements that generate the debt-stabilization result in the model. As such, I deviate from the quantitative setup in Rigon and Zanetti and simplify the model as much as possible. I then discuss the robustness and limitations of this result.

2. Simplified Model

I assume perfect foresight of aggregate quantities after an unexpected shock at $t = 0$. Product and labor markets are perfectly competitive, and prices P and wages W are fixed at their steady-state values. I normalize the price level to $P = 1$. I also abstract from government spending.

Each period a generation of size γ is born. With iid probability γ, a member of a current generation dies. The time discount factor is β, so everyone discounts the future at rate $\gamma\beta$. The per-period utility function is logarithmic in consumption C_t and leisure $1 - L_t$. Thus, an individual of age s chooses a consumption path to maximize,

$$\max_{\{C_{s,t+k}\}_{k=0}^{\infty}} \sum_{k=0}^{\infty} (\gamma\beta)^k \left[\ln C_{s,t+k} + \ln(1 - L_{s,t+k})\right].$$

(Because of sticky wages the individual does not freely choose labor supply.)

There is perfect consumption insurance within a generation of age s. Any bond holdings by members who died are distributed among surviving members. Conditional on survival, the return on a \$1 bond purchased is then $\$\gamma^{-1}(1 + i_t)$. We can therefore write the individual budget constraint as

$$C_{s,t} + \frac{\gamma}{1 + i_t} B_{s,t} = W L_t + B_{s,t-1} - T_t,$$

where $B_{s,t}$ are bond holdings and T_t are net taxes by the government.

The government finances any issuance of government bonds through taxes,

$$B_t = (1 + i_t)(B_{t-1} - T_t),$$

and taxes are increasing in past debt holdings,

$$T_t = T + \phi_1(B_{t-1} - B).$$

Output is produced using a technology linear in labor, so market clearing in the labor market and the goods market requires

$$L_t = Y_t = C_t.$$

2.1 Solution

Given logarithmic utility and perfect foresight, an individual's consumption function is linear in wealth,

$$C_{s,t} = (1-\gamma\beta)\left[B_{s,t-1} + \sum_{j=0}^{\infty}\left(\prod_{k=0}^{j-1}\frac{\gamma}{1+i_{t+k}}\right)(WY_{t+j} - T_{t+j})\right], \tag{1}$$

where $B_{s,t-1}$ captures financial wealth and the summation captures human wealth net of taxes.

Since the consumption function is linear, aggregation is straightforward. The aggregate consumption function is

$$C_t = (1-\gamma\beta)\left[B_{t-1} + \sum_{j=0}^{\infty}\left(\prod_{k=0}^{j-1}\frac{\gamma}{1+i_{t+k}}\right)(WY_{t+j} - T_{t+j})\right].$$

It is immediate that differences in consumption across generations occur only through financial wealth,

$$C_{s,t} - C_t = (1-\gamma\beta)(B_{s,t-1} - B_{t-1}).$$

Bond holdings are critical in the Rigon and Zanetti analysis, both as a determinant of aggregate demand and as a determinant of intergenerational inequality. The next two subsections analyze each part in turn.

2.2 Bond Holdings and Aggregate Demand

Substituting the intertemporal budget constraint for the government into the aggregate consumption function reveals why bonds are net wealth:

$$C_t = (1-\gamma\beta)\left[\sum_{j=1}^{\infty}\left(\prod_{k=0}^{j-1}\frac{1-\gamma}{1+i_{t+k}}\right)T_{t+j} + \sum_{j=0}^{\infty}\left(\prod_{k=0}^{j-1}\frac{\gamma}{1+i_{t+k}}\right)WY_{t+j}\right].$$

So long as there is some generational turnover, $\gamma < 1$, higher taxes in the future raise consumption today. This is because current generations hold claims to taxes on future generations in the form of bonds.

Thus, if the government were to issue bonds today financed by a stream of taxes in the future, then this raises aggregate demand today. And because prices are sticky, the increase in aggregate demand will raise output unless offset by an increase in nominal interest rates $\{i_{t+s}\}_{s=0}^{\infty}$. To the extent that the central bank will want to stabilize aggregate demand and output, it would therefore have to respond to variations in the level of outstanding bonds.

2.3 Bond Holdings and Inequality

Bond holdings also determine the dispersion of demand across cohorts. Rigon and Zanetti assume that new generations are endowed with the steady-state level of bonds, B. Thus, their consumption will typically differ from the average consumption of other cohorts, which is determined by B_{t-1},

$$C_{0,t} - C_t = (1 - \gamma\beta)(B - B_{t-1}). \tag{2}$$

These consumption differences are suboptimal from the perspective of the social planner, whose goal is to equalize marginal utility across alive generations. In particular, the aggregate welfare function is

$$(1-\gamma)\sum_{s=0}^{\infty}\gamma^s\left[\ln\frac{C_{s,t}}{C_t}\right] + \ln C_t + \ln(1-Y_t),$$

where the first term captures differences in marginal utility, while the second and third terms are the standard aggregate utility of consumption and leisure. Since the log function is concave, a mean-preserving spread would reduce $\sum_{s=0}^{\infty}\gamma^s\left[\ln\frac{C_{s,t}}{C_t}\right] \leq 0$. Up to a second-order approximation, this term directly maps into the cross-sectional variation in consumption and the cross-sectional variation in bond holdings,

$$\sum_{s=0}^{\infty}\gamma^s\left[\ln\frac{C_{s,t}}{C_t}\right] \approx -\frac{1}{2}\mathbb{V}_s\left(C_{s,t}\right) = -\frac{1}{2}\mathbb{V}_s\left(B_{s,t}\right),$$

where $\mathbb{V}_s$ is the cross-sectional variance. (The equality follows from the linear consumption function (1).) Thus, inequality in bond holdings reduces welfare.

To minimize the cross-sectional variance, the central bank will need to keep bond issuance B_{t-1} near its steady-state level B. Per equation (2), this will imply that new generations have similar consumption levels as old generations. Thus, the central bank will want to stabilize debt. It can do so by changing the financing cost i_t.

Note that fiscal policy could reduce consumption dispersion to zero by transferring B_{t-1} bonds to new generations as opposed to B. Since fiscal policy is assumed to be suboptimal, the onus to correct the inefficiency falls on monetary policy.[1]

2.4 Optimal Monetary Policy

The effects of bond holdings on aggregate demand and inequality create a new tradeoff for monetary policy. As in any Keynesian model, an increase in the nominal interest rate reduces aggregate demand. However, an increase in nominal interest rates also raises the quantity of bonds B_t, because higher debt costs for the government necessitate the issuance of additional debt when $\phi_1 < 1$. This increase in bonds partly offsets the increase in aggregate demand, but more importantly raises inequality. This implies that the central bank will trade off aggregate demand stabilization with reducing inequality.

For example, suppose that an economy starts with an initial level of bonds above steady-state $B_{-1} > B$. Aggregate demand is high, $C_0 = Y_0$ are above their efficient (steady-state) levels, and the central bank will want to raise nominal interest rates to stabilize output. However, an increase in i_0 also raises B_0, which increases consumption dispersion next period. Since inequality is already inefficiently high, the central bank will moderate the interest rate increase and not completely offset the increase in aggregate demand.

2.5 Quantitative Results

How quantitatively important is this new tradeoff? When γ is calibrated to match the average lifetime of a generation (fifty years),

[1]This feature is common to many Keynesian models. For example, Correia et al. (2013) show that there exists a set of tax instruments that can perfectly replicate any monetary policy. In that sense, optimal monetary policy is always conditional on fiscal policy not already correcting all distortions.

then the effects of bond holdings on both aggregate demand and inequality are small. First, when γ is close to 1, then bonds constitute relatively little net worth since current bondholders are likely to be alive when taxes are due. Second, the new generation born is small, so that any differences in bond holdings by the newborn only translate into small changes in total inequality. Thus, the central bank can largely ignore the tradeoff and achieve near-perfect stabilization.

In a second calibration, the authors set $\gamma = 0.93$, which implies an average lifetime of 3.5 years. In that calibration the central bank is much more cautious about raising nominal interest rates because it is significantly more concerned about the increase in inequality.

This raises the question of which calibration is more reasonable. Clearly, only the first comes close to matching average lifetime. However, an alternative way to discipline the model is to match an aggregate marginal propensity to consume (MPC). Here the MPC out of wealth is

$$MPC_W = (1 - \gamma\beta),$$

which is equal to 0.077 when $\gamma = 0.93$. This suggests that the degree of market incompleteness remains fairly small. For example, Kaplan and Violante (2014) suggests an average MPC in the population near 0.2–0.25.

Indeed, the degree of market incompleteness looks even smaller when I calculate the MPC out of transfers. This more closely approximates the tax rebates in Greer, Parker, and Souleles (2006) and Parker et al. (2013). Here the MPC from a one-time transfer to current generations (assuming constant i) is

$$MPC_T = \underbrace{(1 - \gamma\beta)}_{MPC_W} \underbrace{\frac{\phi_1(1-\phi_1)(1-\gamma)}{1-(1-\gamma)(1-\phi_1)}}_{\Delta W \text{ direct}} \underbrace{\frac{1-\gamma(1-\phi_1)}{\gamma\beta(1-\beta^{-1}(1-\phi_1))}}_{GE},$$

where ΔW captures the change in wealth from a change in bond holdings and GE are the general equilibrium effects from an increase in aggregate demand. In the $\gamma = 0.93$ calibration this is equal to $MPC_T = 0.001$, because the increase in wealth is still quite small.

This suggests that, first, the aggregate demand effects of bond holdings are of second-order importance for monetary policy relative to the inequality effects. Second, even the $\gamma = 0.93$ calibration may be too conservative given that the aggregate MPC is small. Thus, it seems quite plausible that the debt-stabilization motive will be important in a realistic calibration.

3. Does the Result Generalize?

Nevertheless, I am somewhat skeptical that debt stabilization will be a general and robust result in models with incomplete markets. In general, the objective of the central bank will be to complete the market and thereby fix the market failure. In the Rigon and Zanetti model, this requires the central bank to stabilize debt. However, it is not difficult to write down models with incomplete markets where stabilizing debt would yield suboptimal outcomes.

For example, take a simple three-period New Keynesian model with a continuum of agents. At $t = 0$ the economy is in a symmetric steady state without income risk. At $t = 1$ there is an unexpected idiosyncratic income shock, and at $t = 2$ incomes are again symmetric across agents. For simplicity, I fix all prices at the $t = 0$ steady-state values. Income in period 1 can be either high or low and is a fraction of aggregate income, $y_{i1} = \epsilon_i Y_1$ where $\epsilon_i \in \{\epsilon_L, \epsilon_H\}$. The borrowing limit is $\phi(Y_1, i_1)$ and binding for agents with a low income realization at $t = 1$. The market clearing conditions are $Y_0 = C_0$, $Y_1 = C_1$, and $Y_2 = C_2$. Consumption by each type relative to aggregate consumption is

$$\frac{c_{H1}}{C_1} = \frac{1}{1+\beta}\left(\epsilon_{H1} + \frac{1}{Y_1(1+i_1)}\right)$$

$$\frac{c_{L1}}{C_1} = \epsilon_{L1} + \underbrace{\frac{\phi(Y_1, i_1)}{Y_1}}_{\propto \text{ Debt/GDP}} .$$

The borrowing constraint is a form of market incompleteness, which causes inefficient consumption inequality across the two types. In this model there is inefficiently little borrowing and lending. If the central bank can relax the borrowing constraint through monetary policy, $\frac{d\frac{\phi(Y_1,i_1)}{Y_1}}{di_1} < 0$, then optimal policy "overheats" the economy and increases debt-to-GDP to reduce consumption inequality. By contrast, stabilizing debt at its initial level (zero) would be counterproductive. The problem in this economy is that there is too little borrowing following the idiosyncratic income shock, not too much.

This is only an illustrative example to showcase that changing the source of market incompleteness can result in very different optimal monetary policy than the Rigon and Zanetti model.

4. Conclusion

This is not to take away from Rigon and Zanetti's very interesting and important analysis of the interplay of inequality and monetary policy. However, it is only a first step. Going forward, it will be important to see what results generalize to other settings. The existing literature on optimal monetary policy provides a useful benchmark: many studies have shown that price-level targeting performs well in numerous setups, such as pricing frictions, imperfect information, or the zero lower bound. It would be useful if we could establish similar robust policy recommendations when markets are incomplete.

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