How does the timing of markets affect optimal monetary and fiscal policy in sticky price models?

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ABSTRACT

This paper studies optimal monetary and fiscal policy with the Svensson timing in a sticky price model of a stochastic production economy. In this model, the government collects distortionary taxes, prints money, and issues nominal non-state-contingent bonds to finance an exogenous stream of public spending. The numerical results show that (1) optimal monetary and fiscal policy is quantitatively sensitive to the timing of markets; (2) the fundamental nature of optimal monetary and fiscal policy is not sensitive to the timing of markets; and (3) the findings are robust to key structural parameters.

1. Introduction

Following the tradition begun by Lucas and Stokey (1983) and Chari et al. (1991), numerous works have studied optimal monetary and fiscal policy (OMFP hereafter) in sticky price models. A major goal of these efforts is to quantitatively characterize OMFP with dynamic stochastic general equilibrium (DGSE) models. One ad hoc assumption in this large literature is the Lucas timing of markets with which the money market meets before the goods market in each period and nominal money holdings are freely adjustable in response to shocks (Lucas and Stokey, 1983). A natural concern is whether the key theoretical results in this literature are sensitive to the timing of markets, particularly the Svensson timing with which the goods market meets before the money market in each period. The concern arises because with the Svensson timing, money balances are not freely adjustable in response to shocks and they provide liquidity services (Svensson, 1985). These two features associated with the Svensson timing have different policy implications about OMFP, especially in sticky price models.

First, they imply a different volatility of optimal inflation because the Svensson timing introduces an additional trade-off with respect to the value of using inflation variations as a shock absorber. On the one hand, since nominal money balances, due to the Svensson timing assumption, cannot respond to the shocks, inflation variations across states then will bring a direct cost to households from the demand side. On the other hand, the value of liquidity services provided by nominal money balances is subject to inflation variations and households will, due to the precautionary saving motivation, accumulate relatively more nominal money balances to insure against inflation uncertainty.

Second, they imply a higher mean of optimal inflation. With the Svensson timing, nominal money balances provide liquidity services (Svensson, 1985). From the Ramsey government’s perspective, such services should be taxed. This, in turn, implies a higher optimal nominal interest rate, which is the direct tax on nominal money balances and thus an indirect tax on the liquidity services, and which implies a higher mean of optimal inflation than in the Lucas time case. As a result, the introduction of the Svensson timing may help solve one unrealistic feature of OMFP in the literature: the negative mean of optimal inflation.

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This feature is a standard, but widely criticized, result in models with the Lucas timing and has been shown in numerous studies except few works such as Khan et al. (2003) and Schmitt-Grohé and Uribe (2007). It is worth further exploring the impact of the Svensson timing on the mean of optimal inflation because a positive mean of optimal inflation will have a non-negligible impact on OMFP (Ascari and Ropele, 2007).

Third, they imply that the existing near random walk property of real public debt and tax rates may not hold if the volatility of optimal inflation becomes sufficiently large due to the aforementioned trade-off. The near random walk property of tax rates, as an empirical fact, was presented in the descriptions of French and British eighteenth-century public finance in Sargent and Velde (1995), Barro (1979) and Ayigari et al. (2002) explain such a fact with different theoretical models. Later, Schmitt-Grohé and Uribe (2004) and Siu (2004) show that both real public debt and tax rates follow a near random walk property in sticky price models. As emphasized in Schmitt-Grohé and Uribe (2004), whether such a property remains in a theoretical model in which the Ramsey government issues nominal non-state-contingent debt hinges on a negligible volatility of optimal inflation. Since it is not clear how the aforementioned trade-off will affect the volatility of optimal inflation, it is of theoretical interest to check whether such a near random walk property is sensitive to the timing of markets.

In the presence of the above qualitative policy implications and given that both assumptions on the timing of markets are ultimately ad hoc, it is of interest to check whether the existing results about OMFP are quantitatively sensitive to the timing of markets and to what extent if any. However, it is surprising that the impact of the Svensson timing, in particular that of the aforementioned trade-off, on OMFP has not been formally analyzed yet. For example, Chugh (2009) has not provided a formal analysis of the impact of the trade-off on OMFP. There reason is the well known “surprising inflation” result in the literature: with the Lucas timing, the optimal initial price level in a flexible price environment is given by the representative household chooses consumption, $c_t$, working hours, $h_t$, and financial assets $M_t$ and $D_{t+1}$ (which denote the nominal money balance and the one-period state-contingent bond, respectively), to maximize its discounted expected lifetime utility function

$$\max_{c_t, h_t, M_t, D_{t+1}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c_t, h_t).$$

where $\mathbb{E}_0$ denotes the mathematical expectation operator conditional on information available in period 0 and $\beta \in (0, 1)$ denotes the subjective discount factor. The single period utility function $u$ is assumed to be increasing in consumption, decreasing in work effort, strictly concave and twice continuously differentiable. We follow the literature by assuming that the single period utility function is separable between consumption and hours.

The production good $c_t$ is a composite good made of a continuum of intermediate differentiated goods. The aggregation mechanism is given by the Dixit-Stiglitz aggregator. Each household produces one variety of intermediate goods with linear technology, $z_t h_t$. Here household hours, $h_t$, are the only input and productivity $z_t$ follows an exogenous process which will be given in Section 3.1. The household is the monopolistic supplier of the intermediate good, and sets the price of the good it supplies taking the level of the aggregate demand as given. And the household is constrained to satisfy demand at that price, that is,

$$z_t h_t \geq Y_t d(p_t).$$

$Y_t d(p_t)$ denotes the demand for the intermediate input where $Y_t$ denotes the level of aggregate demand and $p_t$ denotes the relative price of the intermediate good in terms of the composite consumption good. Mathematically, $p_t = \frac{P_t}{P_{t-1}}$. The demand function $d(\cdot)$ is decreasing and satisfies $d(1) = 1$ and $d'(1) < 1$. The restrictions on $d(1)$ and $d'(1)$ are necessary for the existence of a symmetric equilibrium. The household hires labor from a perfectly competitive market.

The period budget constraint of the household/firm unit is given by

$$0 = M_{t-1} + D_t + P_{t-1} \left[ \frac{P_t}{P_{t-1}} Y_t \frac{d(P_t)}{P_t} - w_t h_t - \frac{\theta}{2} \left( \frac{P_t}{P_{t-1}} - 1 \right)^2 \right]$$

$$+ (1 - \tau) P_t w_t h_t - P_t c_t \left[ 1 + s(y_t) \right] - M_t - \mathbb{E}_t r_{t+1} D_{t+1},$$

where $w_t$, $y_t$, and $r_{t+1}$ denote the real wage rate, the consumption-based money velocity, and the price of the one-period state-contingent bonds multiplied by the probability of the corresponding contingent state, respectively. Here the consumption-based velocity is given by

$$v_t = \frac{P_t c_t}{M_{t-1}}.$$
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