



Optimal monetary policy and economic growth

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ABSTRACT

A question at the center of many analyses of optimal monetary policy is, why do central banks never implement the Friedman rule? To the list of answers to this question, we add neoclassical production (specifically, the Tobin effect) as one possible explanation. To that end, we study an overlapping generations economy with capital where limited communication and stochastic relocation create an endogenous transactions role for fiat money. We assume a production function with a knowledge externality (Romer style) that nests economies with endogenous growth (AK form) and those with no long-run growth (the Diamond model). The Tobin effect is shown to be always operative. Under CRRA preferences, a mild degree of social increasing returns is sufficient (but not necessary) for some positive inflation to dominate zero inflation and for the Friedman rule to be sub-optimal, irrespective of the degree of risk aversion.

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1. Introduction

The Friedman rule, Milton Friedman's classic prescription for the optimal conduct of monetary policy, remains to date the most significant dictum in monetary theory. Friedman (1969) argued that good monetary policy is one that equates the private opportunity cost of holding money (the nominal interest rate) to its social opportunity cost (which is zero). By this logic, optimal monetary policy should never be expansionary. Critics were quick to point out potential problems with this line of thinking. Phelps (1973) argued that following a contractionary policy as proposed by Friedman may require the government to make up the lost seigniorage using distortionary means which may negate the alleged benefit of the policy. Symmetrically, others have argued that seigniorage may have enough beneficial uses to justify an expansionary policy.¹ Lastly, the empirical evidence suggests that central banks (CBs) never implement the Friedman rule. Walsh (2003a) identifies six countries that have targeted the inflation rate. Each has set its long-run target between zero and three percent, which is clearly inconsistent with a zero nominal interest rate.

This paper studies another potential limitation of Friedman's logic using an argument first articulated in Tobin (1965): What if monetary expansion caused income to rise and grow, thereby overwhelming the non-distortionary benefit of following a contractionary policy? In today's parlance, if the Tobin effect is operative, can the Friedman rule ever be

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¹ Levine (1991) considers an environment in which there are two types of infinitely lived agents who randomly become buyers or sellers and information on agents' type is private. If buyers value consumption sufficiently more than sellers do, and if there is some randomness in the economy, then Levine shows that the optimal monetary policy is *expansionary* and not contractionary as the Friedman rule would suggest. As in our setting, lump-sum taxes that fund the contraction are imposed symmetrically on both the types. As such, a contraction hurts "an unlucky buyer" and because buyers value consumption sufficiently more than sellers do, this monetary action hurts buyers more than it benefits sellers and hence reduces overall welfare.

optimal? In a sense, the Tobin effect and the Friedman rule represent two divergent views on the desirability of inflation.² The former argues that inflation, by raising the relative return to capital, stimulates capital formation and hence growth. The latter argues that monetary expansion raises the opportunity cost of holding real balances and makes liquidity, potentially a desirable commodity, more costly. Which effect dominates? More broadly, can the Tobin effect account for why we do not observe the Friedman rule being implemented.³

We address this question within the context of a monetary growth model. We specify an overlapping generations model economy with capital where limited communication and stochastic relocation create an endogenous transactions role for fiat money.⁴ At the end of each period, a fraction of agents is relocated; only fiat money is useful as a means to “communicate” with their past (hence the “limited communication”). The “stochastic relocations” act like shocks to agents’ portfolio preferences and, in particular, trigger liquidations of some assets at potential losses. They have the same consequences as “liquidity preference shocks” in Diamond and Dybvig (1983), and motivate a role for banks that take deposits, hold cash reserves. The other asset is a commonly available neoclassical technology with knowledge externalities, as in Romer (1986); more specifically, the production function is given by $Y_t = A\bar{K}_t^\beta K_t^\theta L_t^{1-\theta}$, where K_t denotes the capital stock of a representative firm, L_t denotes the amount of labor hired, and \bar{K}_t is the aggregate capital stock in the economy. The assumed knowledge-externality form of the production function nests economies with endogenous growth (AK form, i.e., $\theta + \beta = 1$) and those with no long-run growth (i.e., $\theta + \beta < 1$ as in the classic Diamond, 1965 model).

Our results are as follows. Because seigniorage is rebated to young agents as a lump-sum transfer, the Tobin effect is operative. Under logarithmic utility, we show that the Friedman rule is not optimal (stationary welfare maximizing) if the steady state is dynamically efficient. In this case, we can also show that zero inflation is not optimal (indeed some amount of positive inflation dominates zero inflation). Under the more general CRRA form of preferences, we find that a sufficient (not necessary) condition for some positive inflation to dominate zero inflation is that $\theta + \beta \in (\frac{1}{2}, 1)$; for most realistic values of θ , this translates into a requirement that the societal production function exhibits mild increasing returns. For parameter values such that the economy is dynamically efficient under logarithmic utility, the Friedman rule is not optimal for any value of the risk aversion parameter.

These results stand in contrast to those obtained in economies with linear (fixed real return) storage technologies. Since almost all the literature thus far has focused on linear storage economies and not on neoclassical production economies, an important contribution of this paper is to highlight the fact that optimal monetary policy is strikingly different in these two kinds of economies. As discussed in Wallace (1980), a linear storage economy is one in which 1 unit invested in date- t storage (or capital) returns $x > 1$ units of date- $t + 1$ units of the consumption good. By definition, such economies are dynamically efficient. Bhattacharya et al. (2005b) and others have demonstrated that linear storage random relocation economies, irrespective of the degree of risk aversion, always return a verdict in favor of zero inflation. Here, in contrast we are able to show, for example, that for logarithmic utility, zero inflation is suboptimal if the economy is dynamically efficient. The reason is that in economies with linear storage technologies, storage holdings of the current generation do not influence the incomes of future generations. With neoclassical production, instead, any seigniorage collected is rebated to the young which augments the deposit base of the young and, in standard cases, raises the investment in capital, and hence future incomes.

This paper is related to a vast literature on the Friedman rule (see Bhattacharya et al., 2005a and the references therein). More specifically, our paper complements the work by Paal and Smith (2004) who study suboptimality of the Friedman rule in an environment with endogenous growth that shares many similarities with ours. In a money-in-the-utility-function overlapping generations economy with production, Weiss (1980) finds that the optimal policy produces positive inflation. Smith (1998) studies an overlapping generations monetary economy with production in which the rate of return dominance issue is settled by postulating a minimum size to capital investment that limits one group of agents to holding money. By focusing on the dynamically inefficient equilibria, he shows that welfare at the Friedman rule may be dominated by other feasible monetary policies. Similarly, Palivos (2005) studies an overlapping generations economy with production and heterogeneity in preference for altruism and finds that a case for positive inflation can be made even when capital does not respond to inflation. Our work also complements that of Dutta and Kapur (1998) who pose the exact question as ours in a overlapping generations economy with irreversible unobservable capital investments and uninsured liquidity preference risk (similar to ours). They find that the optimal inflation rate is positive if the Tobin effect is not operative.

² McCallum (1990) observes that in many environments in which the Friedman rule is the optimal monetary policy, money is superneutral. Indeed, most of the literature has focused on economies populated by infinitely lived representative agents (ILRA). Walsh (2003b) provides an excellent overview of the literature dealing with these models, superneutrality, and the Friedman rule. Bhattacharya et al. (2005b) present a detailed discussion on the differences between the Friedman rule in ILRA economies and overlapping generations economies.

³ Nikitin and Russell (2006) review the evidence on superneutrality and on deviations from superneutrality. They argue that when inflation rate is below zero, or positive, but very close to zero, there is clear evidence supporting the Tobin effect. Hence, it is empirically plausible that the Tobin effect is a major reason for suboptimality of Friedman’s rule in the real world. We thank an anonymous referee for suggesting this connection.

⁴ The random relocation with limited communication model was popularized by Champ et al. (1996) and has been used to investigate monetary policy issues in Schreft and Smith (1998), Paal and Smith (2004), Smith (2002), Antinolfi et al. (2001), Antinolfi et al. (2007), among others. The model economy captures Friedman’s idea that fiat money serves a liquidity function as relocated agents need it to overcome the limited communication friction. Tobin’s portfolio allocation problem is embodied in the bank’s problem. In our setup, the bank does not face aggregate risk and can make the efficient portfolio allocation.

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