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The cost of capital, asset prices, and the effects of monetary policy

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ABSTRACT

The primary objective of this paper is to study the interaction between monetary policy, asset prices, and the cost of capital. In particular, we explore this issue in a setting where individuals face idiosyncratic risk. Incomplete information also provides a transactions role for money so that monetary policy can be studied. In contrast to standard monetary growth models which focus on the transmission of monetary policy to the demand for capital goods, we incorporate a separate capital goods sector so that the supply response to monetary policy is taken into account. Consequently, in contrast to the standard monetary growth model, monetary policy plays an important role in investment activity through the relative price of capital goods. Moreover, different sources of productivity can affect the degree of risk sharing. Although the optimal money growth rate falls in response to an increase in productivity in either sector of the economy, monetary policy should react more aggressively to the level of productivity in the capital sector.

1. Introduction

One of the primary responsibilities of central banks is to determine the degree of policy intervention necessary to regulate investment activity in the economy. The neoclassical growth model is the building block for understanding the determinants of real economic activity. In order to address the long-run impact of monetary policy on economic activity, a transactions role for money is introduced through a cash-in-advance constraint or as an argument in the utility function. Such models suggest that money growth is either completely unrelated to economic activity (Sidrauski, 1967) or it acts as a tax on investment (Stockman, 1981). Alternatively, monetary policy may affect economic activity through a Tobin asset substitution channel in which an increase in the rate of money growth generates an increase in investment. Regardless of the direction of policy, standard monetary growth models prescribe transmission channels based entirely on one factor – investment demand. However, would the impact of policy depend on the relative price of capital goods? What about the supply response of the capital sector?

This transmission channel does not appear to receive attention in the monetary growth literature. Standard neoclassical growth models with money are based upon a fixed price of capital. That is, the standard neoclassical growth model does not

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differentiate between investment and consumption. Alternatively, the neoclassical growth model – resting on the response of a single infinitely-lived representative agent to the direction of monetary policy – cannot address how monetary policy affects the relative price of investment. (See, for example, Stockman (1981) and Abel (1985)) Yet, in evaluating the impact of policy, it is important to consider conditions in the capital sector. For example, Goolsbee (1998) shows that equipment goods prices respond to fiscal policy initiatives designed to promote investment. *Consequently, the relative price of capital should also depend on the stance of monetary policy* – a policy channel which cannot be studied in standard neoclassical growth models with money or standard adjustment cost models of investment.[2]

This paper develops a framework to investigate the relationships between monetary policy, asset prices, and the cost of capital. In particular, the paper emphasizes the role of supply behavior from the capital sector. Specifically, the price of capital goods is determined by constructing a two-sector model with adjustment costs in the production of capital goods. In addition, individuals encounter idiosyncratic liquidity risk. Moreover, incomplete information leads to a transactions role for money so that monetary policy can be studied. As in standard models with adjustment costs in investment, the production of capital goods combines consumption goods and the capital stock currently in place. Notably, higher levels of capital accumulation alleviate frictions from adjustment costs. As the rate of money growth affects the relative price of capital goods, the model generates a number of insights into the optimal design of monetary policy.

Since the economy includes two sectors of production, the level of productivity in each sector has important implications for asset pricing and risk sharing. In particular, we study the asymmetric impact of productivity from the capital sector compared to neutral technological change. In this manner, interesting connections between monetary policy and the sources of productivity emerge from our framework because money growth affects the degree of risk sharing.

We proceed by providing specific details about our modeling framework. We construct a two-period overlapping generations model in which individuals are born in two geographically separated locations. Within each location, agents have complete information regarding others' asset holdings. If an individual is forced to relocate, there is no public record-keeping device (see, for example, Kocherlakota (1998)) which allows intermediaries to verify an individual's asset holdings in the home location and authorize a transfer of goods. Thus, individuals do not have the ability to establish claims to assets.[3] Moreover, restrictions on asset portability imply that money must be used to overcome these frictions.[4] Therefore, the model introduces money into a Diamond and Dybvig (1983) setting, following Schreft and Smith (1997).

In addition to two separate locations, there are two different production sectors: consumer goods and capital. In the capital sector, firms face adjustment costs. The equilibrium price of capital reflects decisions by two different groups of participants in the market for capital. On the supply side, capital producers sell capital in order to maximize profits. On the demand side, intermediaries acquire capital on behalf of depositors. From this perspective, our model builds on ideas from "supply function theory" discussed by Mussa (1977).

1.1. Related literature

As a benchmark, one might consider adopting a standard Real Business Cycle type model to study the relationships between monetary policy, capital-embodied productivity, and asset pricing. For example, a separate capital goods sector could be introduced in a framework such as Cooley and Hansen (1989) to study how inflation affects economic activity through the relative price of capital goods. Alternatively, one could introduce a cash-in-advance constraint into Christiano and Fisher (2003).

There are two primary reasons for adopting our structure as opposed to the other approaches. The first reason is that we wish to study the effects of monetary policy in a framework which has a meaningful transactions role for money. Standard RBC approaches lack microeconomic foundations that provide a medium of exchange role. Therefore, the transmission mechanisms behind the effects of monetary policy are unclear. By comparison, in our framework, some individuals are 'anonymous' in trading. Consequently, privately-issued liabilities do not circulate in trade. Thus, only outside money will be accepted as a means of payment.

Second, as articulated by Bencivenga and Smith (1991), an active intermediary sector promotes investment and capital accumulation. Yet, standard RBC approaches omit a role for intermediaries as they focus solely on the behavior of an infinitely-lived representative agent. Because all agents are homogeneous in RBC-type models, there is no role for risk-sharing which is an important function of banking firms (Diamond and Dybvig, 1983). As a result, our framework provides some clear contributions to previous research as conditions in the capital sector affect the ability of intermediaries to provide risk-pooling services. Moreover, monetary policy plays an important role in the degree of risk-sharing in the economy.

[2] Standard adjustment cost models do not consider a separate capital goods sector. In this manner, standard adjustment cost models are similar to the standard neoclassical growth model – in both approaches, there is a perfectly elastic supply of the investment good. That is, the transmission of monetary policy to capital accumulation primarily works through investment demand. However, standard adjustment cost models differ from neoclassical growth frameworks since firms must incur *internal* adjustment costs from converting goods into productive capital. In contrast, our framework identifies an interesting transmission channel for monetary policy through the *supply of capital goods and external adjustment costs*. (See Mussa (1977) and Chirinko (1993) for an extensive survey of the adjustment costs literature.) Moreover, our framework with multiple production sectors features distinct levels of investment-specific productivity and neutral productivity.

[3] There are a few examples of random relocation models in which privately-issued liabilities circulate. See, for example, Azariadis et al. (2001). Also, Bullard and Smith (2003a,b).

[4] Similar restrictions on asset portability have been exploited in previous work on monetary economies – for example, Kocherlakota (2003).