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Money, liquidity and welfare ☆

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ABSTRACT

This paper develops an analytically tractable Bewley model of money demand to shed light on some important questions in monetary theory, such as the welfare cost of inflation. It is shown that when money is a vital form of liquidity to meet uncertain consumption needs, the welfare costs of inflation can be extremely large. With log utility and parameter values that best match both the aggregate money demand curve suggested by Lucas (2000) and the variance of household consumption, agents in our model are willing to reduce consumption by 3–4% to avoid 10% annual inflation. The astonishingly large welfare costs of inflation arise because inflation increases consumption risk by eroding the buffer-stock-insurance value of money, thus hindering consumption smoothing at the household level. Such an inflation-induced increase in consumption risk at the micro level cannot be captured by representative-agent models or the Bailey triangle. Although the development of financial intermediation can mitigate the problem, with realistic credit limits the welfare loss of moderate inflation still remains several times larger than estimations based on the Bailey triangle. Our findings provide a strong justification for adopting a low inflation target by central banks, especially in developing countries where money is the major form of household financial wealth.

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1. Introduction

In developing countries, liquid money (cash and checking accounts) is the major form of household financial wealth and a vital tool of self-insurance (precautionary saving) to buffer idiosyncratic shocks because of the lack of a well-developed financial system. Based on recent data in China and India, more than 90% of the household financial wealth is held in the form of cash and checking accounts.[1] Even in developed countries, because of borrowing constraints and costs of participating in the financial markets, money remains one of the most important assets to provide liquidity to smooth consumption for low-income households. Mulligan and Sala-i-Martin (2000) document that the majority of households in the United States do not hold financial assets other than checking accounts. In particular, based on the Survey of Consumer

☆ This paper is a revised version of Wen (2009).

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[1] Townsend (1995) points out that currency and crop inventory are the major forms of liquid assets to provide self-insurance against idiosyncratic shocks for farmers in India and Thailand, and surprisingly, purchases and sales of real capital assets, including livestock and consumer durables, do not play a role in smoothing income fluctuations.

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Finances (SCF), on average (over the period 1989–2007) nearly 60% of U.S. households do not hold any nonmonetary financial assets (interest-bearing assets), and about 50% of those that hold checking accounts do not hold any interest-bearing assets. In addition, money demand is highly heterogeneous: The Gini coefficient of the distribution of money across households is greater than 0.85 in the United States. This degree of heterogeneity in money demand closely resembles the distribution of financial wealth instead of consumption (with a Gini coefficient less than 0.3). This suggests that the liquidity motive of money demand is at least as important (if not more so) as the transaction motive of money demand, even in developed countries such as the United States.[2]

When money is essential (as a store of value) for consumption smoothing and is unequally distributed across households, largely because of idiosyncratic needs for liquidity and the lack of sophisticated risk sharing, inflation can be far more costly than recognized by the existing literature, which suggests that the welfare cost of inflation is less than 1% of aggregate output (see, e.g., Lucas, 2000).[3]

This paper argues that to properly assess the welfare cost of inflation in developing countries (as well as for low income people in rich countries), it is desirable to use a theoretical model that takes the liquidity function of money and the precautionary motives of money demand into account, so as to capture the buffer-stock-insurance value of cash in addition to the opportunity cost of forgone interest as suggested by Bailey (1956). The loss of the insurance value of money under inflation may generate far larger welfare costs than implied by the Bailey triangle because inflation reduces real money demand and exposes more cash-poor households to idiosyncratic risks by destroying the liquidity value of cash.

This paper constructs such a model by generalizing Bewley's (1980,1983) precautionary money demand model into a tractable, dynamic stochastic general equilibrium (DSGE) framework where money can coexist with other assets (such as capital).[4] The key feature distinguishing Bewley's model from the related monetary literature, such as the heterogeneous-agent cash-in-advance (CIA) model of Lucas (1980) and the (S,s) inventory-theoretic model of Baumol (1952) and Tobin (1956), is that money is held solely as a store of value, completely symmetric to any other asset, and is not imposed from outside as the means of payments. Agents can choose whether to hold money depending on the costs and benefits. By freeing money from its role of medium of exchange, Bewley's approach allows us to focus on the inventory function of money as a pure form of liquidity, so that the welfare implications of the liquidity-preference theory of money demand can be investigated in isolation. Beyond Bewley (1980, 1983), my generalized model is analytically tractable; hence, it greatly simplifies the computation of equilibrium in DSGE environments with both idiosyncratic and aggregate shocks, capital accumulation, financial intermediation, and nontrivial distributions of cash balances, thus facilitating welfare and business-cycle analysis. Analytical tractability also makes the mechanisms of the model highly transparent.

The major finding of the paper is that persistent money growth is very costly. When the model is calibrated to match not only the interest elasticity of aggregate money demand but also the extent of idiosyncratic risk faced by households in the data, the implied welfare cost of increasing the inflation rate from 0% to 10% per year is around 3% to 4% of consumption (or even higher).

Since holding money is both beneficial (providing liquidity) and costly (forgoing interest payment and bearing the inflation tax), agents opt to hold different amounts of cash depending on income levels and consumption needs. As a result, a key property of the model is an endogenously determined distribution of money holdings across households, with a strictly positive fraction of households being cash-constrained (i.e., with zero cash balances) in equilibrium. Hence, lump-sum money injections have an immediate positive impact on consumption for the cash-constrained agents, but not for agents with idle cash balances. Consequently, the aggregate price does not increase with the aggregate money supply one for one, so transitory monetary shocks are expansionary to aggregate output (even without open market operations), the velocity of money is countercyclical, and the aggregate price appears "sticky."

However, with anticipated inflation, permanent money growth reduces welfare significantly for several reasons: (i) precautionary money demand induces agents to hold excessive amounts of cash to avoid liquidity constraints, raising the inflation tax on the population. (ii) Cash-poor agents suffer disproportionately more from the inflation tax because they are more likely to be subject to idiosyncratic risks without self-insurance; thus, for the same amount of reduction in real wealth, inflation reduces their expected utility more than it does for liquidity-abundant agents.[5] (iii) The size of the liquidity-constrained population (with zero cash balances) rises rapidly with inflation, leading to an increased portion of the

[2] Ragot (2009) reports that this stylized fact holds for other developed countries and argues that this is a problem for theories that directly link money demand to consumption, such as cash-in-advance (CIA), money-in-the-utility (MIU), or shopping-time models, but is consistent with incomplete-market models in which money is held as a form of financial asset that provides liquidity to smooth consumption.

[3] Small welfare costs of inflation are also obtained by many others, such as Cooley and Hansen (1989); Dotsey and Ireland (1996); Henriksen and Kydland (2010), in different models. Lagos and Wright (2005) obtain a significantly higher welfare cost of inflation in a search model of money—about 4% of aggregate consumption with a 10% inflation rate. Our welfare results are comparable to those obtained by Lagos and Wright (2005) in the order of magnitude, but with an entirely different mechanism and micro foundation.

[4] General-equilibrium analysis with capital accumulation is important. Cooley and Hansen (1989) emphasize the general-equilibrium effect of inflation on output through substituting leisure for consumption in the face of positive inflation, which causes labor supply and output to decline. However, because these authors assume that money is held only for transaction purposes, the welfare cost of inflation is still small despite the general-equilibrium effects of inflation on output, about 0.4–0.5% of GDP with 10% inflation.

[5] This asymmetric effect of inflation is related but different from the distributional effect emphasized by Erosaa and Ventura (2002) in a heterogeneous-agent model where rich households rely more on credit transactions than low-income households.