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Economic growth under money illusion ☆

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ABSTRACT

Empirical and experimental evidence documents that money illusion is persistent and widespread. This paper incorporates money illusion into a stochastic continuous-time monetary model of endogenous growth. We model an agent's money illusion behavior by assuming that he maximizes nonstandard utility derived from both nominal and real quantities. Money illusion affects an agent's perception of the growth and riskiness of real wealth and distorts his consumption/savings decisions. It influences long-run growth via this channel. We show that the welfare cost of money illusion is negligible, whereas its impact on long-run growth is noticeable even if the degree of money illusion is low.

1. Introduction

The term money illusion refers to the phenomenon where people confuse nominal with real magnitudes. It is widely believed that this term was coined by Irving Fisher who devoted an entire book to the subject (Fisher, 1928). The presence of money illusion has frequently been invoked to account for the short-run non-neutrality of money by Keynesian economists and by some quantity theorists such as Fisher.[2] However, money illusion is often regarded as irrational and costly to decision makers, and hence economists have resisted to use money illusion in formal analysis, with the possible exception of Akerlof and Yellen (1985a,b). Interests on money illusion have been revived by a growing body of empirical and experimental evidence since the mid-1990s, which prompted theoretical studies by Akerlof et al. (1996, 2000) on the Phillips curve, Piazzesi and Schneider (2008) on housing market, and by Basak and Yan (2010) on investor behavior.

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[2] According to Keynesian economics (Keynes, 1936; Leontief, 1936), workers suffer from money illusion. The labor supply depends on the nominal wage rate whereas the demand depends on the real wage. A rise in the price level will raise the equilibrium level of employment.

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In this paper, we extend the preference-based formulation of money illusion by Basak and Yan (2010) and incorporate this extension into an endogenous growth model. We study how the presence of money illusion affects the relationship between inflation and long-run economic growth. Endogenous growth is introduced by adopting the one-sector AK framework of Jones and Manuelli (1990) and Rebelo (1991). Money is introduced via the money-in-the-utility (MIU) function framework of Sidrauski (1967a,b).[3] We show that money illusion affects an agent's perception of the growth and riskiness of real wealth and hence distorts his consumption/savings decisions. Intuitively, real wealth includes real money balances. A money-illusioned agent values both real and nominal terms and hence both expected inflation and inflation uncertainty affect his decision rules.

Our model is tractable and allows us to derive closed-form solutions. Yet, it is rich enough for calibration and quantitative assessments. We establish that the welfare cost of money illusion is second order, whereas the impact on long-run economic growth is first order in terms of the parameter that captures the degree of money illusion. When calibrating our model to the U.S. annual data from 1960 to 2006, we find that a small degree of money illusion, in the sense that the representative agent puts 5% weight on nominal quantities in utility evaluation, results in a negligible welfare loss of 0.06% of real income, whereas it lowers the rate of economic growth by a noticeable 0.11 percentage point. This result complements the one in Basak and Yan (2010),[4] and is reminiscent of the Keynesian proposition that small deviations from rationality have small welfare losses, but can have a significant impact on economic outcomes (Akerlof, 2002; Akerlof and Yellen, 1985b; Mankiw, 1985).

We show that in theory, the monetary authority can choose a growth rate of the money supply to eliminate the cost of money illusion by correcting the distortions on consumption/savings decisions. This monetary policy implements a specific nonzero expected inflation rate or a constant nominal interest rate such that the distortions arising from the agent's misperception of the growth and riskiness of real wealth offset each other.

One may argue that money illusion should not persist in the long run as agents can learn. However, as argued by Shafir et al. (1997), money illusion arises in large part because it is considerably easier and more natural for individuals to think in nominal rather than in real terms. This tendency is likely to persist despite economists' attempts to educate the public. Akerlof et al. (2000) use a variety of psychological evidence to argue that high inflation, not the passage of time, may dissipate money illusion. High inflation is salient so that people may take into account the difference between nominal and real values. Our quantitative results provide support for this psychological argument. We find that the welfare cost of money illusion is small for low inflation. It rises nonlinearly with the expected inflation rate and becomes large for high inflation.

Our model can shed light on the growth and inflation relationship.[5] While some researchers find evidence for a negative relationship (e.g., Barro, 1996; Chari et al., 1995), other empirical studies show that this relationship is not robust (e.g., Bullard and Keating, 1995; Sarel, 1996; Bruno and Easterly, 1998; Dotsey and Sarte, 2000; Fischer et al., 2002; Khan and Senhadji, 2001). We prove that this relationship depends on the representative agent's risk attitudes or the elasticity of intertemporal substitution.[6] In particular, growth and inflation are negatively (positively) related if the degree of relative risk aversion is greater (less) than unity. They are independent if the degree of relative risk aversion is equal to unity.

The rest of the paper is organized as follows. In Section 2, we survey the related literature and provide justification to our formulation. In Section 3, we study a MIU model of endogenous growth in the presence of money illusion. In Section 4, we analyze the quantitative effects of money illusion and discuss the monetary policy that eliminates the welfare cost of money illusion. We conclude in Section 5. Proofs and technical details are relegated to appendices.

2. Related literature

Our paper is related to two strands of literature. First, it is related to the literature on money illusion, which dates back to the early 20th century.[7] Fisher (1928, p. 4) defines money illusion as "the failure to perceive that the dollar, or any other unit of money, expands or shrinks in value." Leontief (1936) defines that there is no money illusion if demand and supply functions are homogeneous of degree zero in all nominal prices. This is what Leontief (1936) called the "homogeneity postulate." Beginning with Haberler (1941, p. 460) other writers have used the term money illusion as synonymous with a violation of this homogeneity postulate. Patinkin (1965) objects this use on the grounds that it fails to take into account the real balance effect. Patinkin (1965, p. 22) defines that "an individual will be said to be suffering from such an illusion if his excess-demand functions for commodities do not depend [...] solely on relative prices and real wealth."

In a static model, the absence of money illusion in Patinkin's sense is equivalent to the assumption of rational behavior, in the following sense. Let an agent's demand functions $x_i^*(p_1,\ldots,p_n,W)$ for goods $i=1,\ldots,n$, together with his money

[3] For robustness, we also analyze a model with a cash-in-advance (CIA) constraint on consumption purchases. We find identical results (see Appendix B).

[4] Basak and Yan (2010) demonstrate that the welfare loss of money illusion to an investor is small for typical environments, while its impact on equilibrium can be considerable.

[5] We note that both inflation and economic growth are endogenous. Their relationship essentially refers to the relationship between money growth and output growth since inflation is determined by the money growth.

[6] Under our power utility specification, the degree of relative risk aversion is equal to the inverse of the elasticity of intertemporal substitution.

[7] See Howitt (1987) for an early survey of the literature on money illusion.