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Monetary policy, doubts and asset prices

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ABSTRACT

Asset prices and the equity premium might reflect doubts and pessimism. Introducing these features in an otherwise standard New-Keynesian model changes optimal policy in a substantial way. There are three main results: (i) asset-price movements improve the inflation-output trade-off so that average output can rise without much inflation costs; (ii) a "paternalistic" policymaker – maximizing the expected utility of the consumers under the true probability distribution – chooses a more accommodating policy towards productivity shocks and inflates the equity premium; (iii) a "benevolent" policymaker – maximizing the objective through which decisionmakers act in their ambiguous world – follows a policy of price stability.

1. Introduction

After the 2007–2009 financial crisis, some argued that monetary policy had been too expansionary fuelling an asset price bubble.[1] This paper revisits the theme of monetary policy and asset prices in a standard New-Keynesian monetary model. An important shortcoming of current models is to have counterfactual implications for the equity premium and other financial relationships. This issue is addressed by introducing distortions in agents' beliefs– doubts and ambiguity aversion – which enable the model to reproduce realistic values for the equity premium and the market price of risk.[2]

The focus of this work is to study how the presence of doubts and ambiguity influences the characterization of optimal monetary policy. In our framework, agents do not trust the true probability distribution and make robust choices using a distorted probability distribution. In this environment, the objective of a policymaker caring about the agents might not be uniquely defined. This paper distinguishes between a "paternalistic" policymaker who cares about the utility of agents evaluated under the true probability distribution, and a "benevolent" policymaker who maximizes the objective through which agents handle their decisions in their ambiguous world. The policy conclusions change in a substantial and interesting way with respect to the rational-expectations model, when the policymaker is paternalistic, while they do not change for the benevolent policymaker.

With rational expectations, the welfare-maximizing policy following a productivity shock requires price stability. Moreover, average output cannot rise because it is too costly to increase inflation and therefore price dispersion.[3] In our

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[1] See for instance the discussion of Taylor (2007) and Section 5 in Greenspan (2010).

[2] Doubts and aversion to ambiguity are introduced using the framework of Hansen and Sargent (2005, 2008). See Barillas et al. (2009) for the ability of this framework to reproduce realistic values for the equity premium and the price of risk.

[3] For an overview of the main results of the literature see Benigno and Woodford (2005), Khan et al. (2003) and the recent review of Woodford (2010b).

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framework, the welfare-maximizing policy of the paternalistic policymaker is more accommodating and involves an increase in inflation following positive productivity shocks. Distorted beliefs enter the stochastic discount factor. This creates a wedge between average real marginal costs (or average output) and average inflation. The wedge is driven by the co-movements between the stochastic discount factor and the real marginal costs. Since the stochastic discount factor is negatively related to long-run productivity, it is countercyclical. If real marginal costs are procyclical, as following accommodating policies, average output can increase without much rise in average inflation and price dispersion. The side effect of this optimal policy is the increase in the volatility of quantities and a larger equity premium. When the policymaker is instead benevolent, two forces balance out to deliver price stability as the optimal policy. One pointing towards a more procyclical policy response through the channel described above, and the other towards a countercyclical policy because now ambiguity enters directly into the welfare objective of the policymaker.

Moreover, this paper shows that an interest rate rule calibrated to match monetary policy under Greenspan's tenure as a chairman of the Federal Reserve achieves equilibrium allocations that resemble the ones prescribed by optimal policy of the paternalistic policymaker in our framework. Greenspan's policy is closer to optimal policy in our model than the traditional Taylor rule. In fact, in our model, exploiting the less severe output-inflation trade-off requires a relatively more procyclical policy. However, the estimated Greenspan's policy is found to be too accommodative even from the perspective of our model.

The closest paper to our work is Karantounias (2013a), which analyzes a Ramsey problem but in the optimal taxation literature where, like in our paternalistic policymaker's case, the private sector distrusts the probability distribution of the model while the government fully trusts it. Our paper also analyzes a benevolent policymaker case.[4]

Woodford (2010a) studies an optimal monetary policy problem in which the monetary policymaker trusts its own model but not its knowledge of the private agents' beliefs. In our context, it is only the private sector that has doubts on the true model whereas the policymaker is fully knowledgeable even with respect to the doubts of the private sector. The different framework of Woodford (2010a) implies, in contrast to our results, that the optimal stabilization policy following productivity shocks is to keep prices stable no matter what is the degree of distrust that the agents might have.[5] Dupor (2005) analyzes optimal monetary policy in a New-Keynesian model in which only the investment decisions are distorted by an ad hoc irrational expectational shock. In our framework, the distortions in the beliefs are instead the result of the aversion to model misspecification on the side of households, which also affects in an important way the intertemporal pricing decisions of the firms on top of the investment decisions. There are several other papers that have formulated optimal monetary policy in ad hoc linear-quadratic framework where the other main difference with respect to our work is that the monetary policymaker distrusts the true probability distribution and the private-sector expectations are aligned with that distrust.[6]

The structure of the paper is the following. Section 2 presents the model. Section 3 describes the monetary policy problem. Section 4 characterizes the optimal policy. Section 5 studies the mechanism through which doubts and ambiguity matter for policy. Section 6 compares optimal policy with interest-rate rules. Section 7 concludes.

2. A model of doubts and ambiguity

Ambiguity and doubts are introduced in a standard New-Keynesian model using the approach developed by Hansen and Sargent (2005, 2008). Agents are endowed with one model, called the "reference" model, represented by a particular probability distribution. The reference model is given to the agent as the true probability distribution, but he/she does not trust it. He/she expresses his/her distrust by surrounding the reference model with a set of alternative nearby models. Decision makers have to make their consumption and leisure decisions under model uncertainty. Preferences are described using the multiplier-preference approach of Hansen and Sargent (2005, 2008):

$$E_{t_0}\left\{\sum_{t=t_0}^{\infty}\beta^{t-t_0}G_t\left[\ln C_t+\eta\ln L_t\right]\right\}+\kappa\beta E_{t_0}\left\{\sum_{t=t_0}^{\infty}\beta^{t-t_0}G_tE_t(g_{t+1}\ln g_{t+1})\right\}, \tag{1}$$

where β, with $0<\beta<1$, is the intertemporal discount factor, C_t is a consumption index, which will be specified later, and L_t is leisure. The objective (1) is composed of two terms. The first term represents the expected discounted value of the utility flows from consumption and leisure, where the non-negative martingale G_t captures indeed the distortions with respect to the reference probability distribution. In the case in which $G_t=1$ at all times, there are no distortions. The martingale G_t acts as a change of measure between the subjective model and the reference one. The second term, instead, represents discounted entropy, which measures the distance between the reference and the subjective probability distributions, where

[4] Besides the different focus of the two economic applications, the other subtle difference is in the approximation method. Whereas Karantounias (2013a) approximates around the stochastic no-distrust case for small deviations of the parameter identifying the dimension of the set of nearby model, our analysis approximates around a deterministic steady state allowing for even large deviations of the same parameter while bounding the maximum amplitude of the shocks.

[5] Recently, Adam and Woodford (2012) have casted Woodford's (2010a) analysis in a New Keynesian model with explicit microfoundations confirming previous results of Woodford (2010a), which were instead obtained adding model uncertainty to an already-linearized New-Keynesian model.

[6] See the papers cited in Ellison and Sargent (2012) and, among others, Dennis et al. (2009), Giannoni (2002), Leitemo and Soderstrom (2008), Rudebusch (2001), Tetlow (2007).