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Inflation contract, central bank transparency and model uncertainty☆

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ABSTRACT

Using a New-Keynesian model subject to misspecifications, we examine how the robust monetary policy could be modified by a linear inflation contract when a central bank is opaque about its preference for model robustness. It is shown that a central bank must limit this preference and opacity about it to ensure the dynamic stability of the economy. An optimal inflation contract with a zero penalty rate provides no incentive for a central bank to be opaque. The latter must rebalance the benefit of avoiding very bad outcomes in worst case scenarios and the economic costs due to higher macroeconomic volatility.

1. Introduction

A discretionary monetary policy suffers from time-inconsistency problems that arise because central banks optimally respond to the wrong incentive structure that they face. A large principal–agent literature proposes to shape the incentives through the design of an institutional structure within which policy is conducted, providing thus an appropriate perspective for addressing such issues (Persson and Tabellini, 1993; Walsh, 1995; Waller, 1995; Fratianni et al., 1997; Candel-Sánchez and Campoy-Miñarro, 2004; Chortareas and Miller, 2007). Such institutional aspects of the central bank structure and its relationship with the government can be considered as a contract between the government and the central bank. The essential idea of the so-called "contracting" approach is that it is possible for the government, as the principal, to design an optimal incentive scheme for obtaining monetary policy outcomes equivalent to those under credible commitment. Generally, there exists an efficient punishment (transfer) mechanism that sufficiently raises the marginal costs of producing high inflation and hence neutralizes the monetary policymaker's tendency to take such actions.

While the initial principal–agent literature assumes full information, subsequent research in the contracting approach is extended to take into account two aspects of imperfect central bank transparency, i.e. the economic transparency and the political transparency.[3] Under uncertainty about the central bank's output target, i.e. a lack of economic transparency, the optimal contract induces an equilibrium inflation rate which is certainty-equivalent to that obtained under full economic transparency (Muscatelli, 1999). Political transparency refers to disclosure of information about the central bank preferences. Considering information asymmetries between the central bank and the public about the weight assigned to the arguments of the central bank's objective function, Beetsma and Jensen (1998), and Muscatelli (1998, 1999) have shown that the optimal linear contract implies a persisting inflation bias in equilibrium and hence the trade-off between reducing the inflation bias and stabilization. According to Chortareas and Miller (2003), when the government is uncertain about the central banker's responsiveness to incentive schemes, more complicated incentive schemes are required for them to work effectively. Examining the same transparency issue under common agency, Ciccarone and Marchetti (2008) show that when opacity increases, the average inflation bias falls.

☆ The detailed technical appendices are available upon request.

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[3] Pioneered by Cukierman and Meltzer (1986), transparency issue has been examined both theoretically and empirically by Nolan and Schaling (1998), Faust and Svensson (2001), Chortareas et al. (2002), Eijffinger and Geraats (2006), Demertzis and Hughes Hallet (2007), among others. See Geraats (2002) and Eijffinger and van der Cruijsen (2010) for a survey of the large literature.

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Insofar the principal–agent literature ignores the role of model robustness which has been extensively examined by Hansen and Sargent (2003, 2007), Svensson and Woodford (2004), Giannoni and Woodford (2003a,b), Onatski and Stock (2002), Giannoni (2002, 2007), and Leitemo and Söderström (2008a,b), among others. It is argued that while a simple model may help the public to understand the monetary policy decisions, it can be criticized for not fitting the data well. One possible response to such criticism is to design more complex models which gain in realism but lose in tractability. The robustness literature suggests that the central bank does not know the true structure of the economy, recognizing that the simple model is a misspecified description of reality. In practice, confronted with such a dilemma, many central banks publish plenty of analysis on their models and policy rules robustness.

The aim of this paper is to address in the contracting approach the issues arising from the introduction of model robustness while the central bank does not fully communicate its private information about the accuracy of the model on which is based the monetary policy decisions. We assume that the true model of the economy lies in the neighborhood of the reference model, and we analyze how monetary policy should be designed in order to work reasonably well for all models inside this neighborhood. The robust policymaker is supposed to be unable to formulate a probability distribution over plausible models and hence designs policy for the worst possible outcome within a pre-specified set of models. Its decision problem is solved then using the robust control techniques (Hansen and Sargent, 2007).

The main objectives of our study are to investigate whether the introduction of uncertainty about the central bank preferences for model robustness under an inflation contract modifies the implications of the robust control approach for the monetary policy decisions on the one hand, and to examine whether the linear contract is an appropriate response to central bank's opacity about the model robustness on the other hand. An important practical implication of this approach is that the attenuation principle established by Brainard (1967) may not always hold. The concern about worst-case scenarios emphasized by the robust control may likewise lead to amplification rather than attenuation in the response of the optimal monetary policy to shocks in a closed economy (e.g., Giannoni, 2002; Giordani and Söderlind, 2004; Leitemo and Söderström, 2008a; Onatski and Stock, 2002). In effect, the precautionary central bank takes stronger actions in order to prevent particularly costly outcomes. However, Leitemo and Söderström (2008b) show that this result does not carry over to an open economy where the optimal robust policy can be either more aggressive or more cautious than the non-robust policy.[4]

This study is related to Dai and Spyromitros (2010) who have examined the same issues under flexible inflation targeting rules. They have shown that the disclosure of the knowledge about the true structure of the economy could significantly influence strategic interactions between the central bank, the government and private agents. In particular, monetary policy makers might strategically use their private information in order to gain benefits in terms of output stabilization and goal independence by being opaque about its preference for model robustness.

The remainder of the paper is structured as follows. In the next section, we present the model. In the section after, we solve the model to obtain the optimal inflation contract under full transparency about the preference for model robustness, and we examine then the effects of opacity on inflation penalty rate, model robustness as well as the macroeconomic performance. In Section 4, the macroeconomic implications of a serially correlated inflation shock are investigated. The last section concludes.

[4] For a more extensive discussion of policy implications of the robust control approach, see Walsh (2003a).

2. The model

The description of the economic environment follows a standard micro-founded Keynesian model based on optimizing private sector behavior and nominal rigidities that have been used extensively in the recent literature on monetary policy (Clarida et al., 1999).

Similarly to Walsh (2003b), we formulate monetary policy in terms of control over the output gap, i.e. output relative to the flexible-price equilibrium level. This allows us to neglect the goods market equilibrium condition. An alternative modeling approach, which takes account of the latter and explicitly treats the nominal interest rate as the instrument of monetary policy in order to attain output and inflation targets, will not affect our results.

In what follows, the New-Keynesian Philips curve is extended to take account of model misspecification faced by the central bank. It is completed by a description of principal–agent framework where the government delegates the monetary policymaking to the central bank using a linear inflation contract while central bank preferences for robustness are not perfectly observed by the government and the private sector.

The economy is characterized by a forward-looking Phillips curve:

$$\pi_t = \beta E_t \pi_{t+1} + \delta x_t + e_t, \quad \text{with } 0 < \beta < 1, \ \delta > 0 \tag{1}$$

where π_t is the inflation rate, $E_t\pi_{t+1}$ the expected rate of future inflation conditional on information available at t, x_t the output gap, e_t a serially uncorrelated inflation or cost-push shock with mean zero and variance σ_e^2. The parameter β represents the discount factor which is positive but inferior to unity. The parameter δ represents the output-gap elasticity of inflation and captures the effects of the gap on real marginal costs and hence on inflation.

Considering the Phillips curve described by Eq. (1) as the most likely specification, the central bank realizes that the true Phillips curve may deviate from the benchmark. However, it is unable to specify a probability distribution of deviations. To take account of such misspecification, a second type of disturbance, denoted by h_t, is introduced in Eq. (1). It is assumed that the disturbance is controlled by a fictitious "evil agent" representing the policymaker's worst fears concerning model misspecification (Hansen and Sargent, 2007). Therefore, the Phillips curve with misspecification is written as

$$\pi_t = \beta E_t \pi_{t+1} + \delta x_t + e_t + h_t, \tag{2}$$

where h_t represents the model misspecification that cannot be described by a law of probability distribution. Its equilibrium value will depend on central bank preferences for model robustness.

The central bank designs robust monetary policy in a way that it performs well in worst case scenarios. The misspecified model belongs to a pre-specified set of models. The latter is chosen so that the policymaker cannot statistically reject any model inside the set. In the present analysis, only marginal amounts of model robustness are considered, so that monetary policy is robust against very small degrees of misspecification. If the misspecification is too important, the evil agent will be able to overturn the model since the basic relationship in Eq. (2) is not a good description of reality (Leitemo and Söderström, 2008a,b).

We remark that adding the IS curve to the model does not modify the equilibrium solutions. In effect, Leitemo and Söderström (2008a,b) have shown that the central bank only worries about misspecification in the Phillips curve since the optimal misspecification in the IS curve is always set to zero by the central bank in the closed economy. Because the central bank is able to offset any misspecification by appropriately adjusting the interest rate without affecting its loss function, it does not fear such misspecification in the IS curve.