Journal of Monetary Economics 55 (2008) 1253–1276

Contents lists available at ScienceDirect

Journal of Monetary Economics

journal homepage: www.elsevier.com/locate/jme

Quantifying and sustaining welfare gains from monetary commitment ☆

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ARTICLE INFO

Article history:
Received 1 December 2006
Received in revised form
12 August 2008
Accepted 19 August 2008
Available online 24 September 2008

JEL classification:
E52
E37
E58

Keywords:
Monetary rules
Commitment
Discretion
Welfare gains

ABSTRACT

Our objectives are: to quantify the stabilization welfare gains from commitment; to examine how commitment to an optimal rule can be sustained as an equilibrium; to find a simple interest rate rule that approximates the optimal commitment one. We utilize an empirical micro-founded euro-area DSGE model, a quadratic approximation of household utility as the welfare criterion, employing a nominal interest rate lower bound. In contrast to previous studies, we find significant commitment stabilization gains of around a 0.4–0.5% equivalent permanent consumption increase, and with higher price stickiness gains over 2%. We find that a simple optimized commitment rule responding to inflation and the real wage mimics the optimal one.

1. Introduction

Following the pioneering contributions of Kydland and Prescott (1977) and Barro and Gordon (1983), the credibility problem associated with monetary policy has stimulated a huge academic literature that has been influential with policymakers. The central message underlying these contributions is the existence of significant macroeconomic gains, in some sense, from 'enhancing credibility' through formal commitment to a policy rule or through institutional arrangements for central banks such as independence, transparency, and forward-looking inflation targets, that achieve the same outcome.

In the essentially static model used in those seminal papers and in much of the huge literature they inspired, the loss associated with a lack of credibility takes the form of a long-run inflationary bias. For dynamic models of the New Keynesian (henceforth, NK) genre, such as the DSGE model employed in this paper, the influential review of Clarida et al.

☆ We acknowledge financial support for this research from the ESRC, Project no. RES-000-23-1126. We are grateful for comments from an anonymous referee, the editor Robert King and from seminar participants at City University, the University of Surrey, the Bank of England, the European Central Bank, and the 12th Conference on Computing in Economics and Finance (Limassol, Cyprus, June 2006). We are also grateful for discussions or correspondence with Roberto Billi, Gregory DeWalque, Albert Marcet, Stephan Sauer, Frank Smets, Peter Welz and Raf Wouters. Views expressed in this paper do not necessarily reflect those of the ECB.

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doi:10.1016/j.jmoneco.2008.08.009

(1999) emphasizes the *stabilization gains* from commitment which exist whether or not there is a long-run inflationary bias. But what are the size of these stabilization gains from commitment? If they are small then the credibility problem is solely concerned with the credibility of long-run low inflation.

The first objective of the paper is to quantify the stabilization gains from commitment in terms of household welfare. Previous work has addressed this question (for example, Currie and Levine, 1993; McCallum and Nelson, 2004; Dennis and Söderström, 2006), but only in the context of models without micro-foundations and using an ad hoc loss function, or both, or for rudimentary NK models. The credibility issue only arises because the decisions of consumers and firms are forward looking and depend on expectations of future policy. In the earlier generation of macro-models lacking micro-foundations, many aspects of such forward-looking behavior were absent and therefore important sources of time-inconsistency were missing. Although for simple NK models a quadratic approximation of the representative consumer's utility coincides with the standard ad hoc loss that penalizes variances of the output gap and inflation, in richer DSGE models this is far from the case. By utilizing an influential empirical micro-founded DSGE model, the euro-area model of Smets and Wouters (2003), and using a quadratic approximation of the representative household's utility as the welfare criterion, we crucially remedy these deficiencies in earlier estimates of the gains from commitment.

A further important consideration when addressing such gains, and missing from these earlier studies, is the existence of a nominal interest rate zero lower bound (ZLB). A number of papers have studied optimal commitment policy with this constraint (for example, Eggertsson and Woodford, 2003; Woodford, 2003, Chapter 6). In an important contribution, Adam and Billi (2007) show that ignoring the ZLB constraint for the setting of the nominal interest rate can result in considerably underestimating the stabilization gain from commitment. The reason for this is that under discretion the monetary authority cannot make credible promises about future policy. For a given setting of future interest rates, the volatility of inflation is driven up by the expectations of the private sector that the monetary authority will re-optimize in the future. This means that to achieve a given low volatility of inflation the lower bound is reached more often under discretion than under commitment. These authors study a simple NK model and are able to employ non-linear techniques. Since we employ a more developed model, we necessarily choose a more tractable linear-quadratic (henceforth LQ) framework.[1] We follow Woodford (2003) in approximating the effects of a zero interest rate lower bound by imposing the requirement that the interest rate volatility in commitment and discretionary equilibria are small enough to ensure that the violations of the ZLB constraint are very infrequent.

Our second objective is to examine how commitment to an optimal or approximately optimal rule can be sustained as a 'reputational' equilibrium in which reneging hardly ever occurs. We extend the incomplete information framework[2] of Barro (1986) to a stochastic setting and a model with structural dynamics.

Our final objective is to search for a simple interest rate rule that closely approximates the optimal commitment (and complex) rule. This particular part of the paper resembles Levin et al. (2006), but unlike those authors incorporates a interest rate ZLB into the design of the rule.[3]

The rest of the paper is organized as follows. Section 2 begins by using a simple NK model to show analytically how a stabilization bias arises in models with structural dynamics. It goes on to generalize the treatment to any linear DSGE model with a quadratic loss function and also to take into account the interest rate lower bound. We derive closed-form expressions for welfare under optimal commitment, discretion and simple commitment rules and use these to derive a 'no-deviation condition' for commitment to exist as an equilibrium in which reneging on commitment takes place very infrequently.

Section 3 sets out a version of the Smets–Wouters model (henceforth SW) with one additional feature: the addition of a tax wedge in the steady state. Appendix A sets out the zero-interest steady state. Our welfare quadratic approximations are accurate if the zero-inflation steady state is close to the social optimum (the 'small distortions case' of Woodford, 2003). In Appendix A we therefore assess the quality of this approximation. A linearization of the model about the steady state and a quadratic approximation of the representative household's utility sets up the optimization problem facing the monetary authority in the required LQ framework. In Appendix B we provide four estimates of the SW model and variants where the indexing of prices and/or wages is suppressed, and a price contract of 4 quarters is imposed.

In Section 4 we address the three central questions in the paper: how big are stabilization gains when an interest ZLB constraint is imposed, how can the fully optimal commitment rule be sustained as an equilibrium given the time-inconsistency problem and can a simple rule mimic the optimal commitment rule? Section 5 concludes. Further results and full details of our solution procedures are provided in our accompanying working paper Levine et al. (2007b), henceforth LMP.

[1] A LQ framework is convenient for a number of reasons: it allows closed-form expressions for the welfare loss under optimal commitment, discretion and simple commitment rules that enable us to study the incentives to renege on commitment. Our Bayesian estimation methods use a linearized form of the dynamic model. Last but not the least, the implementation of the numerical methods utilized by Adam and Billi (2007) for a simple NK model with only 2 state variables would fall foul of the "curse of dimensionality" (Judd, 1998, Chapter 7) in our model with 11 state variables.

[2] This avoids well-established problems of trigger strategies used in Barro and Gordon (1983) —see al-Nowaihi and Levine (1994) and Persson and Tabellini (1994).

[3] See Primiceri (2006) for a discussion of the importance of imposing the ZLB in the design of monetary rules.