Is central bank conservatism desirable under learning?

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ABSTRACT

In a New Keynesian model, we consider the delegation problem of the government when the central bank optimally sets discretionary monetary policy taking account of private expectations formed through adaptive learning. Learning gives rise to an incentive for the central bank to accommodate less the effect of inflation expectations and cost-push shocks on inflation and induces thus a deviation from rational expectations equilibrium. However, discretionary monetary policy under learning suffers from an excessively low stabilization bias. To improve the social welfare, the government should appoint a liberal central banker, i.e., set a negative optimal inflation penalty that decreases with the value of learning coefficient. The main conclusions are valid under both constant- and decreasing-gain learning.

1. Introduction

In the theory of monetary policy, one well-known conventional result is that discretionary monetary policy leads to a positive inflation bias and that the government should delegate monetary policy to an independent and conservative central bank to achieve lower average inflation while avoiding losses in average output (Rogoff, 1985). The inflation bias, consequence of the time consistency problem, is associated with the steady-state inflation rate and is usually analyzed in static models assuming that the central bank aims for a level of output above the potential level. Without this assumption, in New Keynesian models, the time consistency problem could still lead to the stabilization bias of monetary policy (Svensson, 1997; Clarida, 1999), which is a dynamic phenomenon, i.e., the transition path of the economy from its initial equilibrium toward a new equilibrium depends on the commitment or not of the central bank to a policy rule.[1] The stabilization bias means that, compared to commitment, the volatility of inflation (the output gap) under discretion is higher (lower) out of steady state but not their steady state values. Indeed, under commitment, expected future inflation is subdued since the public knows that inflation will respond less to a cost-push shock, making stabilizing inflation less costly in terms of future output contraction. As in the case of inflation bias, the stabilization bias can be amended by appointing a hawkish central banker. The degree of central bank conservatism should be increased if the central bank has little information about

inflation shocks or if the central bank is transparent about its information (Walsh, 2003). This is also the case if the delegation outcome is robust to uncertainty about the degree of shock persistence (Tillmann, 2009) but the central bank should be less conservative when it has a preference for robustness facing model uncertainty (Dai and Spyromitros, 2010; Qin et al., 2013). These results are obtained under the hypothesis of rational expectations (RE).

However, the assumption that private agents always form RE and exclusively base their economic decisions on such expectations seems to be too strong and is even heroic under some circumstances for effective monetary policy decision-making.[2] In fact, models with constant- and decreasing-gain learning seem to provide a good fit to the expectations of professional forecasters about a range of financial and macroeconomic variables (Markiewicz and Pick, 2014). In a world where private agents could make mistakes that are inherent to their learning process, it is important for the central bank to properly consider private agents' expectations in its monetary policy decisions.

Molnár and Santoro (2014) have shown analytically that when the central bank takes into account not only the intratemporal trade-off but also the intertemporal trade-off due to private expectations under adaptive learning, it accommodates less the effect of out-of-equilibrium inflation expectations and noisy cost-push shocks on inflation. Indeed, the central bank can influence future private agents' expectations via the learning algorithm as if it uses a commitment device under RE. By doing this, it eases the short-run trade-off between inflation and the

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[1] Dennis and Söderström (2006) have quantified this bias across various forward-looking New-Keynesian models with rational expectations.

[2] According to Bernanke (2004), modelling adaptive learning is highly relevant to the understanding of modern U.S. monetary history. In a complex economic environment, private agents may not have a full view about the functioning of the economy due to the costs of information collection and treatment and hence cannot form fully rational expectations, particularly when this environment is unstable and could be disturbed by important financial and structural changes as those observed since the recent global financial crisis. This explains why the literature on adaptive learning attracts a growing interest. See Evans and Honkapohja (2009), and Woodford (2013) for a survey of the literature.

output gap.

This paper, extending the analysis of Molnár and Santoro (2014), contributes to the literature on monetary policy by focusing on the consequences of adaptive learning for monetary policy delegation and how the stabilization bias could be managed under discretion. We examine how adaptive learning affects the way the government should delegate monetary policy decision to an independent central bank. Under delegation, central bank accountability is a crucial issue since it is necessary to circumvent the credibility problems that can arise when monetary policy is discretionary. The accountability issue can be solved either by the conservative central banker approach due to Rogoff (1985) or the inflation contracting approach developed in Persson and Tabellini (1993) and Walsh (1995). These two approaches can be interpreted as types of inflation targeting regimes (Svensson, 1997) that modify either the central bank's preferences or incentives to reduce the inflation or stabilization bias.[3] To deal with accountability issue, we adopt a central bank loss function similar to the one in Walsh (2003), which corresponds to a targeting regime where the government imposes a non-linear inflation contract.[4] As in the latter, which assumes RE, accountability can neither be ensured by insufficiently powered incentive schemes nor by excessively powered one, meaning that there is an optimal weight to place on achieving inflation target.

Our study is motivated by the fact that the recent trend of inflation in many industrial countries tends to zero despite the extremely accommodative monetary policy put into place even though many central banks, including the Fed and the ECB, have adopted an inflation target near 2%. One possible explanation of the policy failure to bring inflation to its target level is that private agents follow a learning algorithm and may ignore in some circumstances the central bank's inflation target.[5] Blanchard et al. (2010) argue that the solution to this problem is to set either a policy interest rate largely under zero or a 4% inflation target. An alternative solution to avoid very low inflation is to change the institutional design of the central bank conceived for the case in which private agents form RE by taking into account the implications of learning.

Under delegation, the government could affect both the intratemporal trade-off between inflation and the output gap but also an intertemporal trade-off introduced by a departure from RE. In the current period, the central bank stabilizes the economy in a way to better anchor future inflation expectations, thus reducing the future intratemporal trade-off. However, adaptive learning introduces a distortion that deteriorates the social welfare. Our main findings are that, when private agents form expectations through adaptive learning, a higher inflation penalty weakens the feedback effects of inflation expectations and cost-push shocks on inflation while strengthening those on the output gap and the policy interest rate. Most importantly,

when private agents are learning, the government sets a negative optimal inflation penalty that is inversely correlated with the learning coefficient, implying that it should appoint a more liberal central banker than under RE to help achieve the intratemporal trade-off. To the difference of Molnár and Santoro (2014) who are interested in the dynamic effect of learning on monetary policy and Mele et al. (2014) who ask whether optimal policy under learning ultimately converges to the optimal commitment or discretion solution under RE, we deal with the issue of the stabilization bias during the transition to the steady-state equilibrium. Our result about institutional design contrasts with Orphanides and Williams (2008) since the latter, focusing on model misspecification associated with expectations formation, find that the lack of robustness of optimal control policies can be partially mitigated by appointing a conservative central banker.

Our paper is related to a growing literature that applies learning to macroeconomic models, in particular several strands of literature that examine the consequences of adaptive learning applied to monetary policy. These studies demonstrate the relevance of introducing adaptive learning for monetary policy analysis and design. Marcet and Nicolini (2003, 2005) have shown that the process of learning matches remarkably well some major stylized facts observed during the hyperinflations of the 1980s, while Slobodyan and Wouters (2012) have reported that the adaptive learning model with an inertial Taylor rule fits the data better than the one assuming RE. A number of studies (Bullard and Mitra, 2002; Evans and Honkapohja, 2003, 2006) find that Taylor rules, which ensure determinacy under RE, can lead to instability if private expectations slightly deviate from rationality and are based on adaptive learning. The fact that departures from RE increase the potential for economic instability strengthens the importance of anchoring inflation expectations and argues for a more aggressive response of the interest rate policy to expected inflation under learning than under RE (Ferrero, 2007; Gaspar et al., 2010; Marzioni, 2014; Airaudo et al., 2015). In contrast, we have shown that under monetary policy delegation, such aggressiveness should be attenuated to avoid the undesirable effect of adaptive learning on the stabilization bias.

The remainder of the paper is organized as follows. The next section presents the model. Section 3 solves the model under discretionary monetary policy. Section 4 analyzes how inflation penalty influences the effects of constant-gain learning on the feedback coefficients of endogenous variables in response to inflation expectations and cost-push shocks and determines the optimal level of inflation penalty. Section 5 discusses the implications of decreasing-gain learning for central bank accountability. Section 6 discusses the limitations of the model and possible extensions. The last section concludes.

2. The model

The theoretical framework is based on a standard New Keynesian model that is widely used in the recent literature in monetary policy (Clarida et al., 1999). It is characterized by optimizing private-sector behavior and nominal rigidities. This model consists of an aggregate demand specification (or IS equation) derived from the representative household's optimal consumption decision and a forward-looking inflation adjustment (or Phillips curve) equation.

2.1. Aggregate demand and supply

The New Keynesian IS equation is given by

$$x_t = E_t^* x_{t+1} - \sigma^{-1}(r_t - E_t^* \pi_{t+1}) \tag{1}$$

where x_t stands for the output gap, r_t the nominal interest rate and π_t inflation. Here, σ represents the risk aversion for households. The expectation operator E_t^* represents private agents' expectations conditional on the information set available at time t. The asterisk on the expectations operator in (1) reflects the fact that the private sector may

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[3] Under monetary policy discretion, inflation or stabilization bias can be reduced by appointing as head of the central bank an individual who dislikes inflation more than society. From the latter's point of view, the cost of giving control of monetary policy to such a "conservative" central banker is the lower priority or weight placed on output stabilization by the central bank. By dealing with a central-bank head, a government can directly affect the central bank's objective function using various incentive contracts. In this paper, we consider the type of non-linear inflation contract studied by Walsh (2003) who introduces the penalty weight on deviations from inflation target in the central bank's loss function. This formulation is equivalent to solving accountability issue by appointing a conservative central banker."

[4] Since we assume that the inflation target is equal to zero, our formulation of central bank loss function is actually identical to the one in Walsh (2003).

[5] The current trend to lower inflation following the global financial crisis in many industrial countries is generally explained by weak global demand and economic activity, low commodity (notably energy) prices, and weak credit expansion despite extremely large monetary expansion. Recent inflation rates are near zero in the Eurozone. This particular case is mainly explained by the lack of confidence in the financial markets after global and Eurozone crises and the slow reaction of the ECB, especially compared to the FED. An earlier use of unconventional monetary policies such as quantitative easing could probably lead to a faster recovery of economies and higher inflation rates. Furthermore, the institutional constraints such as the Stability and Growth Pact have restrained the member states to implement accommodating fiscal policies.