



# Imperfect credibility and robust monetary policy



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## ABSTRACT

This paper studies the behavior of a central bank that seeks to conduct policy optimally while having imperfect credibility and harboring doubts about its model. Taking the Smets–Wouters model as the central bank's approximating model, the paper's main findings are as follows. First, a central bank's credibility can have large consequences for how policy responds to shocks. Second, central banks that have low credibility can benefit from a desire for robustness because this desire motivates the central bank to follow through on policy announcements that would otherwise not be time-consistent. Third, even relatively small departures from perfect credibility can produce important declines in policy performance. Fourth, the risk premium shock represents an important potential source of model misspecification. Finally, as a technical contribution, the paper develops a numerical procedure to solve the decision-problem facing an imperfectly credible policymaker that seeks robustness.

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## 1. Introduction

On August 9, 2011, against a background of heightened volatility in global financial markets, the Board of Governors of the Federal Reserve issued a monetary policy statement that read “*The Committee currently anticipates that economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.*” This passage replaced the language in statements issued since December 16, 2008, which said “*The Committee continues to anticipate that economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate for an extended period.*” Similar passages can be found in more recent statements. Although the precise language has changed, each passage is notable for presenting households, firms, and investors with forward-guidance about monetary policy, guidance provided in an effort to leverage credibility in order to stimulate current economic activity. The passages are also notable in that the forward guidance is conditioned on a forecast for inflation and resource utilization, or slack. As a consequence, the effectiveness of the forward-guidance hinges on the Federal Reserve's credibility and on the potential for the forecasting model to be misspecified.

We consider the decision problem facing an imperfectly credible central bank that seeks robustness to model uncertainty and explore the following questions. How important is credibility for monetary policy and macroeconomic outcomes? Does a central bank's desire for robustness help or hinder policymaking? How do imperfect credibility and robustness affect the forward-guidance that central banks provide? The answers to these questions are important when central banks are relying

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increasingly on their credibility and on forward-guidance to gain leverage over current economic outcomes, all-the-while model uncertainty remains an ongoing concern.

To model credibility, we adopt the quasi-commitment approach developed by [Roberds \(1987\)](#), [Schaumburg and Tambalotti \(2007\)](#), and [Debortoli and Nunes \(2010\)](#). According to this literature a policymaker's credibility is associated with the probability that the promises it makes about future policy will be honored. Policymakers that have no credibility honor their promises with probability zero and conduct discretionary policy. Policymakers that have imperfect credibility honor their promises with probabilities between zero and one, with higher probabilities indicating higher credibility and a probability of one indicating commitment. Central banks desire higher levels of credibility because a lack of credibility leads to a (time-consistent) equilibrium characterized by a discretionary inflation bias and/or a discretionary stabilization bias. Under the former, the central bank, faced with the goals of keeping unemployment close to the natural rate and inflation close to target, succumbs to a short-run incentive to create surprise inflation, with permanently higher inflation and no reduction in the unemployment rate the equilibrium outcome ([Kydland and Prescott, 1977](#)). Under the latter, the central bank, seeking to stabilize output and inflation efficiently in response to supply shocks, has an incentive to promise future policy interventions that mitigate the size of today's policy intervention, without having an incentive to subsequently deliver on those promises ([Svensson, 1997](#); [Clarida et al., 1999](#)). The inefficiencies associated with both biases are overcome when credibility is perfect.

In addition to imperfect credibility, the central bank that we study is concerned about model misspecification. To model the central bank's concern for model misspecification we adopt the robust control approach advanced by [Hansen and Sargent \(2008\)](#). According to the robust control literature, a policymaker that desires robustness against model misspecification will formulate policy in the context of a potentially distorted, or misspecified, approximating model so as to guard against the worst permissible misspecification. Through this mechanism the policymaker is able to conduct model-based policy while also expressing distrust in its model.

After developing the decision problem confronting an imperfectly credibility policymaker that seeks robustness to model uncertainty and presenting its solution, we use the [Smets and Wouters \(2007\)](#) model to examine the effects that imperfect credibility and robustness have on optimal policymaking. We employ the [Smets and Wouters \(2007\)](#) model for our analysis because it is widely understood, it forms the basis for many other models, and it is thought to fit U.S. data well; in these respects it can usefully be viewed as the central bank's approximating model. Moreover, the Smets–Wouters model contains a broad array of shocks whose presence provides ample cover for model misspecification and it is forward-looking allowing policy announcements and central bank credibility to potentially play important roles. A further advantage to using the Smets–Wouters model is that our qualitative findings are likely to generalize to the many related models.

The main lessons that emerge are the following. First, a central bank's credibility gives it a powerful lever for managing private-sector expectations and for stabilizing the economy. Second, when a central bank has low credibility the economy can benefit from the central bank's desire for robustness. Put differently, the central bank's desire for robustness can act somewhat as a substitute for credibility when credibility is low. This result emerges because a robust central bank is directed to respond aggressively to stabilize inflation following shocks, pursuing a policy that would ordinarily be infeasible for a central bank that lacks credibility. Third, even relatively small departures from perfect credibility produce big declines in policy performance, giving rise to a form of discretionary stabilization bias. Fourth, the risk premium shock represents an important potential source of model misspecification. The over-riding lesson that emerges from this analysis is that credibility is extremely valuable for central banks, both when the model is known to be correctly specified and when it is suspected that it is not.

In addition to the work of [Schaumburg and Tambalotti \(2007\)](#), [Debortoli and Nunes \(2010\)](#), and [Hansen and Sargent \(2008\)](#), this paper is related to [Bodenstein et al. \(2012\)](#) and [Kasa \(2002\)](#). However, where [Bodenstein et al. \(2012\)](#) focus on the interaction between imperfect credibility and the zero-bound on nominal interest rates, we focus on the interaction between imperfect credibility and model uncertainty. Nonetheless, our results are consistent with theirs in-so-much as we too find that policymakers tend to make more extreme policy announcements as their credibility declines. Like ourselves, [Kasa \(2002\)](#) uses robust control to analyze the effects of model uncertainty on policy design in a model where private agents are forward-looking. But unlike ourselves, [Kasa \(2002\)](#) uses frequency domain methods to analyze the robustness of a simple stylized New Keynesian model and looks at commitment from a timeless perspective ([Woodford, 1999](#)).

The remainder of this paper is structured as follows. [Section 2](#) describes the decision problem facing a central bank that seeks to guard against model misspecification while endowed with imperfect credibility. [Section 3](#) establishes the connection between robust control and risk-sensitive preferences for this class of quasi-commitment decision problems. [Section 4](#) summarizes and analyzes the Smets–Wouters model that serves as our laboratory for analysis. [Section 5](#) concludes.

## 2. Robustness and imperfect credibility

In this section we describe a linear-quadratic planning problem and characterize its solution. This planning problem involves constraints that contain non-predetermined variables and is related to the commitment problems that are solved routinely in the monetary policy literature, while differing in two important respects. First, the decisionmaking environment is one in which the policymaker has imperfect credibility. Imperfect credibility is modeled according to the quasi-commitment literature which allows the policymaker to stochastically default, reoptimizing its plan at stochastic intervals.

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