Journal of Monetary Economics 59 (2012) 449–465

Contents lists available at SciVerse ScienceDirect

Journal of Monetary Economics

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

Monetary policy under financial uncertainty

Noah Williams

University of Wisconsin - Madison

ABSTRACT

Monetary policy may play a substantial role in mitigating the effects of financial crises. In this paper, I suppose that the economy occasionally but infrequently experiences crises, where financial variables affect the broader economy. I analyze optimal monetary policy under such financial uncertainty, where policymakers recognize the possibility of crises. Optimal monetary policy is affected during the crisis and in normal times, as policymakers guard against the possibility of crises. In the estimated model this effect is quite small. Optimal policy does change substantially during a crisis, but uncertainty about crises has relatively little effect.

1. Introduction

The recent financial crisis and subsequent recession have illustrated how developments in credit and financial markets may be transmitted to the economy as a whole. However prior to the crisis, the baseline models for monetary policy analysis had no direct way to model such developments. The potential importance of financial factors was recognized in the literature, but financial factors were not present in the most widely used models for policy analysis. One interpretation of this state of affairs is that in "normal times" financial market conditions are not of primary importance for monetary policy. In such times, policy focuses on the consequences of interest rate setting for inflation and output, reacting primarily to shocks which directly affect these variables. However the economy may occasionally enter "crisis" periods when financial frictions are of prime importance and shocks initially affecting financial markets may in turn impact the broader economy. The transitions between normal and crisis period may be difficult to predict, and a crisis may be well underway before its effects become apparent in the broader economy. In this paper I develop methods to provide guidance in assessing and responding to such financial uncertainty.

In this paper, I focus on monetary policy design when occasional crisis episodes impact on the transmission mechanism. Importantly, we do not consider financial stability policy, which may have distinct objectives (financial stability, appropriately defined) and instruments (bank supervision and regulation, liquidity provision to banks, and so on). In our setting, monetary policy always has as its objective the stabilization of inflation around a target and economic activity around a target of a sustainable level, and sets a nominal interest rate as its instrument. Crises impact the ability of monetary policymakers to attain these objectives, as they introduce additional shocks and factors which affect inflation and output. Importantly, we take crises here as exogenous, reflecting financial market developments beyond the control of monetary policy. Thus we focus on how monetary policy may mitigate the effects of such crises, and how uncertainty about financial crises affects the appropriate monetary policy response.

This paper encapsulates a stylized reading of the developments in monetary policy analysis over the past decade. By the mid-2000s there had been influential work showing that larger New Keynesian models were able to successfully confront the aggregate data. In particular, the work of Christiano et al. (2005) and Smets and Wouters (2003) showed that such

E-mail address: nmwilliams@wisc.edu

0304-3932/$ - see front matter
http://dx.doi.org/10.1016/j.jmoneco.2012.05.006

theoretically based models were able to fit aspects of the data comparable to VARs. Such models incorporated a host of real and nominal frictions, but did not discuss financial factors. In addition, there was a growing literature on monetary policy analysis under uncertainty, some of which used these larger scale models.[1] This literature considered the implications for policy of model uncertainty, including uncertainty about the specifications and parameterizations of the models, and the types of nominal rigidities. But again financial factors were notably (in hindsight) absent. Of course, the seminal contributions of Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Bernanke et al. (1999) were recognized. There was also ongoing work on financial frictions in monetary policy, including work by Christiano et al. (2003) and Gertler et al. (2007) among others. But the ‘‘consensus’’ policy models had not yet incorporated these frictions. The turmoil of the past several years has naturally spurred interest in models of financial frictions and the interaction of real and financial markets more broadly.

In hindsight, it is clear that the much of the previous literature on monetary policy analysis missed a big source of uncertainty: uncertainty about financial sector impacts on the broader economy. Under one reading, this was simply an omission, and monetary policymakers should have been more focused on financial factors throughout. In this paper we suggest another interpretation, namely that there may be significant variation over time in the importance of financial shocks for monetary policy. In normal times, defaults and bank failures are rare, sufficient liquidity is provided for businesses, and monetary policy focuses on responding to shocks to inflation and output. However in crisis periods, defaults and bank failures increase, liquidity may be scarce, and shocks to the financial sector may impact the transmission of monetary policy. I assume that the economy switches stochastically between such “normal times” and “crisis” regimes, and consider the design of monetary policy in an environment where policymakers and private sector agents recognize the possibility of such switches.

As a model of ‘‘normal times’’ I use a small empirical New Keynesian model. In particular, I use a version of the model of Lindé (2005), which adds some additional exogenous persistence in the form of lagged dynamics to the standard New Keynesian model. For the model of crises, I use a version of the model of Curdia and Woodford (2009b), which is a tractable extension of the standard New Keynesian model to incorporate financial frictions. As in the standard model, the key equilibrium conditions of the model include a log-linearized consumption Euler equation (governing aggregate demand) and a New Keynesian Phillips curve (reflecting price setting with nominal rigidities). However the allocative distortions associated with imperfect financial intermediation give rise to a spread between borrowing and lending interest rates, and a gap in the marginal utility between borrowers and lenders. These factors only matter for inflation and output determination in a crisis, and an exogenous Markov chain governs the switches of the economy between normal and crisis periods. Importantly, I focus on a simple specification of the model where the key interest rate spread is exogenous.

I first suppose that crises are observable, so the main source of uncertainty is over the future state of the economy. I then consider the case where agents must infer the current state of the economy from their observations, so uncertainty and learning about the current state become additional considerations. Thus even in normal times, the optimal policy differs from the prescriptions of a model without such crises. The optimal policy under uncertainty reflects the possibility that the economy may transit into a crisis in the future, as well as the uncertainty about whether the economy may already have switched into such a state. Thus the results imply variation over time in the policy response to shocks to real and financial factors, with learning about the state of the economy potentially playing a role in moderating fluctuations.

The policy analysis in this uses the approach of Svensson and Williams (2007a,b). There we have developed methods to study optimal policy in Markov jump-linear-quadratic (MJLQ) models with forward-looking variables: models with conditionally linear dynamics and conditionally quadratic preferences, where the matrices in both preferences and dynamics are random.[2] In particular, each model has multiple “modes,” a finite collection of different possible values for the matrices, whose evolution is governed by a finite-state Markov chain. In our previous work, we have discussed how these modes could be structured to capture many different types of uncertainty relevant for policymakers. Here I put those suggestions into practice, by analyzing uncertainty about financial factors and the transmission of financial shocks to the rest of the economy.

In a first paper, Svensson and Williams (2007b), we studied optimal policy design in MJLQ models when policymakers can or cannot observe the current mode, but we abstracted from any learning and inference about the current mode. Although in many cases the optimal policy under no learning (NL) is not a normatively desirable policy, it serves as a useful benchmark for our later policy analysis. In a second paper, Svensson and Williams (2007a), we focused on learning and inference in the more relevant situation, particularly for the model-uncertainty applications which interest us, in which the modes are not directly observable. Thus, decision makers must filter their observations to make inferences about the current mode. As in most Bayesian learning problems, the optimal policy thus typically includes an experimentation component reflecting the endogeneity of information. This class of problems has a long history in economics, and it is well-known that solutions are difficult to obtain. We developed algorithms to solve numerically for the optimal policy. Due to the curse of dimensionality, the Bayesian optimal policy (BOP) is only feasible in relatively small models. Confronted with these difficulties, we also considered *adaptive* optimal policy (AOP).[3] In this case, the policymaker in each period does update the probability distribution of the current mode in a Bayesian way, but the optimal policy is computed each period

[1] A very brief and highly selective list of references includes work by Onatski and Stock (2002), Giannoni (2002), and Levin et al. (2003, 2006).

[2] Related approaches are developed by Blake and Zampolli (2006), Tesfaselassie et al. (2006), Ellison and Valla (2001), Cogley et al. (2007), and Ellison (2006).

[3] What we call optimal policy under no learning, adaptive optimal policy, and Bayesian optimal policy has in the literature also been referred to as myopia, passive learning, and active learning, respectively.