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Federal Reserve credibility and the term structure of interest rates☆

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ABSTRACT

In this paper, we show how the degree of central bank credibility influences the level, slope and curvature of the term structure of interest rates. In an estimated structural model, we find that historical yield curve data are best matched by the Federal Reserve conducting policy in a loose commitment framework, rather than the commonly used discretion and full commitment assumptions. The structural impulse responses indicate that the past history of realized shocks plays a crucial role in determining the dynamic effects of monetary policy on the yield curve. Finally, the regime-switching framework allows us to estimate likely re-optimization episodes which are found to impact the middle of the yield curve more than the short and long end.

1. Introduction

How does monetary policy impact the term structure of interest rates? The answer to this question is of interest to central bankers who want to understand how their actions affect long-term interest rates and consequently the economy. This topic is also relevant for bond market participants so that they can make informed investment decisions. Thus it is no surprise that there is a growing literature that tries to analyze this issue.[1] As is common in the monetary policy literature most of these analyses use a simple Taylor rule to model monetary policy. But as macroeconomic models become more sophisticated, increasing attention is being paid to the modeling of optimal monetary policy. However, an optimal policy framework with forward looking agents gives rise to the time-inconsistency issue, which is well known since the work of Kydland and Prescott (1977) and Barro and Gordon (1983). The policy maker can reap the benefits of shaping agents' expectations by announcing a plan and credibly committing to it. But this policy is not time-consistent as the policy maker has an ex-post incentive to deviate from the promised plan. The optimal monetary policy literature has dealt with this issue by assuming either that the central bank has access to a commitment technology (full commitment case) or that they re-optimize every period (discretion case). Yet neither of the two dichotomous cases of discretion or full commitment seems

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[1] See recent papers by Ang et al. (2011); Campbell et al. (2014) and Bikbov and Chernov (2013) and references therein.

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reasonable in practice.[2] Moreover, recent theoretical and descriptive evidence suggests that assumptions about central bank credibility may have a key effect on the term structure.[3] In this paper we use the general framework of loose commitment (this nests both the full commitment and discretion cases) and explore both theoretical and empirical implications for the term structure of interest rates.

We begin by considering a simple theoretical model to shed light on the effects of optimal monetary policy on the term structure. This analysis generalizes the work of Palomino (2012) where only discretion and commitment are considered. We use the framework of loose commitment, following the work of Roberds (1987); Schaumburg and Tambalotti (2007) and Debortoli and Nunes (2010). This is a flexible setting in which the central bank has the ability to commit to its future plans, but it may occasionally give in to the temptation to re-optimize plans. These re-optimization episodes are modeled using a regime-switching process where both the policy maker and the agents are aware of the possibility and take it into account when forming expectations. We embed optimal monetary policy within the loose commitment framework in a simple New-Keynesian model where a cost-push shock drives the dynamics. The degree of credibility has a key effect on the covariance between the agents' stochastic discount factor and bond returns. This in turn determines whether long-term bonds are viewed by investors as acting as a hedge or increasing their risk. The typical assumption of full commitment or discretion can have stark implications for yield curve. In contrast, the loose commitment setting provides a more flexible framework where different values for the degree of credibility can generate a wide variety of properties for the yield curve. The loose commitment framework also affects the dynamic behavior of the yield curve through the effects of re-optimization shocks. The response of the economy and bond prices to re-optimization shocks is history dependent and this setting can help generate rich and complicated dynamics for the entire yield curve.

Having highlighted the main mechanisms in the simple model, we then estimate a fully specified medium scale DSGE model using US data on both macroeconomic variables and bond yields. The analysis is conducted in the model based on the work of Smets and Wouters (2007). We depart from that model in two important ways. First, monetary policy is conducted by a central bank operating under loose commitment, rather than being described by a simple interest rate rule. Second, we augment the model with yield data and derive bond prices that are consistent with the stochastic discount factor of the agents. The degree of credibility affects the agents' expectations for both macro variables and bond prices, and is a parameter of the model that is estimated. The presence of re-optimization shocks generates regime-switching dynamics in the state variables. We derive bond prices in this framework using a log-linear approximation as in Bansal and Zhou (2002) and Ang et al. (2008) among others. Additionally, for estimation purposes this requires the use of regime-switching techniques. We use a Bayesian Markov Chain Monte Carlo procedure following (Debortoli and Lakdawala, 2016).

The degree of credibility of the Federal Reserve is estimated to be 0.6, which is a little lower than the estimate of Debortoli and Lakdawala (2016) where they do not use term structure data. The use of quarterly data implies that re-optimizations are expected to occur roughly once every 2.5 quarters. An advantage of the estimation framework is that it allows for the identification of historical episodes when the Federal Reserve likely abandoned its commitments, as measured by the (smoothed) probability of re-optimization. We find that policy re-optimizations likely occurred throughout the sample with the exception of the period from late 1980s to early 1990s. Using impulse responses we emphasize the history dependence in the effects of re-optimization shocks. The effect of a re-optimization that is preceded by a markup shock makes yields lower relative to the case where no re-optimization occurs, while a re-optimization preceded by a technology shock has the opposite effect. An analysis of the historical effects in U.S. data reveals that the contemporaneous effect of re-optimizations is larger for medium maturities than at the short and long end of the yield curve. To understand the effects on the entire yield curve we construct simple measures representing three factors that are commonly used in the literature: level, slope and curvature. The biggest effects of the re-optimization shock occur with a lag of about two years. Comparing the model implied effects of re-optimization shocks to the data, we notice that while the re-optimizations have a non-negligible effect on the level and slope of the yield curve, they have a relatively bigger effect on the curvature.

With the rich DSGE model, we can perform a structural decomposition of the shocks contributing to the yield curve. We find that demand and markup shocks are the main drivers of bond yields, while technology shocks have a limited influence. Finally, we conduct a counterfactual analysis to explore how yields would have behaved under different credibility scenarios. We find that neither full commitment or discretion can satisfactorily characterize the yield dynamics captured by the loose commitment setting and that under discretion bond yields would have been much lower than the data. We conclude that the flexibility of the loose commitment framework helps significantly in explaining term structure data from the perspective of a structural macro model.

Our work is related to a growing macro-finance literature that tries to combine structural macro models with the term structure of interest rates. Early work, like Hördahl et al. (2006), Rudebusch and Wu (2008) combined simple New-Keynesian models with an ad hoc stochastic discount factor to price long-term bonds. In contrast, here we derive the stochastic discount factor and the implied bond price dynamics that are consistent with the inter-temporal marginal rate of substitution. Starting with Bekaert et al. (2010), there are several empirical studies that use this approach, with more recent work that generates a time-varying term premium in a DSGE framework. Rudebusch and Swanson (2012) and

[2] In an empirical study with a medium scale DSGE model, Debortoli and Lakdawala (2016) show that both full commitment and discretion are rejected by the data.

[3] See the analyses of Palomino (2012) and Campolmi et al. (2012) for a detailed discussion.