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Asymmetric monetary policy and the yield curve

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A B S T R A C T

We discuss the Taylor rule near low inflation and interest rates. Using an additional option-like term in the Federal Reserve's loss function (i.e., the "deflation put") we extend the classic Taylor rule to one with an asymmetric response that is more accommodative when the inflation rate is very low. Once calibrated, this payoff profile gives an exact, and easily communicable prescription for Federal Reserve policy under regimes of low inflation. Simple models of central bank behavior can produce highly complex yield curve shapes. Using the usual Taylor rule and our proposed extension as building blocks, we construct a robust framework for generating realistic yield curves and the evolution of the economy. Our main focus is the impact on the yield curve and the economy of the "deflation put". We find that for economies like the U.S. the deflation put reduces yields for all maturities. We also find that in highly leveraged economies (such as Japan) the consequence of an asymmetric deflation fighting policy may result in improved economic conditions, but also raises the possibility of higher long-term yields as a consequence.

1. Introduction

Traditional models for the yield curve are based on essentially an arbitrage-free statistical approach. After assuming reasonable stochastic processes for the key underlying variables, such models are calibrated using a combination of historical and cross-sectional fits to observed yield curves. While these models provide an elegant and computationally effective way to explain the yield curve, as well

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as tools to exploit relative value opportunities, they lack in deeper economic underpinnings. On the other hand, pure macroeconomic models attempt to explain the behavior of the yield curve based on macroeconomic aggregates such as GDP, inflation, etc. In doing so, they do not use the information implicit in the prices of traded securities that make up the yield curve, and the forecasts that they make for individual yields are not related by arbitrage constraints.

In this paper, we combine the macroeconomic approach and the arbitrage-free approach by going back to the fundamental building block – the short rate, and the behavior of the Central Bank, which drives the short rate via the so-called Taylor rule. In this setting, the short rate is driven by a set of policy rules that link macroeconomic variables and the short rate together. By stitching together the short rate for future periods, we are then able to compute the yield for any maturity. The focus of our paper is to explore the behavior of the yield curve as a consequence of possible asymmetries in the monetary policy rule. This question is especially relevant now, since the current financial crisis has forced central banks to significantly reduce rates.

At Jackson Hole in 2003, Federal Reserve Governor Janet Yellen (2003) elegantly stated the need for pre-emptive, asymmetric response when nominal rates and inflation are very low. She argued for a non-linear policy that would call for a central bank to lower its interest rate more rapidly toward zero and hold it at a low level for longer than the classic Taylor (1993) rule would suggest:

> The research shows that it is important to have a "cushion" in the inflation target to minimize the deterioration in macroeconomic performance due to the "zero bound" problem. For the United States, research suggests that the cushion of at least 1 percent (on top of measurement bias) is needed to avoid significant deterioration in macroeconomic performance, while a 2 percent cushion virtually eradicates economic problems relating to the influence of the zero bound. A larger inflation buffer becomes especially desirable if there is good reason to think that a "neutral real fed funds rate" is particularly low, as it might be in a post bubble economy, so that the odds of hitting the zero bound are high (Janet Yellen, Jackson Hole Meeting, 2003).

It has also been pointed out that while linear response rules such as the Taylor rule have worked very well, the Federal Reserve's "risk-management" approach was essential to countering large, negative shocks posing serious asymmetric risks (Yellen, 2003). It is generally accepted that the Federal Reserve has done a very good job of dynamically updating its targets for the structural constants in the Taylor rule – such as the equilibrium real rate and the target inflation rate. But most empirical estimates assume the symmetry of the Taylor rule, and use the simple linear Taylor rule that is obtained by minimizing a quadratic loss function of inflation and output gaps and an inertial term in interest rate changes.

The present crisis provides an example of this risk-management approach. During the early phases, the standard Taylor rule called for a Fed funds rate significantly above what the Fed chose to target. Inflation and output had not yet declined significantly, but the Fed estimated that several negative shocks due to the crisis required an asymmetric response. Now nominal funds rates in the U.S. have reached the zero bound, and the Fed has begun to apply other easing techniques. In fact, the standard Taylor rule would have the Fed funds rate significantly negative if that were possible. While it remains to be seen whether the zero bound will be a major problem in this situation, it is clear that as Federal Reserve Chairman Ben Bernanke has remarked "…policymakers are well advised to act pre-emptively and aggressively to a void facing the complications raised by the zero lower bound." (Bernanke and Reinhart, 2004).

Putting the views of Janet Yellen and Ben Bernanke together, it appears logical to explore the deflation avoidance problem with a modification of the Taylor rule that is both pre-emptive and asymmetric. At Jackson Hole in August of 2005, Alan Greenspan explicitly admitted the risk-management nature of policy under his Federal Reserve leadership (Greenspan, 2005):

> In effect, we strive to construct a spectrum of forecasts from which, at least conceptually, specific policy action is determined through the tradeoffs implied by a loss function. In the summer of 2003, for example, the Federal Open Market Committee viewed as very small the probability that the then-gradual decline in inflation would accelerate into a more consequential deflation. But because the implications for the economy were so dire should that scenario play out, we chose to counter it with unusually low interest rates.