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Estimating Taylor rules in a credit channel environment

Takeshi Yagihashi*

College of Staten Island, Department of Political Science, Economics and Philosophy, 2800 Victory Blvd. 2N-226, NY 10314, USA

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ABSTRACT

There is a general belief that policymakers take into account credit channel conditions when deciding monetary policy. However, literature lacks evidence on the specific role of credit channel in monetary policymaking. This paper estimates an extended version of the Taylor rule by incorporating credit channel variables explicitly. In particular, net worth capital ratio, bankruptcy cost and default rate are included in the model, motivated by the model of Bernanke, Gertler, and Gilchrist (1999). Among the added credit channel variables, net worth capital ratio is both statistically and economically significant during 1989–2008. We test the potential misspecification of the estimated model by allowing the serial correlation of errors arising from the omitted variables to enter the Taylor rule specification. This experiment confirms that our main findings are robust to such model misspecifications.

1. Introduction

Since Taylor (1993) first estimated a reaction function of the federal fund rate to inflation and an output measure, the Taylor rule has become widely popular in describing monetary policy behavior of the Federal Reserve. Woodford (2003) has provided a welfare theoretic justification for the rule, showing that an optimal Taylor rule can be computed from the parameters that characterize the model economy. Policymakers have found the Taylor rule to be useful in communicating their policy intentions to the public, while skipping the technical details that they use in the model analysis.[1] Clarida, Gali, and Gertler (2000) and others have shown that the Taylor rule explain the conduct of monetary policy in countries other than the United States.

* Present address: Old Dominion University, Department of Economics, College of Business and Public Administration, 2044 Constant Hall, Norfolk, VA 23529, USA. Tel.: +1 757 683 3567/718 982 2900.
E-mail addresses: tyagihas@odu.edu, takeshiyagihashi@gmail.com

[1] See Yellen (1995).

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There is now a growing interest in whether the Taylor rule should include credit channel variables, in addition to the common inflation and output gap measures. The credit channel is the monetary policy transmission mechanism, through the supply of loanable funds.[2] In the theoretical literature, risk premium, defined as the yield spread between a risky asset and a safe asset, is used widely as a proxy for credit channel conditions,[3] and some have demonstrated the optimality of including risk premium in the Taylor rule.

In the empirical literature, different risk premium measures have been incorporated in estimating the Taylor rules, and the general finding is that these variables increase the overall fit to the data. However, there is still disagreement on which variable is best to use as the empirical proxy. Taylor himself proposes the LIBOR-OIS spread, the spread between London Interbank Offered Rate ("LIBOR") at 3 month maturity and an index of overnight federal fund rate, expected for the same period (Taylor, 2008).[4] A more common choice is the Baa spread, which is the spread between the yield on Moody's Baa corporate bond index and the ten-year U.S. treasury bond.[5] Both time series look quite different due to different maturity structures, and existing theories do not provide definite answers to favor one over the other.[6] More broadly, using any of the risk premiums in the Taylor rule estimation suffers from the reverse causality argument, i.e. the policy rate causes the chosen risk premium to change. Without proper instrumenting, it is difficult to isolate the policy reaction to the credit channel condition.

This paper suggests an alternative approach to the above-mentioned problem. It replaces the risk premium measure with "slow-moving" variables, which are believed to be relatively less prone to policy change. In particular, the role of the net worth capital ratio, bankruptcy cost and default rate in the Taylor rule is examined. These series are used in the structural DSGE model of Bernanke, Gertler, and Gilchrist (1999, hereafter BGG). The advantage of this approach is threefold. First, these new variables naturally exhibit low frequency variations relative to risk premia, which filters out the market disturbances most common to the short maturity risk spread. Second, in the BGG model these variables comprise a part of the optimal contracting problem, which cause the risk premium to change. This eliminates the reverse causality problem at the concept level. Lastly, BGG's model is currently the *de facto* workhorse model for credit channel analysis in the monetary policy literature, and the structural interpretation of key variables and parameters is well understood by policymakers.[7] The model is also analytically tractable and conveniently nests within the conventional new Keynesian model as the special case.

This paper first explains the basic mechanism of the BGG model and reports the key simulation results on the optimal Taylor rule. The optimality of the Taylor rule is assessed through the welfare loss function. It is shown that the optimal Taylor rule involves a positive reaction coefficient on the net worth capital ratio, together with large reaction coefficients on inflation and output gap. In addition, it reports that the optimal Taylor rule coefficients interact with the credit market friction.

The empirical analysis is constructed in the following steps: first, the empirical proxies for the net worth capital ratio, bankruptcy cost and default rate are selected. These proxies are constructed using publicly available data, downloaded from the Federal Reserve website. Next, the Taylor rules under different specifications are estimated using nonlinear ordinary least squares as in Rudebusch (2006). This paper finds evidence that the Federal Reserve was systematically reacting to the net worth

[2] It is often contrasted with the money channel, which focuses on the liquidity effect through the supply of bank reserves.

[3] For a recent development, see Goodfriend and McCallum (2007), Cúrdia and Woodford (2010).

[4] A similar measurement to the LIBOR-OIS spread is the TED spread, which is the spread between the 3 month LIBOR and the yield on a 3 month treasury bill.

[5] See for example Gerlach-Kristen (2004), Driffill, Ronondi, Savona, and Zazzara (2006), Taylor (2007), and McCulley and Toloui (2008).

[6] The LIBOR-OIS spread does particularly well at capturing the present credit channel condition due to its shorter maturity, but it becomes quite noisy when the financial market distress becomes large. Baa spread is less noisy compared to the LIBOR-OIS spread due to its longer maturity, but the yield of the corporate bond is limited to companies with certain risk characteristics, which might not be representative of the overall credit channel condition.

[7] As Mishkin (2008) clearly states, in the last decade a broad consensus emerged among the policymakers that the financial accelerator model of BGG best describes the concerns that they share.