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In search of robust monetary policy rules – Should the Fed look at money growth or stock market performance? ☆

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ABSTRACT

This paper studies whether monetary policy should respond to changes in monetary aggregates or stock market indices. Based on an empirical model of the US it presents estimates of how the inclusion of monetary aggregates or stock market indices in the central bank's information set affects the stabilization performance of an optimal monetary policy rule. It is shown that accounting for uncertainty about the structural relationships within the economy leads to a strong deterioration in the stabilization success of monetary policy reaction functions that respond to the growth rates of monetary aggregates or stock market indices. In addition it is analyzed whether money growth or changes in stock market indices help to explain US monetary policy in the recent years.

1. Introduction

This paper investigates whether the stabilization performance of interest rate rules can be improved by responding to monetary growth rates or stock market indices. There has been an intense debate whether the central bank should react to these variables and theoretical arguments have been presented both for and against such a proposition. In this paper I present an empirical evaluation of the economic effects that result from including such variables in the monetary policy reaction function. This is achieved by simulating and comparing the stabilization results from alternative optimal interest rate rules that have been derived from an empirical model of the US economy. The simulation pays special attention to the fact that the central bank faces uncertainty about the structure of the economy.

The monetary policy reaction function most widely discussed is the Taylor rule (Taylor, 1993) which assumes that the interest rate is set by the central bank in response to current, lagged or forecast values of the inflation rate and the output gap or the deviation of the unemployment rate from its natural level. Additional variables that have been proposed to be included in the monetary policy reaction function are the exchange rate (e.g. Ball, 2000; Leitemo and Söderström, 2005) and the growth rates of monetary aggregates.[1] In the now standard New Keynesian macro model there is no special role for monetary aggregates in the conduct of monetary policy. In such models money only reacts endogenously to the interest rate set by the central bank and it is the interest rate which matters for the effects of monetary policy.[2] However, it has been

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[1] Taylor type rules that include exchange rates are estimated by Chadha et al. (2004) and Lubik and Schorfheide (2003) for a number of open economies.
[2] For an extended discussion, see Nelson (2003).

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argued that even within this class of models monetary aggregates may contain information useful for monetary policy making.[3]

An additional set of variables that might be included in the monetary policy reaction function are asset prices, in particular stock prices. The most convincing arguments in favor of monetary policy reacting to changes in stock prices refer to the predictive content of asset prices with respect to future output and inflation. These studies recommend that monetary policy should respond to changes in asset prices to the extent that these changes through their effects on firm's financing conditions and household consumption signal future deviations of unemployment, output and inflation from their targets (e.g. Bernanke and Gertler, 2000, 2001; Gilchrist and Leahy, 2002). Other authors argue that asset prices should be targeted by monetary policy in their own right because drastic changes in asset prices – in particular stock market or housing market crashes – have strong and persistent negative effects on output and employment (e.g. Cecchetti et al., 2000; Bordo and Jeanne, 2002). In contrast, other authors warn that including stock market variables in monetary policy reaction functions might at best be irrelevant for the overall economic outcome but might cause considerable harm in the worst case (Bullard and Schaling, 2002).[4]

Which variables should be included in a monetary policy rule and how the interest rate should be set in response to them can be studied analytically by deriving optimal monetary policy rules. Optimal monetary policy rules are reaction functions that minimize a prespecified central bank loss function (e.g. Ball, 1999; Clarida et al., 2001; Giannoni and Woodford, 2003a,b; Schmitt-Grohe and Uribe, 2004; Svensson, 2003). In these models the optimal reaction function is determined by assumptions about the structural relationships within the economy and by the parameters of the loss function. The central bank reacts to all economic variables relative to their predictive content with respect to future values of the central bank's goal variables.

These theoretically derived optimal policy rules assume that the central bank knows the structural relationships within the economy with certainty. In practice, however, central banks must rely on estimated models of the monetary transmission mechanism and have only a rough understanding of how the economy operates. This leads to an important caveat concerning the practical implementation of optimal monetary policy rules: for many models optimal reaction functions tend to be quite complex and very sensitive to changes in the structural assumptions of the model. This sensitivity of optimal policy rules in combination with uncertainty about the structure of the economy has led to a number of studies on "robust" monetary policy rules. A monetary policy reaction function is robust if its performance as measured by a loss function is not very sensitive to changes in the underlying structural economic model. That is, for a robust model the value of the loss function does not deteriorate dramatically if the structural equations or coefficients of the model are changed. That approach is similar to the one in this paper: the parameters of the reaction function are chosen to minimize the central bank's loss function under the assumption of a particular structural economic model. Finally, the performance of the optimized simple reaction function is studied for alternative structural models different from the one it was optimized for. This is done by simulating the altered structural model together with the unchanged reaction function and comparing the resulting values of the loss function or the resulting variances of the central bank's goal variables (e.g. Walsh, 2003). This technique captures the inherent uncertainty of monetary policy makers about the true structure of the economy. While relatively simple monetary policy reaction functions generally perform worse than complex ones in the model they were optimized for, many studies have shown that the performance of simple rules deteriorates less under different economic structures than that of more complex reaction functions (e.g. Levin and Williams, 2003; Levin et al., 1998; Orphanides and Williams, 2002; Williams, 2003).

This leads directly to the question how different policy rules that include different sets of variables can be ranked with respect to their robustness and how the relative performance of these rules changes if central assumptions under which they were derived turn out to be erroneous?

This paper's contributions are twofold: first, the paper investigates whether the inclusion of monetary aggregates or stock market variables in an optimal monetary policy reaction function improves its ability to explain actually observed monetary policy in the US in the recent period. This does not conclude whether the Fed did or did not use these variables in its monetary policy deliberations but it indicates whether the variable in question helps to describe the Fed's behavior and can be used for forecasting the Federal Funds Rate. For example, monetary aggregates might be correlated with other financial information the Fed actually looks at when deciding about the Federal Funds Rate Target, such as credit volume.

Second, the paper compares the robustness of optimal policy rules containing alternative sets of economic variables. This is done by explicitly accounting for uncertainty about the true structural relationships in the economy both in deriving the optimal policy rules and in evaluating their stabilization performance.

The empirical analysis proceeds as follows: the starting point is an empirical model suggested by Sack (2000) who shows that US monetary policy can be approximated fairly well by a policy rule derived from an optimal control model in which the structure of the economy is assumed to be given by an estimated vector autoregression (VAR). The dynamic programming problem of the central bank is solved and an optimal monetary policy reaction function is derived. This approach is similar to the literature on optimal policy rules but the structural model imposes only relatively few restrictions on the economy.

[3] For example, Coenen et al. (2005) argue that monetary aggregates convey information on the measurement error in the output gap. Söderström (2005) shows that assigning a monetary growth target to the central bank makes monetary policy more inertial and improves social welfare relative to discretionary monetary policy. Empirical models of the monetary policy reaction function that include monetary aggregates have been estimated for the Euro Area by Gerdesmeier and Roffia (2004).

[4] Some empirical studies have investigated the effects of the stock market on monetary policy. Evidence that the Fed reacts to the stock market is presented, for example, in Bjørnland and Leitemo (2005), Chadha et al. (2004), D'Agostino et al. (2005), D'Amico and Farka (2003), and Rigobon and Sack (2003).