Stock market and exchange rate information in the Taylor rule: Evidence from OECD countries

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ABSTRACT
We analyze the effects of stock market and exchange rate information in a forward-looking Taylor rule for monthly data from 14 OECD countries during the years 1999–2016. Especially the stock market information in the form of dividend but also the currency market information in the form of real exchange rate are revealed to be relevant in Taylor rule for many of the countries examined by helping to strengthen the role of inflation and real economic activity deviations in the policy rule. In many cases the rule also seems to be opportunistic, i.e., the inflation target has been time-varying.

1. Introduction

There is ample evidence that many of the modern central banks would seem to have followed the Taylor (1993) rule as the rule of thumb in their monetary policy actions, in one form or the other. From the point of view of the central banks’ monetary policy target functions e.g. the role of financial markets is especially connected to the question of whether the financial market performance is or should be an actual policy target variable, or whether it merely reflects the future performance of the macroeconomy, and hence, the behaviour of the more traditional policy variables in the Taylor rule, i.e. the real economic activity and inflation. The set of papers attempting to scrutinize the role of financial and also currency market (that is the second focus in this paper1) information in the formulation of the Taylor rule is somewhat limited. One of the most recent attempts is the paper by Castro (2011), who, compared to our approach, introduces a much more complicated financial market indicator variable to the traditional Taylor rule. Some details of the Castro (2011) approach are given in section 2, but there are also some other previous papers that have attempted to use more simple measures for the market performance, like Chadha, Sarno, and Valente (2004) and Fuhrer and Tootell (2008).

After the studies by Taylor (2001) and Clarida (2001) there has been a long debate whether and how the stock and other financial market information and exchange rates should explicitly be taken into account in formulating the monetary policy. While presumably asset prices should be used as indicator variables for the real economy, during the last two decades it has been actually more or less obvious that the central banks have started to take into account the apparent increase in financial instability, and in many studies asset booms and busts have been found to be important factors in macroeconomic fluctuations in both developing and industrial countries.2

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1 See for example Molodtsova, Nikolsko-Rzhevsky, and Papell (2011), who implicitly study whether using the real exchange rate in the Taylor rule helps to outperform the random walk model in out-of-sample forecasting attempts.

2 For an early contribution on these findings see Borio, Kennedy, and Prowse (1994), and for similar conclusions on the role of exchange rates in central banks’ reaction functions see Clarida et al. (1998) and Taylor (2001).
Chadha et al. (2004) introduced empirically both the asset prices and exchange rates to the standard interest rate rule for the United States, the United Kingdom and Japan since 1979. In the empirical analysis they used GMM estimation and without any theoretical, model based derivations, specified the monetary policy rule as a forward-looking Taylor rule augmented by the dividend-price ratio calculated using the Datastream composite stock price indices for each country, and the log-real effective exchange rate. Their main findings on the role of asset prices and exchange rate were that monetary policy makers may have used asset prices and exchange rates not only as part of their information set for setting interest rates, but also to set interest rates to offset deviations of asset prices or exchange rates from their equilibrium levels.

Also Fuhrer and Tootell (2008) examined the role of financial market information, specifically equity prices, in affecting the U.S. monetary policy steering rate directly. Alternatively, they considered financial market information as an instrument for forming the forecasts of the traditional policy variables, which were in their study a vector of variables consisting of quarterly percentage changes in real GDP, a gap variable measured by either the unemployment rate or a Hodrick-Prescott detrended real GDP gap, and a four-quarter moving average of inflation, measured in three different ways. They also estimated a forward-looking Taylor rule using Generalized Method of Moments (GMM). More specifically, they distinguished the Federal Open Market Committee’s (FOMC) reaction to forecasts of traditional goal variables, which may depend on equity prices, from the FOMC’s independent reaction to changes in equity prices. They used actual forward-looking variables examined by the FOMC before each action (the “Greenbook” forecasts) and found little evidence to support the proposition that the FOMC responds to stock values, except as filtered through a forecast of accepted monetary policy goal variables.

Finally, according to Castro (2011) the Taylor rule type monetary policy rules might be nonlinear for the part of financial market effects. He analyzed whether the rule can be augmented with a financial conditions index containing information from some asset prices and financial variables. His results indicated that the monetary policy behaviour of the European Central Bank and Bank of England is best described by a nonlinear rule, but the behaviour of the Federal Reserve can be best described by a linear rule. In addition, his findings indicated that only the European Central Bank is reacting to financial conditions.

First, our analysis will focus the standard linear representation similar to the original Taylor rule, but we will allow for the interest rate smoothing and also for the possibility of opportunistic rules with a time-varying inflation target, as has been found in some of the recent studies on monetary policy rules. Second, the main new contribution in our study is to introduce two very simple forms of information from the stock and currency markets, i.e., the dividend yield and the real exchange rate as additional information variables that may have affected the monetary policy decisions of central banks, especially in turbulent time periods in the overall economies. In the first stage, this is based on adding these information as additional regressors to the regression analysis of the standard Taylor rule containing also the interest rate smoothing (i.e. lagged values of the interest rate) and time-varying inflation target. Third, we will use real-time data for the aggregate economic target variables in the policy rule, and based on the previous findings in the literature, the financial market information contains forecasting power for these variables. Hence, we are able to examine whether the role of these additional stock and currency market information is actually more of the ‘instrument type’, i.e., does their inclusion to the set of instrument variables in a GMM regression of the Taylor rule improve or strengthen the role of original economic target variables. Using real-time data from 1999 to 2016 for 14 OECD countries we clearly find that for all the other countries except the three big countries (in terms of their role in the global economy) outside the euro area – i.e. Japan, the UK and the U.S. – especially the role of stock but also of the currency market information seems to be essential when analysing the responsiveness of the interest rate on real activity and inflation deviations from their target values. Furthermore, for many countries the inclusion of financial market information to the estimation of the Taylor rule reveals that for the part of inflation effects the rule has been opportunistic, i.e., the inflation target has been time-varying.

The structure of this paper is the following. In section 2 we give the theoretical motivation for the role of stock and currency market information in the Taylor rule. Section 3 gives the description of the data, some descriptive statistics and finally, the proposed specifications of the Taylor rule that we empirically analyze. Section 4 reports our empirical results based on real-time data from 14 OECD countries, and finally, section 5 gives conclusions.

2. The theoretical model

2.1. Stock market performance and currency market information as additional explicit policy targets

Usually in macroeconomic modelling the stock market performance has in many cases been treated as a forward looking variable that is able to forecast the future real economic activity or other aggregate variables out of sample. However, in some of the previous studies e.g. the performance of stock market has been introduced to the Taylor rule simply as an additional policy variable. For example Castro (2011) starts from a linear representation of the Taylor rule (later abbreviated as TR) in the form

\[ i_t = \pi_t + \pi^* + \beta(\pi_t - \pi^*) + \gamma \left( y_t - y_t^\ast \right), \]

that gives the nominal short-term target interest rate \((i_t)\) as the sum of equilibrium real interest rate \((\pi_t)\) and target inflation \((\pi^*)\) and the policy reactions \((\beta\) and \(\gamma\)) to inflation deviations \((\pi_t - \pi^*)\) and deviations of output \((y_t)\) from its (time-varying) trend or potential value \((y_t^\ast)\), respectively. In addition, many of the modern studies scrutinizing the policy relevant representations of the original TR use the

\footnote{Actually in the forward looking opportunistic Taylor rule the financial market information proved to be important also for the case of Japan.}
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