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'Ex-ante' Taylor rules – Newly discovered evidence from the G7 countries

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ABSTRACT

This paper addresses the question of whether financial market participants apply the framework of Taylor-type rules in their forecasts for the G7 countries. To this end, we use the Consensus Economic Forecast poll providing us a unique data set of inflation rate, interest rate and growth rate forecasts for the time period 1989–2008. We provide empirical evidence that financial market participants incorporate Taylor-type rules in their forecasts. Thus, the paper uses ex-ante data for the estimation of Taylor rules. This is a new approach, because so far only ex-post (revised) or real-time data have been applied.

1. Introduction

In his seminal paper Taylor (1993) explains the development of the short-term interest rate in terms of a monetary policy reaction function of the Federal Reserve Bank (Fed). The Fed sets the short-term interest rate in accordance with an equilibrium rate from which it deviates whenever actual inflation and/or actual output deviate from target levels. The so-called Taylor rule has been extended in several ways, especially by taking into account the forward-looking behavior of central banks and their intention to smooth the interest rate adjustment. Such Taylor-type rules have gained significant importance in both monetary theory and policy. Although the structure of Taylor-type rules is simple, it captures the essence of the behavior of the monetary authority. Probably due to this feature, the application of Taylor-type rules for describing central bank behavior is not only limited to the academic community. Applications can also be found in various publications of the financial industry when commercial banks and others intend to describe and forecast central bank behavior.

As the pioneers of the application of Taylor rules, Clarida et al. (1998) use ex-post revised data and find that the monetary policy of the G7 central banks is Taylor-rule-based. Subsequently, Orphanides (2001a) estimates the Taylor rule on the basis of real-time data instead of revised data in order to precisely describe the information set of the central bank. The present paper moves one step further and indeed uses forecasts, i.e., data based on real-time data. As forecast data, we use the Consensus Economic Forecast poll which includes interest rate, real output growth and inflation rate forecasts for the G7 countries. This unique data set allows us to analyze the fundamental question that relates the financial market to the Taylor rule, i.e., whether the financial market applies Taylor-type rules to forecasts of macroeconomic variables.

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Since the Taylor-type rules state that output, inflation and the interest rate are linked through a certain relationship, it is possible to check whether the financial markets' forecasts are internally consistent (i.e., display relationships known from estimation of Taylor-type rules) or whether they are inconsistent in the sense that financial market participants talk a lot about Taylor rules when describing the observed behavior of a central bank but neglect this reasoning in their forecasts of the short-term interest rate, the inflation rate, and output changes. In this paper we thus change the perspective of looking at interest rate rules from the typical use in the academic literature as a reaction function explaining central bank behavior to the important issue of 'rules versus discretion'. We analyze whether, in the perception of the financial market, the G7 central banks are assumed to be rule-based. We refer to this as' ex-ante' Taylor rules.

The paper is structured as follows: The subsequent Section 2 sets out the concept of Taylor-type rules and briefly presents the core results that have emerged from the respective empirical literature as a yardstick for the subsequent analysis. Section 3 describes the data employed. Section 4 presents the results, while Section 5 concludes.

2. The morphology of Taylor-type rules

Since the seminal paper of Taylor (1993), it has become conventional to describe the interest rate setting behavior of central banks in terms of monetary policy reaction functions. In its plain form, the so-called Taylor rule states that the short-term interest rate which, in this analysis, represents the instrument of a central bank, reacts to deviations of inflation and output from their respective targets. Clarida et al. (1998) proposed a forward-looking variant of the Taylor rule which takes into account the pre-emptive nature of monetary policy as well as an interest smoothing behavior of central banks. This particular type of reaction function has become very popular in applied empirical research on Taylor rules, but it is still in the spirit of the original Taylor rule. Formulations of this type represent a modification of the original Taylor rule. Therefore, the literature often refers to them as Taylor-type rules.

A number of studies demonstrate that the monetary policy of industrialized countries can be explained by this kind of reaction function. The most prominent studies are those of Taylor (1999), Judd and Rudebusch (1998), Clarida et al. (2000). While Taylor (1999) examines the fit of the original Taylor rule, Judd and Rudebusch (1998) incorporate interest rate smoothing in a modified version. Finally, Clarida et al. (2000) introduce forward-looking elements. All authors find that the monetary policy can reasonably well be explained by Taylor-type rules.[1]

Following Clarida et al. (1998, 2000) the baseline forward-looking policy rule takes the form:

$$i_t^* = \bar{i} + \alpha_1 E_t(\pi_{t+k} - \pi^*) + \alpha_2 E_t(y_{t+k} - y_{t+k}^*), \tag{1}$$

where i^* is the desired level of the nominal short-term interest rate, and $\bar{i}$ is its equilibrium level. The second term on the right-hand side is the expected deviation of the k-period ahead inflation rate (π) from the target rate (π^*) which is assumed to be constant over time. The third term is the expected deviation of the k-period ahead level of output (y) from its natural level (y^*) (i.e., the output gap). The coefficients α_1 and α_2 represent the intensity with which the desired interest rate of the central bank reacts to the inflation and the output gap. The assumption of interest rate smoothing behavior then leads to:

$$i_t = (1-\rho) i_t^* + \rho i_{t-1} + v_t, \tag{2}$$

where the parameter ρ (with $0 < \rho < 1$) describes the degree of interest rate smoothing and v_t represents an i.i.d. exogenous random shock to the interest rate. Combining (1) and (2) leads to:

$$i_t = (1-\rho)(\bar{i} + \alpha_1 E_t(\pi_{t+k} - \pi^*) + \alpha_2 E_t(y_{t+k} - y_{t+k}^*)) + \rho i_{t-1} + v_t \tag{3}$$

Eq. (3) represents the econometric specification which is commonly used to describe the central bank behavior. Since the right-hand side of Eq. (3) includes expectations that are not directly observable, it is common to measure them by the observed ex-post levels of the respective variables and rearrange the estimated equation into a form that contains the expectation errors of the central bank in the error term. Then this form is mostly estimated by General Methods of Moments. Eq. (3) becomes the plain Taylor rule, when ρ is assumed to be zero and the horizons of the forward-looking behavior of the central bank, k, is set equal to zero. In order to precisely describe the information set of the central bank, Orphanides (2001a) estimates the Taylor rule on the basis of real-time data instead of ex-post revised data. He finds that estimated policy reaction functions using the ex-post revised data can yield misleading descriptions of historical monetary policy.

The main message generated by empirical studies focusing on the G7 central banks can be summarized as follows. First, forward-looking specifications seem to fit the central bank's behavior better than contemporaneous versions. Here the forward-looking feature is most relevant for the inflation gap with the horizon (k) being about 1 year. Second, the relevance of the *Taylor principle* for stability, i.e., a reaction coefficient for inflation being greater than unity, is well-demonstrated and is a strong feature of the more recent monetary policy. Third, the reaction coefficient for the output gap is mostly significant but has a significant lower value compared to the inflation gap coefficient.[2] Fourth, persistence in the central bank's interest rate is

[1] See Hamalainen, 2004) for a survey of empirical studies related to the USA.

[2] In particular, for the output gap the literature emphasizes that it is relevant to discriminate between ex-post and real-time data. Orphanides (2001a,b) demonstrates that the real-time policy recommendations differ considerably from those obtained with the ex-post revised data. Hence, monetary-policy rules relying on ex-post revised data can also prove quite misleading in attempts to identify the historical pattern of policy by estimating monetary policy reaction functions.