Economic Modelling 26 (2009) 946–960

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/econbase

Monetary policy in Germany: A cointegration analysis on the relevance of interest rate rules☆

Maria Eleftheriou

Department of Business Economics, Universidad Europea de Madrid, Calle Tajo s/n, 28670 Villaviciosa de Odón (Madrid), Spain

ARTICLE INFO

Article history:
Accepted 4 March 2009

JEL classification:
C32
E52
E58

Keywords:
Cointegration
Impulse response analysis
Monetary policy
Taylor rule
Vector error correction model
Deutsche Bundesbank

ABSTRACT

The paper attempts to identify an empirical relationship that characterizes the way the Bundesbank adjusted its short-term rate with respect to various objectives. By building on a careful exploration of the properties of the variables involved, it is established that interest rate rules —often remarkably similar to the Taylor rule— remain valid and relevant in a Vector Error Correction framework, and thereby proposing a distinctive interpretation of German monetary policy during the period 1975–1998.

1. Introduction

The German Central Bank, the Deutsche Bundesbank (DBB henceforth), is commonly associated with the concept of monetary targeting. However, operationally, its policy involves the setting of the short-term interest rate, or, in other words, the translation of its main goals into interest rate objectives. The present paper is based on a careful exploration of the properties of the related variables and attempts to identify an empirical relationship that characterizes the way that the Bundesbank adjusted its short-term rate over time. The estimation of this relationship reveals the implicit way the bank's decisions translated into a reaction function and is of interest since very often EMU monetary policy is compared to what it is believed the Bundesbank would have done.[1]

Although the DBB is no longer responsible for policy setting, an analysis of the German experience is indeed most relevant for at least the following reasons. First, Germany is a major economy of the EMU and as such matters for decision making by the European Central Bank (ECB henceforth): the subscription of the DBB to the capital of the ECB is the highest among all the banks of the European System of Central Banks. Second, the ECB operates within a framework very similar to the one of the DBB, in an attempt to inherit good reputation and to cope with the uncertainties of the starting period. Third, the DBB used to be a leading monetary authority (both internationally and within the European Monetary System) that followed an independent monetary policy. Its performance is judged, by international standards, as strikingly good given that the level and the fluctuations of the domestic inflation rate over time were among the lowest. Such a stable inflation environment is likely to be representative for the euro area, as well as for other economies worldwide. Therefore, all in all, analysing policy setting by the Bundesbank provides significant insights for the conduct of monetary policy.

There are numerous empirical studies on monetary policy in Germany. One strand of the literature focuses on the modelling of a money demand relation in various frameworks —for a brief review see Lütkepohl and Wolters (1998). Another strand of the literature acknowledges in the German monetary targeting regime key elements of inflation targeting. In this context, Mishkin and Posen (1997) have offered a narrative comparative study and, as regards some often cited relevant empirical studies, Bernanke and Mihov (1997) have noted that forecasted inflation explained a greater share of the variance of German monetary policy than did forecasted money growth, while Clarida and Gertler (1997) and Clarida et al. (1998) have shown, by means of distinct approaches, that the DBB was adjusting the short-

☆ This paper is part of the author's doctoral thesis completed at the European University Institute under the supervision of Helmut Lütkepohl. Financial support from the European University Institute and the Greek State Scholarships Foundation is acknowledged.

E-mail address: maria.eleftheriou@uem.es.

[1] Numerous studies (among others Doménech et al. (2002), Gerdesmeier and Roffia (2003), Hayo and Hofmann (2003), Faust et al. (2001) and Gerlach and Schnabel (1999)) investigate monetary policy in the euro-area during the pre-1999 period; it is crucial to have reliable evidence on how policy behaviour is represented empirically in each country and primarily in Germany.

0264-9993/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.econmod.2009.03.003

term interest rates according to an interest rate rule. However, crucial properties of the data, like for instance the integration properties, are often ignored in this empirical literature.[2]

Within the context of interest rate rules, there is a growing literature concerned with these shortcomings. The root of the matter is the finding of Granger and Newbold (1974) and Phillips (1986, 1989) that if variables integrated of order one are found not to be cointegrated, a static regression in levels is spurious. As regards up-to-date research, Bunzel and Enders (2005) and Siklos and Wohar (2006) have discussed a number of issues, have reported evidence of non-stationarity of the involved variables (with US data) and, as Christensen and Nielsen (2003), have experimented with long-run cointegrating relationships. Furthermore, Gerlach-Kristen (2003) and Österholm (2005) have explored the econometric properties of the Taylor rule and have found signs of instability, misspecification and inconsistencies due to the mistreatment of the non-stationarity of the data.

The present paper begins with a thorough analysis of the features of the data generating process (DGP) and, in the context of the literature on inflation targeting, elaborates on an interest rate relationship, namely the Taylor (1993) rule. This is a so-called 'simple' rule originally designed to track policy setting in the United States that has become a rather popular benchmark: it calculates an economy's best interest rate value as a function of its state, which is described by the deviation of actual inflation rate from a target and of actual output from its long-run potential.[3] The analysis is performed by means of a trivariate vector error correction model (VEC model henceforth), which comprises an output variable and inflation apart from the short-term interest rate. A model that includes a measure of the money stock is without any doubt required, given the privileged role attributed to money growth in the DBB's announcements; besides, exploring the implications of such a model may be a way to deal with the point raised by Minford et al. (2002), who have argued that the empirically estimated Taylor-type rule reaction function can be a reduced form of a monetary policy rule with the money supply hidden in the residual. By adding variables like the US overnight rate or a long-term rate, I investigate whether the DBB responded to other indicators.[4]

The analysis examines a complete historical period of German monetary policy, as it covers the period from roughly 1975 to 1998. In 1975, shortly after the breakdown of the Bretton Woods system of fixed exchange rates, the first annual monetary target was announced by the DBB. According to its statute, the bank was bound to 'safeguard the currency', which, in Issing (1997), was interpreted to mean price stability. By means of a procedure that remained in principle unchanged, the bank was setting targets for monetary growth that implicitly incorporated goals for inflation-for a comprehensive presentation of the German monetary policy see Neumann and von Hagen (1993), Baltensperger (1999) or Schmid (1999). On 1 January, 1999 the responsibility for the conduct of monetary policy was handed to the ECB.

The paper is organized as follows: in the next section, I provide explanatory information on the dataseries and the econometric framework utilized; in the third section, I present the results of the empirical analysis for each model and, in the last section, I offer some concluding remarks. In a nutshell, I demonstrate that a stable interest rate rule, very similar to the popular Taylor (1993) rule, emerges repeatedly as the long-term relationship connecting the policy rate with output and inflation. Thereby, an untraditional standpoint on the DBB's monetary policy is put forward and an alternative methodological approach is established.

2. Preliminary analysis

2.1. The data

The time series used in the analysis are monthly seasonally unadjusted, and cover the period from 1974:01 to 1998:12. A detailed description of the data can be found in Appendix A, and in Figs. 1 and 2 the series are depicted in levels and first differences. Except for the price level, all the other series are included in the system estimation. Concerning notation, the series are labelled as follows:

Name	Definition
P	Log of consumer price index, 1995 = 100
Δp	Monthly inflation rate$(=p_t-p_{t-1})$
Y	Log of real GDP
$m3-p$	Log of real M3
RS	Call money rate
RL	Long-run rate (government bond yield)
$USRS$	US Federal Funds rate

Regarding the short-term rate used as the policy instrument of the DBB, the call money rate (also known as the day-to-day rate, or the overnight interbank lending rate) is thought to be more appropriate given the practice of monetary policy in Germany. This choice is not uncommon in the relevant literature-Clarida and Gertler (1997), Clarida et al. (1998), Lütkepohl and Wolters (2003), Brüggemann (2003) have used the same rate as the relevant policy variable. Bernanke and Mihov (1997) have found that the Lombard rate has historically been a good policy indicator, even though the use of the day-to-day rate cannot be statistically rejected.

A caveat to the analysis is its reliance on ex-post revised data, i.e., not on the data that was available to the policymakers at the time their decisions were taken. As argued by Orphanides (2001, 2003), estimating a monetary policy rule with ex-post data can yield misleading descriptions with questionable normative implications. This criticism is confined mainly to real GDP, since the rest of the variables are subject only to minor revisions, as Gerberding et al. (2004) have confirmed. Concerning data on German real output, Clausen and Meier (2003) have found that real-time and ex-post revised data are generally quite close, inferring that the magnitude of the revisions is not large.[5]

2.2. Unit root and cointegration tests

To start with, the stochastic properties of the data series need to be well understood in order to obtain a consistent and robust model. In any case, it should be borne in mind that the way these properties are modelled may depend on the sample length and the observation frequency, which implies that the approach followed, despite its coherence with the present dataset, may not be valid for larger samples.

The results of the unit root tests for the various variables are presented in Table 1. A number of variations concerning not only the maximum lag order, but also, and most importantly, the deterministic terms and the actual lag order, validate these results. Concerning unit root tests, determining the deterministic terms and the lag order is essential since the outcome depends heavily on both. The selection of

[2] For instance, Clarida and Gertler (1997) build a VECM on the grounds that ≪it is better suited for making long horizon run forecasts≫ and make no reference to the stochastic properties of the variables. Similarly, Clarida et al. (1998) assume stationarity of the involved variables and pay no special attention to the unification of Germany, an indisputably important event included in their sample period.

[3] The reader is referred to Eleftheriou (2003) for some issues associated with its specification and other developments.

[4] Bunzel and Enders (2005) and Welz and Österholm (2005) explore the consequences of omitted variables in the context of Taylor rules.

[5] Nevertheless, Orphanides and van Norden (2002) are mostly concerned with the expost estimates for potential output because the full sample estimate of the trend in the GDP is likely to differ from the estimate using real-time information. Döpke (2004) has confirmed that with the German data the poor performance of the output gap estimates is due to the end-of-sample problem. To deal with this issue a recursive estimation could be implemented as a further step in the research.