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Modelling Taylor rule uncertainty: an application to the euro area

Fernando Martins[a,*], José A.F. Machado[b], Paulo Soares Esteves[c,*]

[a]*Banco de Portugal and Universidade Lusíada, Rua Francisco Ribeiro 2, Lisboa, Portugal*
[b]*Banco de Portugal, Universidade Nova de Lisboa, Lisboa, Portugal*
[c]*Banco de Portugal, Rua Francisco Ribeiro, Lisboa, Portugal*

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Abstract

This paper presents a methodology to estimate an asymmetric probability density function for a forward-looking version of the Taylor interest rate, assuming that not only the explanatory variables but also the parameters of the rule are random variables. The methodology allows for correlation across different sources of uncertainty and the resulting distribution for the Taylor interest rate is obtained by numerical simulation, avoiding any assumption concerning the aggregation of non-normal distributions. The paper presents an application for the euro area as a whole. The main conclusion is that the uncertainty surrounding the Taylor interest rate could be high, i.e. the confidence intervals could be too wide to give clear indications concerning the evolution of interest rates.

Keywords: Euro area; Density; Methodology

1. Introduction

Indications given by monetary policy rules are usually put forward in debates about current and prospective stance of monetary policy. Moreover, in the context of macroeconomic models, these rules are used to account for monetary policy reactions. Among several alternatives, the Taylor rule has became the most prominent monetary policy rule.

*Corresponding author.
E-mail address: pmesteves@bportugal.pt (P.S. Esteves).

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The objective of this paper is not to discuss the theoretical and operational problems underlying the Taylor rule,[1] but just to emphasize that those Taylor rule indications should be interpreted with prudence. Indeed, they are usually presented as point estimates (see McCallum (2000) and Judd and Rudebusch (1998)) giving a sense of accuracy that can be misleading. No weight is placed on the discussion of risks to those estimates and, at least to a certain extent, the reader is encouraged to concentrate on an apparently precise central projection, ignoring the wide degree of uncertainty and operational difficulties surrounding them. Indeed, policymakers do not follow the indications given by monetary policy rules in a pure mechanical way. Monetary policy rules are mostly used by economists at central banks as an additional piece of information in the decision-making process. In this sense, even for central banks, the coefficients of monetary rules are not known. Furthermore, even if central banks had a precise monetary rule, other sources of uncertainty would remain, given the presence of forward-looking variables, such as the inflation or output gap forecasts.

This paper presents a methodology to estimate an asymmetric probability density function for a forward-looking version of the Taylor rule assuming that not only the explanatory variables but also the parameters of the rule are random variables. Despite dealing with a different issue, our approach to model uncertainty is related with the one followed both by the Bank of England (see Whitley (1997) and Britton et al. (1998)) and the Sveriges Riksbank (see Blix and Sellin (1998)) in the context of their inflation forecasting exercises. Unlike those approaches, some correlation across the different sources of uncertainty is allowed and no assumptions were made concerning the aggregation of non-normal distributions.

Additionally, the paper presents an application for the euro area as a whole. The main conclusion is that the uncertainty surrounding the Taylor interest rate could be high, i.e. the confidence intervals could be too wide to give clear indications concerning the evolution of interest rates.

This article is structured as follows. Section 2 presents a brief outline of the Taylor rule and describes the procedure used to compute a probability density function for the Taylor interest rate. In Section 3, we present a simple statistical model for the dependence between the inflation and the output gap forecasts. This procedure is then applied to the euro area in Section 4. Finally, Section 5 presents some concluding remarks.

2. Taylor rule: a distribution assumption for the explanatory variables and the simulation of the joint distribution

The original formulation of the Taylor rule (Taylor, 1993) is the following:

$$i_{Tt} = r^* + \pi^* + \beta(\pi_t - \pi^*) + \theta X_t, \tag{1a}$$

[1] Martins (2000) provides a summary of the empirical literature on Taylor rules as well as a discussion on the operational difficulties and limitations associated with this kind of instrument