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# A survey on time-varying parameter Taylor rule: A model modified with interest rate pass-through

Ebru Yüksel <sup>a,\*</sup>, Kivilcim Metin-Ozcan <sup>b,1</sup>, Ozan Hatipoglu <sup>c,2</sup>

<sup>a</sup> Hacettepe University, Department of Industrial Engineering, 06800 Beytepe, Ankara, Turkey

<sup>b</sup> Bilkent University, Department of Economics, 06800 Bilkent, Ankara, Turkey

<sup>c</sup> Bogazici University, Department of Economics, Natuk Birkan Hall, 34342 Bebek, Istanbul, Turkey

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## ABSTRACT

Today, the prime aim of central banking is to achieve price stability and, to a lesser extent, output stability. To this end, central banks use various monetary policy rules. This paper intends to provide a broad survey of the literature on Taylor-type monetary policy rules with a time-varying parameter (TVP) specification. To include the TVP feature, some modification is made in the monetary transmission mechanism of Taylor-type monetary policy models to account for the changing risk preference of individuals. In line with this approach, we introduce an interest rate pass-through specification of the monetary transmission process in a general equilibrium model to account for the varying perceptions of risk by individuals. We include an application for Turkey and estimate the time-variable parameters of the model by employing a structural extended Kalman filter (EKF). The results indicate that the EKF performs better than the standard Kalman filter in estimating the reaction function of the central bank.

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## 1. Introduction

Recently, New Keynesian models with micro foundations have gained a lot of attention. These models raise interest in reducing inflation volatility and accordingly inflation targeting in order to

\* Corresponding author. Tel.: +90 312 297 89 50; fax: +90 312 297 89 53.

E-mail addresses: [eyuksel@hacettepe.edu.tr](mailto:eyuksel@hacettepe.edu.tr) (E. Yüksel), [kivilcim@bilkent.edu.tr](mailto:kivilcim@bilkent.edu.tr) (K. Metin-Ozcan), [ozan.hatipoglu@boun.edu.tr](mailto:ozan.hatipoglu@boun.edu.tr) (O. Hatipoglu).

<sup>1</sup> Tel.: +90 312 290 20 06; fax: +90 312 266 51 40.

<sup>2</sup> Tel.: +90 212 359 76 40; fax: +90 212 287 24 53.

establish macroeconomic stability. Today, the prime aim of central banking is to achieve price stability and, to a lesser extent, output stability. According to New Keynesian models, the design of optimal monetary policies and rules are essential in establishing price stability. In this context, as suggested by Taylor (1993) and Woodford (2003), short-term interest rates, used as policy instruments, are key variables. The importance of the use of interest rate patterns for developing efficient monetary policy rules, especially for inflation targeting countries, has been further stressed by Taylor (1999a). Hence, it becomes essential for central banks to determine accurate interest rate rules to achieve price stability in an economy (see, for example, Clarida et al., 1999; Taylor, 1993, 1999b).

In the last decade, considerable attention has been given to the TVP specification of monetary policy rules. There are mainly three factors that necessitate the use of dynamic parameter specification. First, monetary policy rules are based on the attitude of policymakers toward the structure of the economy and contradicting objectives of monetary policy. Therefore, the parameters of interest rate rules are subject to change due to the changing nature of the behavior of policymakers and policy objectives as demonstrated by Favero and Rovelli (2003), Ozlale (2003) and Valente (2003).

Second, central banks utilize a wider information set when devising policy decisions instead of relying only on a single policy rule equation. Thus, for example, if the policy rule is a Taylor-type interest rate rule,<sup>3</sup> the same levels of output gap and inflation may not produce the same level of interest rate in different periods since the information set used by central banks will be different for each period. The unstable nature of the coefficients of a policy rule can translate into nonlinearities in the central bank's reaction function, which is another issue that should be addressed. For instance, Nobay and Peel (2003) discuss the optimal discretionary monetary policy under the assumption that the central bank has an asymmetric loss function. For monetary policy in the UK, Martin and Milas (2004) concluded that policymakers use discretionary policy for inflation targeting and that monetary policy responds to inflation nonlinearly. Empirically, commensurate with existing asymmetries in the patterns of interest rate setting, Dolado et al. (2005) argued that the European Central Bank's behavior can be explained by the nonlinear optimal policy function, unlike the behavior of the US Fed. Castro (2011) later supported this finding, suggesting that the European Central Bank and the Bank of England follow nonlinear monetary policy rules whereas the US Fed acts according to a linear Taylor rule. However, Petersen (2007) previously found that the monetary policy of the US Fed could be associated with a nonlinear policy rule once inflation approaches a certain threshold. Likewise, Surico (2007) investigated the asymmetric behavior of the monetary policy of the US Fed.

Furthermore, variations in the monetary policy transmission mechanism can be the third reason for the unstable nature of the coefficients of a policy rule. Thus, interest rate rules should be treated as dynamic instead of static. Intuitively, due to shifts in the coefficients of policy rules, studies using stable parameters may be misleading or inefficient in formulating policy advice. Parallel to the Lucas (1976) critique, in order to conduct empirical policy analysis, dynamic parameter models are more appropriate for accounting for policy shifts contrary to fixed parameter models.

The aim of the present survey article is to review the literature on monetary policy rules with a TVP specification for a closed economy.<sup>4</sup> Following Taylor (1993), numerous works have studied the implications of various versions of the Taylor rule for different countries; as a result, the use of Taylor-type interest rate rules in analyzing policy shifts has increased substantially. After a review of the literature, this article evaluates the performance of the Taylor rule in the transition of monetary policy

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<sup>3</sup> Taylor rules are simple monetary policy rules that prescribe how a central bank should adjust its policy instrument, interest rate, in a systematic manner in response to developments in inflation and macroeconomic activity. Most of the survey papers review the development and characteristics of Taylor rules in relation to alternative monetary policy guides and discuss their role for positive and normative monetary policy analysis as in Orphanides (2007) and Clarida et al. (1999).

<sup>4</sup> The theoretical literature has mainly assumed a closed economy framework. Literature that analyzes the open economy monetary policy tools also exists. But in this survey article we would like to focus only on the interest rate channel rather than the exchange rate channel, since the main open economy alternatives may perform poorly in the face of specific types of exchange rate shocks, such as a rule based on a monetary conditions index (MCI). Since the MCI is a function of the real exchange rate it is influenced by events such as terms of trade shocks and changes in business and consumer confidence, which do not necessarily affect interest rates.

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