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Forecasting monetary policy rules in South Africa

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ABSTRACT

This paper is the first one to: (i) provide in-sample estimates of linear and nonlinear Taylor rules, augmented with an indicator of financial stability, for the case of South Africa, and (ii) analyse the ability of linear and nonlinear monetary policy rule specifications, as well as nonparametric and semiparametric models, to forecast the nominal interest rate setting that describes the South African Reserve Bank's (SARB) policy decisions. Our results indicate, first, that asset prices are taken into account when setting interest rates; second, that there are nonlinearities in the monetary policy rule; and third, that forecasts constructed from semiparametric models perform particularly well over the inflation targeting regime and that there are gains from semiparametric models in forecasting the interest rates as the forecasting horizon lengthens.

1. Introduction

Six times a year, approximately every 8 weeks and sometimes more often, the South African Reserve Bank (SARB) announces its target for the key lending rate, the repo rate, which is the price at which the central bank lends cash to the banking system. The Reserve Bank's target for the repo rate is one of the most anticipated and influential decisions which regularly affects financial markets, and is of interest to economic analysts, economic forecasters and policymakers. We first conjecture that this monetary policy decision can be described within the general form of Taylor rule models, for a number of reasons. First, the SARB has a mandate to achieve and maintain price stability, in the interest of balanced and sustainable economic growth, and therefore output/employment stability. Second, the Monetary Policy Committee (MPC) of the South African Reserve Bank (SARB) has formulated its policy in terms of the repo rate since 1998. This issue is especially relevant and is currently being debated in the case of South Africa, which has undergone important changes in its monetary policy settings over the last two decades. These reforms include central bank independence and the introduction of inflation targeting of 3%–6% in 2000, having moved from a constant money supply growth rate rule which was first set in 1986.

The general benchmark of monetary policy rules has been the subject of intense debate over the last few years, as recent economic events have turned attention to the behaviour of certain asset prices (stock prices, house prices, exchange rates), and also as a result of the concern of central banks with respect to the maintenance of financial stability (see e.g. Bernanke & Gertler, 2001). This is in line with the current debate on central banks having additional objectives over and above inflation and output stabilisation (Walsh, 2009). If such is the case, it is most likely that the monetary policy reaction function will respond to those variables once they reach certain 'unsustainable' levels, as opposed to when they follow their 'fundamental' path. This could indeed be the case with the SARB, because its other primary goals, as defined in the Constitution, are to protect the value of the currency and achieve and maintain financial stability. Woglom (2003), in his discussion of how the introduction of inflation targeting in 2000 affected monetary policy in

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South Africa, points out that the response of the SARB to changes in the real value of its currency are far from clear, and are therefore a source of confusion.[1] It is also worth noting that South African financial institutions experienced no direct exposure to the sub-prime crisis in terms of interbank or liquidity problems of the type experienced in developed countries (see e.g. Mminele, 2009). The first contribution of this paper is therefore to examine whether asset prices are one of the determinants of interest rate setting by the SARB in the in-sample estimates. The fact that we combine three different asset prices to give a single index complements the work by Woglom (2003), where only changes in the real effective exchange rates are included in the determinants of the rule.

The second contribution is to analyse whether the Taylor rule followed by the SARB, with or without asset prices, displays a nonlinear functional form. Recent research has theoretically demonstrated the possibility that a central bank might not follow a linear reaction function. Asymmetric preferences (e.g. a linex function, as in Nobay & Peel, 2003) impose a higher cost on overshooting the inflation target than undershooting it. The opposite would be true for the output gap if booms are thought of as being less costly than slumps. Aksoy, Orphanides, Small, Weiland, and Wilcox (2006) show that, under the opportunistic approach to disinflation, the policymaker would not respond actively to any deviation of inflation from the target. The policymaker concentrates on output stabilisation for sufficiently small deviations, and will only act to bring inflation down when it exceeds a certain threshold.

A nonlinear policy rule also results from assuming a nonlinear Phillips curve. To the extent that nominal wages are downwards inflexible, inflation is a convex function of the unemployment rate (see e.g. Layard, Nickell, & Jackman, 1991). This, by Okun's law, means that inflation is also convex in the output gap. The nonlinear aggregate supply, combined with a quadratic loss function, leads to a policy rule where the response of interest rates to inflation is higher (lower) when inflation is above (below) target. For example, Surico (2007) argues that the response to inflation may be higher in periods of poor economic performance, while Cukierman and Muscatelli (2008) find that the opposite is true. Given the above strand of the literature, we therefore try to shed some light on the specification of the particular monetary policy rule in South Africa.

Finally, we contribute to the sparse body of literature that uses Taylor rules to forecast the nominal interest rate out-of-sample. Some notable exceptions are Qin and Enders (2008) and Moura and de Carvalho (2010). The former use US data to compare the in-sample and out-of-sample properties of linear and nonlinear Taylor rules for different monetary policy regimes. The latter examine different specifications of Taylor rules in terms of their out-of-sample performances for the seven largest Latin American economies. In this study about South Africa, we construct the forecasts from linear and nonlinear parametric models, as well as from the more flexible nonparametric and semiparametric models under three alternative expectations formations for the target variables, and examine their forecasting gains. Furthermore, it is well known that significant in-sample evidence of predictability does not guarantee a significant out-of-sample predictability. There could be a number of reasons for this, such as the power of tests (Inoue & Kilian, 2004). We therefore provide both in-sample and out-of-sample results in order to shed some light on the specification of the SARB policy rule and provide guidance on models for forecasting interest rates in SA.

2. Taylor rules

2.1. Benchmark linear Taylor rule

Existing studies of the impact of inflation and output on monetary policy use a version of the Taylor rule (Taylor, 1993) which allows for interest rate smoothing (Clarida, Gali, & Gertler, 1998, 2000) and assumes that the actual nominal interest rate, i_t, adjusts towards the desired rate, i_t^*, as follows:

$$i_t = \alpha_i(L)i_{t-1} + (1-\alpha_i)i_t^*, \tag{1}$$

where $i_t^* = \bar{\imath} + \alpha_\pi E_t(\pi_{t+p} - \pi^*) + \alpha_y E_t(y_{t+p} - y^*) + \alpha_I E_t(I_{t+p} - I^*)$, with i_t^* being the desired nominal interest rate, $\bar{\imath}$ the natural interest rate, $E_t\pi_{t+p}$ the expected inflation rate at time $t + p$, π^* the inflation target, $E_t(y_{t+p} - y^*)$ the expected output gap at time $t + p$, $E_t(I_{t+p} - I^*)$ the expected financial indicator gap used to augment the original rule, α_π the weight on inflation, α_y the weight on the output gap, and α_I the weight on an index I of financial variables such as exchange rates, house prices, stock prices and other financial variables. $\alpha_i(L) = \alpha_{i1} + \alpha_{i2}L + \cdots + \alpha_{in}L^{n-1}$ is the lag polynomial in the interest rate, showing interest rate persistence and smoothing.[2] We can thus write our benchmark linear model as:

$$\begin{aligned} i_t = {} & \alpha_o + \alpha_i(L)i_{t-1} + (1-\alpha_i)[\alpha_\pi E_t\pi_{t+p} \\ & + \alpha_y E_t(y_{t+p} - y^*) + \alpha_I E_t(I_{t+p} - I^*)] + \varepsilon_t, \end{aligned} \tag{2}$$

where $\alpha_o = (1-\alpha_i)(\bar{\imath} - \alpha_\pi\pi^*)$ and ε_t is an error term. Eq. (2) represents a constant proportional response to inflation, output and financial indicator gaps. The theoretical basis for the linear Taylor rule (Eq. (2)) comes from the assumption that policymakers have a quadratic loss function and that the aggregate supply or Phillips curve is linear.

[1] A different approach to the one used in our paper, and in the literature cited here, is the analysis by Knedlik (2006) of the effect of real exchange rate deviations on the design of monetary policy rules in SA. In Knedlik's case, optimal rules should provide optimal monetary conditions (internal stability), and should avoid the volatility of capital flows (external stability). Such rules are derived from the estimation of the parameters of the estimated Monetary Conditions Index (MCI).

[2] We use a lag polynomial of order two in our estimation. These are determined according to the AIC, and we note that a model with one lag of the interest rate suffers from serial correlation.