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Structural breaks, ARIMA model and Finnish inflation forecasts

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Abstract

Via the use of the rolling regression technique and a specific procedure for analysing strong structural breaks in a univariate time series model, we forecast the rate of future inflation in Finland for the time period of unregulated financial markets since the beginning of 1987. The identified structural changes in the data generating process (DGP) of inflation are labelled with both economic events and changes in the main leading inflation indicators. The final intervention model yields, in some cases, better forecasts than the pure rolling regression technique without identification of the strong breaks. When comparing the obtained forecasts with certain noncontinuous time series based on inflation expectation surveys with respect to actual future inflation, we find that the comparable point forecasts from our rolling regressions perform better than the corresponding point expectation proxies from questionnaires. When compared with the performance of the forecasts by the Research Institute of the Finnish Economy, the recursive procedure also produces more accurate forecasts.

Keywords: AR(I)MA models; Structural breaks; Time variation; Forecasting

1. Introduction

The role and effect of structural changes in the economy, economic models and data generating processes (DGPs) of economic variables themselves have been the subject of vivid discussion and research in economics for a long time. The most frequently examined economic variables include the rate of inflation and the exogenously assumed events in the economy supposed to have an effect on the DGP of inflation. Structural breaks have also been reported to invalidate the modern econometric testing procedures of, for example, unit root analysis. By utilising the same set of several US macroeconomic time series, the group of papers starting from Nelson and Plosser (1982), via Perron (1989) to Zivot and Andrews (1992) and Newbold, Nunes and Kuan (1994) gives an example of the fragility of unit root analysis when the possibility of structural changes is recognised (see also on this subject Dufour and Ghysels, 1996).

This study uses an ARIMA model in the forms of recursive and rolling regressions with monthly data for the period 1/1978–9/1996 to examine the impact of structural breaks on the

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forecasts of Finnish inflation in the period of unregulated financial markets beginning in 1987 up to 1996. The empirical literature reveals that this type of exercise has been conducted elsewhere using various techniques such as time varying vector autoregression models (e.g., Webb, 1995), Markov switching models (i.e., Evans & Wachtel, 1993) and genetic algorithms (e.g., Arifovic, 1995). More specifically, the role of parameter instability and structural breaks in affecting the forecast performance of ARIMA models has been analysed recently by Clements and Hendry (1998). They actually advocate that a theory of economic forecasting which allows for model mis-specification and structural breaks is feasible, and may provide a useful basis for interpreting and circumventing systematic forecast failure in macroeconomics.

An examination of the Finnish economy reveals that the 1980s can be characterized as a period of economic expansion (unemployment was below 5%), although the last 3 years of the decade witnessed a huge rise in housing prices and inflation. On the contrary, the 1990s represent a recession period with a high unemployment rate whose root causes are internal as well as external: i.e., overheating in the domestic financial markets at the turn of the decade and the collapse of the Soviet Union accompanied by recession in Western markets. In fact, besides the up- and down-turns experienced in the economy in general, the inflation rate might have been affected by the changes in the conduct of monetary and exchange rate policies. Since the floating of the mark in 1992, the ultimate object of monetary policy in Finland has been defined more precisely in terms of a specifically announced low inflation target from February 1993.

The question of the role and effect of structural changes on inflation forecasts and inflation expectations is extremely important as it can affect, for example, the effectiveness of monetary policy. In this paper we attempt to take into account the effects of possible, but *not a priori defined*, structural changes in the economic policy and economy as a whole, which may have affected the DGP of inflation in Finland especially during the analysed period of 10 years. For this purpose, we first estimate a univariate time series model on the observed inflation rate using recursive and rolling regressions of an AR(I)MA model. These estimation procedures are here the first step in an attempt to take into account the possibility that agents, basing their *adaptive* expectations of future inflation on the past behaviour of actual inflation, would be *able to learn* from the changes in the most recent observations on inflation. The second step involves an attempt to capture the effects of large exogenous shocks (especially on forecasts and, hence, expected values for the longer run), where we utilise the analysis for outliers, level and variance changes in the univariate time series model introduced in Tsay (1988).

The paper proceeds as follows. In Section 2 we give an overview of the most recent papers related to the formation of inflation expectations. In Section 3 we give a fairly detailed description of the method and testing procedure for the detection of structural breaks in a univariate time series model. Section 4 contains the empirical results and discussion and Section 5 gives conclusions.

2. Structural changes and inflation generating mechanism

In 1976 Milton Friedman argued that the uncertainty concerning the inflation regime is an important source of inflation uncertainty itself. The set of research papers involving attempts to take into account inflation uncertainty includes, for example, the modelling of the conditional variance of inflation as an ARCH process (Engle, 1982, 1983; Cosimano & Jansen, 1988).