Recent Reserve Bank research

Economics Department

Summary

The Bank's recent economic research can be divided into three broad strands: policy research; structural model research; and forecasting research. Our policy research addresses how we can efficiently implement monetary policy. Our structural model research seeks to improve our understanding of how the economy works. We anticipate this increased understanding will heighten the accuracy of our forecasts. The remaining element of our research agenda contains projects, not directly related to the structural model, but also aimed at improving our inflation forecasts.

I Introduction

At regular intervals, future Bulletins will contain a summary of Reserve Bank research; each article covering the preceding six month period. By publishing these summaries we aim to increase the general level of awareness about Reserve Bank research and, further, to stimulate interest and comment on our research activities. Research by the Bank is currently available to the public through Bulletin articles, Discussion Papers, and Research Notes.

In general terms, our economic research can be divided into three principal categories: general forecasting; structural modelling; and monetary policy. Lately, we have pursued building a structural model, investing a large proportion of our resources into this project. While the model is not yet complete and, hence, not ready to be published, we have gained considerable insight into how to build structural models.

A highlight of our policy research was the Monetary Policy Workshop hosted by the Bank in June. This Workshop was attended by some of New Zealand's leading macroeconomic researchers as well as by colleagues from the Reserve Bank of Australia. Professor Bennett McCallum (Carnegie-Mellon University), Professorial Fellow in Monetary Economics at Victoria University, also attended this Workshop as an invited guest.

II Structural macro-model research

Potential uses for a structural model include: forecasting; counter-factual analysis; and policy analysis. Additionally, a structural model may be used as a tool for addressing specific economic issues. For example, the potential for instrument instability[1] may be explored using a well-specified model.

Before building our structural macro-model we undertook an extensive evaluation of most of the main macroeconomic models in the world today. From this evaluation, we identified two realistic routes for our macroeconomic modelling. The first route involved building a neo-classical style growth model along the lines of some Australian models. Alternatively, we could build a macroeconomic model based on New-Keynesian theory in the short-run, but with classical properties emerging in the longer-run - similar to the UK National Institute of Economic and Social Research's NIDEM model. We chose the latter route.

The model we have built focuses primarily on short-term forecasting. Consequently, it does not contain full stock/flow accounting and other features which we assessed would be of diminished importance for short-term forecasting. These features will be added later.

Given the requirement in the Policy Targets Agreement that the Bank maintain annual underlying inflation between zero and two percent, it is not surprising that the emphasis of the model is on explaining price movements. In a sense one could describe our model building approach as putting the basic building blocks necessary for modelling prices in place and then sequentially developing the model by endogenising those variables that enter the price system.

Prices are modelled on the theory of imperfect competition. Capacity utilisation enters the price system as a proxy for demand pressure and is a major link from the real economy back into the nominal economy (the other major link is through the unemployment rate in the wage equation). Our wage equation is based on bargaining theory

[1] To achieve their inflation objectives, the authorities may have to occasionally alter policy conditions. If an inflation goal is targeted too closely, large shifts in monetary conditions may be needed to ensure the goal is met. Instrument instability describes the case where, while attempting to meet the inflation target, the policy instrument becomes increasingly volatile.

following Layard *et al* (1991). In this model, workers increase their nominal wage claims in line with anticipated inflation, productivity growth, and profits (arising from imperfectly competitive markets).

In modelling the real economy, we take the unusual approach of describing aggregate demand with a single equation. Single equation approaches have been successfully used elsewhere for modelling aggregate demand - notably at the Bank of Canada. We have used a single equation for aggregate demand not only as a practical response to the difficulty of modelling the individual components of demand in New Zealand, but also as a convenient tool for summarising demand behaviour in the economy. The aggregate demand curve represents the crucial link from the real economy into the price system.

Two important features of the structural model are, first, that output, in the short-run, is demand-determined (in the short-run) and, second, that the model's Non-Accelerating Inflation Rate of Unemployment (NAIRU)[2] is endogenous. Instead of having a constant equilibrium unemployment rate to which the model converges, the NAIRU in equilibrium is driven (like output, investment, etc.) by all the exogenous variables in the model.

The endogenous NAIRU approach we have followed differs from that in a hysteresis model. The crucial difference lies in the model's response to temporary shocks. In an endogenous NAIRU model, a temporary shock will cause a temporary change to the NAIRU. By contrast, in a hysteresis model a temporary shock will cause a permanent change to the equilibrium unemployment rate.

The rest of the model consists principally of equations for the financial sector. The monetary policy instrument is the nominal exchange rate which directly enters both the price system and the uncovered interest parity equation. We also have an interest rate term structure linking the 5-year and 90-day interest rates.

First round estimation of all equations is complete, and the model is coded into simulation software so that it can be used for forecasting. We are in the process of developing protocols that will allow us to integrate the model into the quarterly forecast rounds smoothly.

III Policy implementation research

The aims of the Bank's policy research are twofold. First, we wish to identify areas where we can improve the way we operate monetary policy, and, second, we wish to increase our understanding of how inflation is generated and how it affects the economy.

New Zealand's monetary policy framework is unusual in so far as it explicitly sets a single statutory objective for monetary policy - that of keeping annual underlying inflation between zero and two percent. The techniques we use to change policy conditions are also slightly unusual. For example, we have considerable latitude for altering monetary conditions, without changing our policy instruments, simply by communicating our wishes to the markets. These aspects of New Zealand's monetary policy framework were commented upon by Bennett McCallum (1995) during his participation in the Monetary Policy Workshop organised and hosted by the Bank in June. Notwithstanding these differences, McCallum did not believe our policy structure introduces any particular operational risk[3].

McCallum also suggested that a weakness in our current framework is that the measure of underlying inflation, for which the Bank is accountable, is constructed by the Bank and cannot be independently replicated using official data series. Also, McCallum argues that the main advantage of the Reserve Bank Act is not that it constrains the Bank but rather that it reduces the scope for unobserved political intervention when implementing monetary policy. McCallum concludes by saying that despite the differences between New Zealand's policy implementation methods and those used elsewhere, he sees no reason to alter our techniques.

At the same Workshop, Hansen and Razzak (1995) presented an investigation into inflation and excess demand variability under various monetary policy rules[4]. While their research is incomplete, Hansen and Razzak (1995) found that, unlike other research in the literature, the relative performance of the price level and zero inflation targets depended on the parameters of the model[5]. Additionally, they found that the nominal exchange rate rule outperformed a zero inflation target when the variability of

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[2] In Layard *et al* (1991), workers' ability to bargain with firms is moderated by the level of unemployment relative to the NAIRU. If unemployment is above the NAIRU, wage growth (and hence inflation) will fall because workers' bargaining power is reduced. Similarly, if unemployment is below the NAIRU, wage growth (and hence inflation) will rise because workers' have increased bargaining power. Consequently, the NAIRU is the unemployment rate at which no upward or downward inflationary pressure is exerted from unemployment.

[3] By operational risk, McCallum was referring to the possibility of speculative attacks on the currency.

[4] The rules used in their study were: a price level target; a zero inflation target; a fixed nominal exchange rate rule; a real exchange rate target; and an output gap target.

[5] Indicating that it may not always be optimal to accept past inflation errors.

wage shocks was small. On the topic of policy rules, McCallum argues in favour of a nominal output growth target on the grounds that such a target lessens the potential for instrument instability.

In addition to the Workshop, we have, using empirical equations, explored the sources of inflation in the New Zealand economy. Corfield (1995), using a recently estimated Consumers' Price equation, found that increases in unit labour costs (driven by wage growth) had the largest influence on inflation between March 1987 and March 1992. In recent years a depreciating currency and widening profit margins have made the biggest contributions.

Finally, Mayes and Chapple (1995), in a recent Bulletin article, present a discussion on the sacrifice ratio. They argue that estimates of this ratio cannot be relied upon because the long-run economic effects of low inflation are not usually accounted for. They go on to discuss aspects of the economy – such as central bank credibility – which may affect the sacrifice ratio.

IV General forecasting research

This section contains research, not directly related to the structural model, aimed at improving our inflation forecasts. As it happens, all of the papers summarised have a financial markets focus. Specifically, we have tried to improve our inflation forecasts by developing equations for the exchange rate, and money demand. Additionally, we have searched for information about future inflation and output growth in the yield curve.

Chapple (1995) investigated whether the yield gap (i.e. the difference between long- and short-term interest rates) contains useful leading information about future inflation and output growth. Support for the notion that the yield gap is informative about future inflation comes from the Fisher equation, linking real and nominal interest rates, and the expectations theory of the interest rate term structure. A link between the yield gap and future output growth can be motivated by the influence of monetary policy on the yield curve. A tightening in monetary policy, which drives up short rates relative to long rates, would be associated with a temporary decline in the rate of future output growth.

The results of this project suggest that there is little direct leading information about inflation contained in the yield gap. However, some support for the theory that the yield curve is an indicator of future output growth is found. Specifically, the five year - two year gap may be useful for forecasting output growth two to three years into the future.

Pierre Siklos (visiting scholar from Wilfrid Laurier University) (1995) modelled money demand in New Zealand, accounting for the substantial financial reforms undertaken in New Zealand over recent years. These reforms have ushered in numerous technological innovations into the financial system, each of which has altered the demand for money. While establishing a money demand relationship, Siklos concludes that the unpredictability of future financial innovation prevents the conduct of monetary policy using money aggregates in New Zealand.

It is notoriously difficult to find an exchange rate equation whose forecasts can out-perform a naive assumption of no change. However, recent developments in the theory of non-stationary variables and cointegration seem to offer cause for optimism. Eric Hansen and Michael Hutchison (the latter a visiting scholar from the University of California at Santa Cruz) (1995) develop an exchange rate equation that estimates both the long- and short-run parameters of the model simultaneously. Their model for the real exchange rate recognises that import and export prices need not enter the system symmetrically (in the form of a terms-of-trade variable).

Hansen and Hutchison's results indicate an important role for non-tradeables supply and significant import and export price effects. Moreover, their model out-performs a naive no change model when forecasting - particularly over longer horizons.

VI References

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