

Introduction

It is now a reasonably common international practice for governments to give their monetary authorities clear, well-defined price stability objectives to achieve. A growing number of monetary authorities claim to operate with an explicit inflation target or, at the least, to operate within an inflation-targeting framework. It is also increasingly common for monetary authorities to have the freedom to choose how their policy instruments should be adjusted to achieve their low inflation objectives. In the jargon, the monetary authority has been given operational independence to achieve an inflation goal that has been agreed by the government. The Reserve Bank of New Zealand (RBNZ) is no stranger to these developments, having pioneered inflation targeting in 1988 and formalising its operational independence in the Reserve Bank Act of 1989.

However, while the operation framework and objectives for monetary authorities have become more certain, their ability to achieve their designated objectives has not. Operating monetary policy under uncertainty remains a reality for central bankers and was the motivation behind the RBNZ's Workshop in June 1998. The breadth of issues covered and the variety of participants from central banks and academia globally, provide clear evidence of the interest in this topic. The timing and backdrop to the RBNZ workshop was also apt. At the time, the New Zealand economy was being buffeted by the Asian financial crisis and had just experienced two consecutive droughts. In addition, RBNZ economists, amongst others, were grappling to quantify the impact of many years of deregulation and economic liberalisation. The combination of unexpected events and an evolving economic structure ensured that uncertainty was pervasive.

So what is the key source of uncertainty when it comes to monetary policy? While established goals for monetary authorities are now common, the interaction between changes in policy instruments and their subsequent impact on the inflation objectives remains uncertain. Policymakers must set instruments today to achieve their objective at some point in the future. To do this effectively, several factors need to be accounted for, including assessing: where the economy is today; the dynamic links between the instruments and objectives; and other factors that may arise that can impact on the objectives in the interim. If policymakers could perfectly account for each of these factors then their objectives could be achieved at all points in time. In such a world of certainty, inflation expectations would be well anchored and price stability the norm. Unfortunately, this is not the case. The necessity of prediction means uncertainty abounds in monetary policy, with each

of the above factors mentioned above only ever partially accounted for. As has been suggested before, an economist who climbs the flagpole of prediction displays only one part of their anatomy.

When discussing the difficulties of prediction, economists often note that at least weather forecasters can see what the weather is like today. Economic forecasters on the other hand don't have this luxury. At any point in time it is generally unclear exactly what the state of the economy is. Data on macroeconomic outcomes are generally only available with a lag and, even then, often subject to significant revision. However, in the absence of alternatives, these data are used to estimate unobservable concepts, such as the degree of spare capacity in an economy, that play crucial roles in the setting of the stance of monetary policy. In addition, these data are used for forecasting how the economy is likely to evolve. Consequently, deciding what policy actions you need to take to reach a particular objective is very difficult when you are unclear as to where you currently are relative to your target and what relationships you can rely on to hold.

Even if policymakers knew exactly where they were starting from, they must still rely on their understanding of the transmission between policy actions and macroeconomic outcomes to decide how the stance of policy should be set. Unfortunately, this understanding is less than perfect, reflecting the fact that economies are complicated and constantly evolving. Monetary policy is focussed on macroeconomic outcomes that result from the complex interaction amongst concrete technical factors, less concrete human behaviour and institutional structure. Not only is it extremely difficult to understand exactly how each of these factors contributes to the outcome, they also change through time.

The extent of the structural reform that the New Zealand economy has undergone in the last 15 years is testament to exactly how profound that change can be. The structural reforms have included, amongst other things, financial market liberalisation and the deregulation of foreign trade. The economic adjustment to such factors left policymakers grappling throughout the 1990s with issues such as the potential growth rate of the economy and the extent to which demand pressures would arise following a period of financial repression in the household sector. Such factors are only obvious in hindsight, while policy must be made in the here and now.

Perhaps a more written about recent example, although no less relevant, is the degree to which the US monetary authorities have been surprised by the lack of inflation pressure over the second half of the 1990s. To quote Alan Greenspan, the Chairman of the United States Federal Reserve in his August 1999 Statement to the Congress, "The failure of economic models based on history to anticipate the acceleration in productivity contributed to the recent persistent underprediction of economic growth and overprediction of inflation. Guiding policy by those models doubtless would have unduly inhibited what was a remarkable run of economic prosperity."

Of course, even knowing where you are and how to get to where you want to be still isn't enough to ensure that the actions you take today will prove optimal. Events could arise tomorrow that throw you off course. As already mentioned, few policymakers were able to successfully forecast the degree of difficulty experienced by many Asian economies in 1997 and 1998, despite what some have since claimed! These difficulties had significant spill-over effects on many industrialised

countries, necessitating quite dramatic policy responses. Had policymakers foreseen these events, instrument settings prior to 1997 would undoubtedly have been much different than they were.

Policymakers have attempted to deal with these uncertainties in two ways. The first and most obvious has been to attempt to resolve as much of the uncertainty as possible. This has been done by encouraging greater speed and accuracy in the collection of economic data, conducting extensive research on the links between policy actions and macroeconomic outcomes, and devoting considerable resources to forecasting how other factors that influence the policy objective are likely to evolve in future. At the same time, policymakers have also focussed on the best way to adjust the policy instrument given that all the uncertainties surrounding the factors central to the policy decision are not resolvable.

The objective of the RBNZ's workshop was to bring together researchers from policy institutions around the world to share their research on conducting monetary policy in the face of these pervasive uncertainties. Research on the implications for conducting monetary policy under uncertainty has a rich heritage originating with the Brainard (1967) work examining the implications of uncertainty about the strength of the economy's response to policy actions. The Brainard result, that uncertainty implies caution, has dominated conventional wisdom for a considerable time. An analogy sometimes used is that of driving an unfamiliar motor vehicle on a foggy night with dim headlights. In such a situation, the motorist is unsure exactly how the car will respond to changes in direction and speed. They are also unsure of where the next bend is and what direction it will take. In such a situation, it appears intuitive to slowdown, to remain as close to the centre of the road as possible, and to alter your path only gradually.

However, much has changed in the economics profession since Brainard's work was completed and current research suggests that the answer may not be so simple. The ongoing research in this area has been spurred by a general feeling amongst 'central bank-watchers' and academics that monetary authorities often appear to do 'too little too late'. Some of the issues reported on in this volume (and persisting with the car analogy) include the driver becoming more familiar with the vehicle, being confronted with rapidly changing conditions, and picking up information which suggests that they are elsewhere on the road. As the complexity of the issue increases, the general rule of going slowly and only gradually adjusting the wheel is not always optimal. If, for example, the driver suddenly realises they are close to the edge of the road then rapid action would be called for. In addition, as the driver learns the response of the car, it may be optimal to move faster to the ultimate destination. You have the idea.

The considerable advance in computer technology and solution algorithms means that we are no longer restricted to using simple models and analytic solution techniques to resolving the optimal policy response. These advances in numerical techniques are reflected in the fact that several of the papers presented in this volume use stochastic simulations of nonlinear, rational expectations models as the basis for analysis. Further, these improved numerical techniques have meant that it is now feasible to consider interesting dynamic and learning aspects that lie at the heart of the uncertainty issue in a very fundamental way. The research contained in this volume investigates many of the key uncertainties faced by monetary authorities. Uncertainty about where they are starting from,

the links between instruments and objectives, and future events. Not surprisingly, as the complexity of the question increases, so does the complexity of the answer.

Uncertainty about both the starting point (eg the economy's current extent of excess supply or demand) and unexpected events are examined in the Smets, Isard and Laxton, and Drew and Hunt papers. Their results suggest that the implications depend on the structure of the policymaker's errors. Importantly, a more cautious response in the face of such uncertainty does not always result.

Uncertainty about the links between policy actions and macroeconomic outcomes is investigated in several of the workshop papers. As usual, the answer is 'it depends.' The Salmon and Martin paper, which focuses on model parameter uncertainty, yields the standard policy attenuation result of Brainard. By contrast, the Shuetrim and Thompson paper extends the Brainard formulation to accommodate multiple time periods and objectives for policy. Their work shows that while uncertainty about the effectiveness of policy tends to recommend a more conservative approach, other forms of uncertainty may actually lead to more aggressive policy approaches. Explicitly, uncertainty about the dynamics affecting the economy (eg the persistence of economic variables) can be a source of additional activism. These results suggest that a careful examination of where the most significant degree of uncertainty lies is important for each individual economy. Policymakers must be careful not to assume that research results for one economy can be applied to what may appear to be broadly similar economies.

Looking at uncertainty from the perspective of economic agents, the Tetlow, von zur Muehlen and Finan paper shows that the transition costs of agents having to learn the monetary authority's policy rule can more than offset the gains from shifting to an otherwise superior rule. Policymakers must factor in the implications of the uncertainty faced by other economic agents when they alter their policy strategies.

A closely related topic, credibility, is investigated in the Amano, Coletti and Macklem paper and the Dillén and Nilsson paper. In both papers, the notion that improved credibility can be a double-edged sword comes through quite clearly. For policymakers to take advantage of improved credibility, they must be cognisant of the improvement and have adjusted their policy responses accordingly. The authors note that the difficulty in determining the level of credibility that the policymaker enjoys implies that designing policy strategies that are robust under a range of credibility levels may be the best way forward.

One theme that emerges from the research presented at this workshop is that uncertainty can have a dramatic impact on the stabilisation properties of different monetary policy strategies. Further, there does not appear to be a simple answer for guiding the design of policy strategies in the face of this uncertainty.

Relative to the certainty case, different aspects of uncertainty pull the preferred policy response in different directions. Consequently, considerable benefits can be expected to accrue from enhancing our knowledge of how economies work, understanding exactly where the economy is when the decision on how to set the instrument must be taken, and formulating the best possible fore-

casts of what might await down the road. That being said, uncertainty will never be completely resolvable. Policy strategies need to be robust to the range of considerable uncertainty that monetary policy can always be expected to have to operate under. Robustness should therefore be a constant focus of future research on operating monetary policy under uncertainty. Advances in computing power and numerical techniques will continue to improve our ability to consider simultaneously the implications of more dimensions of the uncertainty policymakers face. Meanwhile, the editors remain convinced that the vagaries of monetary policy and the conditional nature of projections will continue to be conveyed to the public in the usual fashion – through the use of a lot of words and economists continuing to wring both hands.

The editors would like to thank all contributing authors, discussants, and participants at this workshop. Special thanks also goes to Cheryl Ng and Matthew Wright of the Reserve Bank of New Zealand for their technical expertise in pulling the papers together. We are also pleased to note that a follow up workshop has already been hosted by the Swedish Riksbank in August, 1999, with the Bank of Canada putting their hands up as hosts for 2000. The growth in the number of inflation targeting countries and interest in this topic more generally is quickly adding to the volume of research and our understanding. It will also add to the number of exotic destinations for future workshop participants.

Kia Ora