

# Monetary policy in an uncertain world

*“It’s not so much the things you don’t know that cause the trouble, as the things you do that ain’t so”.* Will Rogers

Central banks conduct monetary policy in an environment that is characterised by incomplete information and imperfect understandings of the dynamics and inter-relationships of the economy. Much research has been done internationally on conducting monetary policy under uncertainty. In this paper we describe the different types of uncertainty that policy-makers face and their implications for policy choices, and discuss some of the broader lessons offered by the research literature.<sup>1</sup>

Various ways of adapting policy to allow for imperfect knowledge are available. Perhaps the most common is judgementally to moderate the pace at which interest rates are adjusted. Notwithstanding the existence of uncertainty, however, over the last decade or so central banks have shown themselves capable of delivering low and stable inflation outcomes, suggesting that their application of judgement has generally been sound.

## Introduction

- 1 While the objectives and operational framework for monetary policy in New Zealand have become more certain in recent years, the economic environment in which policy is implemented probably has not. In this environment, the Reserve Bank contends with a range of uncertainties that can have implications for the design and conduct of monetary policy. Unexpected events, changes in the way the economy responds to various influences, revisions of past data that alter our interpretation of history, etc., must all be allowed for.
- 2 To manage monetary policy successfully in this world, we try to understand the nature and implications of having imperfect knowledge. Recent international literature on monetary policy under uncertainty has sought ways for monetary policymakers to act so that there is the maximum chance of desirable macroeconomic outcomes, irrespective of the type of uncertainty faced. Perhaps unsurprisingly, no general rules have been discovered. It would appear that, because of its nature, uncertainty cannot be incorporated into the policymaking process in a mechanical or rigid fashion.
- 3 Instead, within the context of the constraints imposed by the monetary policy framework in place – in New Zealand’s case, inflation-targeting – policymakers inevitably exercise judgement. Meantime, there is an ongoing search for ways to better understand what is going on.
- 4 In this paper, we describe the key points from the literature on uncertainty. We describe the different types of uncertainty that policymakers contend with and their implications for policy choices, and we discuss some of the broader lessons. In an accompanying paper [see [“The monetary policy decision-making process”](#)] we describe the processes we use in the course of deciding on the appropriate policy stance – these processes being designed with the aim of making sure we look at the issues from a number of sides rather than getting locked into one view.

## Sources and implications of uncertainty

- 5 Monetary policymakers set instruments today to achieve the inflation objective at some point in the future. There is imperfect knowledge about the structure of the economy and how this will impact on the way events unfold, the current state of the economy, the shocks that will impact on the economy in the future, and how their own actions will affect people's behaviour. In the academic literature, the policy implications of these different types of uncertainty are usually assessed in the context of economic models in which the policymaker is exposed to some (artificially well understood) form of uncertainty. In this environment, researchers search for 'rules' for conducting monetary policy that minimise the extent of macroeconomic volatility in the model economy, in spite of the uncertainty under consideration. In this section, we briefly discuss the *causes* and policy *implications* of the different types of uncertainty.

### Limitations to knowledge about the structure of the economy

#### *Causes:*

- 6 The way economies behave is ultimately the result of individual actions by a great many people who display some relatively methodical traits, and some powerful whims and flights of fancy that generate a degree of unpredictability about individual and collective actions.
- 7 These limits to knowledge are described in the literature as 'model uncertainty' because it reflects uncertainty about the structure of the economic relationships that comprise policy-makers' (formal or informal) models. Even where the structure of the models' economic relationships is a valid representation of what matters for people, how much each individual factor matters is still likely to be captured imprecisely. For example, policy-makers may be confident that interest rates influence consumption and investment spending, but uncertain about the speed and potency of these effects. As a subset of 'model uncertainty', we thus have 'parameter uncertainty' (since in models the presumed strength of individual factors is represented in various 'parameters').
- 8 Note also that the structure of the economy and the strength of the relationships are evolving through time. Just as human behaviour evolves and changes through time, so too do macroeconomic relationships.
- 9 For all of these reasons, our understanding of how the economy works is imprecise. Economic models – such as the Reserve Bank's *Forecasting and Policy System* (FPS) and the less formal 'models' that we carry in our heads – are only approximations of reality.

#### *Implications:*

- 10 The policy implications of specific aspects of model uncertainty have also been studied extensively. In a seminal article, William Brainard assessed the policy implications of parameter uncertainty.<sup>2</sup> He argued that, if policymakers are uncertain about the potency with which policy actions affect aggregate demand and inflation, it is optimal to move the interest rate by a smaller amount in response to shocks than in the case of no uncertainty. The Brainard attenuation result – estimate your best policy response and

then do less – would suggest that we should ‘feel our way’ with smaller changes to the OCR relative to what we would do if we were totally certain about the effect of policy changes on economic activity. Such a strategy would avoid interest rate changes that could create, through their interaction with other factors, larger effects on economic activity than intended.

- 11 However, recent research by Gabriel Srouf suggests that the implications of parameter uncertainty for monetary policy may not be so clear cut.<sup>3</sup> Srouf points out that, for some economic relationships, it would be incorrect to presume that being uncertain implies policymakers should ‘feel their way’. For example, if we do not know how much unexpected changes in inflation will spill over into generalised inflation, then it may be sensible for monetary policy to respond *more* forcefully to inflation surprises, thereby minimising the potential for inflation to deviate persistently from the target. Srouf’s arguments suggest that, if there is quite widespread uncertainty how the economy works, then it might be risky to adopt the Brainard strategy in all circumstances. It might turn out to have been the right thing to adjust the OCR cautiously, but then again it might not.
- 12 Many of the studies in this area focus on very precise examples of uncertainty, with the resultant policy prescriptions also tending to be very specific. In one exercise conducted at the Reserve Bank, we considered the case of uncertainty about the length of time it takes for policy actions to influence inflation.<sup>4</sup> This research indicated that, if monetary policy responds relatively gradually to bring inflation back to target, monetary policy’s impact on the economy will be less affected (relative to more aggressive monetary policy) by not getting the speed of the transmission of policy’s influence exactly right. In another exercise, we examined uncertainty about the impact of exchange rate movements on people’s expectations of future inflation.<sup>5</sup> This research suggests that macroeconomic stability might be enhanced if policymakers ignore (‘look through’) the inflationary impact of temporary exchange rate shocks, even if it turns out that exchange rate movements influence inflation expectations to a surprising degree. Of course, unless we know what specific policy prescription to apply at each point in time, these prescriptions are affected by Srouf’s point that it might be dangerous to presume too much.

### **Limitations to knowledge about the current state of the economy**

#### *Causes:*

- 13 Meteorologists have some advantage over economists in that they have more accurate, up-to-the-minute, information on the current state of the weather. Economists, in contrast, have to cope with a wider range of issues that compromise data quality and introduce uncertainty into assessments of the current economic ‘weather’. At a fundamental level, a great deal of macroeconomic data only approximates the underlying macroeconomic concepts that economists are interested in.
- 14 Macroeconomic data are also sometimes revised and redefined in light of additional source information, changes in measurement or sampling method, or shifts in seasonal adjustment factors. For example, revisions to the quarterly growth rate of New Zealand’s GDP have averaged around 0.3 of a percentage point since the early 1990s and have been in the vicinity of plus or minus one percentage point on a number of occasions.

- 15 As well as these problems, assessments of the current state of the economy are affected by the fact that a lot of important macroeconomic data are only available with a lag. For example, June quarter GDP is not available until the end of September. As a result, the most recent data do not reflect the current state of the economy, but instead pertain to a slightly earlier time period.<sup>6</sup>
- 16 Finally, assessments of the economy are also prone to uncertainty because some of the most important economic concepts – notably potential output and expectations – are not directly measurable using conventional data-collection techniques. Measures of these economic variables are typically inferred from surveys or other macroeconomic data.

*Implications:*

- 17 In this area as elsewhere, research has been catching up with policymakers' intuition. Until relatively recently, research into the implications of imperfect knowledge about the state of the economy suggested that policymakers should simply ignore the uncertainty and set policy on the basis of their best estimates (the so-called certainty equivalence result).<sup>7</sup>
- 18 However, a number of recent studies have suggested that uncertainty about economic data can, in fact, have important implications for the policy process. These studies tend to focus on uncertainty about the output gap – an inherently uncertain economic indicator that can play an important role in monetary policy.<sup>8</sup> Frank Smets, for example, develops a model in which policymakers, as in life, have to estimate the true level of the output gap using imperfect indicators to aid the assessment.<sup>9</sup> Smets shows that, as the accuracy of the output gap estimates deteriorates, it pays to put less weight on these estimates when assessing the state of the economy and making policy decisions. That is, in the spirit of Brainard, it becomes optimal for policymakers to attenuate their response to the estimated output gap.<sup>10</sup> While that seems logical, work at the Reserve Bank points out that attenuating the policy response works fine on average, but might cause problems in circumstances where errors in estimating the output gap turn out to have been persistently on one side.<sup>11</sup>
- 19 That uncertainty about data can have important implications for the policy process is not news to policymakers, who are generally well aware of the need for judgement when inferring the state of the economy from a narrow range of (uncertain) data.<sup>12</sup> There is no substitute, it seems, for considering a broad range of data when assessing the state of the economy, to distil a more accurate picture through the use of cross-checks. For this kind of reason, each year we speak with around a hundred different businesses and commercial banks to hear their views on the current state of the economy. We also have frequent contact with Statistics New Zealand and other data providers to determine how different economic indicators are constructed and what exactly they are measuring.

**Limitations to knowledge about future events**

*Causes:*

- 20 Because policy actions affect the economy with 'long and variable lags', monetary policy should be set on the basis of the expected future state of the economy. However,

monetary policymakers do not, unfortunately, have perfect foresight. The economy is subject to ‘shocks’ of unknown nature and duration; consequently, economic reality will turn out to be somewhat different from forecasts, even when the starting point is well understood and the economic model is accurate.

- 21 New Zealand’s economic history is full of examples of this type of ‘shock uncertainty’. The fallout from the financial crisis in Southeast Asia and the current oil shock are good examples of unanticipated events that have had a significant impact on the New Zealand economy. This type of uncertainty can also arise from unexpected changes in other areas of economic policy. For example, unanticipated changes in fiscal policy, tariffs, and other areas of microeconomic reform may influence future inflation in ways that are difficult to quantify *ex ante* (although many policy changes are announced somewhat in advance of taking effect).

#### *Implications:*

- 22 The optimal way in which policymakers should respond to uncertainty about future events is, in theory, relatively straightforward. Policymakers should simply base their actions on the *expected* nature of future events. For example, if it is uncertain how long an already-observed shock will persist into the future, it is optimal for policymakers to base their response on the expected degree of persistence of the shock. If policymakers’ expectations are on the mark, the associated policy actions will be as well. As policymakers learn more about the nature of shocks affecting the economy, they will revise their forecast and reset monetary policy accordingly. Under this strategy, monetary policy follows a ‘middle of the road course’ in which the balance of risks associated with uncertain future events are evenly balanced.
- 23 In general, this is the approach we adopt. As is frequently pointed out in the Reserve Bank’s *Monetary Policy Statements*, the published projection is conditional on future events turning out as predicted. If the nature, size, or persistence of economic shocks turn out to be different from our expectations, then our forecasts, and policy settings, will be adjusted.
- 24 However, it might, from time to time, be sensible to depart from this middle of the road approach. Some of the potential shocks that we are conscious of might be of greater consequence than others, even if they are no more likely or even less likely. In such circumstances, the distribution of risks around the most likely view might be skewed. It can be appropriate to take such a skewed risk distribution into account when setting policy, rather than playing it down the middle.

### **Practical policy responses**

- 25 Given the problems with uncertainty, it would be good to be able to remove as much as possible from the policymaking process. Obviously, we try to enhance our knowledge of how the economy works, understand exactly the state of the economy when policymaking decisions are made, and formulate the best possible forecasts of what the future might hold. But making significant progress on these fronts is difficult. [See [“Data challenges in the monetary policy process”](#) and [“The projection process and accuracy of the RBNZ projections”](#).]

- 26 We believe that a high degree of transparency in the policy-making process helps mitigate the effects of uncertainty. If it is clear what the central bank's objective is and how it plans to achieve that objective, then market participants will be more likely to react to incoming data in a way that is consistent with the objectives of monetary policy. As a result, lags in the policy process may be shortened by anticipatory actions on the part of private sector agents. This is an important reason why the Reserve Bank publishes economic forecasts and other material that helps people understand our thinking. It has to be acknowledged, however, that publishing detailed economic projections in an uncertain world means that some facet of the forecast will invariably turn out to be different from economic reality, especially around turning points in the economic cycle or in the wake of significant shocks to the economy. Hence, the Bank treads a fine line between providing useful information that can help condition expectations, and generating a false benchmark for assessing the Bank's capability. [See "[Publication of projections](#)".]
- 27 To help develop our own and the public's understanding of the practical implications of uncertainty, we regularly generate 'alternative scenarios' in which some aspect of the central forecast is changed to reflect the uncertainties that predominate at the time. By asking these types of 'what if' questions, we explore the range of possible outcomes that might arise if economic reality turns out to be different from the assumptions on which the central forecast is based. This case-by-case approach is consistent with the lessons from the literature on monetary policy under uncertainty, namely that there are few general rules-of-thumb and that policymakers should use judgement.
- 28 Because at the end of the day some uncertainty will remain, we tend to move interest rates by less than we would do than if we were certain. Various analyses, undertaken here and elsewhere, suggest that policy would involve much larger steps than our normal limit of 50 basis points were the world a more certain place. The degree of deliberate interest rate smoothing in response to uncertainty is, however, clearly not constant. In our most recent policy decisions, we have purposely stayed our hand given questions over how fast the economy will recover from its confidence slump. But that response has been in the context of a situation in which we judged interest rates to be close to 'neutral'. In different circumstances, had real interest rates been either very high or very low (by historical standards, or relative to an assessment of neutral), it is likely that our response would have been different. In such circumstances, policy changes that took interest rates further away from neutral would be taken more cautiously than changes in the direction of neutral. Interestingly, this type of asymmetric response to uncertainty is not something that the research has evaluated at all thoroughly, but it is something that policy makers do quite naturally.
- 29 Finally, we have limits on the extent of our caution, limits that are implied by the inflation targeting framework. That framework has a target band, which calls for action as evidence emerges of a persistent move of inflation away from price stability. Substantial and persistent breaches of the range require dispensing with the benefit of the doubt, and acting strongly in favour of returning inflation inside the range. This structure for decision making – discretion to assess the nature of the circumstance and adjust the strength of the policy response accordingly, but only up to certain limits – seems an appropriate reaction to the uncertainties facing monetary policy.

## Concluding remarks

- 30 Monetary policy is made with imperfect knowledge. Unfortunately, there does not seem to be a generic or simple answer for guiding the design of policy strategies in the face of uncertainty. The theoretical literature suggests that some types of uncertainty should induce the policymaker to ‘do less’ while other types call for no moderation in policy setting. Because the predominant uncertainties faced by policymakers are likely to change through time, it would appear that, because of its very nature, uncertainty cannot be incorporated into the policymaking process in a consistent fashion.
- 31 Accordingly, although a clear policy framework might be used to direct the medium-term orientation of monetary policy, to a great extent tactical policy responses need to be decided on a case-by-case basis. This approach is aptly termed ‘constrained discretion’. Policymakers are ‘constrained’ in that monetary policy must be conducted consistent with the overall policy framework (notably, to keep inflation within the target band). However, within the inflation-targeting framework, policymakers have ‘discretion’ to factor such uncertainties that might prevail at the time into their policy decisions.
- 32 These types of policy subtleties are not captured by economic models, but are instead part of the ‘art’ of monetary policy. In this context, an important part of this ‘art’ is discerning the nature of the current uncertainties and altering policy accordingly. And for such reasons, it is unlikely that inflation will always stay within the 0 to 3 per cent target band. Recent work at the Reserve Bank suggests that, as a result of uncertainty about future events, there is every possibility that consumer price inflation will fall outside the target band one in every five years.<sup>13</sup>
- 33 With frequent policy resets and the constraints imposed by the inflation-targeting framework, departures from the target band should not be persistent, and New Zealanders will continue to enjoy low and stable inflation. In the meantime, monetary policy will never be able to deliver “perfect” results on all the dimensions identified as relevant in the Policy Targets Agreement. However, despite imperfections in our knowledge, central banks in New Zealand and elsewhere have been able to keep inflation low and stable.

## Endnotes

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- <sup>1</sup> This paper draws heavily on Conway (2000), [“Monetary policy in an uncertain world”](#), *Reserve Bank of New Zealand Bulletin*, Vol 63, No 3.
- <sup>2</sup> Brainard, W (1967), “Uncertainty and the effectiveness of policy”, *American Economic Review*, Vol 57, 411-425.
- <sup>3</sup> Srouf, G (1999), “Inflation targeting under uncertainty”, Bank of Canada Technical Report No. 85.
- <sup>4</sup> Ha, Y (2000), [“Uncertainty about the length of the monetary policy transmission lag: Implications for monetary policy”](#), *Reserve Bank of New Zealand Discussion Paper DP2000/01*.
- <sup>5</sup> Conway, P, A Drew, B Hunt and A Scott (1998), “Exchange rate effects and inflation targeting in a small open economy: a stochastic analysis using FPS”, *BIS Conference Papers*, vol 6.
- <sup>6</sup> Not all economic data are prone to these types of difficulties. Individual exchange rates and interest rates, for example, are accurate, timely and continuous.
- <sup>7</sup> Chow, G (1977), *Analysis and control of dynamic economic systems*, Wiley.
- <sup>8</sup> For a discussion on the output gap in the context of New Zealand’s monetary policy, see Claus, I, P Conway and A Scott (2000), [“The output gap: measurement, comparisons and assessment”](#), *Reserve Bank of New Zealand Research Paper No 44*.
- <sup>9</sup> Smets, F (1999), “Output gap uncertainty: does it matter for the Taylor rule?” in *Monetary policy under uncertainty: workshop held at the Reserve Bank of New Zealand 29-30 June 1998*, 10-29.
- <sup>10</sup> A number of other recent studies also refute certainty equivalence and find that efficient monetary policy should put less emphasis on the output gap relative to the case of certainty. See, for example, Orphanides, A (1998), “Monetary policy evaluation with noisy information,” *Federal Reserve Board Finance and Economics Discussion Series 1998-50*, and Swanson, E T (2000), “On signal extraction and non-certainty-equivalence in optimal monetary policy rules,” *mimeo*. Board of Governors of the Federal Reserve System.
- <sup>11</sup> Drew, A and B Hunt (2000), “Efficient policy rules and the implications of potential output uncertainty,” *Journal of Economics and Business* Vol 52, 143-160.
- <sup>12</sup> In the New Zealand context, this approach to interpreting data is reinforced by a relatively high level of macroeconomic volatility relative to other OECD countries (as discussed in a recent Board Paper).
- <sup>13</sup> This work is reported in Drew, A and A Orr (1999), [“The Reserve Bank’s role in the recent business cycle: actions and evolution”](#), *Reserve Bank of New Zealand Bulletin*, Vol 62, No 1.