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Managing and Communicating Risk and Uncertainty in Macroeconomic Policymaking

Introduction

In policymaking, as in life, we often must make decisions without knowing how the future will play out. Taking uncertainty into account when making macroeconomic policy allows policymakers to help improve economic outcomes. This article considers three aspects of improving outcomes for fiscal and monetary policymaking: considering risk and uncertainty in decision-making; communicating risk and uncertainty; and designing better tools to communicate risk.

To start with, it is useful to differentiate between risk and uncertainty, terms that are often used interchangeably.[1] Risks are what we might call the 'known unknowns'. They are future events for which the past provides guidance on both their likelihood of occurring and their effects, and we can insure ourselves against them. An example of a macroeconomic risk for the New Zealand economy is exchange rate movements: there is a long history of exchange rate movements which we can use as a basis for assessing the likelihood of small or large changes in the future.

Risk lends itself to measurement and quantification by statistical tools. Using such tools is a useful and important part of policymaking. Further, the results of such measurement and quantification can, and often should, be communicated to the public.

By contrast, uncertainty captures the 'unknown unknowns', often called Knightian uncertainty following the pioneering work of Frank Knight (1921). Uncertainty is about events that cannot be foreseen or defined *a priori*. Their likelihood of occurrence and macroeconomic impacts are not quantifiable because the past is considered to provide little guide to the future. Hence, statistical tools cannot be used to evaluate the likelihood of future outcomes. By definition it is difficult to discuss specific uncertain events, and so we focus here on uncertainty as a concept. If we can describe likely events and the damage they may then do, they are risks, not uncertainties.

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But how should we react to the genuine uncertainties? Optimal behaviour when faced with uncertainty is to minimise the potential damage from worst possible outcomes. This is known as maximin (i.e. maximize the minimum) in the technical literature. But how should this concept be applied in practice? A good response is to think about strategies to build resilience capable of cushioning against adverse outcomes. We may not know what all the uncertainties are, but we can think about our ability to absorb these uncertainties as they unfold. Some uncertainties will be positive, and these can be treated as windfalls. In this vein, we will describe how such resilience might be evaluated and communicated as a worthwhile answer to the difficulties of describing uncertainties and the impossibility of quantifying them.

Dealing with risk and uncertainty is a fruitful area for advancing better government through collaboration between academics and those who make policy. It requires an understanding of the available tools with their strengths and weaknesses, an area in which academia has a definite strength, while government advisers and decision-makers bring an understanding of where such analyses might be applied to inform and improve policy.

How do policymakers take risk and uncertainty into account when making decisions?

Macroeconomic policies are often made with the goal of reducing economic fluctuations and the risks around them. Uncertainties around future policy reactions can be converted into risks by outlining how policymakers would react in various scenarios (Ilut and Schneider, 2014), to reduce risk around the policies themselves (Fernández-Villaverde et al., 2015)[2] and to reduce the size of economic fluctuations (Bekaert, Hoerova and Duca, 2013). Lowering economic and policy risk by identifying possible risks and using them to inform policymaking cultivates an economic environment in which businesses tend to invest more and employ more people (Bloom, Bond and Van Reenen, 2007; Bloom, 2009). Likewise, if consumers perceive income certainty they

will tend to spend more (Bertola, Guiso and Pistaferri, 2005). Conversely, more risk – other things being equal – means less income, less investment and more unemployment. Reducing risk can thus help to both increase the level of GDP and reduce fluctuations in GDP.[3]

In New Zealand, as one of the two pillars of macroeconomic policy, fiscal policy contributes to reducing economic uncertainty by keeping public finances in order, sustaining a stable tax system and ensuring predictable expenditure policies. As the second pillar, monetary policy contributes to reducing economic uncertainty by maintaining price stability through a transparent and predictable interest rate policy.

In practice, policymaking by monetary and fiscal authorities for macroeconomic risk management purposes typically consists of four basic steps: the identification and quantification of risk; decisions about whether to mitigate risks; decisions about whether to make provision for risks; and decisions about whether to accommodate for residual risks (IMF, 2016). A variety of analytical tools support those decision-making processes. A typical set of heuristic methods includes: general probabilistic assessment of current and projected economic conditions based on historical risk valuation; the classification and valuation of risk that can be controlled or reacted to; assessments of specific alternative risk scenarios, and which risks are simply beyond the control of policymakers; and the cost–benefit analysis of policy options.

In international comparisons, many observers rank New Zealand practices among the most advanced (for example, on the monetary policy framework see Svensson, 2009; for fiscal policy see Ter-Minassian, 2014). The standard practice is

that policy decisions refer to an assessment of risks and alternative scenarios that have been considered. On the other hand, we seldom find in available documents formal probabilistic assessment of projected economic conditions or cost–benefit analysis. We are among those who argue that more can be done in these areas in New Zealand. We return to this point in the final sections of this article, where we talk about tools for communicating risk outlooks and cooperation between government institutions and academia.

We often look to the past for guidance on which policies appear to work or not work in order to make better policy. Whether this is done informally through discussion or formally as a statistical analysis of past policies, it is important that we are aware that the past was, at the time, a risky future. Orphanides (2001) shows how the uncertainty in the real-time data has real consequences if we

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ignore it and simply look at historically revised data when evaluating monetary policy decisions of the past. For example, with hindsight, revised data may show that a recession was not as large as was thought at the time and that monetary policy was overly loose.

Risk analysis can be very extensive, and for those interested in an academic reading on policy and uncertainty we suggest *Public Policy in an Uncertain World: analysis and decisions* by Charles Manski (2013). However, there is a limit to what policy can achieve with respect to reducing and managing risks. Kydland and Prescott (1977) teach us that good policy does not need to, and often should not, try to react to every single development.

On the other hand, no matter how many risk scenarios policymakers consider, they will still face uncertainty – the 'unknown unknown'. What should

policymakers do when faced with such uncertainties? There are two angles to the answer. The first is operational: what is the first best response when the unknown unknown materialises? To minimise mistakes in such situations, robust control theory recommends that policymakers follow heuristics ('rules of thumb'). Rules of thumb support robust decisions that help minimise the *ex post* adverse outcomes in the case of uncertainties (see, for example, Dupuis, James and Peterson, 2000; Hansen and Sargent, 2001).

The second response is building the resilience of the economy. Instead of only trying to consider what uncertainties the economy faces, we might also consider how to improve the ability of

they are unknown and unknowable. However, we can discuss the concepts of uncertainty and resilience. Policymakers can discuss resilience and weaknesses (we will later describe ways to measure resilience). Thinking about how to deepen resilience and remove weaknesses provides a sensible strategy for dealing with uncertainty.

Should risk and uncertainty be communicated?

The potential power of communicating policy is captured in the term 'open mouth operations' coined by former Reserve Bank of New Zealand governor Don Brash. He observed that he seemed to be able to move interest rates simply by talking, without conducting the actual open

There are two main reasons to believe that risks should be communicated. The first is to explicitly acknowledge that government policy is being made in a risky world. This includes acknowledging whether or not policymakers are explicitly accounting for risks in their decisions, or are simply making decisions as if things were certain. Being open in communicating the particular risks in the face of which policy was made helps the public better understand policymakers' objectives and reasoning. The second is to help justify any future recalibration of policy. If risks were not initially communicated, any subsequent policy adjustments may appear to be an 'about face'. This greater public understanding is likely to make subsequent policy adjustments easier to implement politically.

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the economy to 'roll with the punches'. An example in fiscal policy is the idea of 'fiscal space': that is, ensuring that the country is positioned such that should adverse uncertainties become manifest, it is possible to implement fiscal policies to counter them. The experience of Ireland and Spain during the recent global financial crisis illustrates the value of such 'fiscal space': both countries found themselves in a position where fiscal austerity was necessary, despite being undesirable during a recession; if they had gone into the crisis with greater fiscal space and resilience they would have been able to avoid this. The aim of such policies should be to enhance the resilience and adaptability of the economy to absorb adverse economic shocks arising from the 'unknown' in the long term. Examples for fiscal policy of measuring such resilience include fiscal space and fiscal stress tests, both of which are described in more detail later.

As mentioned above, uncertain events by definition cannot be directly measured;

market operations the Reserve Bank uses to steer short-term interest rates. But just communicating policy is not a panacea. Poor or unclear communication might work against policy actions, weakening their effect. Evidence from monetary economics, for example, emphasises the role of good, clear communication in reinforcing the effects of monetary policy actions.[4]

So, good, clear communication of policy in general is important. Can the same be said of communication of risks and uncertainties? Since uncertain events involve the unknowable, these events cannot be readily communicated. Hence, we will focus here on risk. The communication of macroeconomic risks faces a similar challenge to the one we saw in making policy in the face of risks: communication should not add to existing risks. So how might communicating risks help to reduce their material impacts if realised? Is it even possible to be clear about risks?

Take earthquake insurance as an example of the second point. Suppose the risk of an earthquake occurring is viewed as having increased, because, say, of a better scientific understanding of the causes of seismic activity. This suggests that the insurance premiums should rise. If the risk and its subsequent increase have been communicated, then it will be understood that this rise has not involved any change in policy, but simply reflects the same policy being updated to reflect evolving circumstances. The understanding of higher risk of an earthquake is also likely to trigger a market response, such as better household preparedness or changes in the building code.

But can regular communication help make things clearer and reduce the level of risk? One example of communication reducing the level of risk is from exchange rate regimes. Fixed exchange rates in one sense should be more predictable, but in practice they are subject to periodic large and sudden revaluations. Allowing the exchange rate to float – so that it reflects existing market perceptions of risk – can actually make its movements more predictable. It communicates the necessary (price) information for the market participants: the private sector accepts and adapts to the exchange rate risks as part of its business environment. Floating the exchange rate

eventually reduces the risk of building macroeconomic imbalances and systemic vulnerability to crisis (Ghosh and Ostry, 2009).

A further case for communicating risks is simply that the analysis of these risks will often already have been undertaken as part of policymaking, and this information may be valuable in and of itself.

Of course, there may be a limit to how much can and should be communicated. The United States Federal Reserve board of governors' choice to publish their Tealbooks and Bluebooks with a time lag is an example of constraining the degree of communication in order to protect the quality of policy deliberations. A former vice-chairman, Don Kohn, has argued that although prompt publication of such documents may be useful from the public's perspective, it is not so clear that it is desirable from the institution's perspective. The main concern was that the board staff would be more cautious (and thus less open) in putting their recommendations forward if they knew they were going to be made public with the decision.

We now turn to economic resilience. We feel that evaluation and communication of resilience, both qualitative and quantitative, would be beneficial for two reasons. First, the need to communicate issues of resilience to the public would help focus policymakers on thinking through the issue clearly. Second, and most importantly given the difficulties relating to resilience to uncertainty, it will allow for open feedback from the general public. Some of this feedback will be in the form of direct submissions to government agencies, but much is likely to be simply public discussion in the news media and online. Discussion of resilience is likely to be mostly qualitative, given the unquantifiable nature of uncertainty. There will be a lesser role for quantitative assessments, such as measuring fiscal space and implementing stress tests. Stress tests involve quantitatively looking at how the economy would react to combinations of major shocks which would be large by historical standards.

Tools to communicate risks
This section examines some examples of informal and formal (statistical)

Figure 1: An illustrative fan chart for RBNZ forecast of 90-day interest rate
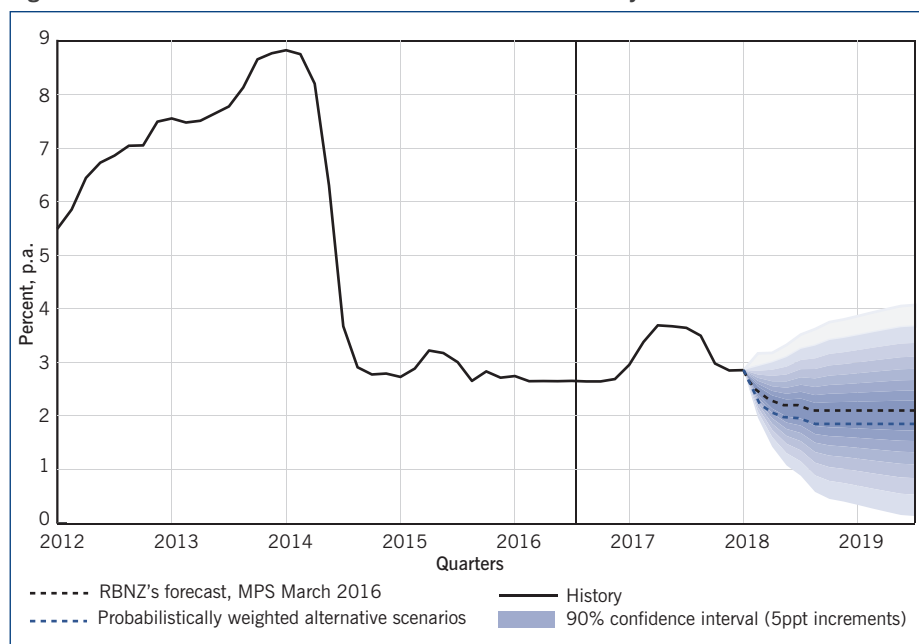
Source: Reserve Bank of New Zealand; authors' calculations
Note: The fan chart in this figure is for illustrative purposes only. The Reserve Bank does not publish its forecast with any measure of confidence. We construct the confidence intervals using a vector autoregressive model of CPI quarterly inflation, GDP quarterly growth, 90-day rate and quarterly percentage change in the real trade-weighted index of exchange rates. The model was estimated on quarterly New Zealand data from 1995q1 through 2015q4.

communication of risks in the practice of monetary and fiscal policy in New Zealand, the United Kingdom and the US; we also draw some general lessons for policy more broadly.

Verbal communication
Central banks have been at the forefront in communicating policy. For instance, the Reserve Bank of New Zealand publishes a monetary policy statement accompanying every decision on setting interest rates, explaining the bank's views on the state of the economy and why it made the decision it did.[5] These statements include some discussion of both uncertainty and risk, but do not extend to a formal evaluation of risks. There is also typically an accompanying series of research papers and notes providing deeper analyses of specific topics.

Other central banks take this a step further and release the minutes of their policy deliberations (for example, the Bank of England, the US Federal Reserve System and the Reserve Bank of Australia). Releasing the minutes is seen not only as a way to communicate why certain policy decisions were made; by revealing internal disagreements at these meetings the minutes also provide a gauge as to how much confidence

there was around reaching the final decision and guide expectations about risks surrounding future economic outcomes. Some market analysts set up word-counters: if statements are longer than average, this may signal that decisions were hard to make; repetition of particular words may signal specific policy biases. This informal measure of risk is seen as an important part of communicating the monetary policy decisions of these central banks.

We turn now to considering a few examples of more formal analysis (with an acknowledgement that these methods are appropriate only for risk and not for uncertainty): the use of fan charts, alternative scenarios and identification of the nature and sources of risks.

Fan charts
One example of formally communicating risk is the Bank of England's fan charts.[6] Each quarter the Bank of England releases an inflation report[7] which contains forecasts of short-term interest rates, inflation or GDP growth, forecasts that are not just a single path (or 'baseline forecast'). 'Uncertainty' around the forecasts is shown in the form of fan charts showing a range of possible future outcomes, along with

Table 1: Sources of risks for net core Crown debt projections: illustration

Fiscal year	Macroeconomic risks	Fiscal risks	Statistical error risks
2015	0%	0%	100%
2016	20%	49%	32%
2017	25%	63%	12%
2018	27%	64%	9%
2019	27%	65%	8%
2020	27%	65%	8%
2021	27%	66%	7%
2022	26%	69%	5%
2023	26%	72%	3%
2024	25%	74%	1%

Source: Authors' calculations

Note: For illustration purposes only. Units are the percentage shares of total risk. The results above are taken from the authors' work on measuring uncertainty around the government's target of reducing the value of net public debt to below 20% of GDP by around 2020.

estimations of how likely they are to occur.

In Figure 1 we present an illustration of what a fan chart for the Reserve Bank of New Zealand's forecast of the interest rate on the 90-day bank bill, the key money market rate, might look like. The Treasury in its budget and half-year economic updates regularly publishes a similar measure of risk for its public revenue projections. The left-hand side of the figure simply shows historical outcomes, and so we just have the solid line. At present all the Reserve Bank publishes is a point forecast for interest rates, which is here shown as the dotted line extending into the future. But the future is uncertain, and while the present forecasts simply present a single future, a fan chart provides much richer information about other likely future outcomes. These likely alternative futures are represented by the shaded regions. The darker regions represent the central outcome, with lighter regions indicating progressively less likely outcomes.

While the Treasury and Reserve Bank discuss risks in their economic forecasts, their probabilistic evaluation is not as systematic as it could be and it is often limited to a handful of forecasted variables. We believe that fan charts, or some other way of illustrating the probabilistic measure of confidence about the economic outlook, should be routinely reported for every macroeconomic variable that the Treasury and Reserve Bank forecast. Enhancing

their communication in this way would benefit public discussion about economic policy and help build its credibility. Such measures of confidence will shed light on how optimistic or pessimistic those forecasts are.

Alternative scenarios
Another common communication tool is the assessment of plausible alternative scenarios. Fan charts provide information about the likely distribution of economic outcomes for all possible risks and combinations of them that the economy faced in the past. However, the economy might be subject to very specific headwinds or tailwinds. The alternative scenarios evaluate the economic impact of these specific risks. When assigned probabilistic weights and aggregated, the alternative scenarios measure helps to reduce the balance of prevailing risks. We should stress that the alternative scenarios are a measure of perceived risks and are therefore inherently subjective.

At its full width the shaded area in the fan chart in Figure 1 displays the likely outcomes in 90% of possible futures, an assessment based on all the economic outcomes seen over the past 20 years of a stable monetary policy regime. The dashed line represents the probabilistically weighted alternative economic scenarios. The purpose of the alternative scenarios is to help narrow, and point to, skewness in the uncertainty distribution and inform the decision-makers about the likely direction of the risks. In the case shown

in Figure 1, the probabilistic summary of alternative scenarios points to risks being skewed to the downside over the forecast horizon, informing the policymaker that they are more likely to face downside than upside risks.

Risk classification and identification
Not all risks can be controlled for or are worth responding to. For macroeconomic risk management in practice, we also need to understand the sources of risk. A useful tool is a structural macroeconomic model that allows us to identify the main structural drivers of risk that underpin fan charts such as the one above. Using such models for structural decompositions of historical risks helps identify risks that can be fully or partially controlled, and those that are simply uncontrollable and must be accepted.

For example, current research on the sources of risks for the government net debt projections classifies risks into three main categories: macroeconomic uncertainty, statistical uncertainty and fiscal uncertainty. Table 1 illustrates the risk classification. Governments have no control over statistical risk (for example, GDP figures are subject to data revisions). Governments have only modest control over macroeconomic risk arising from external sources, such as the level of Chinese demand, the exchange rate, foreign competition, droughts and so on. The level of fiscal policy risks is, however, under the government's control, especially over longer periods of time.

The risk classification yields useful insights. For example, most of the risks related to statistical confidence are over short time horizons, and thus the government could not control or reduce these risks. Policymakers may, however, choose to create a buffer capable of absorbing the consequences of these risks, and the risk identification and quantification allows us to evaluate the size such a buffer would need to be. Or they can communicate risks by making clear that debt level targets are best understood as a general goal, not as something to be hit with precision. By contrast, over longer time horizons the majority of the risks fall into the category of fiscal policy risks

(i.e. risks around tax revenue outcomes or expenditure policy), and are thus within the government's ability to control and reduce by communication or guidance.

Conclusion

We conclude that greater awareness of the risk landscape in which policy decisions are made leads to better policy, and allows for the possibility of better communication of policy decisions to the public. The Treasury and Reserve Bank of New Zealand currently include a discussion of various risks in their public communications, but would benefit from better and more systematic communication of these risks to the public. Publishing measures of statistical confidence for economic projections or assumptions underlying economic policies should be the new practice. Doing so will require an effort to separate what events are considered to be quantifiable risks and what are uncertainties.

Adoption of some of the tools for formally analysing risk that we have discussed may be difficult for institutions without advanced analytical capabilities. But it represents a perfect opportunity for cooperation between government agencies and universities. Academic research can help to advance better government in this area by providing key analytical capability and build internal government capability through education and training.

1   There is also an aspect of ambiguity in the context of risks and uncertainties that can give rise to heterogeneous expectations (Hansen and Sargent, 2012), but we will leave this aspect out of the present discussion.
2   For example, consider the 'debt ceilings' in the United States. These impose a dollar limit on the amount of debt that the US government can issue. But Congress can approve a budget for spending and revenue that would necessitate an amount of borrowing in excess of this limit. This creates a risk relating to what would actually happen if the debt ceiling is not raised, and this risk is created by the policies themselves.
3   This latter point of reducing fluctuations in GDP should not, however, be over-interpreted as saying that the level of uncertainty is more than a minor contributing factor to recessions (Bachmann and Bayer, 2013; Bachmann, Elstner and Sims, 2013; Jurado, Ludvigson and Ng, 2015).
4   See http://www.voxeu.org/article/central-bank-communication; http://www.voxeu.org/article/measuring-clarity-central-bank-communication.
5   The Reserve Bank has been releasing monetary policy statements going back to 1996: see http://www.rbnz.govt.nz/monetary_policy/monetary_policy_statement/.
6   The Bank of England was one of the first central banks to introduce this communication tool.
7   http://www.bankofengland.co.uk/publications/Pages/inflationreport/default.aspx.

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