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Monetary policy in unknowable times

Introduction

It is an honour for me to deliver the Eric J. Hanson Memorial Lecture for 2020. I want to thank the University of Alberta for the invitation and for your flexibility and perseverance in these difficult and unusual times.

Eric Hanson was a great economist and Albertan whose pioneering work on public finance helped define the Canada we know today. The lecture series established in his memory has seen contributions from some very important names in Canadian economics and public policy, such as Thomas Kierans, Judith Maxwell and Kevin Lynch, to name just a few.

The Bank of Canada has been involved with this lecture series almost from the beginning. I was working at the Bank in 1988 when then-Governor John Crow delivered the second-ever Hanson Lecture. Crow cemented the idea that price stability should be the prime mission for the central bank because it is the best contribution monetary policy can make to our economic well-being. That lecture laid the foundation for inflation targeting—the highly successful monetary policy framework now practised in Canada and virtually every advanced economy.

David Dodge would follow John Crow 20 years later, at a time when the global economy was poised on the edge of crisis. Dodge questioned whether inflation targeting really did represent the end of monetary policy history, despite the Bank of Canada's success in meeting its objectives. As Dodge rightly pointed out, our knowledge remains very limited, and monetary policy-makers should always approach their task with humility and crossed fingers. Five years later, Mark Carney would be the third Bank of Canada Governor to take this stage, discussing the lessons policy-makers learned from the 2008–09 global financial crisis—including the need to understand how monetary policy interacts with other macroeconomic policies.

I am grateful for the opportunity to join this distinguished list. When the possibility of delivering this lecture first arose last year, I knew that I wanted to talk about uncertainty as it relates to the conduct of monetary policy. After all, the past seven years have been marked by several major events that have forced policy-makers to confront unprecedented uncertainty—unprecedented in both

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magnitude and origin. Economists, including many at the Bank of Canada, have responded by developing ways to think about and formally incorporate these uncertainties into the conduct of monetary policy.

Given that I have been part of this history, I thought I could put the bow on my time as Governor by going to Edmonton and talking to a knowledgeable and engaged audience about uncertainty and monetary policy.

Then came the global tragedy we know as COVID-19. The clear imperatives for authorities around the world were to flatten the curve of infections, try to keep health-care systems from becoming overwhelmed and minimize preventable deaths. This led to severe but necessary restrictions on the movement of people and the shuttering of large sections of the economy. Policy-makers tried to cushion the blow through economic policies of historic size and scope, put in place for an undetermined length of time. Clearly, this is uncertainty in the extreme.

Today, there are encouraging signs in Canada that efforts to flatten the pandemic curve are paying off, and jurisdictions are taking tentative steps toward relaxing containment measures. But it is safe to say that the policy-makers who will guide us to whatever "normal" turns out to be will be dealing with unparalleled uncertainty. They will have to deal with all the unknowns surrounding the restart of shuttered sectors, the reconstruction of broken value chains, the unwinding of emergency measures and the unpredictable behaviour of consumers and business leaders. Some of the financial vulnerabilities already present in the economy will have grown worse, and other sources of vulnerability are likely to emerge. We are truly entering unknowable times.

Obviously, the context has shifted dramatically since I first started thinking about this lecture, but that has made the topic even more fitting. I will review how monetary policy practitioners have dealt with uncertainty in the past and how that has changed, particularly since the global financial crisis. Specifically, I will illustrate how a risk management approach to monetary policy has been developed over time, by describing case studies from my tenure at the Bank and referring to supporting research along the way. Finally, I will offer some early thoughts on how the lessons of the recent past will be applied as policy-makers face massive uncertainty in the months and years ahead.

Dealing with uncertainty: an evolution

Uncertainty has always been a key part of practical economics and policy making, and a large body of academic literature has developed over the years to provide guidance on how to make policy under uncertainty. Much of the literature builds on the thinking of American economist Frank Knight, who a century ago came up with a way to classify the things economists don't know about.[1] Knight used the word "risk" for situations where it is possible to calculate the probability of various outcomes. The term "Knightian uncertainty" came to refer to situations where calculating the odds is impossible. In reality, most situations fall

[1] F. H. Knight, *Risk, Uncertainty and Profit* (Boston, MA: Hart, Schaffner & Marx; Houghton Mifflin Co., 1921).

somewhere between these two extremes, but the notion of Knightian uncertainty remains pertinent today.

The means by which policy-makers account for and respond to uncertainty has evolved over time, as have the types of uncertainty they have faced in making decisions.[2] Consider all the uncertainties involved in using economic models—the indispensable tools for practitioners of monetary policy. The Bank of Canada is an inflation-targeting central bank. We know that our policy actions can only affect inflation in the future, after a lag that reflects all the complexity of the monetary policy transmission process. This means it is crucial that we have a deep understanding of the economy to guide our policy decisions. We have developed increasingly sophisticated economic models to help inform our decisions. Their predictive power comes from the various linkages between the variables in those models. These interdependencies represent our best understanding of the structure of the economy—a coherent view of how all the pieces fit together.

While these interdependencies make the model a powerful tool for the policy-maker, they can also be its Achilles heel. This is because a systematic error in just one component of the model can affect how it projects many variables. Consequently, from the earliest use of forecast models, policy-makers have had to take into account "model uncertainty," whether associated with parameters or specification. Model parameters are not predetermined and may change over time, which inserts uncertainty into the model outputs and implied policy recommendations. Besides, uncertainty about model specification—which is to say, the basic ingredients of the model—reflects the fact that there is much we do not know about the fundamental structure of the economy.[3] Simply put, all models are simplifications of the real world. Because policy-makers today rely on models to develop coherent economic forecasts and policy decisions, it follows that a certain amount of uncertainty must be incorporated into the decision-making process.

The possible sources of uncertainty do not stop there. Policy-makers must also be aware of measurement error, which arises because many key concepts for monetary policy—such as potential output—are unknown and must be estimated. Measurement error also applies to the underlying data, which are subject to revision.

A scan of the economics literature reveals several other forms of uncertainty that are pertinent to the policy-maker. These include mandate uncertainty, which can affect economic performance when consumers and businesses are unsure about the central bank's policy objectives. Mandate uncertainty has decreased in Canada since the early 1990s, when the Bank and federal government first spelled out an agreement on a framework for inflation targeting containing an

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[2] Mendes, Murchison and Wilkins summarize and compare the main results that have emerged in the literature on optimal monetary policy under uncertainty with actual central bank behaviour in R. R. Mendes, S. Murchison and C. A. Wilkins, "Monetary Policy Under Uncertainty: Practice Versus Theory," Bank of Canada Staff Discussion Paper No. 2017-13 (November 2017).

[3] An important aspect of model uncertainty relates to how households and firms in the model form expectations.

explicit objective for inflation. The statement of the central bank's policy framework in 1991 was followed by several moves to increase transparency. These began under the leadership of Governor Gordon Thiessen and continued through the work of Governors David Dodge and Mark Carney.[4] As transparency increased and the Bank developed a reputation for achieving its inflation targets, we earned credibility and mandate uncertainty was essentially eliminated.

Since 1995, we have regularly published the *Monetary Policy Report* (MPR), which provides a thorough update of the Bank's economic outlook. Since 2009, each MPR has had a separate section spelling out what we see as the main risks to the outlook. Before 2000, interest rate announcements took place only when the rate was changing, and you can imagine the anticipation and angst that was often present in financial markets. Since 2000, some of that uncertainty has been removed, as we have established fixed announcement dates (FADs) for our policy interest rate announcements. At each FAD we issue a press release that explains our economic outlook and any changes since the previous FAD, identifies uncertainties clouding the outlook and reinforces market understanding of the Bank's reaction function. In 2013, we started including Governing Council's assessment of the risks directly in the press release, in part to emphasize our risk management process.

There is much more to the Bank's efforts to increase transparency, so the topic of communications will be an important thread in this lecture. For now, let me just say that clear and transparent communications are vital for monetary policy. We recognize that policy is more effective, and the economy works better, when the central bank is clear about its target and the reaction function that helps it achieve the target. Clear communication improves decision making throughout the economy by reducing various sources of uncertainty, including mandate uncertainty.

The usual practice for policy-makers is to see how well their models forecast economic developments and figure out the cause of any errors. Often, the errors can be considered benign white noise generated by various sources of uncertainty. However, when the data consistently show results that are different from what the model projects, it could be a sign that something more important is at play. Because of all the interdependencies, we have to guard against the possibility of persistent problems with the model, which can lead to a biased projection and monetary policy errors.

The problem with this common practice was revealed during the global financial crisis and subsequent Great Recession. The events illustrated a key weakness in most macroeconomic policy models at the time. In particular, they captured fewer and less-detailed linkages between financial markets and the real economy than ideal. They also revealed the need for the profession to work toward the goal of

[4] Kozicki and Vardy and the references therein outline ways in which the Bank of Canada seeks to explain its economic outlook and monetary policy decisions, with an emphasis on how different sources of uncertainty factor into monetary policy communications. See S. Kozicki and J. Vardy, "Communicating Uncertainty in Monetary Policy," Bank of Canada Staff Discussion Paper No. 2017-14 (November 2017).

having a grand, unified model that adequately captures both macroeconomic and financial sector risks.[5]

In addition to illustrating the limitations of our models, the global financial crisis and Great Recession heralded the start of a series of shocks that have emanated from events beyond our borders and beyond our control. These kinds of shocks often cannot be easily modelled—they are examples of Knightian uncertainty. Today, the obvious example is the shock associated with the pandemic and the global policy response. Before this year, I would have illustrated this type of Knightian uncertainty by talking about global trade policy, as we had witnessed the emergence of trade wars that threatened to change the global trading system. The associated business uncertainty became a factor that on its own weighed on economic growth by dampening business confidence, investment and exports.[6] Forecasting the size and duration of the impact of this uncertainty, particularly given the on-again, off-again nature of trade talks and the unpredictable nature of the protagonists, required an enormous amount of judgment by policy-makers.

The development of a risk management approach

In 2013, when I returned to the Bank, it was obvious that the Canadian and global economies were dealing with many uncertainties and risks that lay outside the scope of our main monetary policy models of the time. This represented a clear challenge for our monetary policy. During my first year as Governor, I delivered a speech that spelled out the importance of risk management to monetary policy.[7] I also offered some early thoughts about risk management in a paper I delivered to the Canadian Association for Business Economics in 2014.[8]

Moving monetary policy from the theoretical, or formulaic, space into a problem of risk management acknowledges and accepts the uncertainties inherent in

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[5] An early contribution in this direction built additional financial system detail into a small open-economy macroeconomic model and included various macroprudential policy levers. See S. Alpanda, G. Cateau and C. Meh, "A Policy Model to Analyze Macroprudential Regulations and Monetary Policy," *Canadian Journal of Economics* 51, no. 3 (August 2018): 828–863. Potential trade-offs faced by monetary policy were addressed by M. Shukayev and A. Ueberfeldt, "Monetary Policy Trade-offs between Financial Stability and Price Stability," *Canadian Journal of Economics* 51, no. 3 (August 2018): 901–945. In addition, Bank research has examined the effectiveness of macroprudential and monetary policies to address vulnerabilities. See, for example, S. Alpanda and S. Zubairy, "Addressing Household Indebtedness: Monetary, Fiscal or Macroprudential Policy?" *European Economic Review* 92 (February 2017): 47–73.

[6] Bank staff analyses that relate elevated uncertainty of various types to weaker economic activity include S. Jo, "The Effects of Oil Price Uncertainty on Global Real Economic Activity," *Journal of Money, Credit and Banking* 46, no. 6 (September 2014): 1113–1135; S. J. Byun and S. Jo, "Heterogeneity in the Dynamic Effects of Uncertainty on Investment," *Canadian Journal of Economics* 51, no.1 (February 2018): 127–155; L. Ferrara and P. Guérin, "What Are the Macroeconomic Effects of High-Frequency Uncertainty Shocks," *Journal of Applied Econometrics* 33, no.5 (August 2018): 662–679; R. Sekkel and S. Jo, "Macroeconomic Uncertainty Through the Lens of Professional Forecasters," *Journal of Business & Economic Statistics* 37, no. 3 (2017): 436–446.

[7] S. S. Poloz, "Monetary Policy as Risk Management" (speech to the Canadian Club of Montréal, Montréal, December 12, 2013).

[8] S. S. Poloz, "Integrating Uncertainty and Monetary Policy-Making: A Practitioner's Perspective," Bank of Canada Staff Discussion Paper No. 2014-6 (October 2014).

policy making. This does not mean rejecting the use of models in decision making. In fact, the Bank's various models provide the base case that serves as the starting point for Governing Council's deliberations. They are also used to simulate alternative scenarios, which is an excellent means of reaching a fuller understanding of the risks we face.[9] The essence of risk management is identifying the most important risks and uncertainties around the outlook. We examine the probabilities that the risks will be realized, consider alternative futures related to uncertainties and think about the potential consequences of making a policy error. We then choose a policy course that weighs these risks and uncertainties in order to best manage them. This process can entail a degree of flexibility around the inflation target itself, allowing inflation to return to target more slowly or quickly than on average, while keeping in mind that our target sits within a control range of 1–3 percent.

Given all the uncertainties and risks, it does not make sense to think a single, optimal path for our policy interest rate will be consistent with achieving our inflation target. It makes no sense to try to engineer such a path with precision. Instead, we recognize that for every base-case economic projection, a wide range of possible interest rate paths could ultimately be broadly consistent with the inflation target. We weigh the various risks associated with things we do not know and then take actions that are based on a nuanced balancing of those risks.[10] In doing so, we often use several smaller, specialized models to augment the input from our main projection models, look at anecdotal and survey evidence and apply considerable judgment.

Notice that balancing the risks we face also requires taking into account the starting point for the economy, inflation and interest rates. Consider a situation where inflation is below target, as was often the case in the wake of the Great Recession. With the right monetary policy, an economic model will project a path for inflation that gradually rises toward the target. A forecaster might look at the projection and see that the risks to the inflation projection appear to be statistically balanced. In other words, inflation is just as likely to end up below that path as above it.

But the policy-maker may have a different view. If the starting point for inflation is already below the target, any random shock that drives inflation even further below target would be worse from a policy-maker's perspective than a shock that pushes inflation up toward the target. So, even if statistical risks to the projected inflation path are roughly balanced, the risks in terms of inflation outcomes may be skewed in the policy-maker's eyes. And, the closer the policy rate is to its effective lower bound, the more skewed this risk becomes. So, when the starting

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[9] Some of these alternative scenarios have been published in Bank of Canada staff analytical notes: R. Barnett and R. Mendes, "A Structural Interpretation of the Recent Weakness in Business Investment," Bank of Canada Staff Analytical Note No. 2017-7 (July 2017); J. Yang, B. Tomlin and O. Gervais, "Alternative Scenario to the October 2017 MPR Base-Case Projection: Higher Potential Growth," Bank of Canada Staff Analytical Note No. 2017-18 (October 2017); K. B. Charbonneau, "The Impact of a Trade War: Assessment of the Current Tariffs and Alternative Scenarios," Bank of Canada Staff Analytical Note No. 2019-20 (July 2019).

[10] See the discussion of the Bank's risk management approach to monetary policy in Bank of Canada, *Renewal of the Inflation-Control Target: Background Information—October 2016* (Ottawa: Bank of Canada, 2016).

point for inflation is low, the policy-maker would be more concerned about downside risk to inflation than upside risk and would rebalance the risks, keeping monetary policy more stimulative than the model and the forecaster would recommend.

The application of risk management becomes particularly important as a wider array of risks enter into policy deliberations. In the aftermath of the global financial crisis, the economy took a long time to return to full capacity and inflation loitered below target. As a result, interest rates remained low for longer than expected, driving an increase in borrowing that showed up in household and housing sector vulnerabilities. Elevated financial vulnerabilities can change how interest rates affect the economy, adding even more uncertainty into our models.[11] For instance, at high levels of household indebtedness, a reduction in interest rates may not provide as much economic stimulus as when debt levels are low. The main reason for this is that fewer households would likely be interested or able to take on additional debt. In contrast, the restraining effect of interest rate increases could be larger, both relative to history and relative to the impact of a similar-sized interest rate reduction.[12] This is because interest rate changes affect disposable income, and highly leveraged borrowers might save a large proportion of increases in disposable income but cut their consumption steeply when their disposable income declines.[13]

Financial vulnerabilities are also important because they can affect the "time trade-off" for economic growth. Specifically, a reduction in interest rates today will boost near-term economic growth through greater borrowing. Greater borrowing increases financial vulnerabilities, which in turn increase the risk that a future negative shock will have a magnified effect on the economy. This leads to much slower economic growth and makes the inflation target more difficult to achieve. In short, by acting aggressively to achieve its inflation target today, the Bank can make it harder to achieve its target in the future. The effect is to trade faster growth today for slower growth in the future. The Bank is working on new tools to help evaluate this time trade-off. We use "growth-at-risk" models to capture the downward asymmetry in the distribution of growth associated with elevated levels of household indebtedness.[14]

All this to say that financial vulnerabilities and the risks they pose for future growth and inflation have earned a place at the table as the Bank considers its policy options. Let me emphasize, however, that the Bank's inflation target remains the overarching goal—the prime mission of our monetary policy.

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[11] See, for example, T. Duprey, "Asymmetric Risks to the Economic Outlook Arising from Financial System Vulnerabilities," Bank of Canada Staff Analytical Note No. 2018-6 (March 2018).

[12] The destabilizing effects of tightening in the short term are examined in G. H. Bauer and E. Granziera, "Monetary Policy, Private Debt, and Financial Stability Risks," *International Journal of Central Banking* 13, no. 3 (2017): 337–373.

[13] In 2017, the Terms of Trade Economic Model (ToTEM) was revised to have improved modelling of household debt and a more-detailed modelling of the housing market. See Bank of Canada, "Appendix: Recent Changes to ToTEM," *Monetary Policy Report* (October 2017): 24–25.

[14] For more details on growth at risk, see T. Duprey and A. Ueberfeldt, "How to Manage Macroeconomic and Financial Stability Risks: A New Framework," Bank of Canada Staff Analytical Note No. 2018-11 (May 2018); and T. Duprey and A. Ueberfeldt, "Managing GDP Tail Risk," Bank of Canada Staff Working Paper No. 2020-03 (January 2020).

Financial stability issues are generally not a significant constraint on monetary policy actions. However, our policy framework does give us flexibility in the time it takes to get inflation back to target, which allows us to make tactical decisions to avoid unintentionally making financial stability concerns worse.

This can all seem vague and judgmental to those who would prefer a more formulaic approach to monetary policy: inflation rises, interest rates rise, inflation falls. Unfortunately, the world is really not that simple. First, because monetary policy acts with a lag, we are always aiming to achieve our inflation goal in the future, offsetting invisible shocks that threaten to move us away from target. Therefore, a perfectly executed monetary policy would see interest rates moving in anticipation of the consequences of recent shocks and inflation remaining on target the whole time. In effect, the more effective monetary policy is, the more difficult it may be to explain. Second, weighing one uncertain, complex risk against another is inherently judgmental and not amenable to mechanical or formulaic decision making. The Governing Council's consensus approach to decision making, coupled with enhanced transparency around the judgments made about the risks, shows its strength in this regard.

Before moving on, let me stress that taking a risk management approach to monetary policy is not a uniquely Canadian practice. The Chair of the US Federal Reserve, Jerome Powell, describes the Fed's approach to policy as having "three important parts: monitoring risks; balancing risks, both upside and downside; and contingency planning for surprises."[15] Possibly a better description of risk management would be to call it a "common sense approach," since it reflects reality rather than the elegance of economic theories.

Over the years, we at the Bank have increasingly viewed monetary policy through a risk-management lens. And this has led to a wide variety of changes in processes and procedures and has sparked many key avenues of research. What I'd like to do now is go through two case studies from the past seven years, show how risk management applied to each situation and talk about changes in our processes that emerged. Then, I will turn to monetary policy and the unknowable implications of the pandemic.

Case study 1: the oil price shock of 2014–15

Let us look back at the oil price shock of 2014–15. In 2014, amid signs of improving business investment and exports, real gross domestic product was expanding at a rate above its estimated potential. Core inflation rose through the year to around 2 percent. Following a prolonged period of low interest rates, household spending was robust, and Canada continued to experience rising prices in key housing markets and increasing risks from elevated levels of household indebtedness.

Against this backdrop, West Texas Intermediate oil prices fell by roughly half, from a peak of more than US$100 per barrel near the end of the second quarter to about US$50. By the last quarter of 2014, the marked decline in global oil prices posed a significant downside risk to the Canadian economy and inflation.

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[15] J. H. Powell, "Monetary Policy and Risk Management at a Time of Low Inflation and Low Unemployment" (remarks delivered at the "Revolution or Evolution? Reexamining Economic Paradigms" 60th Annual Meeting of the National Association for Business Economics, Boston, MA, October 2, 2018).

At the same time, an important upside risk was the possibility of a more robust recovery in the United States. Finally, a key two-sided risk was the possibility of greater-than-expected strength in housing and consumption, which would boost Canadian economic growth while increasing the likelihood and potential severity of a correction later on.

All of this presented a complex mix of risks to weigh. Through 2014, we judged that the risks to our inflation projection were roughly balanced, while the financial stability risks associated with household imbalances continued to edge higher. Overall, the balance of risks was such that we felt the prevailing setting of the policy interest rate was appropriate to keep inflation aimed at our 2 percent target.

But by January 2015, it became clear that low oil prices would endure, that the energy industry would be making major markdowns to their investment plans and that Canada would need to adjust to a significant drop in its terms of trade. The decline posed a sufficiently large downside risk to our inflation outlook to warrant a reduction in the policy interest rate. We cut rates again in July, bringing our policy rate to 0.5 percent, as the persistence and impact of the shock became clearer.

Note that throughout this episode, financial vulnerabilities associated with elevated levels of household debt and rising house prices could have motivated higher interest rates, while projections of declining inflation would have favoured lower interest rates. In other words, financial stability risks were working at cross purposes from macroeconomic risks; cutting interest rates would reduce macroeconomic risks but increase financial stability risks at the same time. But the oil price decline ultimately proved to be sufficiently large that it materially shifted the balance of risks and led the Bank to lower the policy interest rate in support of its primary mission.

Risk management considerations helped inform our decisions in several ways throughout this episode. To begin with, Governing Council was receiving input from multiple macroeconomic models, each with its own strengths and perspectives. The Bank was using ToTEM—the Terms of Trade Economic Model—a state-of-the-art dynamic stochastic general equilibrium model.[16] ToTEM anticipated how serious the oil price shock would be, how the effects would persist and how the economy would adjust to lower oil prices.[17] But we

[16] For additional details on ToTEM, see S. Murchison and A. Rennison, "ToTEM: The Bank of Canada's New Quarterly Projection Model," Bank of Canada Technical Report No. 97 (December 2006); J. Dorich, R. R. Mendes and Y. Zhang, "Introducing Multiple Interest Rates in ToTEM," *Bank of Canada Review* (Summer 2011): 3–10; J. Dorich, M. K. Johnston, R. R. Mendes, S. Murchison and Y. Zhang, "ToTEM II: An Updated Version of the Bank of Canada's Quarterly Projection Model," Bank of Canada Technical Report No. 100 (October 2013).

[17] An estimate of the impact of the lower oil prices without a monetary policy response was provided in Bank of Canada, "Appendix: The Impact of Lower Oil Prices on the Canadian Economy," *Monetary Policy Report* (January 2015): 25–26.

were able to cross-check ToTEM's advice with LENS—the Large Empirical and Semi-structural model.[18]

Using multiple models for projections is a hallmark of risk management. In fact, the Bank was already using ToTEM and LENS by 2013 as we worked to understand a series of surprisingly weak export data. The Bank also developed other models for exports to inform that part of the projection.[19] We always strive for transparency about the development and use of our models. We summarize new analysis in MPRs and publish related staff analytical notes, staff discussion papers and technical reports.

Another feature of risk management I can highlight is the use of so-called soft data to inform our process. Our decision to lower interest rates was influenced by conversations with businesses in the oil sector. There would not be a lot of hard data on Canadian investment intentions until well after the fact. But through our Business Outlook Survey, as well as through personal conversations with oil industry executives, we were able to estimate in a timely way the scale of future reductions in business investment.[20]

The oil price shock also coincided with an important communications advance for the Bank. I am referring to the opening statements that either the Governor or Senior Deputy Governor give at the start of the press conference that follows publication of an MPR.

The usual practice had been to use the opening statement simply to restate the key points of the FAD press release and takeaways from the MPR, or even to read the press release verbatim. By the time of the January 2015 MPR, we had decided to make the opening statement a vehicle for elaborating on the key issues in Governing Council's deliberations. The statement thus serves the same purpose as minutes of the deliberations of other central banks and does so in a way that is more timely and often more concise and efficient.

While the change to the format of the opening statement was an advance in transparency, our moves to lower interest rates in 2015 sparked some complaints from financial market participants. They felt we had not been sufficiently transparent with our intention to lower our policy rate before acting. This reaction was seen by some as a natural consequence of our decision in 2013 to stop giving routine guidance about the future path of interest rates in our FAD press releases. To be clear, I'm referring to general statements about the

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[18] O. Gervais and M.-A. Gosselin, "Analyzing and Forecasting the Canadian Economy through the LENS Model," Bank of Canada Technical Report No. 102 (July 2014).

[19] New tools that were developed to inform export projections are described in R. Barnett, K. B. Charbonneau, G. Poulin-Bellisle, "A New Measure of the Canadian Effective Exchange Rate," Bank of Canada Staff Discussion Paper No. 2016-1 (January 2016); P. Alexander, J.-P. Cayen and A. Proulx, "An Improved Equation for Predicting Canadian Non-Commodity Exports," Bank of Canada Staff Discussion Paper No. 2017-1 (January 2017); and A. Binette, T. Chernis and D. de Munnik, "Global Real Activity for Canadian Exports: GRACE," Bank of Canada Staff Discussion Paper No. 2017-2 (January 2017).

[20] See, for example, Bank of Canada, "Box 1: Investment in the Oil and Gas Sector: An Industry Perspective," *Monetary Policy Report* (January 2015): 17.

future direction of interest rates, not specific commitments about monetary policy that form part of the Bank's policy tool kit for extraordinary times.

Offering routine forward guidance about the future path of interest rates obviously makes it easier for financial market participants to predict our policy. It can be argued that it makes markets more efficient because it reduces uncertainty. However, it does not reduce the total amount of uncertainty. Uncertainty is simply shifted onto the central bank's shoulders.

When we decided to stop giving guidance, it was at a time when we could not fully explain why exports and business investment were weaker than our economic models were projecting.[21] We wanted markets to appreciate the uncertainty we were facing and were concerned that providing forward guidance was giving participants a false sense of certainty. By being honest about the extent of our uncertainty, and by not offering false certainty, we managed to shift some of the uncertainty off our plate and put it back into markets.

This is a positive and important development because routine guidance also comes with a cost—it suppresses the natural signalling role of financial markets. When market participants pay attention only to the words we say about future policy and begin to discount the flow of actual economic data, they set up a one-way bet in markets.[22] Market prices cease acting as a check for our own projections. Bank research suggests that this can also lead to inefficient capital flows.[23]

It is normal that there will be times when market views about the future of the economy and interest rates, and those of the central bank, do not align. Indeed, normal market function depends on there being a variety of views about the economy. The central bank should not try to force alignment of market views with our own. Instead, we should be helping markets understand the thinking behind our policy decisions.

For financial market participants and the public to understand the nuances involved in risk management, we need to communicate our assessment of the events and issues that are influencing our decisions, while being honest about the high level of uncertainty inherent in policy making. The discussion of uncertainty is particularly important when a large shock—such as the collapse in oil prices—hits the economy and must be considered in the outlook, as it was

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[21] Several studies that subsequently contributed to the Bank's understanding of the drivers of export weakness include A. Binette, D. de Munnik and E. Gouin-Bonenfant, "Canadian Non-Energy Exports: Past Performance and Future Prospects," Bank of Canada Staff Discussion Paper No. 2014-1 (April 2014); M. Coiteux, P. Rizzetto, L. Suchanek and J. Voll, "Why Do Canadian Firms Invest and Operate Abroad? Implications for Canadian Exports," Bank of Canada Staff Discussion Paper No. 2014-7 (December 2014); and A. Binette, D. de Munnik and J. Melanson, "An Update—Canadian Non-Energy Exports: Past Performance and Future Prospects," Bank of Canada Staff Discussion Paper No. 2015-10 (October 2015).

[22] Sensitivity of financial markets to central bank policy statements is examined by M. Ehrmann and J. Talmi, "Starting from a Blank Page? Semantic Similarity in Central Bank Communication and Market Volatility," *Journal of Monetary Economics* 111 (May 2020): 48–62.

[23] The analysis in Ghironi and Ozhan suggests that if monetary policy artificially suppresses near-term uncertainty about the policy rate then it would encourage inefficient capital flows. See F. Ghironi and G. K. Ozhan, "Interest Rate Uncertainty as a Policy Tool," Bank of Canada Staff Working Paper No. 2020-13 (April 2020).

during this episode. This requires as much transparency as we can give without resorting to false precision about the outlook and the future path for the policy interest rate.

Case study 2: policy normalization amid growing uncertainty in 2017–18

Let us now skip ahead a couple of years to 2017–18 and look at how risk management shaped our actions as we set out to bring our policy interest rate back to more normal levels.

By mid-2017, the national economy had largely recovered from the oil price shock of 2014–15, although weakness remained in some regions. Still, growth was broadening across sectors, and the output gap was expected to close by the end of 2017. Inflation was rising, although it remained below 2 percent. In this context, we raised the policy interest rate in July 2017, two years after we had lowered it to 0.5 percent. In all, we would tighten policy by 125 basis points by the end of 2018.

In reviewing this period, I will note several important considerations from a risk management perspective and some key contrasts from the previous case study.

The first consideration is that during this period, both the macroeconomic environment and the financial vulnerabilities associated with elevated household indebtedness and house prices favoured higher interest rates. Unlike the previous period, monetary policy and financial stability concerns were now pointing in the same direction.

Another key difference from the previous case study is the role played by macroprudential policies. Canada announced two rounds of changes to mortgage-lending guidelines that would broaden the scope of stress testing of new mortgage borrowers. This policy was designed to improve the quality of new lending to contain vulnerabilities associated with household indebtedness. This had a direct impact on the macroeconomy—it considerably reduced the level of housing activity when the second round became effective in 2018. More importantly, this policy combined with increased housing-related taxes in some municipalities and provinces to contribute to a large decline in speculative activity and a reduction of froth in house price expectations that had been prevalent in some regions.[24] With less-risky mortgages being added to the stock of household debt, the economy's vulnerability was becoming contained.[25] And with these macroprudential policies in place, the time trade-off was altered: we could increase the weight on risks associated with achieving the inflation target and reduce the weight on risks associated with household vulnerabilities.

A third important difference from the first case study is the introduction of increasing amounts of Knightian uncertainty linked to global trade policy.

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[24] M. Khan and M. Verstraete, "Personal Experiences and House Price Expectations: Evidence from the Canadian Survey of Consumer Expectations," Bank of Canada Staff Analytical Note No. 2018-8 (April 2018); M. Khan and M. Verstraete, "Non-Resident Taxes and the Role of House Price Expectations," Bank of Canada Staff Analytical Note No. 2019-8 (March 2019); M. Khan and T. Webley, "Disentangling the Factors Driving Housing Resales," Bank of Canada Staff Analytical Note No. 2019-12 (April 2019).

[25] O. Bilyk and M. teNyenhuis, "The Impact of Recent Policy Changes on the Canadian Mortgage Market," Bank of Canada Staff Analytical Note No. 2018-35 (November 2018).

Beginning with the Brexit vote in 2016, rising populism had led to large shifts in government priorities in some countries, which was showing up as vows to overhaul trade relationships. Without knowledge about what future trade arrangements might look like, uncertainty was elevated and rising as geopolitical tensions broadened and trade tensions became trade conflicts. Two fronts in the trade wars were particularly relevant for Canada—the China–US conflict and the renegotiation of trade arrangements between Canada, the United States and Mexico.[26]

When a source of Knightian uncertainty arises, the Bank must decide how to handle it within the base-case scenario and explain how (or whether) it has taken this uncertainty into account. The Bank of Canada provided base-case economic projections under assumptions about trade arrangements over the projection horizon. But to help explain how Governing Council thought about and weighed the risks, the Bank's MPRs supplemented the base cases. The MPRs described the various channels through which economic activity could be affected by abrupt changes in trade policies and in the level of policy-related uncertainty. Trade policy uncertainty was two-sided. Because the uncertainty itself was weighing on demand, agreement on future trade arrangements between regions could reduce the drag on economic activity, providing an upside risk to growth. However, if negotiations were to deteriorate or be resolved in a way that would obstruct trade, economic activity would likely be worse than in the base case, providing a downside risk to growth.

Another key part of our deliberations from a risk management point of view was the extent to which strong growth could continue, even in the context of a closed output gap, in order to absorb excess labour capacity and possibly also contribute to a stronger-than-expected increase in supply. Traditional measures of the output gap suggested that the economy was approaching its capacity limits or possibly operating above them. Yet, we were not seeing signs of inflation pressures.

With inflation below target for some time and wage growth subdued, we judged that the risk of a small temporary overshoot of inflation was outweighed by the risk that strong demand could lead to persistently higher potential output. We were aware that the effects of digitalization were probably adding to economic growth in ways that were not being adequately measured.[27] Further, the labour market was evolving in a way that was increasing labour force participation, mainly through part-time or "gig" occupations.[28] All this suggested that there was scope for more gradualism in raising the policy interest rate relative to historical

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[26] Simulations were used to estimate the economic impact on the United States and other countries of tariff changes applied and proposed by the United States in K. B. Charbonneau and A. Landry, "Estimating the Impacts of Tariff Changes: Two Illustrative Scenarios," Bank of Canada Staff Analytical Note No. 2018-29 (September 2018); and K. B. Charbonneau and A. Landry, "The Trade War in Numbers," Bank of Canada Staff Working Paper No. 2018-57 (November 2018).

[27] C. D'Souza and D. Williams, "The Digital Economy," *Bank of Canada Review* (Spring 2017): 5–18.

[28] O. Kostyshyna and C. Luu, "The Size and Characteristics of Informal ('Gig') Work in Canada," Bank of Canada Staff Analytical Note No 2019-6 (February 2019), show that informal "gig" work may have been contributing to reduce wage pressures.

experience, despite the low level of the policy rate and domestic economic strength.

Our ability to follow a risk management approach was aided by a couple of advances in communication. By late 2016, we had augmented the risks section of our MPRs to give more information on developments related to risks—both what had happened since the previous MPR and what was going to be monitored in the near term. This new content helps clarify the Bank's assessment of when a risk may be receding and may eventually be dropped in a future MPR; when a risk may become more important because aspects of it may be materializing, leading to a revision to the economic projection; or when the nature of a risk may be changing, for example, from being one- to two-sided.

Another advance was the launch of the "Economic Progress Report" speech. Starting in 2018, we aimed to enhance transparency around the interest rate decision by having a Governing Council member deliver a speech the day following non-MPR FADs. These speeches provide more details on the Bank's updated view of the economy, as well as insights into the key issues that figured in Governing Council's deliberations.

By October 2018, we had raised the policy interest rate to 1.75 percent. By that time, we again were becoming concerned that financial market participants were extrapolating recent policy actions to anticipate future policy, rather than taking a close look at the various risks that were relevant to policy. In her opening statement following the publication of the MPR, Senior Deputy Governor Wilkins was explicit, saying:

> Governing Council agrees that the policy interest rate will need to rise to a neutral stance in order to achieve the inflation target. You may have noticed that we have not used the word "gradual" to describe the pace of policy adjustments. This is to avoid the impression that we are following a preordained, mechanical policy path. The appropriate pace for interest rate increases will depend on Governing Council's assessment at each fixed announcement date of how the outlook for inflation and related risks are evolving.

The Bank began to stress the term "data dependence" during this period. This was to reinforce that our policy decisions are never predetermined and that markets should rely on their own assessments of the data and their understanding of the Bank's reaction function in developing their forecasts of our policy.

The future of risk management in a COVID-19 world

The Bank has come a long way in adopting a risk management approach to our inflation-targeting framework. But it is clear that the events of this year will be a massive test for everyone's policy-making ability. We are entering unknowable times, and we will have to be nimble and innovative.

The questions are many and daunting. How and when will the global trading system recover? How will companies rebuild value chains? What structural damage will the pandemic cause? How quickly will labour markets recover, and how complete will the recovery be? Vulnerabilities linked to high levels of

household debt will be accompanied by an increased pile of public debt—what kinds of policies will be needed to address this?

In the very short run, actions that are normally thought of as monetary policy moves will continue in support of the financial system. After all, a well-functioning financial system is a necessary precondition for effective monetary policy.

Keep in mind that monetary policy works by first having an impact on financial markets and prices of financial assets. This means that central banks can use some tools to restore market functioning in turbulent times and also to stimulate macroeconomic activity when financial markets are not disrupted. The same actions that we have taken to improve market functioning will become an important source of economic stimulus down the road.

Obviously, the economy will need significant monetary stimulus in the rebuilding stage. But how much stimulus will it need and for how long? Our economic models were not built to deal with this kind of situation with extreme levels of Knightian uncertainty. For the present, policy-makers will likely rely heavily on illustrative scenarios to guide their decisions.

Importantly, the economy was in very good shape when the pandemic hit: inflation was very close to target, and the unemployment rate was sitting at 40-year lows. Just as a healthy, fit individual is more likely to shake off COVID-19, so is the Canadian economy. The policy interest rate, however, had made it up to only 1.75 percent, which meant that monetary policy still had very little room to manoeuvre should a major event occur. Before the pandemic, there was a strong global consensus among central banks that the next major economic downturn would need to be addressed mainly through fiscal policies, with monetary policy playing a supporting role.

The pandemic created a sudden stop in economic activity that was not really addressable by monetary policy. Cutting interest rates to stimulate demand would have little effect when stores and factories were closed. Fiscal action, however, could be designed to support incomes, allowing the economy to “stop the clock” and wait for the pandemic to pass. Even so, the scale of the disturbance meant that monetary policy would need to deliver everything available to complement that fiscal action and support the economy, so the policy interest rate was moved rapidly to the effective lower bound of 0.25 percent. Further, we took a wide range of actions to ensure that financial markets continued to function so that credit would remain available to both households and firms.

This episode has meant some important changes to the conduct of monetary policy. First, the level of coordination between the Bank of Canada and the fiscal authority has been unusually high. This has even included unprecedented joint Governor–Finance Minister press conferences, a show of strength intended to buttress confidence in the economy. Throughout, the importance of the independence of the central bank has been underscored by both parties. It is well understood that the Bank’s ability to lend without limit must be backed up by the inflation target to anchor inflation expectations.

Second, the need to restore financial market function has prompted the Bank to launch an aggressive array of asset purchase programs. These programs are not

only motivated by our mandate to promote financial stability, they are also essential if the cut in the policy rate to the effective lower bound is to find its way to the ultimate borrowers: households and firms. These actions include purchases of federal debt, provincial debt and corporate debt and are leading to a huge increase in the Bank's balance sheet. This will reverse later as conditions gradually normalize. Through this episode, the lessons of 2008–09 led the Bank to eschew gradualism. Instead, the unconventional policy tools were deployed across the board, and aggressively so. In one press conference I was asked if perhaps we were overreacting. I responded that a firefighter has never been criticized for using too much water.

At the time of writing, it appears that the approach has worked so far. Financial markets are performing well. We recognize that near-term cash demands from governments may put renewed strain on financial markets, but we are prepared for that possibility. Mostly, though, we are focusing our efforts on making sure the economy has a solid base for recovery.

With all the uncertainty surrounding the economic outlook, it is fair to ask about the relevance of a risk management approach for decision making. Although a minority of observers worry that these extreme policies will create inflation someday, our dominant concern was with the downside risk and the possibility that deflation could emerge. Deflation interacts horribly with existing debt, the two main ingredients of depressions in the past. In effect, then, we were saying that the downside risks were sufficiently dire that there were no relevant trade-offs for monetary policy-makers to consider. Picture the pandemic creating a giant deflationary crater in the middle of the economy; it takes what looks like inflationary policies to offset it.

The actions taken to counter the effects of the pandemic will clearly lead to higher indebtedness, for governments in particular. Getting the economy back onto its growth track—which is what is required if we are to hit our inflation target—is the surest means of servicing those debts over time. With the situation more like a natural disaster than a recession, there is reason to expect confidence to be buttressed by fiscal income supports and a reasonably swift return to growth for significant segments of the economy. Any structural damage, such as business failures and labour market scarring, will of course take longer to repair.

The extreme uncertainty we face today gives an added sense of urgency to the research being done at the Bank and elsewhere. This research will help us better understand some crucial issues as risk management continues to evolve. Ongoing research related to uncertainty includes work looking at spillovers in times of uncertainty[29] and how macroeconomic uncertainty can lead firms to defer hiring.

Of course, the Bank also continues to work on the nexus between monetary policy and financial stability. We are working toward a better understanding of how vulnerabilities affect policy transmission. There is new modelling work

[29] K. Tuzcuoglu and L. Uzeda, "Measuring Aggregate and Sectoral Uncertainty," Bank of Canada Staff Working Paper, forthcoming.

underway to dig into the today-versus-tomorrow trade-off that is created by vulnerabilities.[30]

Enhancing our understanding of real financial linkages will continue to be at the forefront. We have already learned a lot about the importance of taking into account household heterogeneity, including issues related to demographics and differences in income, debt and wealth.[31] Our research will take advantage of microdata to develop a deeper understanding of how household heterogeneity matters for monetary policy transmission.

Heterogeneity is also important for reducing our uncertainty about macroeconomic fundamentals. The size of a firm can affect access to credit through the business cycle. Supply-chain structures can be relevant for the impact of monetary policy and fiscal policy on investment, exports and imports. Again, microdata will improve our understanding.[32]

This work will enhance our modelling of the macroeconomy and also improve our representation of the macroeconomy in our financial stability tools. Moreover, a number of research projects are helping us close in on a model that includes a wider variety of financial system variables and financial stability metrics than our current macro models have. This won't be the grand synthesis, but we may end up with the kind of tool that can improve our forecasting and risk analysis and enhance our policy deliberations.

The pandemic is an example of Knightian uncertainty that will also force us to reconsider many fundamental ideas about how our economy can and should function. Many have said that when we eventually return to normal, that normal will be very different from what it was before COVID-19. The pandemic has revealed weaknesses in global and domestic supply chains, and it has ignited innovation in Canada and elsewhere that has revealed payoffs for flexibility.

There will be lessons to learn from how supply chains evolve. It will be interesting to see if future arrangements build in more redundancy of suppliers, and if more production of critical goods will be done domestically. More broadly, there may be changes to industrial structures as economies put less emphasis on global supply chains for products deemed essential for national health and security.

One clear impact of the pandemic is that many companies and employees have quickly moved to full-time telework arrangements once thought impractical, if not impossible. Meetings that people once thought had to be done face-to-face are

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[30] P. Beaudry, "Monetary Policy and Financial Vulnerabilities" (remarks at Université Laval, Québec, Quebec, January 30, 2020).

[31] Related research includes A. T. Y. Ho and J. Zhou, "Housing and Tax-Deferred Retirement Accounts," Bank of Canada Staff Working Paper No. 2016-24 (May 2016); S. Cao, C. Meh, J.-V. Ríos-Rull and Y. Terajima, "The Welfare Cost of Inflation Revisited: The Role of Financial Innovation and Household Heterogeneity," Bank of Canada Staff Working Paper No. 2018-40 (August 2018); E. Djeutem and S. Xu, "Model Uncertainty and Wealth Distribution," Bank of Canada Staff Working Paper No. 2019-48 (December 2019); and K. Kartashova and X. Zhou, "How Do Mortgage Rate Resets Affect Consumer Spending and Debt Repayment? Evidence from Canadian Consumers," Bank of Canada Staff Working Paper No. 2020-18 (May 2020).

[32] X. Guo, "Identifying Aggregate Shocks with Micro-level Heterogeneity: Financial Shocks and Investment Fluctuation," Bank of Canada Staff Working Paper No. 2020-17 (May 2020).

now taking place virtually. Out of necessity, online commerce is expanding rapidly. It is worth considering whether these trends will accelerate digitization of the economy and more broad-based use of some technologies.[33] It is also worth considering whether this will accelerate initiatives that contribute to a reduction in carbon emissions.

Finally, there will be lessons to learn about the effectiveness of various policies—fiscal, regulatory, financial and monetary—and how they interact.

Conclusion

If there is one common thread to this romp through recent economic history, it is that economists and policy-makers learn through experience. Uncertainty has been a common theme of my predecessors. This brings a certain measure of humility to the policy table and makes us always wishing for more understanding, more insight and more clarity. Certainly, the lessons from the global financial crisis helped enormously in our approach to financial markets during the current pandemic.

Looking ahead, our experience will be supplemented by research to improve our methods of dealing with uncertainty and risk management. We can find better ways to model the impact of Knightian uncertainty on confidence and behaviour. We can broaden our analysis of the optimal policy mix to manage risks and uncertainty. We can improve our measurement of the trade-offs between financial stability and inflation targeting.

This habit of continuously learning will be absolutely essential as we work our way through unknowable times. I have every confidence that we will find our way back to prosperity here in Canada, not just because of the strength of our foundations, but in the usual way–through hard work and ingenuity.

[33] T. Lane, “Money and Payments in the Digital Age” (remarks to the CFA Montréal FinTech RDV2020, Montréal, Quebec, February 25, 2020).