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**CHECK AGAINST DELIVERY**

## **How People Think and How It Matters**

It is always an honour for the Bank of Canada to be invited to CAFE's annual summer conference. I am especially pleased to find myself in the company of so many fellow economists.

My remarks today will be about expectations—how people form them and how it matters for monetary policy.

I will be talking about how we think we think. At some level, this might sound absurd. Don't we actually *know* how we are thinking?

This reminds me of a question once asked of me. While completing graduate school and looking for a job, I presented my dissertation at various institutions. The goal of my work at the time was to use historical data to document the behaviour of the Federal Reserve and how it had changed over time. On one occasion, after I had spent the better part of an hour explaining the brilliant methodology I was so proud of, someone asked, "Wouldn't it have been easier to just go and ask Chairmen Greenspan and Volcker what they did?"

This was meant as a joke—although I am not sure I laughed much at the time. Whether it would have been conceivable to question directly the Fed Chairmen, I don't even know. I would have certainly loved to. But that was not the point. Although we obviously learn much by talking directly to people and get important colour, actions are the results of a very complex process—believe me, something I appreciate even more now—and we cannot hope to get a complete understanding of behaviour simply by asking. That's why I needed to take a hard look at the actions themselves.

This should resonate even louder in the context of today's topic. As economists, we spend our professional lives trying to make sense of how the economy works. Ultimately, this understanding depends on how we think we think—and that's not something we can fully understand by simply asking ourselves.

My goal today is to paint a portrait of the uncertainty we have about how expectations are formed and discuss the implications for two current policy questions: the desirability of price-level targeting and the implications of financial imbalances for monetary policy. I will end with a few remarks about efforts to deal with the uncertainty surrounding expectation formation and ongoing challenges.

## Why Are Expectations So Important for Monetary Policy?

But the first question is: why are expectations so important to monetary policy? Economic outcomes are the result of people's collective decisions and these decisions depend on how people think and what they expect the future to bring.

For example, a decision to buy a house will depend on expectations of future income, what interest rates might be, and whether one thinks the real estate will increase or decrease in value. The price a firm sets and the wages it negotiates with employees are influenced by its expectations about the rate of inflation in the coming quarters.

The future is inherently uncertain. Firms, individuals, families and policy-makers—all of us—form best guesses, or expectations, regarding events we are uncertain about.

This means that current economic outcomes are determined by what people *think* the future will be, not necessarily by what the future will *actually* be. People will be right or wrong about the future, but what matters to their decision today is their perception of it.

This perception can be fast changing, as recent developments in financial markets have once again made clear. A reassessment of the global economic outlook and a heightened degree of uncertainty contributed to the significant fall in equity prices and increase in overall market volatility of the past few weeks. But Keynes coined the term “animal spirits” to describe the emotional, non-purely logical state that influences our decision-making.<sup>1</sup> With the unusual sequence of large drops and rebounds in capital markets in recent weeks,<sup>2</sup> it is difficult to argue that fear and animal spirits were not also at play.

Obviously, given that expectations determine the evolution of the economy, they matter for monetary policy.

But it works both ways.

Monetary policy also influences expectations. In fact, expectations management—or the expectations channel—is a powerful tool through which monetary policy can influence and stabilize the economy. What people think future policy will be influences their decisions and can have an important impact today.

Through the adjustment of expectations, the monetary authority has the opportunity to better offset fluctuations in the level of output or inflation. This expectations channel of monetary policy has always been at work, but as its existence has become better appreciated, its influence might have become greater as well.<sup>3</sup> We can see a clear illustration of its importance in the conditional commitment the Bank of Canada used

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<sup>1</sup> Keynes (1936).

<sup>2</sup> For instance, the Dow Jones Index dropped by 5.5 per cent and 4.6 per cent on 8 and 10 August, respectively, followed by pick-ups of 4.0 per cent and 3.9 per cent on 9 and 11 August.

<sup>3</sup> Woodford (2003) emphasized the importance of “managing” the public's expectations through systematic monetary policy. Boivin, Kiley and Mishkin (2010) showed that changes in the behaviour of monetary policy in developed countries have anchored inflation expectations better and significantly changed the transmission of shocks to economic activity and inflation.

during the financial crisis—one of three types of potential unconventional monetary policy tools at its disposal.<sup>4</sup>

In April 2009, the Bank stated that it would maintain the policy interest rate at 0.25 per cent from April 2009 to mid-2010, conditional on the outlook for inflation. This exceptional guidance provided additional monetary policy stimulus through greater certainty about the policy path and by influencing rates at longer maturities.<sup>5</sup> The Federal Reserve used a similar device two weeks ago with the statement that interest rates are likely to remain at current levels through mid-2013.

But the expectations channel can also seriously handicap policy if not managed properly. As research and experience have shown, policy makers cannot manipulate the economy by creating false expectations without damaging their credibility. And with impaired credibility, a central bank's influence on the economy is seriously diminished.<sup>6</sup>

This reciprocal dynamic between expectations and monetary policy is one of the most important insights of economic research of the past forty years. The successful achievement of monetary policy objectives helps to establish credibility and anchor inflation expectations. This credibility, in turn, gives the central bank greater scope and flexibility to stabilize the economy more effectively while keeping inflation expectations in line with monetary policy objectives.

These insights are the cornerstone of Canada's inflation-targeting regime. Since its adoption, well-anchored inflation expectations have allowed businesses, individuals and families to take a longer view in their planning, which has led to a better allocation of economic and financial resources and a more stable economy overall.

### **Decision Making and Expectation Formation**

So we know that expectations are crucial, but what do we know about how they are formed?

Trying to understand better how we think is a timeless quest, spanning numerous disciplines such as philosophy, psychology, biology, neuroscience and political science, as well as economics. These all offer different perspectives and the picture that emerges confirms in some ways the obvious: decision making is an extremely complex process. It is in part about conscious rational calculations, but it is also about the unconscious influences of intuition, beliefs, perceptions and emotions. In recent years, important progress has been made in satisfying the rigorous part of our brains and providing scientific support for Keynes' intuition on the importance of animal spirits.

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<sup>4</sup> Bank of Canada, *Monetary Policy Report*, April 2009. The Annex to this report describes the Bank of Canada's approach to and the principles surrounding the conduct of monetary policy when the overnight interest rate is at the effective lower bound.

<sup>5</sup> Evidence suggests that the Bank of Canada's forward-guidance lowered Canadian interest rates out the yield curve relative to what their historical relationship with inflation and unemployment rates would imply. See He (2010).

<sup>6</sup> Kydland and Prescott (1977); and Barro and Gordon (1983). For more recent contributions, see Clarida, Galí and Gertler (1999); and Athey, Atkeson and Kehoe (2005). For a discussion of challenges involved in trying to build credibility in the early days of inflation targeting in Canada see Clinton and Zelmer (1997).

So what's an economist to do? How do we form a view on how people think?

A useful starting point has been rational expectations. As the name states, it's based on the optimistic assumption that people are as sophisticated as they can possibly be—that they fully understand how economies and markets work, take into account all the information available, fully appreciate the future consequences of their actions today, and make decisions that are fully consistent with this understanding.

Taken at face value, this might look like a completely crazy idea. The mere fact that we economists have jobs—and think that we play a useful role—contradicts rational expectations. After all, if everyone was so sophisticated in their understanding of how the economy works, why would the world need us?

But, while crude and simplistic, the assumption of rational expectations is a useful and tractable way to capture two fundamental ideas. First, what people think about the future can affect their current decisions. Second, in the face of changing circumstances, people will not forever do the same thing expecting a different outcome, to paraphrase Einstein's oft-cited definition of insanity. They will eventually adapt their behaviour to changing circumstances or policies.

These insights have proven to be powerful<sup>7</sup>. As I discussed earlier, they make a compelling case for the importance of expectations for monetary policy and form the intellectual foundation of inflation targeting regimes around the world.

But rational expectations should come with warning labels: "Handle with care." "Keep away from children." The concept was never meant to be taken literally and never should be. While useful for some policy issues, it can be a very misleading assumption for others. In trivializing the decision-making process, it leaves out elements that have the potential to overturn important policy prescriptions.

Researchers across disciplines have investigated various aspects of decision making that are not consistent with a literal and simplistic interpretation of rational expectations. Here are a few key examples.

First, our conscious cognitive capabilities are limited. People are able to retain only a finite number of signals in their memory. Consequently, it may in fact be rational to ignore some types of information, or to be "rationally inattentive."<sup>8</sup> It also seems that these cognitive constraints may make us overreact or under-react to information depending on the general degree of uncertainty we perceive.

Second, perceptions and emotions can play an important role, even in the most practical business decisions. For instance, price changes might appear unfair to consumers and they may experience regret, disappointment and anger when they occur. To avoid alienating its consumer base, a firm might take these fairness considerations into account

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<sup>7</sup> For instance, they are the basis of both the Friedman (1968) and Phelps (1968) hypotheses on the absence of the long-run trade-off between inflation and real activity, and the Lucas critique (Lucas 1976).

<sup>8</sup> The concept of "bounded rationality" (i.e., in making decisions, people are limited by the amount of information they have or can process, by the amount of time they need to make a decision or by other limitations of their minds) was introduced by Herbert Simon (1955) and further developed by Tversky and Kahneman (1974). See also Kahneman (2003). Sims (2010) reviews the literature on rational inattention.

in its pricing decision, even if that means sacrificing some short-term profits.<sup>9</sup> Some would say that this is just good marketing.

Third, dozens of unconscious tendencies and biases have been found to be “hardwired” into human behaviour. People often rely on a limited number of “heuristic” rules, or rules of thumb, to reduce a complex task of assessing probabilities of future events.<sup>10</sup>

These tendencies can lead us to: evaluate outcomes within a frame of reference or pre-existing beliefs so that we see only what we want to see; react to the order in which information arrives or put too much weight on some particular piece; be impatient and put more weight on the present; be overconfident in the face of uncertainty; be subject to herd mentality and believe what we do simply because others believe it as well; have a preference for the status quo; or see patterns where there are none and mechanically extrapolate current outcomes and views into the future.<sup>11</sup>

To be clear, the issue is not whether these behaviours and tendencies are ultimately rational. For instance, some patterns of behaviour, even if unconscious, could represent automated responses that millions of years of evolution and adaptation have refined and perfected. Rather the issue is that, rational or not, how we think involves many dimensions that a stylized view might miss and these have key implications for monetary policy.

### **Expectations and Monetary Policy Issues**

For example, the way people form expectations has a significant impact on two issues that have been the subject of research at the Bank related to the renewal of the inflation-control target agreement between the Government and the Bank of Canada. These are the desirability of price-level targeting versus inflation targeting and the nexus between financial stability and monetary policy.

Let me talk about price-level targeting first.

Research has shown that targeting the price level instead of the rate of inflation could help better stabilize the economy. Under price-level targeting, the monetary authority would commit to reverse deviations of the price level from its target path. If properly understood, firms should feel less compelled to change their price since they know that the effect of shocks on the price level will be reversed. Since prices do not move as much, smaller adjustments in production levels are required. In essence, what price-level targeting does is to make expectations act as a buffer against shocks, delivering lower volatility in both inflation and output.<sup>12</sup>

This could prove particularly useful in situations where deflationary forces cause the zero lower bound on the policy rate to bind. The promise that the effects of shocks pushing the

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<sup>9</sup> Kahneman, Knetsch and Thaler (1986); Akerlof and Yellen (1987); Rotemberg (2010, 2011).

<sup>10</sup> Tversky and Kahneman (1974).

<sup>11</sup> Hostile media effect: Vallone, Ross, and Lepper (1985); hyperbolic discounting: Ainslie (1992) and Laibson (1997); anchoring: Tversky and Kahneman (1974); confirmatory bias: Lord, Ross and Lepper (1979); overconfidence effect: Hoffrage (2004); bandwagon effect: Bikhchandani, Hirshleifer and Welch (1992); status quo bias: Samuelson and Zeckhauser (1988); primacy and recency effects: Luchins (1957).

<sup>12</sup> For a recent review of research on price-level targeting see Côté (2007); Amano et al. (2009); Ambler (2009) and Murray (2010).

price level below target will be reverted means that prices don't have to fall as much today. The only way by which monetary policy can bring the price level back up to its target is by eventually injecting further monetary stimulus. The promise of bringing the price level back to target is thus equivalent to a promise of future monetary policy stimulus which helps to stimulate the economy today.<sup>13</sup>

Clearly, then, under price-level targeting, expectations do the heavy lifting. They serve as automatic stabilizers in response to shocks. But if people's expectations do not adjust favourably, the edge of price-level targeting over inflation targeting diminishes.<sup>14</sup> The success of a price-level targeting regime would depend on how quickly the public learns and adjusts its expectations and on the degree of credibility with which policy-makers can implement price-level targeting.<sup>15</sup>

Our understanding of behaviour and of expectation formation also has an impact on a second question that has come to the forefront in the aftermath of the crisis: to what extent does monetary policy have a role to play in supporting financial stability?

A blind faith in purely rational expectations would tilt one towards the conclusion that monetary policy—and in fact most policies—would have a limited role in this regard. Asset prices should reflect all available information and the best decisions people could make given this information. Contracts should be designed optimally, reflecting a complete understanding of the consequences of the incentives at play. If expectations are assumed to be fully rational—while not impossible—it may be harder to see how bubbles could form.

But, as the recent financial crisis made clear, various facets of human behaviour and decision making can contribute to the build-up of financial vulnerabilities. People show a tendency to forget the past and assume that the future will be like the present. Periods of stability could breed complacency, making us overconfident that good times are here to stay and generate an excessive appetite for risk.

The existence of such patterns of behaviour reinforces the importance of proper regulatory and supervisory policies.<sup>16</sup> After personal responsibilities of the borrower and the lender, these are the next lines of defence against the build up of financial imbalances. But we cannot rule out the possibility that monetary policy might also, in some circumstances, have a role to play. In fact, monetary policy could itself be a contributing factor. For instance, if people mechanically extrapolate the present into the future, or overweight the present in their risk assessment, low interest rates—or a perceived

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<sup>13</sup> Krugman (1998), Svensson (2001), Egerstsson and Woodford (2003), Lavoie and Murchison (2008), Murchison (2011). Amano and Shukayev (2010) provide an overview of implications of the zero bound on nominal interest rates for monetary policy.

<sup>14</sup> Price-level targeting leads to smaller welfare gains than inflation targeting if the fraction of backward-looking agents is larger than half, see Steinsson (2003); and Ambler (2009). Dorich (2009) provides a review of the literature estimating backward-looking rule-of-thumb price-setting behaviour.

<sup>15</sup> Kryvtsov, Shukayev and Ueberfeldt (2007) examine the desirability of switching to price-level targeting if imperfect credibility caused the private sector to be slow in adjusting their inflation expectations under the new policy regime. They find that when imperfect credibility lasts for more than 10 quarters, the cost of switching to price-level targeting outweighs the benefits.

<sup>16</sup> Macklem (2011) reviews G-20 efforts and achievements toward a more resilient financial system and the challenges related to oversight and regulation.

certainty around their future path—could generate excessive risk taking on the part of financial institutions or induce people to take on more debt than they should. These are some of the manifestations of what is known as the risk-taking channel of monetary policy.<sup>17</sup>

Policy makers are grappling with these and other issues, all of which are affected by the formation of expectations.

### **What Does It Mean for Policy?**

Faced with the uncertainty and complexity of decision making and our imperfect understanding of it, what should policy makers do?

For a start, we need to embrace this uncertainty. We cannot be dogmatic. We need to take a broad perspective and make sure that our decisions are robust by choosing policies that would be desirable under different types of expectation formation. This is another important reason why monetary policy cannot simply follow mechanistic and simplistic rules.

This is why various types of expectation formation mechanisms are explicitly included in our analysis at the Bank of Canada. We look at different surveys of expectations from forecasters and business owners. Also, one of our main policy models, ToTEM, allows for different types of expectation formations—incorporating both forward-looking expectations and alternative types as well.<sup>18</sup>

We also need to push our understanding of decision making further. This requires that insights and tools from the other disciplines that study the human brain and its decision-making processes from different perspectives be more integrated in our economic research and policy analysis.

In that spirit, Bank researchers have recently been drawing on the growing field of experimental economics to investigate more directly how people's expectations behave and adapt under different policy regimes. Simulations that replicate key features of the Canadian economy have allowed us to observe how people's expectations change when we tweak some aspects of the environment. For instance, in one set of experiments, we looked at how inflation expectations would change if monetary policy evolved from inflation targeting to price-level targeting. The results suggest that expectations do adapt to a change in regime. However, the subjects' behaviour revealed only incomplete understanding of the implications of price-level targeting.<sup>19</sup> These experiments constitute a useful starting point and can be extended to investigate many more questions, including

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<sup>17</sup> Carney (2010) discusses the factors that have led to a low interest rate environment in major advanced economies and the implications for financial stability and economic growth. Borio and Zhu (2008) discuss the need to incorporate the risk-taking channel in monetary policy analysis, including that of extrapolative expectations. Sims (2008) argues that rational inattention and differences of opinion in expected inflation can generate excess investment in real capital. See also Adrian and Shin (2009).

<sup>18</sup> ToTEM is the Bank of Canada's principal projection and policy-analysis model for the Canadian economy. It is a medium-scale, open-economy, dynamic-stochastic general-equilibrium (DSGE) model with multiple goods. See Murchison and Rennison (2006); and Dorich, Mendes, and Zhang (2011).

<sup>19</sup> Amano, Engle-Warnick and Shukayev (2011).

how central bank communications influence people's decisions or the tendency people have to extrapolate the present into the future.

### **Conclusion**

I would like to conclude with the following observation.

I have argued that the uncertainty we have about how we think has important policy implications. But we should not forget a fundamental lesson from rational expectations. The way we think is not set in stone. People learn and eventually adapt. Even if people are constrained by their cognitive ability and a hardwired need for simple rules of thumb, effective communication and greater common knowledge can override some unconscious biases; make it possible to switch to still simple, but better, rules of thumb; learn more quickly; make more informed decisions; and, ultimately, reach better outcomes. A better understanding of expectation formation and effective communications can positively reinforce each other. This is not only true for monetary policy, but for decision making in general.

This is why, even though I am not sure how you think, I'm sure you expect me to be done just about now. And you are right.

Thank you.

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