Reflections on Three Decades at the Bank of Canada

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Reflecting on my three decades at the Bank of Canada has led me to think about the economic issues that I have had to deal with and the people I have worked with at the Bank over the years. In this paper, I focus mainly on the economic issues. In passing, however, I touch upon some of the people I have worked with and on the Bank as an institution.

Let me begin by noting that I have had the pleasure and privilege of working for five of the seven governors that the Bank has had since its establishment in 1935. And I was fortunate to report directly to John Crow or Gordon Thiessen for over 26 years, as they and I moved up the ladder at the Bank. Of course, Graham Towers and James Coyne were before my time. But I spent the academic year 1971–72 in the Bank as a visiting professor towards the end of Lou Rasminsky's tenure. And when I joined the Bank as a permanent employee, Gerry Bouey was Governor, to be followed by John Crow, Gordon Thiessen, and David Dodge. Although Lou Rasminsky was Governor during my year as visiting academic, I did not actually meet him during that year.[1] That can be taken as symbolic of how different the Bank was then and how much it has changed over the years. At that time, the Governor simply did not meet or invite to lunch a mere visiting academic.

John Helliwell, who was a visiting scholar in the Bank in the late 1960s, came to work one day without a jacket and tie. When he was asked by a Bank employee what he would do if he was invited to lunch by the

1. I did, however, get to know Lou very well after his retirement.

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Governor, John replied that it was also possible that it might snow in July in Ottawa but he did not wear an overcoat to prepare for that contingency. The contrast with more recent years is striking. Governors regularly invite visiting academics to lunch, the conversation is always lively, and jackets and ties are no longer required.

The focus of much of this paper relates to the major developments and initiatives in which I was involved. While I will deal mainly with issues related to monetary policy, I also want to discuss some of the fascinating challenges I faced in the context of my responsibilities for financial stability in general, and clearing and settlement systems in particular. Although I was very involved in these matters, and I will present them from my own perspective, I want to emphasize how much of the work in the Bank is the outcome of collective effort, in what was and is a very collegial environment.

Several years ago, I was invited by Angelo Melino of the University of Toronto to deliver the luncheon address to a meeting of the Canadian Macroeconomics Study Group. The provisional title of my address was "The Influence of Academic Research on Policy Design in Recent Years." After writing the paper, however, I changed the title to "The Influence (or Lack Thereof) of Academic Research on Policy Design in Recent Years." The reason for the change was my realization that for the most interesting and most challenging issues with which I have had to deal over the years, there was very little academic research to guide the Bank, and my colleagues and I had to develop our views without much assistance from the literature. Let me list the issues before going into detail: (i) inflation targeting; (ii) monetary policy implementation following the elimination of reserve requirements; (iii) the risk proofing of large-value clearing and settlement systems; (iv) the role of the central bank in financial stability; and (v) the impact of electronic money on central banking.

Evolving Monetary Policy Framework

I will begin this section with a chronological account of the framework of monetary policy over the past thirty or so years. Since the Canadian dollar was floated in mid-1970, there has been a need for a nominal anchor to serve as the centrepiece of the monetary policy framework. One can characterize the period since then as one in which the Bank searched for and found nominal anchors, initially M1 targets and subsequently inflation targets.

The Bank introduced monetary aggregate targeting in 1975, aiming at achieving a decelerating rate of growth of the narrow aggregate M1 in order to bring down the rate of inflation. In contrast to the introduction of inflation targets 16 years later, when, as I just mentioned, there was a dearth of academic literature, a great deal of academic research had been done on the relationship between monetary aggregates and the rate of inflation. Nonetheless, a lot of internal analysis had to be done on the demand for money relationship in Canada and on some of the mechanics of using a monetary aggregate as the target. And here I would note the central roles of George Freeman and Bill White in developing the framework.

While the Bank was successful in gradually reducing the rate of growth of M1, it was less successful in keeping down the rate of inflation after an initial slowing. This was due to two factors. The first and better known was the instability in the demand for money in the early 1980s. As Gerry Bouey put it in a memorable phrase after the withdrawal of the targets in 1982, "We did not abandon M1, M1 abandoned us." The second and less well-known factor was that the interest rate elasticity of M1 turned out to be too high (and higher than we had originally thought), implying that in response to upward pressure on inflation and hence on M1, the interest rate increase needed to bring M1 back to target was relatively small and indeed was probably insufficient to counter the inflationary pressures over the short to medium run. Nonetheless, as long as the growth in nominal spending exceeded the target growth rate for M1, interest rates would have continued to rise, and the monetary tightening would eventually have had an impact on output and inflation. But this might have taken quite a long time.

Professor Michael Parkin, who was very supportive of the use of monetary targets to bring down inflation, made one very telling criticism of the arrangements. While the Bank was aiming at a gradual deceleration of M1 and a resulting slowing of the rate of inflation, the Government in its budget projections in the late 1970s and early 1980s assumed a rate of inflation on the order of 9 to 10 per cent over the subsequent five years. Which of the two entities responsible for macroeconomic policy, Parkin asked, should he believe? When inflation targeting was introduced in 1991, it was announced jointly by the Bank and the Government, thereby making clear that the Government was involved in, and fully committed to, the initiative. And the budget projections since then have been entirely consistent with the targets for the rate of inflation.

An anecdote from the monetary targeting experience throws some light on the change in transparency over the years. A few years ago, I received, in galley form, an article prepared for the *NBER Macroeconomics Annual* by Bernanke and Mishkin on the experience of a number of countries with monetary targets. It was critical of the Bank of Canada for making announcements of new money targets on an irregular basis and employing base periods for the measurement of money growth that were as much as six months earlier than the date of the announcement. I phoned Rick Mishkin to tell him that he had completely misunderstood our process. In the United States, the monetary targets had been plagued by "base drift," which resulted from a mechanical retargeting every four quarters. In contrast, we chose to wait until M1 was back in the middle of its band (and the data were not likely to be revised in a major way) before announcing a new base for the subsequent period. Rick's response was that we had never explained our process in any of our publications. I replied "of course we did." But to my surprise and chagrin, he was right. After a rereading of *Annual Reports*, speeches, and so on, I realized that we had never explained the motivation for our approach to rebasing. The contrast with the recent approach to policy design, where we explain the policy framework in great detail, could not be more striking. Similarly, our hesitation about publishing an M1 equation during the period of monetary targeting also reflected a lack of transparency.

It was in 1978, when Bill White and I exchanged positions, that I became involved in the research and analysis underlying monetary targeting. And, following the withdrawal of the M1 targets in 1982, the Department of Monetary and Financial Analysis, of which I was then the Chief, spent a great deal of time and energy searching for an alternative monetary aggregate that could be used as the basis for policy. What we were looking for was an aggregate that bore a stable relationship to output, prices, and the interest rate. Steve Poloz and the late John Kuszczak were central to this endeavour and in 1983 Steve actually found an aggregate that was slightly broader than M1, which we called M1A, and that appeared to be stable. While there was pressure both from inside the Bank and from outside commentators to introduce a new money target, those of us involved in the analysis were more cautious. While the demand for total M1A appeared stable, this was the outcome of large and offsetting errors in its two components, household deposits and business deposits. And indeed, in the following year, the fortuitous offsetting of errors disappeared and aggregate M1A followed M1 into instability. Our reservations about introducing M1A as the new monetary aggregate target were clearly vindicated.

One final comment before leaving the monetary aggregates. It used to be that most academic research treated money (or sometimes base) as the exogenous policy instrument under the control of the central bank. This was an irritant to those of us working in central banks, because the instrument of policy had always been the short-term interest rate, and because all monetary aggregates (beyond base) have always been and remain endogenous. In recent years, more and more academics, in specifying their models, have treated the short-term interest rate as the policy instrument, thereby increasing the usefulness of their analyses for our thinking about monetary policy and allowing for more cross-fertilization of work done inside and outside central banks.

I should mention in passing that Bank staff in the latter part of the 1980s experimented with nominal spending as the target for policy and it was used in internal analyses. Although it never got any further, some of the insights gained from this work proved useful later when we moved to inflation targeting.

This brings me to 1988 and John Crow's Hanson Lecture. It received a lot of attention because of its emphasis on price stability as the goal of monetary policy. I had held the pen for some of the early drafts of the lecture (which meant that several of my *the*'s, *a*'s, and *or*'s made it into the final draft). What I remember from this process (in addition to numerous debates with John about the ideas and phrases as we went through about 30 drafts) was giving John a draft one Friday in which the objective of monetary policy had been characterized as "a very low rate of inflation" and getting back John's marked-up copy on Monday morning with that phrase crossed out and "price stability" inserted in its place. When I asked John whether he really wanted to go that far, his response was, "Is there any other possible goal for monetary policy?"

In February 1991, the Bank and Government announced the introduction of inflation targeting. In his recent book, John Crow has given a fairly detailed account of the circumstances around the new policy initiative. Dave Longworth and I held the pen on the background document issued at the time, in which the Bank set out the way in which the policy would be carried out in practice. (Incidentally, Dave and I had the same task ten years later for the background document of the targets announced in 2001.) Looking back, the arrangements set out in 1991 have stood the test of time very well and indeed can still be read with profit.

Before discussing the operation of the targets, let me remind you of the circumstances leading to their adoption. There was upward pressure on wage and price inflation towards the end of the 1980s, as the Canadian economy went through a period of excess demand. The sharp rise in oil prices in the period leading up to the first Gulf War and the introduction of the GST caused CPI inflation to rise to 6.8 per cent in early 1991. The concern at the time about a resurgence of inflation expectations and a return of the kind of price-wage spiral that we had seen in the 1970s and early 1980s were key factors behind the new policy initiative. Introducing the inflation targets also made clear that, while we would accommodate the first-round effects of the GST on the price level, we were not prepared to accept second-round repercussions leading to a ratcheting up of the inflation process. At the same time, the Government thought that its decision to hold public service pay increases to 0 and 3 per cent over the following two years would seem more reasonable in the context of a decline in the rate of inflation to 3 per cent in the near future and then even further over time.

The inflation-reduction targets made concrete the way in which the Bank intended to reduce inflation to lower levels and then move to price stability. The following technical issues had to be addressed in the context of the introduction of the targets, and they were discussed in some detail in the background document. (i) The measure of inflation that was chosen was the CPI because it is the best known measure, it is never revised, and it is published monthly. (ii) The role of a core inflation measure as a way of seeing through short-term fluctuations and one-off increases in the price level was introduced. (iii) We decided to use ranges around the target rate of inflation. These indicated a region of uncertainty, not a region of indifference. I would note in passing that the ranges were soft-edged, not hard-edged (in contrast to the initial approach in New Zealand) and that we expected to breach the limits of the range from time to time. (iv) We were also explicit that if we failed to achieve one of the targets, we would aim at achieving the subsequent target (18 months later), but we would not take action to get back to the target overly rapidly. The reason for this more gradual return to target was to avoid unnecessary fluctuations in output and interest rates. The last three were Canadian innovations (i.e., not used by the Reserve Bank of New Zealand) and have proved very helpful over the years.

A few comments on the inflation-targeting arrangements. First, what we should have emphasized even more than we did at the time was that the objectives of low inflation and then price stability were a means to an end, the end being a well-functioning economy. Second, it was decided to bring down the rate of inflation gradually. But how gradual should the reduction of inflation be? In hindsight, we were perhaps overly cautious (three years to go from 3 per cent to 2 per cent), but recall that it had been many years since inflation had been that low in Canada, and there were a lot of people (inside and outside Ottawa) who were skeptical of our ability to achieve even the initial 3 per cent target. Indeed, when Paul Jenkins and I met the financial community in Toronto on the day after the announcement of the targets, you could have cut the skepticism with a knife.

The gradualism in bringing down the targets, and the gradualism in returning to the targets if we failed to achieve them, as well as the soft-edged nature of the ranges, were all related to the avoidance of unnecessary and excessive fluctuations in output and interest rates. What we arrived at by good economic intuition, and some small model simulations, was formalized some years later by Lars Svensson in a series of excellent articles on inflation targeting in which he specified the loss function to be minimized by the central bank as containing two arguments, the variance of inflation from its target, and the variance of output from capacity. He combined this loss function with an IS curve and an augmented Phillips curve that each had a one-period lag. I remember thinking when I read Lars' first article on the subject that our approach to policy effectively involved minimizing this type of loss function, in the context of an economy where lags play a key role, without realizing it. Incidentally, the rapid growth of the literature on inflation targeting since about 1995 has been very useful to central banks. In 1991, however, all we had to go on in developing the approach and writing it up was the document issued by the Reserve Bank of New Zealand when it introduced inflation targets one year earlier.

Third, a crucial element of the targeting process was its forward-looking nature. We were targeting inflation six to eight quarters in the future, not the current inflation rate. Indeed, in a study of various kinds of targets written in 1986, Dave Longworth and Steve Poloz compared money, nominal spending, and exchange rate targets as ways of anchoring monetary policy. Prices and inflation were not even candidates for the target because the model that Longworth and Poloz were using exploded if the central bank tried to target current prices. The insight that the Bank had to target *future* prices or inflation, not their current level, was central in moving our thinking forward. And that insight developed from the experience of the staff with using nominal spending as the anchor for policy in the projections carried out over the 1987–90 period.

Fourth, while there is no logically necessary connection between inflation targeting and transparency, it is the case that the countries that have adopted inflation targeting have all increased significantly the transparency of their policy making. There are two factors behind this development. The first is the view that monetary policy is more effective if it is more transparent. The second is the demand for greater accountability as central banks have been given increased independence to carry out their monetary policy responsibilities.

In Canada, over the decade of the 1990s, the Bank made a significant number of changes that enhanced transparency. These included: (i) the announcement of the inflation target; (ii) detailed explanations of its views on the transmission mechanism; (iii) periodic detailed discussions of its views on the economic outlook and inflation, in the *Monetary Policy Reports (MPRs)* released in April and October (since 1995) and in the *Updates* released in January and July (since 2000); (iv) the setting in 1994 of an operational target band of 50 basis points for the overnight rate of interest, followed in early 1996 by the issue of a press release (with explanations) when there was a change in the band and then by the linking of Bank Rate to the top of the band, and in 1999 by the setting of the target overnight rate as the midpoint of the band; (v) the move to fixed announcement dates (FADs) in late 2000, with a press release on each date regardless of whether or not there was a change in the policy rate; and (vi) on the communications front, more frequent speeches by the Governor and Deputy Governors, regular press conferences and appearances before the House of Commons Standing Committee on Finance, and subsequently the Senate Standing Committee on Banking, Trade, and Commerce, following publications of the *MPR*, and lock-up arrangements for the media with background briefings by senior officials before releases.

Let me expand a little on the move to the FADs. The idea was under study for quite some time before the decision was made to go ahead. The initial note suggesting the change in approach was written by Mark Zelmer, and I subsequently wrote a number of papers assessing the idea and then pushing it forward. Different disadvantages of the system in place and of the benefits of moving to FADs were prominent at different times in the discussions. Under the pre-FAD system, the policy rate could be changed at 9:00 a.m. on any business day. At times when the Fed had changed or was expected to change the federal funds rate, the market for overnight funds in Canada froze around the 9:00 a.m. announcement time while the market waited to see if the Bank would or would not make a change in its policy rate. At other times, there was the awkwardness of wanting to reduce the policy interest rate in circumstances when the Canadian dollar was weak, relating to the concern that exchange markets might overreact. In addition, the advantage of having more regular opportunities to comment on ongoing economic and inflation developments and placing them in a medium-term context was seen as an important potential benefit of the FAD arrangements. But the most important factor in leading the Bank to introduce the FADs was the tendency through much of 2000 for the press and market commentators to focus their attention on whether the Bank would follow the Fed when it changed or did not change the federal funds rate, while largely ignoring the Canadian economic and inflation context in which the Bank makes its decisions.

At the time of the introduction of the FADs, a concern was expressed that in circumstances where the Canadian decision date lagged the U.S. date by a few weeks, financial markets could become excessively volatile. Our examination of the experience of the United Kingdom, Switzerland, Sweden, and the Czech Republic indicated that their markets were not overly volatile in cases where their decision dates lagged those of the ECB. Moreover, as long as the financial markets understood the framework underlying our actions, we did not think that there would be any significant problems of this sort. And indeed, the movement to FADs has turned out to be very successful, with the attention of media and market commentators now fully focused on the monetary policy actions that are appropriate to the Canadian circumstances.

In my view, our experience (and that of other countries) with inflation targets has been a great success. The rate of inflation has come down and remained low. As Dave Longworth showed in a recent *Bank of Canada Review* article, the volatility of output over the 1990s was lower than that in previous decades, and many of the benefits anticipated from low inflation, such as low interest rates, longer terms of wage settlements, and well-anchored inflation expectations, have been realized.

But there are some interesting areas currently receiving attention by researchers that could provide challenges to monetary policy going forward. Stock market bubbles, and subsequent reversals, which we saw in the United States in the 1920s, in Japan in the late 1980s and early 1990s, and in the United States and elsewhere more recently, took place in an environment of low rates of inflation of the prices of goods and services. Indeed, some have argued that low CPI inflation played a role in asset-price inflation by keeping the interest rates on safe assets low and hence inducing investors to search for yield in riskier assets. So, should monetary policy respond to asset-price movements and other financial imbalances over and beyond their effects on demand and inflation pressures? Stay tuned as this debate continues.

Another area receiving considerable scrutiny is the possibility that the zero lower bound on interest rates could result in certain cases in a Japan-style outcome. The debate here relates to whether the central bank loses its ability to affect the economy in such circumstances. Or is the problem that the Bank of Japan is unwilling to take appropriate action? Or is it mainly the result of the weakness of the Japanese financial system?

Looking ahead a few years, I can see further debate in Canada and elsewhere about whether to remain at the very low rate of inflation that we have achieved or to go further to price stability (probably just below 1 per cent, given the bias in the CPI measure). And there may be increasing interest in price-level targeting (either with an unchanged target or with one that increases at a fixed pre-announced rate each year) as opposed to inflation targeting.

Policy Implementation

Let me now turn to policy implementation. In the late 1980s and early 1990s, the elimination of reserve requirements on the chartered bank deposits was proposed. While the Bank supported this change, we were faced with the challenge of developing new techniques for policy implementation, i.e., for controlling the very short-term interest rate, after the new legislation to eliminate reserve requirements was passed. At that time, policy implementation was considered a rather esoteric topic, with the details understood solely by monetary policy practitioners, and it was not of much interest to academics. Indeed, most textbooks treated central banks as using changes in base to affect the supply of money via the money multiplier, with the interaction of money supply and money demand determining the short-term interest rate. In practice, central banks had always used reserve adjustments to affect very short-term interest rates, and changes in those interest rates radiated out to other interest rates and the exchange rate, the quantity of money, output, and inflation.

As far as the actual changes needed to our mechanisms for policy implementation in response to the elimination of reserve requirements were concerned, let me just say that Bank staff came up with a number of imaginative ways of achieving the desired result, i.e., having about the same degree of influence over short-term rates as before. I would note, however, that we received expressions of concern at the time from a number of well-known Canadian economists, who worried about whether we could maintain our influence over interest rates and money without reserve requirements.

Subsequently, in 1994, shortly after Gordon Thiessen became Governor, we introduced the 50-basis-point band in the overnight rate that became the centrepiece of our arrangements for policy implementation. These arrangements were much more transparent and comprehensible than the ones that they replaced. Although we maintained the 50-basis-point band when the Large Value Transfer System (LVTS), Canada's new large-value payment system, came into operation in 1999, we had to change the details of the mechanism for policy implementation once again. The new arrangements were developed by a small task force that brought together a monetary theorist (Kevin Clinton) and an expert in the chartered banks' approach to cash management (Donna Howard), under my supervision.[2] In the process of developing the new techniques, we put out two discussion papers for public comment, and a final report, as befitted the Bank's increasingly open approach to its operations. In anticipation of the new mechanisms, we had asked for and received in 1996 legislative authority (under the Payment Clearing and Settlement Act or PCSA) to pay interest on deposits at the Bank of Canada by participants in clearing and settlement systems.

2. This provides a good example of the cross-departmental task forces that the Bank often uses to such good effect.

It was issues of monetary policy implementation that fortuitously got me interested in payments system questions, which later resulted in my intimate involvement with issues related to clearing and settlement systems for payments, securities, and foreign exchange, and in financial stability more broadly. Indeed, since the mid-1980s, about half of my time has been devoted to these issues, and I have to say that the financial stability area has provided as much in the way of challenges as did monetary policy issues.

In the early 1980s, it became clear to me that the precise mechanisms used for monetary policy implementation depended on the way in which payments cleared and settled. Moreover, at a conference at the Bank for International Settlements (BIS) in 1984, at which I presented a paper on policy implementation co-authored by Jim Dingle, I was struck by the differences in the way in which the various central banks implemented policy, even though most of them were aiming at the same operational objective, namely influencing a short-term interest rate. The main reason for the variety of approaches turned out to be the differences in institutional arrangements in payments clearing and settlement across countries, typically because of historical differences in the way that these arrangements were structured.[3]

There was only a short step between the analysis of the payments system for purposes of understanding monetary policy implementation and the examination of questions of exposures and risk control of the system. In particular, I became interested in what would happen to settlement in the payments system in the event of a failure of a key participant and how any consequent losses would be allocated.

Clearing and Settlement Systems

In 1988, when the late Tim Noël began a year's leave of absence at Princeton University, John Crow asked me to take on responsibility for overseeing developments in the clearing and settlement of securities during Tim's absence. After a long gulp, I agreed despite the fact that I knew almost nothing about the subject. Thus began my long and fascinating relationship with the Canadian Depository for Securities (CDS) and its systems.

To put the subsequent 15 years or so of my involvement with large-value clearing and settlement systems for payments, securities, and foreign exchange in perspective, let me sketch out the challenges that faced us at the time. All of the payments system and much of the securities system was

3. The institutional differences across countries in the implementation of policy have become less significant over time.

paper-based, at a time when the rest of the world was moving or was planning to move to electronic systems. Both for cost and efficiency reasons and to lessen systemic risk, it was essential that Canada move in the same direction. But Canada was and is in a unique situation. In contrast to other major countries, all of the clearing and settlement systems in Canada are under private sector ownership and control, either directly (in the case of CDS) or indirectly (in the case of the Canadian Payments Association or CPA), and are neither owned nor operated by the central bank. Hence, the authorities had to negotiate with the designers of the emerging electronic large-value clearing and settlement systems to bring about proper risk proofing. In particular, it was essential to minimize or eliminate the possibility of systemic risk occurring through the clearing and settlement systems, where systemic risk can be thought of as a sort of domino effect in which the failure of one participant in the system leads, through exposures in the system, to failures of other participants or of the system itself or even to the failure of other related systems.

The Bank ended up with the responsibility for assessing whether the new systems were appropriately risk-proofed, initially on behalf of the Ottawa agencies (because of our expertise in this area) and subsequently, after Parliament passed the Payment Clearing and Settlement Act in 1996, as the legislatively responsible institution for overseeing systemically important clearing and settlement systems. I ended up as the point man for the negotiations with the large financial institutions who would be the key participants in these systems. The reason that the negotiations proved so time-consuming and arduous is that appropriate risk proofing is costly, requiring, among other things, that the participants pledge considerable amounts of collateral, while many of the benefits are seen to be social rather than private. Or, to put it another way, because we were trying to protect against the externalities of events with very low probability of occurring but high systemic costs, the individual institutions had difficulty seeing the benefits as accruing to them and hence were not enthusiastic about bearing the costs involved. In his recently published book, John Crow described a meeting in 1992 with senior officers of the major banks that was needed to break the logjam that had developed in these matters. And I have set out in some detail our role in the negotiations over the design of the securities clearing and settlement system in a presentation to a global conference of securities depositories, which was published by the Bank as Technical Report No. 87.

I recall a meeting that I had with the key financial institutions early in our discussions of what was needed to risk-proof the securities clearing and settlement system. As I said, they were very unenthusiastic about the need for collateralizing exposures and pressed me on what I saw as the problem. I replied by asking them to consider the outcome of the failure of a key participant, say the Royal Bank. (I always used the Royal as an example because it was the largest Canadian bank and its possible failure seemed to be a most implausible scenario.) They looked at me in some disbelief, and went on to argue that the possible failure of the Royal was not a contingency that required anything more than the non-collateralized guarantee that they were proposing for the system. But our position was that if the Government of Canada debt were to be moved into the CDS system, the risk proofing of that system had to be improved so that a failure of any participant could not bring down the system or lead to multiple failures. Otherwise, the Government could one day be faced with the options of watching the system fail, or preventing the failure of the system by bailing out the failing participant or the system itself. The option of allowing the failure of the system on which the Government debt was housed was not acceptable, nor was the moral hazard associated with having to bail out participating institutions to avoid the failure of the system. Hence, it was essential to risk-proof the system, and we succeeded in getting the CDS system risk-proofed to the desired extent.

I was once asked how I was able to negotiate these matters with the large Canadian banks. I replied that, as in all negotiations, we had something that they wanted and they had something that we wanted, and that allowed us to reach a successful outcome. More precisely, we wanted a properly risk-proofed securities clearing and settlement system, and they wanted Government of Canada debt housed on that system. At times, I worried that we might not succeed in achieving our goal, but in the end, with the occasional compromise, we did arrive at the desired objective, and we now have in Canada state-of-the-art, highly efficient, world-class, properly risk-proofed large-value clearing and settlement systems in payments, securities, and foreign exchange. And I leave the Bank with a feeling of considerable accomplishment, and pride in our achievements in this area.

One of the complexities that arose in the development of the LVTS was that the participants decided on a survivors-pay system rather than the conventional defaulter-pays real-time gross settlement (RTGS) system used in most countries. The reason that they wanted such a system is that it requires considerably less collateral than the RTGS, and hence would be less costly to operate. One of the problems that this gave rise to initially was the widespread view among my colleagues in the Committee on Payment and Settlement Systems (CPSS) at the BIS that the Canadian LVTS was not as safe as the standard RTGS. I spent a lot of time trying to persuade them that what was important was not the mechanisms used but the characteristics of the resulting system. More specifically, the LVTS would have the same key characteristics of real-time settlement and intraday finality of payments (i.e., no reversals and good funds available) as an RTGS and would be just as sound in response to a participant failure as an RTGS. [4] My conclusion in a 1996 paper that aimed at convincing them of the soundness of the LVTS (and that succeeded in so doing) was that the LVTS had only two drawbacks relative to the RTGS—first, it was more difficult to explain; and second, the participation of branches of foreign banks could create difficulties for the system. However, I went on to say that the latter wasn't a real problem for the Canadian system, since foreign banks were required to enter Canada via subsidiaries, and branches were not permitted. Hence, no problem.

Needless to say, this was not my best forecast. And, indeed, when the law was changed a few years later to allow foreign bank branches to operate in Canada, the Bank of Canada was given the power to decide whether these branches could be a participant in the LVTS. Such a decision will be based on whether the arrangements regarding insolvency of financial institutions in the home country of the parent of the branch would create undue risks for the LVTS or the Bank of Canada in the event of a failure.

My close involvement with payments systems has continued over the years. Bob Hamilton and I co-chaired the Payments Systems Advisory Committee in 1996–97, and we currently co-chair the Payments Advisory Committee of the Department of Finance and the Bank.

Financial Stability

Another area in which there has been great change during my career has been the role of the Bank in financial stability. While the Bank had included the promotion of the safety and soundness of Canada's financial system as one of its objectives in its Commitment to Canadians in the mid-1990s, the clarification of its role took place in the latter part of the decade.

One day in 1998, Gordon Thiessen came to my office to discuss what issues in financial stability should be keeping us awake at night, now that we were clearly well on the way to successfully risk proofing the various clearing and settlement systems. At about the same time, we received requests from the Bank of England and the Reserve Bank of Australia for our views on the role of a central bank without supervisory responsibilities, since they had just lost their supervisory function and we had never had one. Superimpose upon these factors the financial crises that were spreading in the developing and emerging economies, with their global impacts, and you can see why financial stability was becoming an increasing focus of our attention at the Bank.

4. Recently, there has been a trend to "hybrid" arrangements that combine the safety of an RTGS with lower collateral costs, much as is done in the LVTS.

In fact, the Bank had always been involved in the area of financial stability, because (i) we are lender of last resort; (ii) the health of the financial system can affect the transmission of monetary policy; (iii) monetary policy is implemented through financial markets; (iv) we act as fiscal agent for the government; (v) we provide services to clearing and settlement systems; and, more recently, (vi) we are responsible for the oversight of such systems.

But the constellation of developments in the later 1990s caused us to consider more carefully our role in the area of financial stability. One point of great importance was that while in monetary policy we had sole responsibility for conducting policy, once the inflation-targeting agreement was reached with the Government (leaving aside a possible but highly improbable directive), in financial stability we shared responsibility with the Department of Finance, the Office of the Superintendent of Financial Institutions (OSFI), the Canada Deposit Insurance Corporation (CDIC), and various provincial entities. Indeed, our links with the other Ottawa entities are formalized through our participation in the Financial Institutions Supervisory Committee (FISC) and the Senior Advisory Committee (SAC), and our membership on the Board of CDIC. And, of course, there was the international dimension, where we were engaged in these issues through the IMF, the G-7, the G-20, the BIS, and various BIS committees (including the CPSS, on which I served for some years). Since 1999, I have served as the Bank of Canada's representative on the Financial Stability Forum, which brings together the treasuries, central banks, and supervisory authorities of the G-7 countries and authorities from four other important financial centres, as well as international financial institutions and key standard-setting bodies. Its objective has been "to promote international financial stability through information exchange and international co-operation in financial supervision and surveillance."

The increased attention to financial stability matters has resulted in a considerable increase in Bank resources devoted to such matters. While, in earlier years, the main staff members involved in financial stability issues were myself, Serge Vachon, and Clyde Goodlet (who, for over 20 years, has been my right-hand man in all matters pertaining to the financial system), we now have more than 25 staff devoted largely to the analysis of financial stability. Also reflecting its increased importance, last December, the Bank publicly released the first semi-annual *Financial System Review* (*FSR*). This report assesses developments and trends in the financial system, both domestically and internationally, discusses policy and infrastructure developments in the Canadian financial system, and provides brief summaries of the research of Bank staff in the area. We hope that it will enhance public understanding of these matters and contribute to increased awareness and debate on financial stability issues.

The *FSR*, which I think of as my baby, had a long gestation period, but I am sure that it will be a welcome addition to Bank publications and receive increased attention over time. In addition to its public role, it serves as a coordinating mechanism for the six Bank departments involved in the area of financial stability (the four economics departments, Banking Operations, and the legal division).

Electronic Money

The final area that I want to discuss is my role in research on electronic money, or e-money for short. The saga began with the visit of the Royal Bank to our offices in Ottawa in 1994 or 1995 to show us the recently developed Mondex stored-value card. The demonstration left me speechless. I had always been dismissive of the idea of the so-called cashless society that for some observers always seemed to be just around the corner. But Mondex, other stored-value products then under development, and prepaid software products that use the Internet (such as "digital cash") did seem to have the potential, at least in theory, to supplant bank notes and maybe even the Bank's role as the central provider of services to the payments system.

As you can imagine, Mondex raised a lot of issues related to monetary policy, regulation, the legal system, money laundering, cross-border issues, and so forth. And it struck me that these were subjects that all central banks would have to deal with and hence should be addressed in an international forum. I asked Gordon Thiessen to raise the issue at the next meeting of the G-10 Governors at the BIS, and the Governors decided that e-money did merit further study. A number of committees were set up to examine various aspects of e-money, and I was asked to chair a committee to look into the likely growth of e-money and its implications for monetary policy formulation and implementation, central bank seigniorage, the role of lender of last resort, and related issues.

At my request, the Steering Committee, which had overall responsibility for the project, was composed of the members of a senior-level working party on domestic monetary policy, which met once a year at the BIS and in which I had participated for several years. It included, among others, Don Kohn, Rick Mishkin (then director of research at the New York Fed), Otmar Issing, Ian Plenderleith, and George Rich. We quickly set up a working group, which I also chaired and which was composed of the officials at the G-10 central banks who actually did the necessary analysis. Within about six months, the twenty or so research projects that we had identified were completed, illustrating the firepower of the research staff of the central banking community. Following a meeting of the working group to discuss the research papers, I wrote the first draft of the report (since I do not believe that a committee can write), received very helpful comments from members of the Steering Committee, and presented the final version of the report to the G-10 governors in July 1996, where it was well received.

Among the conclusions reached was that e-money would spread only gradually (and even that turned out to be overly optimistic, since e-money, while technically brilliant, has not found an economic niche), and that it would not cause insurmountable problems for central banks in any of their roles, although some changes in operating techniques might eventually be needed. In 1996, the Bank of Canada requested and received an amendment to its Act that would permit it to issue interest-bearing liabilities in case it needed funds to deal with a lender-of-last-resort situation. This was done in anticipation of the possibility that the spread of e-money might lead to a situation in which the decline in the use of bank notes and hence in the size of the Bank's balance sheet could prevent us from fully offsetting the expansion of liquidity in a lender-of-last-resort operation by the sale of assets. While it is useful to have this power in legislation, I do not think it will be needed in practice in either my professional or actual lifetime.

Although the e-money report was not released, a short summary of its argumentation and conclusions was published in October 1996 as part of a BIS document entitled "Implications for Central Banks of the Development of Electronic Money." I also used some of the analysis in an article published in the journal *International Finance* in 2000, which was a response to Ben Friedman's exaggerated claims regarding the negative implications for monetary policy of the spread of e-money. Chairing that international committee and holding the pen in the preparation of the report was great fun, even though the writing itself had to be done between five and eight in the morning over a period of some weeks. And to continue a theme I began earlier in this paper, there was very little economic literature to help us in our research.

Working at the Bank of Canada

I will conclude with a few general comments on working at the Bank of Canada. As I tell Ph.D. students who visit the Bank as job candidates, for those who are interested in issues of macroeconomics, monetary theory and policy, and international economics, I can't think of a better place to work. From my perspective, the central bank environment is especially appealing since it brings together research, policy analysis, and policy making. Furthermore, central banks have the luxury of devoting considerable resources to in-depth research on matters relating to their concerns. Even after I moved into positions involving more policy making, I was able to continue my research, although the focus moved away from more basic research to more policy-oriented studies. I cannot overemphasize the importance to me of being able to continue to do research (and in many cases to publish the studies) throughout my career at the Bank. And I can't think of one area of economic research or analysis that I have been involved with over my years at the Bank that I wouldn't have been happy to study as an academic.

When I was a faculty member at the University of Minnesota thirty years ago, I had superb colleagues—Sargent, Wallace, Sims, and Krueger, to mention just a few. But not one of them was interested in exactly the kinds of issues related to international finance on which I was doing research in those years. And, remember, this was in the days before e-mail, when it was not as easy as it is today to do joint work with professors in other universities. One of my moments of enlightenment was when I gave a presentation in the early 1970s in Washington to staff at the IMF and the Federal Reserve Board and realized that everyone in the room was interested in what I was interested in. And that's the way it's been at the Bank.

While I have talked about a number of the issues I have dealt with over the years and the research I have done, I want to reiterate the point I made earlier, that the work in the Bank is largely the outcome of collective effort in a very collegial environment. The commonality of interest of Bank staff in so many areas of research and policy and the interaction among the staff in furthering this work have been central to the way in which the Bank operates. Indeed, over the years, one of the really positive aspects of my working life has been the ability to send anything I was writing to five or six colleagues and get quick, insightful responses, not because of my position in the Bank, but because they were interested in what I was writing and had thought deeply about the issues. In fact, I'm not sure how I'm going to cope without this wonderful safety net. So many of the ideas were born out of a process of discussion, out of a sequence of papers in which we built on each other's thinking. I was sometimes amazed when I came to the office on a Monday morning eager to discuss an idea that had come to me over the weekend or a solution to a problem that had been worrying us, only to discover that one of my colleagues had also thought of the same idea or arrived at the same solution.

You have surely gotten the impression from my frequent references to papers, notes, and articles that the Bank is very much a written culture, in which the fundamental debate takes place more in written form than orally. And, in my view, such an environment is more conducive to good outcomes than one more focused on oral debate.

After I had completed the preparation of these remarks and reread them, it struck me that most of the discussion was directed either to issues related to the framework of policy or the development of infrastructure, and relatively little dealt with the actual conduct of policy. That allocation probably reflects my own interests and the challenges faced over the years. After all, it has only been since 1994, when Gordon Thiessen created the Governing Council, that I have participated directly in the interest-rate-setting process. But over the entire three decades of my career, I was writing papers and analytic notes that addressed the framework issues and assessed the economic environment within which policy was being made, even when I had no direct responsibility for the interest rate decision.

If time permitted, I could have discussed a number of other developments or episodes that were of considerable interest, and in which I was very involved. These include the saga of the rise and fall of the monetary conditions index (MCI), the communications problems that we had in the summer and fall of 1998 when we made a conditional statement about the outlook for the policy instrument and the market interpreted it as an unconditional statement, the Bank's role over the years in the development of new legislation governing financial institutions, the run-up to Y2K, and the negotiation of an increased line of credit with the Fed after 11 September 2001. But these topics will have to await another paper.

While I have devoted most of these remarks to my involvement in monetary policy and financial stability, and fittingly so since these were the focus of most of my attention and effort, I had other responsibilities over the years that played a significant role in my Bank experience. Three of the most important were my involvement with the banking services part of the Department of Banking Operations, the Staff Planning Committee (which I co-chaired for a number of years with Sheryl Kennedy), and, most important, the Bilingualism Committee. I am very proud of the Bank as an institution that has taken bilingualism seriously and that has gone a long way in creating an environment in which employees can speak and write in their own official language in a natural way. We still have a way to go, but I have every confidence that we will continue to make progress and move ever closer to a fully bilingual institution.

I would like to conclude this paper by paying tribute to those colleagues with whom I have worked so closely for so many years and from whom I have learned so much. To Gerry Bouey, the Governor when I arrived at the Bank as a full-time employee in 1974, who struggled so mightily against the tide of inflation and whose ability to deal effectively with members of Parliament was an eye-opener to me. To George Freeman, who for many years held the job I currently hold and who was a role model worthy of emulation. To John Crow, with whom I exchanged so many ideas and from whom I learned so much, including the importance of doing rigorous analysis as a basis of policy. To Gordon Thiessen, to whom I reported for over twenty years, and with whom I collaborated in so many areas.

There is also a group of colleagues who entered the Bank at about the same time as I did and whose careers have been closely intertwined with mine. To Bill White, now at the BIS, whose friendship and collegiality were a source of delight through the years. To Paul Jenkins, our new Senior Deputy Governor, with whom I exchanged ideas and speeches, and whose comments always resulted in an improved product. To the late Tim Noël, whose knowledge of financial markets and whose willingness to share it greatly enhanced my understanding. To Pierre Duguay, the precision in whose thinking forced me to make my own thinking more precise. To Dave Longworth, who was assigned to work with me when I first arrived at the Bank, and who became a frequent co-author and now my successor as Deputy Governor. To Clyde Goodlet, who was my right-hand man for twenty-five years on all matters related to financial institutions and financial stability, and whose encyclopedic knowledge on these matters has been incredibly helpful. To John Murray, whose wise comments and thoughtful analyses have improved the quality of my work over the years. To Jack Selody, who pressed me over the years to pay more attention to the role of financial variables in the making of policy. And, finally, to two shorter-term colleagues. To Sheryl Kennedy, with whom I have worked closely on financial issues, as her responsibilities for financial markets and my responsibilities for financial institutions have overlapped and converged in a rapidly changing financial environment. And to David Dodge, my last governor, whose enthusiasm and energy have carried us in new directions and provided new challenges to the Bank.

I would also note the presence here today of the two people who introduced me to macroeconomics and money when I was an undergraduate at the University of Toronto some forty years ago, Bill Hood and Ed Neufeld.

Finally, I want to express my thanks to those who made this event possible. To the Bank of Canada for holding the festschrift in my honour. To the three organizers who did so much of the work that made it such a success—Dave Longworth, John Murray, and Clyde Goodlet. To the presenters whose excellent work you have seen on display in the last 24 hours. To the discussants, who have been friends and colleagues for many years and whose insightful comments on the papers were much appreciated. To the current and former governors of the Bank for their kind remarks. And to you, my friends and colleagues, for turning out in such numbers to this event. To my sons and daughters-in-law—Barry and Beth, Daniel and Catriella—who came up to Ottawa with their children to participate in this festive occasion. And finally, to my wife, Aviva, who has always been so supportive, sharing the good times and the occasional less good times.

If I were asked to sum up my career in one sentence, I would say, “it’s been interesting, it’s been challenging, and it’s been fun.”

Thank you all very much. I really appreciate this and I will never forget it.