# Bank of Canada Review

Autumn 2005

**Special Issue**
Exchange Rates and the Canadian Economy

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**SPECIAL ISSUE**
**EXCHANGE RATES AND THE CANADIAN ECONOMY**

### *Introduction*



### *Articles*



### *Speeches*



### *Announcements*

*Cover*

## Ready References

*Paul Berry, Chief Curator, Currency Museum*

In fifteenth-century Europe, there were no bank notes, and even simple everyday transactions could involve a wide array of gold and silver coins. It was a challenge for merchants to know the intended value of these coins. Not only did design differ from one country to the next, but the fineness and weight of the pieces often differed as well. The invention of the printing press changed all this. Ready references—simple catalogues of coins accompanied by written descriptions of their ideal weights and fineness—began to be published as useful guides. These works gradually became more sophisticated, including tables where the values of pieces from one nation were compared with those of another. Ready references were used by merchants until the middle of the nineteenth century, when other payment instruments became available, and nations endeavoured to set common standards of fineness and weight for their precious-metal coinage.

The reference illustrated here is a collection of ordinances and edicts issued in the Netherlands during the mid-sixteenth century. Throughout that century and the next, Amsterdam was a major financial centre of Europe. Precious metals in all forms were shipped from across Europe through this area to pay for goods from the Far East. The Netherlands' prominent role in the commercial activity of the period and the vast array of coinage that passed through its borders made it an obvious centre for the production of such books.

Images of gold and silver coins from Europe and Asia are presented in the guide, along with identifying information. It is printed on laid paper and measures about four inches by six inches. The title page of the section illustrated features a woodcut of King Philip II, "King of Spain and England and Duke of Brabant," written in Latin, as well as his coat of arms. The title reads "Ordonance and posted by-law of His Royal Majesty regarding gold and silver coins. Published in the year of our Lord fifteen-hundred and fifty-nine." The book is part of the National Currency Collection, Bank of Canada.

Photography by Gord Carter, Ottawa.


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# Exchange Rates and the Canadian Economy

*Robert Fay, Guest Editor*

The large, and rapid, appreciation of the Canadian dollar in 2003 and 2004 has generated substantial interest in how this development has affected the Canadian economy. Canada is among the most open of the industrialized countries, and exchange rate movements can be expected to play an important role in its economic developments. This special issue of the *Review* features articles that tackle exchange rate questions from four perspectives.

It is not a straightforward exercise to determine the impact on exports and imports of movements in the Canadian dollar. A host of additional factors must be considered, including business cycle effects, the impact of global and sector-specific shocks, and, more recently, competition from newly industrialized economies, most notably, China. In "Exports, Imports and the Appreciation of the Canadian Dollar," Richard Dion, Michel Laurence, and Yi Zheng discuss the influences that have affected Canada's international trade over the past two years and outline econometric models developed at the Bank to better understand changes in Canada's exports and imports, including the role played by the exchange rate.

A more direct way to examine the impact of the dollar appreciation is to ask firms. The Bank included supplementary questions in its quarterly *Business Outlook Survey* in 2003 and 2004 to track how firms were affected by the appreciation and the steps they took in response. Jean Mair summarizes the results in "How the Appreciation of the Canadian Dollar Has Affected Canadian Firms: Evidence from the Bank of Canada *Business Outlook Survey*," placing their actions in a longer-term perspective and examining what they tell us about firms' adjustment process.

Understanding what causes an exchange rate to move has been an ongoing challenge for economists. Despite extensive research, traditional macro models of exchange rate determination—with the exception of the Bank of Canada's exchange rate equation—have typically not fared well. This has motivated economists to explore new ways to model exchange rate movements that incorporate more complex and realistic settings. Jeannine Bailliu and Michael King revisit the academic literature on exchange rate determination and summarize the state of knowledge in their article "What Drives Movements in Exchange Rates?"

An essential element of the Bank's inflation-targeting framework is a floating exchange rate that is free to adjust in response to shocks that affect the Canadian and world economies. This floating rate plays an important role in the transmission mechanism for monetary policy. A practical question is how the Bank of Canada incorporates currency movements in the monetary policy decision-making process. Only after determining the cause and persistence of an exchange rate change, and its likely net effect on aggregate demand, can the Bank decide on the appropriate policy response to keep inflation low, stable, and predictable. Christopher Ragan, Special Adviser at the Bank in 2004–2005, takes up this issue in "The Exchange Rate and Canadian Inflation Targeting."

# Exports, Imports, and the Appreciation of the Canadian Dollar

*Richard Dion, Michel Laurence, and Yi Zheng, Research Department*

- *Exports and imports adjusted significantly to the appreciation of the Canadian dollar in 2003 and 2004. Other factors, such as global and sector-specific shocks, competition from emerging economies, and constraints on the domestic supply of a few products also affected exports and imports over that period.*
- *Exports and imports of machinery and equipment and non-automotive consumer goods, as well as imports of non-energy raw materials, appear to have been the most affected by the currency appreciation.*
- *Econometric models suggest that, by the end of 2004, the drag on exports exerted by the appreciation would have offset more than half of the stimulus provided by the growth of U.S. demand since the end of 2002. As well, the appreciation would have accounted for about 60 per cent of the total increase in imports over the same period.*
- *Model simulations signal that the adjustment to the appreciation experienced over 2003 and 2004 should have started tapering off in the first half of 2005, thereby lending support to economic growth in the short term.*

Movements in the exchange rate affect the economy through multiple channels, but it is through international trade that their effect is felt most directly. Yet, isolating the specific contribution of exchange rate movements to the growth of exports and imports is a daunting task, not least because of the volatility in trade flows and the difficulty accounting for the many cyclical, structural, and sector-specific factors that affect them at any moment. In this article, we evaluate what this contribution might have been over 2003 and 2004, in the midst of one of the sharpest movements of the Canadian dollar in history.

We begin by identifying the main factors that might have masked the true impact of the currency appreciation on export and import volumes, including shifts in the composition of demand, sector-specific shocks, constraints on domestic supply, and competition from emerging-market economies.[1] We then use this preliminary analysis to interpret the evidence of exchange rate effects, first as signalled by the time path of the ratios of exports or imports to activity variables, and then as estimated by econometric models that control for business-cycle developments, exchange rate movements, and trends in international trade. Only these models can provide statistically valid estimates of the contribution of the Canadian-dollar appreciation to the recent developments in exports and imports. These estimates are specific to a particular model, however, and are subject to a considerable margin of error. As such, they are only meant to be taken as tentative, pending more information and better models.

1. In reality, some of these factors may not be entirely independent of exchange rate movements. For simplicity, however, they are treated as such in this article.

## Recent Movements of the Canadian Dollar in Perspective

Following almost a decade of general depreciation against the currencies of Canada's major trading partners, the Canadian dollar appreciated abruptly during 2003 and 2004 (Chart 1). The dollar shot up by just over 17 per cent against a trade-weighted basket of currencies[2] during 2003 and by nearly 7 per cent during 2004, mostly in the latter half of the year. The appreciation was slightly more pronounced against the U.S. dollar. Only once in the past three decades has there been an appreciation of the Canadian dollar of similar magnitude. However, the previous rally unfolded over five years, from 1987 to 1991, and was therefore much less abrupt than the most recent surge.

## Exports

As a result of a recession in the United States, exports of goods faltered in 2001, with a sharp reduction in shipments of machinery and equipment (M&E) and automotive products, which together account for roughly 40 per cent of total exports (Table 1). The slump in M&E exports dragged on to 2002, offsetting much of the rebound in most other components that accompanied an uneven recovery in the United States. As the Canadian dollar started to climb relative to other currencies in 2003, renewed weakness affected virtually all major export categories even as the U.S. upturn was gathering momentum. Among the hardest hit were industrial goods and materials, M&E, and automotive products. The year 2004 saw a broad-based rebound, thanks to strong gains in the first two quarters. Several major categories of exports enjoyed growth rates close to, or even exceeding, the average annual growth in the late 1990s.

**Table 1**

**Annual Growth Rate in the Volume of Canadian Exports by Product**

Per cent

| | Average of 1996–2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Total exports[1] | 9.3 | -3.0 | 1.0 | -2.1 | 5.0 |
| Goods | 9.5 | -3.4 | 0.8 | -1.8 | 5.4 |
| Energy products (7.3) | 4.0 | 2.0 | 3.9 | -1.7 | 3.1 |
| Other commodities[2] (30.8) | 5.7 | -0.4 | 1.8 | -2.9 | 6.7 |
| Machinery and equipment (21.4) | 16.5 | -7.5 | -5.8 | -4.8 | 6.0 |
| Of which: | | | | | |
| Telecom equipment | n/a | -39.6 | -18.9 | -6.4 | 13.3 |
| Aircraft and parts | n/a | 18.0 | -11.4 | -2.0 | -2.8 |
| Auto products (20.0) | 9.5 | -8.7 | 3.5 | -2.1 | 6.9 |
| Other consumer goods (3.5) | 11.2 | 5.4 | 7.8 | -2.3 | 0.5 |
| Services | 7.9 | 0.4 | 2.3 | -4.0 | 2.5 |
| Travel (3.3) | 5.0 | 1.3 | 1.7 | -10.4 | 12.1 |
| Transportation (2.0) | 4.9 | -6.0 | 1.6 | -9.6 | 8.7 |
| Commercial (6.7) | 10.7 | 2.0 | 3.5 | 1.4 | -3.6 |

1. 2004 share of total exports shown in brackets
2. Includes agricultural and fish products, forestry products, and industrial goods and materials

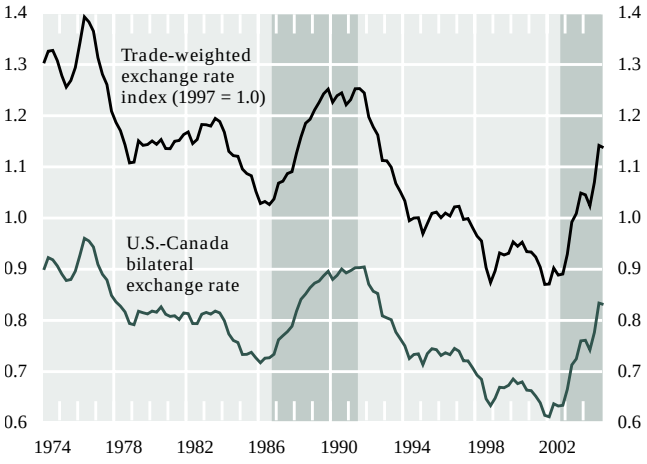
### Sources of weakness

*The geographic focus and product composition of Canada's exports contributed to strengthen rather than to weaken export growth in recent years, particularly in 2004.*

Since 2001, Canadian export volumes have grown at a much slower pace than the volume of imports in advanced countries,[3] with a marked widening of the gap in 2003 and 2004 (Table 2). Unfavourable composition effects played no role in this pattern, since the geographic focus and product composition of Canada's exports contributed to strengthen rather than

**Chart 1**

**Canadian-Dollar Exchange Rates**




2. The basket consists of the euro (6.0 per cent), yen (5.3 per cent), pound sterling (2.2 per cent), and U.S. dollar (86.5 per cent).

3. As defined by the International Monetary Fund, advanced countries consist of 29 countries capturing about 95 per cent of Canadian exports.

**Table 2**

**Effects of Geographic Focus and Product Composition on the Growth in Volume of Canadian Exports**

Per cent

| | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|
| Geographic composition | | | | |
| U.S. imports | -2.7 | 3.4 | 4.6 | 10.7 |
| Actual imports of advanced countries[1] | -0.8 | 2.6 | 4.0 | 8.8 |
| Weighted imports of advanced countries[2] | -2.5 | 3.3 | 4.5 | 10.5 |
| Composition effect[3] | -1.7 | 0.7 | 0.5 | 1.7 |
| Product composition | | | | |
| Actual U.S. imports of selected products[4] | -3.6 | 3.5 | 5.6 | 11.8 |
| Weighted U.S. imports of selected products[5] | -4.5 | 3.1 | 4.3 | 12.3 |
| Composition effect[6] | -0.9 | -0.4 | -1.3 | 0.5 |
| Canadian exports | -3.0 | 1.0 | -2.1 | 5.0 |

1 Actual growth of the combined imports of the United States, the euro area, Japan, the United Kingdom, and the newly industrialized Asian economies (International Monetary Fund)
2 Fixed-weighted growth of the combined imports of the advanced countries. The weights are based on their average share of Canadian exports in 2001 and 2002.
3 Difference between the weighted and the actual growth of imports of advanced countries
4 Actual growth of U.S. imports of oil, non-oil commodities, machinery and equipment, motor vehicles and parts, and non-auto consumer goods
5 Fixed-weighted growth of U.S. imports of selected components with the weights based on their average share of Canadian exports in 2001 and 2002
6 Difference between the weighted and the actual growth of U.S. imports

to weaken export growth in recent years, particularly in 2004. Indeed, total imports by the United States, Canada's largest market by far, grew comparatively quickly, and those imports shifted towards products that have a relatively large weight in Canadian exports, notably non-oil commodities. The appreciation of the Canadian dollar likely played a key role in the relative weakness of the Canadian exports, but several other factors may have also contributed to it.

## *Shocks and supply constraints*

One consequence of product specialization is that it makes a country vulnerable to unfavourable shocks in particular sectors. Two such shocks, of global dimension, have had disproportionate effects on Canadian exports in recent years: the worldwide collapse of the telecommunications equipment industry in 2001, followed by a gradual recovery that only began in 2004; and the contraction of demand for aircrafts and parts in the aftermath of the 11 September terrorist attacks, with no steady recovery by the end of 2004 (Table 1). These shocks had considerably more impact on Canadian exports than on U.S. imports of M&E because of the much larger weights of telecommunications equipment and aircrafts and parts in Canadian exports than in U.S. imports of M&E.

For aircrafts and parts, the shock would have contriuted to a marked decline in the ratio of Canadian exports to U.S. imports of M&E right into 2003 and 2004, adding to the effect of the Canadian-dollar appreciation on this ratio. For telecommunications equipment, the shock would have had a similar effect in 2003 but not in 2004. U.S. imports of telecommunications equipment started recovering in 2003, but the corresponding Canadian export resurgence only occurred in 2004.

Several other shocks have at times restrained exports. Poor harvests in 2001 and 2002 depressed wheat exports. The ban on imports of Canadian cattle and beef,[4] following an incident of bovine spongiform encephalopathy (BSE) in late May 2003, temporarily depressed meat shipments abroad (the U.S. ban on beef was lifted in late September 2003) and cut total live animal exports by half. Largely as a result of the outbreak of severe acute respiratory syndrome (SARS) early in 2003, exports of travel services plunged in the first half of that year and recovered slowly afterwards (Table 1).[5] Taken together, these shocks appeared to have worked in the same direction as the impact of the Canadian-dollar appreciation on total exports over a good part of 2003.

In the second half of 2004, capacity utilization rates in some industries of the resources extraction and manufacturing sectors reached peak levels that had not been seen since the 1990s or the end of the 1980s. The extent to which this generated constraints that may have contributed to the observed decline in exports during this period is difficult to ascertain.

## *Competition from emerging-market economies*

The integration into the world trading system of China's large emerging economy adds a new dimension to competition. China has such low production costs relative to advanced economies like Canada that even a sizable rise in its currency or its costs would not prevent the country from making inroads in foreign export markets. When this advantage is brought to bear on a wide range of products, as is the case for China, the result is a rapid capture of market share in key export markets for advanced countries. As shown in Table 3, China has gained, and Canada, along with other areas (especially Japan and other Asian countries), has lost shares in U.S. import markets for several product categories since 2000, including M&E, non-

4. Beef refers to the meat from cattle and does not include live animals.

5. There was also a sharp decline in exports (and imports) in August 2003 at the time of the electricity blackout in Ontario. It was reversed in September but still depressed the quarterly total significantly.

**Table 3**

**Share of the Value of U.S. Imports by Source for Selected Products**

Per cent

| | Canada | China | European Union | Japan | Mexico | Others | Total |
|---|---|---|---|---|---|---|---|
| Machinery and equipment[1] (M&E) | | | | | | | |
| 2000 | 8.6 | 8.8 | 15.2 | 16.6 | 11.4 | 39.3 | 100.0 |
| 2002 | 6.6 | 14.1 | 16.5 | 13.3 | 12.8 | 36.7 | 100.0 |
| 2004 | 5.8 | 21.9 | 15.8 | 11.4 | 11.6 | 33.6 | 100.0 |
| Consumer goods, other than motor vehicles and parts[2] | | | | | | | |
| 2000 | 7.0 | 21.3 | 11.9 | 5.3 | 12.6 | 41.9 | 100.0 |
| 2002 | 6.3 | 25.3 | 11.6 | 4.2 | 12.3 | 40.3 | 100.0 |
| 2004 | 5.6 | 29.3 | 11.7 | 3.2 | 11.0 | 39.2 | 100.0 |
| Semi-manufactured goods, excluding chemicals[3] | | | | | | | |
| 2000 | 22.0 | 8.0 | 20.6 | 7.6 | 8.7 | 33.0 | 100.0 |
| 2002 | 22.5 | 11.1 | 19.7 | 6.4 | 10.0 | 30.3 | 100.0 |
| 2004 | 19.8 | 12.9 | 18.4 | 5.3 | 9.3 | 34.3 | 100.0 |
| Total[4] | | | | | | | |
| 2000 | 18.8 | 8.2 | 18.1 | 12.0 | 11.2 | 31.6 | 100.0 |
| 2002 | 18.1 | 10.8 | 19.4 | 10.4 | 11.6 | 29.7 | 100.0 |
| 2004 | 17.4 | 13.4 | 18.6 | 8.8 | 10.6 | 31.2 | 100.0 |

1 M&E is defined as North American Industry Classification System (NAICS) 333 (machinery, except electrical) and 334 (computer and electronic products)
2 Consumer goods other than motor vehicles and parts are defined as NAICS 313 (textiles and fabrics), 314 (textile mill products), 315 (apparel and accessories), 335 (electrical equipment, appliances, and components), 337 (furniture and fixtures), and 339 (miscellaneous manufactured goods)
3 Semi-manufactured goods, excluding chemicals, are defined as NAICS 327 (non-metallic mineral products), 331 (primary metal manufacturing), and 332 (fabricated metal products)
4 Totals are the sum of the three product categories divided by the total U.S. imports for the three categories.
Source: U.S. Census Bureau

automotive consumer goods, and semi-manufactured products other than chemicals.[6] On the assumption that China's cumulative gains in 2003 and 2004 with respect to these three product categories would have affected the other countries in proportion to their market share for these same categories in 2002, the impact of China's penetration would have been to cut the volume of Canadian exports by about 0.5 per cent in 2003 and by 1.0 per cent in 2004. Though not a trivial amount, it nevertheless indicates that the effect of the Canadian-dollar appreciation on exports could still have been substantial.

## Isolating the exchange rate effect

The changing product composition of U.S. imports and Canadian exports primarily reflects variations in the structure of aggregate demand and production in the United States as a result of cyclical and structural forces. By relating broad Canadian export groupings to specific components of U.S. aggregate demand or supply, it may be possible to isolate the effects of exchange rate variations.

*The substantial rise in U.S.-dollar commodity prices in 2003 and 2004 has made it profitable for Canadian producers to export commodities in spite of the Canadian-dollar appreciation.*

By that measure, only exports of M&E and non-automotive consumer goods seem to have been markedly affected by the recent appreciation of the Canadian dollar (Charts 2 to 6). In contrast, since the second half of 2002, exports of industrial materials have held up relative to U.S. industrial production, with much volatility. Because such materials are less differentiated than end products, they offer less scope for pricing to deviate from U.S.-dollar quotes on commodity exchanges or competitors' prices. Furthermore, the substantial rise in U.S.-dollar commodity prices in 2003 and 2004 has made it profitable for Canadian producers to export commodities in spite of the Canadian-dollar appreciation. Exports of motor vehicles have also remained aligned, on average, with U.S. sales of motor vehicle units. Little exchange rate effect on these exports is to be expected in the short term in view of the high integration of the North American automobile industry and the resulting geographic specialization of production. Canadian parts producers, on the other hand, would be expected to lose market share as contracts are re-tendered. Exports of motor vehicle parts did decline relative to U.S. motor vehicle production in 2003 and 2004, but part of this movement reflects an ongoing downward trend since 2001.

The evolution of broad export categories relative to U.S. activity variables provides useful, but purely

6. One mitigating factor stems from the possibility that the total size of the export market may have expanded in response to lower-cost products offered by countries like China.

**Chart 2**

### Ratio of Canadian Exports of Machinery and Equipment to U.S. Investment in Machinery and Equipment

2000 = 1.0

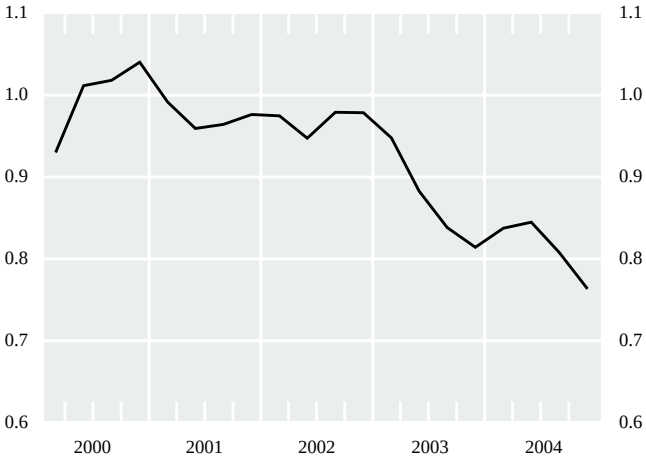



**Chart 3**

### Ratio of Canadian Exports of Non-Auto Consumer Goods to U.S. Consumption, Excluding Autos

2000 = 1.0

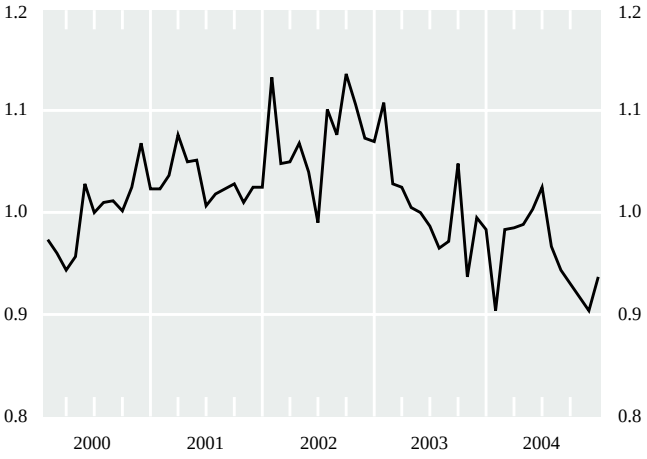



**Chart 4**

### Ratio of Canadian Exports of Industrial Goods and Materials to U.S. Industrial Production

2000 = 1.0

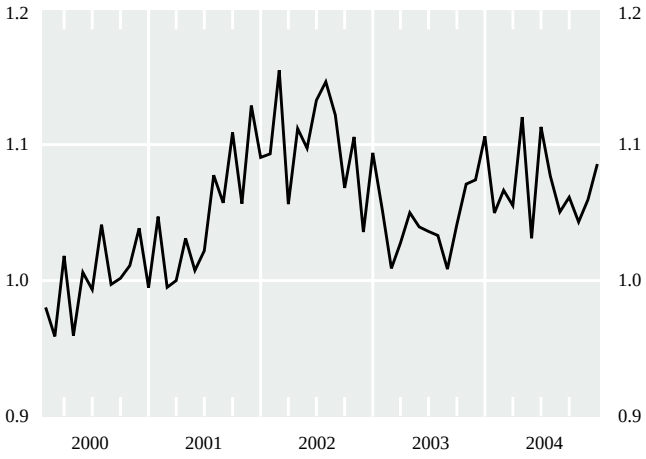



**Chart 5**

### Ratio of Canadian Exports of Motor Vehicles to U.S. Auto Sales

2000 = 1.0

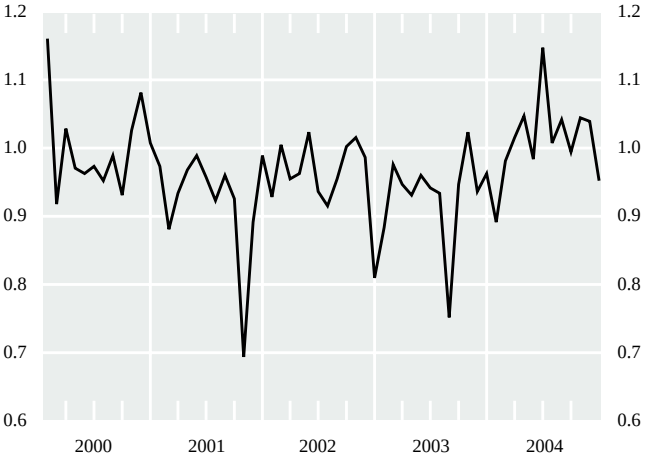


**Chart 6**

**Ratio of Canadian Exports of Motor Vehicle Parts to U.S. Auto Production**

2000 = 1.0

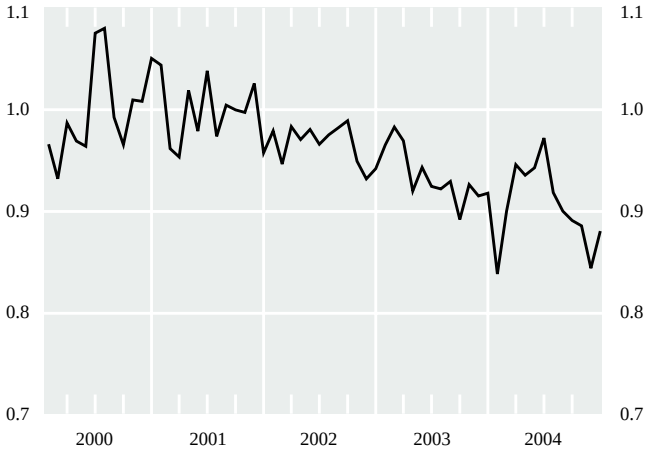
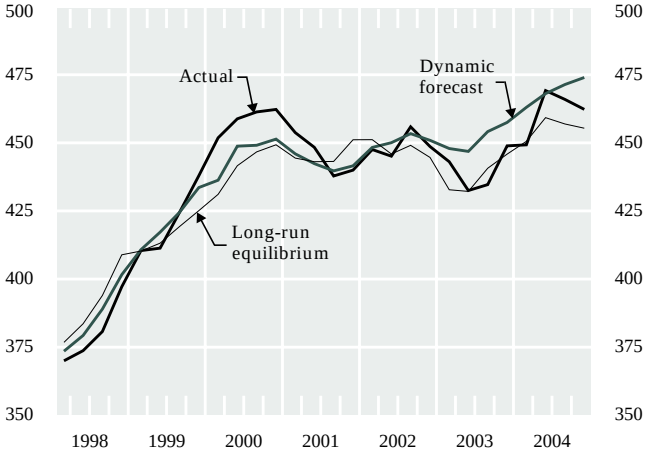



**Chart 7**

**Exports: Actual, Dynamic Forecast, and Equilibrium Values**

Billions of chained 1997 dollars, seasonally adjusted annual rates*




* A number expressed in chained 1997 dollars is a measure of real value adjusted for price changes in adjacent periods, using 1997 as a base period.

circumstantial, evidence on the underlying adjustment to the exchange rate appreciation. An estimated regression model of exports may provide a firmer basis for conclusions by more rigorously controlling for developments in foreign business cycles, real exchange rate movements, and trends in international trade over a period long enough to permit valid statistical inference of the relationship between exports and exchange rates. No matter how rich the specifications of such a model may be, however, it will make significant prediction errors over history for several reasons, including sectoral shocks that have disproportionate effects on exports, mismeasurement of the relevant activity or exchange rate variables in the model, or undetected shifts (caused by structural changes) in the true relationship between exports and one or more of the explanatory variables.

Box 1 describes the essential features of an estimated aggregate export model for Canada, including the resulting elasticities of export volumes with respect to U.S. demand components that are intensive in imports from Canada and to a real exchange rate, defined as the bilateral Canada-U.S. exchange rate adjusted by the ratio of the Canadian overall export price to the U.S. gross domestic product (GDP) deflator. Chart 7 presents the profiles of actual and forecast exports, along with their estimated long-term equilibrium values, using the model described in Box 1. Exports would have been about 2 per cent above long-term equilibrium by the end of 2004, consistent with a gradual adjustment to the appreciation.

*The first wave of the Canadian-dollar appreciation, which spanned 2003, had its peak effect on export growth around the end of that year. The second wave, in the latter part of 2004, led to considerable additional restraint on exports.*

A decomposition of the model predictions reveals that the first wave of the Canadian-dollar appreciation, which spanned 2003, had its peak effect on export growth around the end of that year (Table 4). The second wave, in the latter part of 2004, led to considerable additional restraint on exports. The model interprets the spike in export growth in the second quarter of 2004, between the two waves of appreciation, as having arisen largely from shocks unrelated to U.S. demand or to exchange rate developments. Indeed, the decline in exports over the following two quarters would have stemmed more from a reversal of these shocks than from the additional drag associated with the

## Box 1
## An Estimated Model of Exports

The model[1] used in this article relates Canadian export volumes to components of U.S. demand, a real exchange rate variable, and a measure of global trade openness, within an error-correction framework. Estimation of the model over the period 1973Q1 to 2004Q4 yields the following results (*t*-ratios are shown in brackets):

$$\Delta x_t = \underset{(3.17)}{1.08} \cdot \Delta c^{us}{}_t + \underset{(3.24)}{0.29} \cdot \Delta i^{us}{}_t + \underset{(1.30)}{0.12} \cdot \Delta x^{us}{}_t$$

$$+\underset{(3.77)}{1.67} \cdot (\Delta inv^{us}{}_t / y^{us}{}_{t-1}) - \underset{(-1.42)}{0.13} \cdot \Delta(p^x{}_t \cdot pfx_t / p^{yus}{}_t)$$

$$-\underset{(-3.78)}{0.08} \cdot d82q4_t - \underset{(-4.72)}{0.31} \cdot (x_{t-1} - x^{eq}{}_{t-1}),$$

where percentage changes in exports ($x_t$) in quarter *t* are predicted by changes in U.S. consumption ($c^{us}{}_t$), in U.S. investment in fixed capital ($i^{us}{}_t$), and in U.S. exports ($x^{us}{}_t$); by the change in inventory investment relative to GDP ($\Delta inv^{us}{}_t / y^{us}{}_{t-1}$); by relative prices as measured by the ratio of the Canadian export-price deflator expressed in U.S. dollars to the U.S. GDP deflator ($p^x{}_t . pfx_t / p^{yus}{}_t$)[2]; and by a dummy variable for 1982Q4 ($d82q4_t$).[3] Further influencing the forecast is the "correction" for the most recent divergence of exports from their equilibrium level ($x_{t-1} - x^{eq}{}_{t-1}$), governed by a speed-of-adjustment parameter of 0.31. The equilibrium level is determined by a long-run, cointegration relation linking the level of exports to those of relative export prices, the U.S. demand components, and global openness to trade, captured by the ratio of exports to GDP in countries that are members of the Organisation for Economic Co-operation and Development (OECD) ($open_t$)[4]:

$$x^{eq}{}_t = \underset{(4.60)}{7.38} - \underset{(-6.48)}{0.56} \cdot (p^x{}_t . pfx_t / p^{yus}{}_t) + \underset{(0.49)}{0.11} \cdot open_t$$

$$+\underset{(3.30)}{0.42} \cdot c^{us}{}_t + \underset{(3.51)}{0.29} \cdot i^{us}{}_t + \underset{(4.76)}{0.35} \cdot x^{us}{}_t$$

The resulting long-run elasticities of exports with respect to real exchange rate and U.S. activity are consistent with theoretical priors. The model was tested for structural parameter breaks and found to be stable.

**Table B1**

**Key Elasticity Estimates for Total Canadian Exports**

| | Short run (on impact) | Long run |
|---|---|---|
| Relative price of exports | -0.13 | -0.56 |
| U.S. consumption | 1.08 | 0.42 |
| U.S. investment | 0.29 | 0.29 |
| U.S. exports | 0.12 | 0.35 |

1. This model was developed by Jean-Phillipe Cayen, an economist in the Research Department of the Bank of Canada.

2. The movements in the relative price variable are primarily driven by those in the nominal exchange rate vis-à-vis the U.S. dollar, but can also be affected by changes in commodity prices and other factors that influence the growth rates of the export price and the U.S. GDP deflator.

3. This variable has no theoretical justification. It is included only because it helps to keep the model stable over time in the face of an exceptionally large drop in exports in 1982Q4.

4. A crude dummy variable to capture the effect of the Free Trade Agreement was also tested but turned out to be statistically insignificant. However, this could simply indicate that the profound impact of the trade agreement emerged only over time and could hardly be captured by a simple dummy variable. The variable $open_t$ is kept in the equation, even if it is not significant, because it helps to maintain the stability of the equation over time.

**Table 4**

**Contributions of Various Factors to Quarterly Growth in Total Exports**

Per cent

| | 2003 | | | | 2004 | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Total exports | -1.25 | -2.42 | 0.50 | 3.22 | 0.08 | 4.34 | -0.70 | -0.79 |
| U.S. demand | -0.10 | 0.54 | 2.38 | 1.55 | 1.93 | 1.60 | 1.52 | 1.76 |
| Relative prices | -0.60 | -0.79 | -0.74 | -0.84 | -0.81 | -0.60 | -0.93 | -1.32 |
| Trade openness | 0.03 | 0.02 | -0.02 | 0.03 | 0.08 | 0.09 | 0.12 | 0.09 |
| Residual | -0.58 | -2.18 | -1.11 | 2.48 | -1.12 | 3.26 | -1.41 | -1.33 |

second wave of appreciation. By the end of 2004, the drag exerted by the appreciation would have offset about 60 per cent of the stimulus provided by the growth of U.S. demand since the end of 2002.

The predominantly negative prediction errors from the model, as reflected in the residual component of Table 4, indicate that, through much of 2003 and 2004, exports were depressed by factors not taken into account by the model, including some that were discussed before, such as Canadian vulnerability to the downturn in telecommunications and aircrafts, the various ad hoc shocks that hit exports in 2003 and before, and the loss of market share to emerging-market economies. The negative errors also raise the possibility that exports

may have responded more swiftly than in the past to movements in the exchange rate, perhaps as a result of the unusual abruptness of the recent appreciation of the Canadian dollar. Such a front-loading of the exchange rate effect should give rise to systematically positive errors later on. The ongoing appreciation of the dollar, however, makes it particularly difficult at present to come to any conclusion with respect to this hypothesis.

Based on the impulse-response function, the past appreciation of the Canadian dollar would continue to cut into export growth during 2005, even with a stable real exchange rate from the first quarter onwards (Chart 8). Net of their import content, exports would be cumulatively reduced by the equivalent of about 0.5 per cent of GDP during the year. As this drag would diminish rapidly, the expansion of exports would tend to accelerate, thereby lending support to economic growth in the short term.

## Imports

Following a period of strong growth from 1996 to 2000, sharp declines were registered in 2001 for key import categories, such as M&E, automotive products, and industrial goods and materials (Table 5). Services imports also fell in that year, mostly because of weakness in the travel and transportation categories. Automotive products recovered the following year, barely offsetting continued declines in M&E and some other categories. By 2003, imports had taken a decided turn to the upside, with M&E and services contributing the most. The gains were sustained and even amplified in 2004, not least because of an acceleration in imports of industrial goods and materials and further momentum from M&E. While growth of goods imports in 2003 and 2004 remained below the average rate seen in the late 1990s, the same cannot be said of services. Of particular note are travel and transportation services imports, which bounced back from the effects of earlier negative shocks to surge over the 2003–2004 period at a rate not seen since the previous episode of Canadian-dollar appreciation (1987–1991).

While goods from the United States still account for more than half of all Canadian imports, their share has declined steadily in recent years (Table 6). Also losing ground has been Japan's share, which fell behind that of China in 2002. The growth in goods imports from China has since accelerated, resulting in a full 3 percentage point lead in import share over Japan in 2004. Other countries, including the European Union, also made modest gains during the 2003–2004 period.

**Chart 8**

**Effect of the Exchange Rate on Exports: Historical Path and as Forecast by the Error-Correction Model**

Per cent contribution to growth

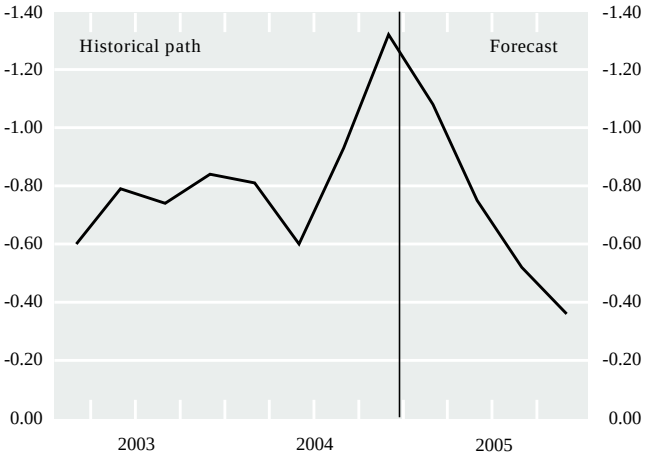



**Table 5**

**Annual Growth Rate in the Volume of Canadian Imports, by Product**

Per cent

| | Average of 1996–2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Total imports[1] | 8.8 | -5.1 | 1.5 | 4.1 | 8.1 |
| Goods | 9.8 | -5.7 | 1.7 | 3.6 | 8.3 |
| Energy products (3.2) | 7.0 | 3.2 | -9.5 | 9.5 | 8.7 |
| Other commodities[2] (21.8) | 8.5 | -2.4 | 3.0 | 1.0 | 7.9 |
| Machinery and equipment (28.0) | 13.3 | -10.6 | -5.3 | 4.2 | 12.5 |
| Auto products (18.1) | 9.3 | -8.7 | 11.0 | 2.1 | 4.3 |
| Other consumer goods (11.0) | 9.2 | 2.4 | 8.0 | 8.8 | 8.1 |
| Services | 3.4 | -2.0 | 0.6 | 6.4 | 7.3 |
| Travel (4.1) | 0.1 | -5.5 | -3.3 | 9.1 | 14.0 |
| Transportation (3.2) | 3.3 | -5.9 | 1.7 | 6.3 | 12.3 |
| Commercial (7.4) | 5.7 | 1.4 | 2.4 | 5.4 | 2.5 |

1 2004 share of total imports shown in brackets
2 Includes agricultural and fish products, forestry products, and industrial goods and materials

**Table 6**

**Share of the Value of Canadian Imports of Goods, by Source**

Per cent

| | Average of 1996–2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| United States | 67.0 | 63.6 | 62.6 | 60.7 | 58.8 |
| European Union | 10.1 | 11.5 | 11.4 | 11.9 | 11.8 |
| China | 2.6 | 3.7 | 4.6 | 5.5 | 6.8 |
| Japan | 4.6 | 4.3 | 4.4 | 4.1 | 3.8 |
| Others | 15.7 | 16.9 | 16.9 | 17.8 | 18.8 |

## Sources of strength

Import volumes grew at a much faster pace than did total demand for Canadian goods and services in 2003 and 2004 (Chart 9), an indication that the appreciation of the Canadian dollar may have induced a shift towards cheaper foreign sources of supply. Factors other than the exchange rate that could also have led to a rise in the overall import intensity include a shift in demand towards particularly import-intensive components, shocks or constraints on domestic supply, and competition from emerging-market economies.

### *Composition of total demand*

Imports of goods and services accommodate final domestic demand, exports, and inventory investment. They include end-products as well as the intermediate goods and services in domestic production. Import intensity varies considerably across the various demand categories, depending on the tradability of the relevant goods and services, the specialization and vertical integration of Canadian production, and the degree of product differentiation within the same classes of goods and services. Investment in M&E and personal expenditures on motor vehicles, other durable goods, and semi-durable goods have relatively high import propensities compared with expenditures on services by the personal and government sectors (Table 7). A comparison of growth in total demand with growth in weighted components, using import propensities[7] as weights, indicates that the composition of demand made little difference in 2003 but stimulated imports moderately in 2004. Contributing to the latter were relatively strong advances in investment in M&E, personal expenditures on non-automotive durable and semi-durable goods, and exports of goods and services, all components with higher-than-average import propensities. The fact that, over the 2003–2004 period, actual imports accelerated relative to the pace suggested by the growth of weighted total demand points to an intensifying effect of the Canadian-dollar appreciation. This effect may even be greater than implied by the rise of imports relative to weighted total demand, inasmuch as the shift in demand towards import-intensive components was itself prompted by the lower import prices resulting from the appreciation of the Canadian dollar.

**Table 7**

**Annual Growth and Import Propensity of the Components of Final Demand**

Per cent

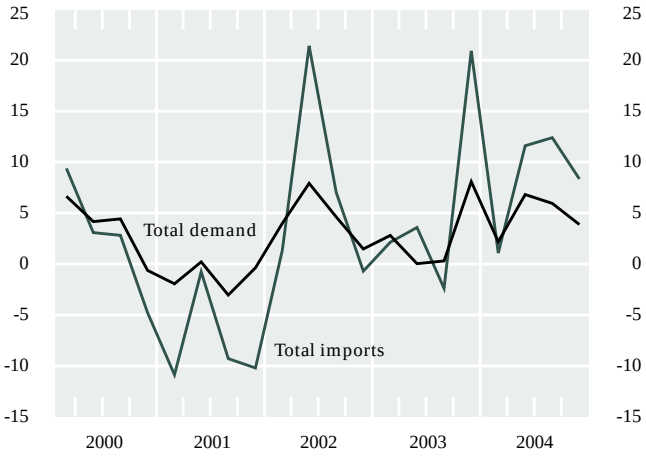
| | Import propensity[1] (%) | Annual growth 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Components of final demand | | | | | |
| Personal expenditures on: | | | | | |
| - food, beverages, and tobacco | 31.9 | 1.3 | 1.0 | 1.5 | 1.8 |
| - electricity, natural gas, and other fuels | 20.3 | -4.0 | 2.7 | 2.6 | -0.9 |
| - other non-durable goods | 24.5 | 2.8 | 5.3 | 3.5 | 4.6 |
| - semi-durable goods | 40.5 | 4.0 | 4.1 | 3.4 | 5.5 |
| - motor vehicles, repairs, and parts | 55.6 | 1.7 | 9.0 | -0.6 | -0.8 |
| - other durable goods | 47.2 | 7.8 | 7.8 | 6.3 | 8.9 |
| - services other than rent | 17.8 | 1.7 | 2.5 | 3.8 | 3.7 |
| - paid and imputed rent | 8.7 | 2.8 | 3.4 | 3.5 | 3.8 |
| Investment in: | | | | | |
| - residential structures | 21.0 | 10.6 | 14.3 | 6.2 | 8.3 |
| - non-residential structures | 23.9 | 5.4 | -7.3 | 5.7 | 0.8 |
| - machinery and equipment | 71.7 | -3.0 | -3.3 | 6.4 | 9.8 |
| Government expenditures on goods and services | 10.9 | 3.9 | 2.6 | 2.9 | 2.7 |
| Government gross fixed-capital formation | 36.9 | 11.5 | 8.4 | 4.5 | 4.9 |
| Exports of goods and services | 34.3 | -3.0 | 1.0 | -2.1 | 5.0 |
| Investment in inventories (year-over-year difference) | 35.0 | -15,762 | 4,146 | 9,306 | 469 |
| Total demand | 29.3 | -0.2 | 2.7 | 2.5 | 4.2 |
| Weighted total demand[2] | | -1.1 | 2.4 | 2.5 | 5.0 |
| Actual imports | | -5.1 | 1.5 | 4.1 | 8.1 |

1 Estimated for 2000 (Finance Canada)
2 Fixed-weighted growth of all final demand components with the weights based on their import propensity

**Chart 9**

**Growth Rate of Imports vs. Total Demand**

Quarter-over-quarter annualized per cent




7. We are grateful to Jian-guo Cao at Finance Canada for providing us with the estimates of import propensities for 2000 used in this article.

### *Shocks/constraints on domestic supply*

Particular sectoral developments or shocks appear to have affected imports less than exports over recent years. Nevertheless, imports did experience shocks that at times masked, and at other times enhanced, the impact of the Canadian-dollar appreciation. The uncertainties created by SARS and the war in Iraq, for instance, delayed travel spending abroad by Canadians in the second quarter of 2003. There was also a sharp decline in merchandise imports in August 2003, at the time of the electricity blackout in Ontario. The decline was reversed in September but nonetheless depressed the quarterly total markedly. These shocks had the effect of somewhat masking the impact of the currency appreciation. On the other hand, demand may have outstripped domestic supply in particular sectors, leading to the need for additional imports to make up for the shortfall and thereby amplifying the exchange rate effect. In this vein, the rise in imports to high levels relative to exports of energy in 2004 likely stemmed more from excess demand for energy in Canada than from the appreciation of the Canadian dollar. A trend decline in the productivity of the Western Sedimentary Basin oil fields, temporary production problems at extraction sites, and a vigorous rise in personal consumption of gasoline would have contributed to this excess demand. Likewise, continued depletion of mineral reserves in Canada and a faster rate of mine closings than openings over most of the decade up to 2004 likely contributed to a substantial rise in imports of metal ores relative to primary metals exports in 2003 and 2004.

### *Competition from China*

Because of its substantial cost advantage, China has made considerable inroads in recent years, not only in the markets for Canadian exports, but also in the Canadian market itself, where its import share has risen particularly rapidly with respect to M&E and non-automotive consumer goods, partly at the expense of the United States, Japan, and Taiwan. Chinese exports to Canada of computer and peripheral equipment, clothing, toys and sporting goods, audio-video equipment, footwear, and communications equipment are particularly important. Measuring the displacement of domestic production by these exports is problematic, if only because their fine product composition may not match that of Canadian supply. Nevertheless, it is significant that, for most of the above products, especially computers and peripheral equipment, marked increases in the Chinese share of total supply in Canada in 2003 and 2004 were accompanied by declining shares of Canadian shipments (Table 8).

**Table 8**

**China's Share of Canadian Total Demand or Supply and Imports of Selected Products**

Per cent

| | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|
| As a share of total demand or supply[1] | | | | |
| Selected machinery and equipment (M&E) | 3.0 | 4.9 | 7.8 | 11.1 |
| Computer and peripheral equipment manufacturing | 4.6 | 7.2 | 12.8 | 19.7 |
| Communications equipment manufacturing | 2.2 | 4.4 | 6.1 | 6.3 |
| Industrial machinery manufacturing | 0.7 | 0.9 | 1.2 | 1.6 |
| Selected consumer goods | 18.0 | 20.8 | 23.1 | 26.5 |
| Cut-and-sew clothing manufacturing | 11.3 | 14.3 | 15.2 | 18.1 |
| Footwear manufacturing | 39.7 | 41.6 | 45.0 | 46.9 |
| Audio-video equipment manufacturing | 15.2 | 18.0 | 21.8 | 26.3 |
| Sporting and athletic goods manufacturing | | | | |
| Doll, toy, and game manufacturing | 27.1 | 29.2 | 32.4 | 36.6 |
| As a share of imports from all countries | | | | |
| Selected M&E | 5.1 | 7.9 | 12.2 | 17.6 |
| Selected consumer goods | 29.4 | 32.7 | 36.2 | 39.2 |

1 Total demand or supply is approximated by the sum of apparent domestic demand or supply plus exports, or, alternatively, by the sum of shipments and imports.

*Because of its substantial cost advantage, China has made considerable inroads in recent years, not only in the markets for Canadian exports, but also in the Canadian market itself.*

## Isolating the Influence of the Exchange Rate

Ratios of imports to Canadian activity variables suggest an increasing stimulus exerted by the Canadian-dollar appreciation on non-energy raw materials, M&E, and non-automotive consumer goods in 2003 and 2004 (Charts 10 to 14).

An estimated regression model also indicates that exchange rate effects were important. Box 2 describes the essential features of such a model, including the resulting elasticities with respect to demand components and a real exchange rate, defined as the ratio of the Canadian overall import price to the Canadian GDP deflator. Chart 15 shows actual and forecast imports, along with their estimated long-run equilibrium values.

**Chart 10**

### Ratio of Canadian Imports of Non-Energy Raw Materials to Canadian Industrial Production

2000 = 1.0

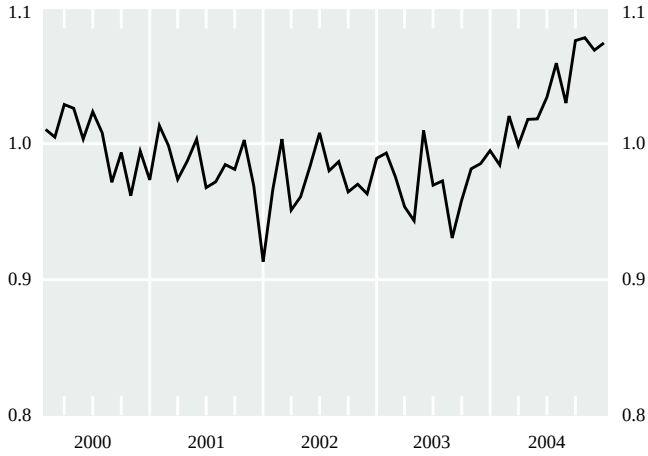



**Chart 11**

### Ratio of Canadian Imports of Machinery and Equipment to Canadian Investment in and Exports of Machinery and Equipment

2000 = 1.0

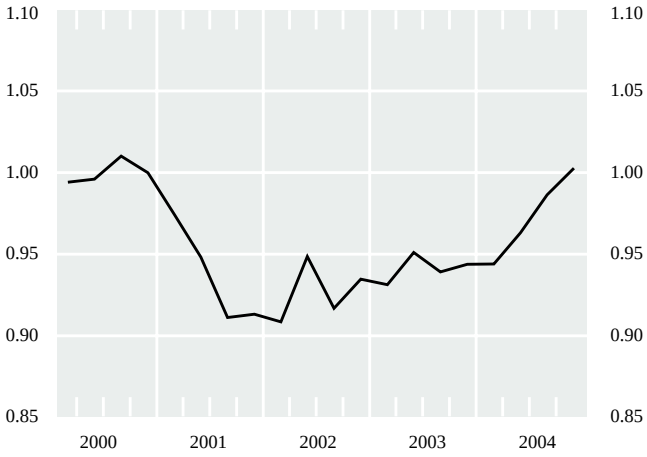



**Chart 12**

### Ratio of Canadian Imports of Non-Auto Consumer Goods to Canadian Consumption, Excluding Autos

2000 = 1.0

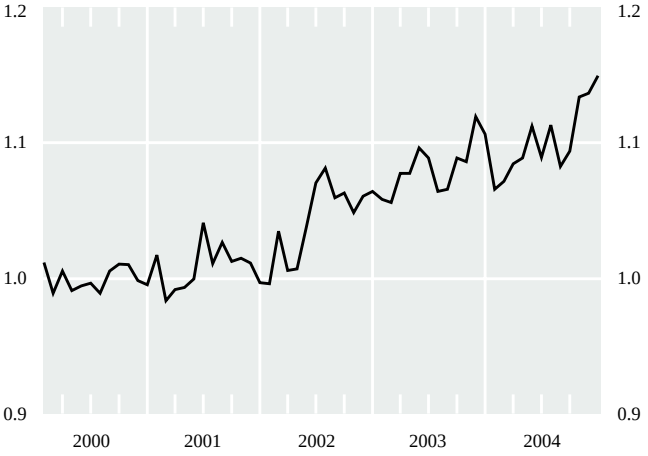



**Chart 13**

### Ratio of Canadian Imports of Motor Vehicles to Canadian Consumption of Motor Vehicles

2000 = 1.0

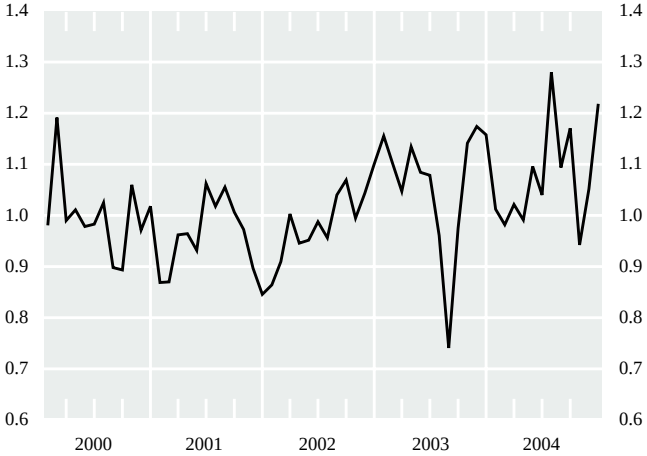


**Chart 14**

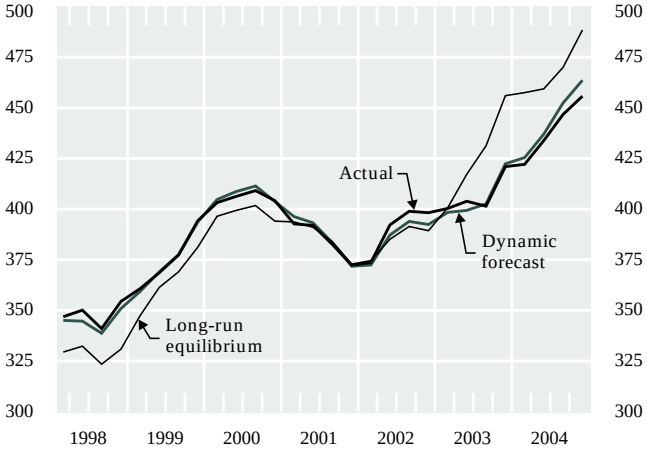
**Ratio of Canadian Imports of Motor Vehicle Parts to Canadian Exports of Motor Vehicles**

2000 = 1.0


**Chart 15**

**Imports: Actual, Dynamic Forecast, and Equilibrium Values**

Billions of chained 1997 dollars, seasonally adjusted annual rates*




* See the footnote to Chart 7 for a definition of chained 1997 dollars.

Imports would have been about 7 per cent below long-term equilibrium by the end of 2004, consistent with a more gradual adjustment to the appreciation than exports.

A decomposition of the model predictions indicates that the appreciation of the Canadian dollar would have boosted import growth by about 1 percentage point per quarter in 2003 and 2004 and accounted for about 60 per cent of the total advance in imports over these two years (Table 9). The rate of response of imports to the real exchange rate changes shows a profile similar to that of the response of exports, with a first peak at the end of 2003 and another one a year later as the second wave of the appreciation started to be felt. From the fourth quarter of 2003 onwards, however, the strength of total demand in Canada would have explained most of the vigorous expansion of imports. The relatively modest size of the residual component in Table 9 suggests that shocks that are unrelated to demand components or the exchange rate, including gains in China's share in the Canadian market, would have played a comparatively minor role in the evolution of imports.

*From the fourth quarter of 2003 onwards, the strength of total demand in Canada would have explained most of the vigorous expansion of imports.*

**Table 9**

**Contributions of Various Factors to Quarterly Growth in Total Imports**

Per cent

| | 2003 | | | | 2004 | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Total imports | 0.53 | 0.88 | -0.60 | 4.75 | 0.27 | 2.74 | 2.92 | 2.00 |
| Demand | 0.84 | -1.07 | -0.26 | 3.43 | -0.20 | 2.34 | 2.48 | 1.06 |
| Relative prices | 0.67 | 1.31 | 1.06 | 1.37 | 0.92 | 0.35 | 0.98 | 1.39 |
| Residual | -0.98 | 0.63 | -1.40 | -0.05 | -0.45 | 0.05 | -0.54 | -0.45 |

Based on the impulse-response function, the past appreciation of the Canadian dollar would continue to stimulate import growth during 2005, even with a stable real exchange rate from the first quarter onwards (Chart 16). Imports would be cumulatively raised by the equivalent of about 1.0 per cent of GDP during 2005. As this stimulus would diminish steadily, their expan-

## Box 2
## An Estimated Model of Imports

The model[1] relates Canadian import volumes to components of total Canadian demand and a real exchange rate variable, within an error-correction framework.[2] Estimation of the model over the period 1973Q1 to 2004Q4 yields the following results (*t*-ratios in brackets):

$$\Delta m_t = \underset{(3.23)}{0.59} \cdot \Delta c_t + \underset{(7.53)}{0.37} \cdot \Delta i_t + \underset{(12.06)}{0.61} \cdot \Delta x_t + \underset{(8.16)}{1.58} \cdot (\Delta inv_t / y_{t-1}) \underset{(-2.22)}{-0.18} \cdot \Delta(p^m{}_t / p^y{}_t) - \underset{(3.54)}{0.10} \cdot (m_{t-1} - m^{eq}{}_{t-1}),$$

where percentage changes in imports ($m_t$) in quarter $t$ are predicted by changes in domestic consumption ($c_t$), in investment in fixed capital ($i_t$), and in exports ($x_t$); by the change in inventory investment relative to Canadian GDP ($\Delta inv_t / y_{t-1}$); and by relative prices as measured by the ratio of the Canadian import-price deflator to the Canadian GDP deflator ($p^m{}_t / p^y{}_t$).[3] There is also a "correction" for the most recent divergence of imports from their equilibrium level ($m_{t-1} - m^{eq}{}_{t-1}$), governed by a speed-of-adjustment parameter of 0.10. The equilibrium level is determined by the long-run cointegration relation:

$$m^{eq}{}_t = \underset{(1.40)}{4.24} \underset{(-4.36)}{-0.90} \cdot (p^m{}_t / p^y{}_t) + \underset{(0.27)}{0.11} \cdot c_t + \underset{(1.49)}{0.29} \cdot i_t + \underset{(4.51)}{0.61} \cdot x_t.$$

The magnitude of the short-run relative price elasticity is similar to that in the export model, but the size of the long-run elasticity is markedly larger, and the speed of adjustment much slower. Again, the sum of the long-run elasticities to final demand components is very close to unity.

The parameter estimates were found to be stable over time. Statistical tests reveal that the contemporaneous variations in the demand components, including the changes in inventory investment relative to GDP, were exogenous to those in imports.

**Table B2**

**Key Elasticity Estimates for Total Canadian Imports**

| | Short run (on impact) | Long run |
|---|---|---|
| Relative price of imports | 0.18 | 0.90 |
| Domestic consumption | 0.59 | 0.11 |
| Domestic investment | 0.37 | 0.29 |
| Domestic exports | 0.61 | 0.61 |

1. This model was developed by Jean-Phillipe Cayen, an economist in the Research Department.

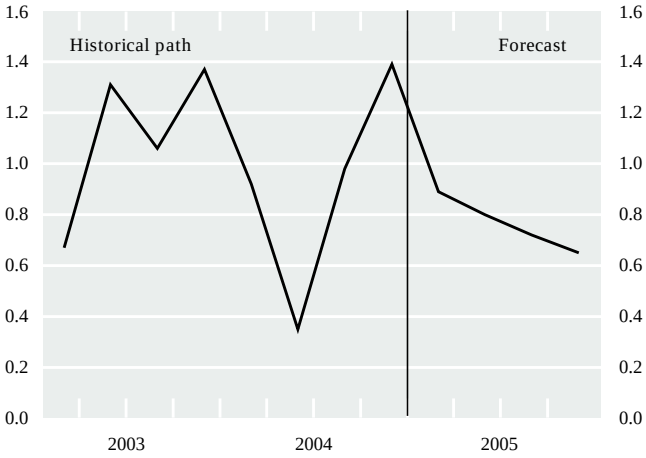
2. A measure of global trade openness was tested but found statistically insignificant.

3. The movements in the relative price variable are primarily driven by those in the nominal exchange rate vis-à-vis the U.S. dollar, which feed into the import prices estimated by Statistics Canada. They can also be affected by changes in U.S. price indexes, commodity prices and other factors that influence Canadian import prices and the GDP deflator .

**Chart 16**

**Effect of the Exchange Rate on Imports: Historical Path and as Forecast by the Error-Correction Model**

Per cent contribution to growth




sion would slow down, thereby supporting economic growth in the short term.

## Conclusion

Trying to isolate the specific contribution of exchange rate movements to the evolution of exports and imports is fraught with risks because it is difficult to properly account for the many other factors—cyclical, structural, and sector-specific—that affect trade flows at any point in time. Evidence examined in this article indicates that both exports and imports have adjusted significantly to the Canadian-dollar appreciation in 2003 and 2004. Model simulations suggest that this adjustment should have started tapering off in the first half of 2005, thereby lending support to economic growth in the short term.

# How the Appreciation of the Canadian Dollar Has Affected Canadian Firms: Evidence from the Bank of Canada *Business Outlook Survey*

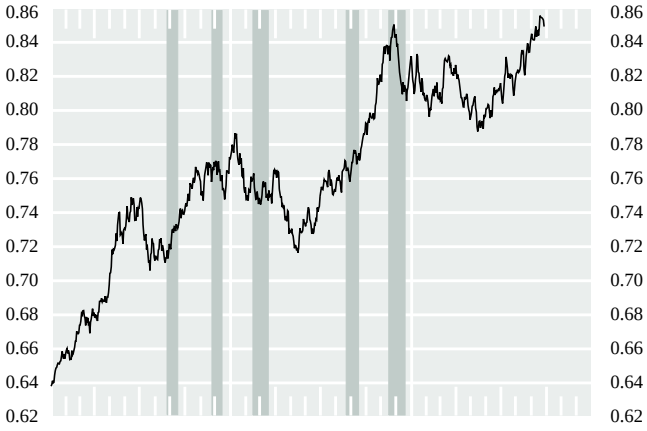
*Jean Mair, Calgary Regional Office*


- *About one-half of Canadian firms surveyed by the Bank of Canada's regional offices between September 2003 and December 2004 reported being adversely affected by the appreciation of the Canadian dollar. Roughly one-quarter reported a favourable impact, and the remainder said that there was no effect.*
- *The firms most adversely affected tended to be in the manufacturing sector and in primary industries. Those that benefited were largely in retail and wholesale trade and in transportation. Firms unaffected by the appreciation were predominantly in the construction, finance, insurance and real estate, and personal services sectors.*
- *The adverse impact of the appreciation stemmed largely from lower profit margins on foreign sales, since many goods are priced in U.S. dollars. In contrast, favourably affected firms generally benefited from lower input costs.*
- *Firms undertook a diverse set of actions in response to the appreciation, including measures to cut costs, increase productivity, move certain activities abroad, and reorient their activities towards more profitable products and markets. However, fully one-third of companies that were adversely affected reported no plans to respond. Typically, such firms were affected only moderately by the appreciation or were otherwise enjoying strong demand for their products.*


As part of their *Business Outlook Survey*,[1] the regional offices of the Bank of Canada asked questions to gauge the impact of the appreciation of the Canadian dollar. Asking firms how they are responding to exchange rate movements can complement empirical analysis, permitting a richer understanding of the way firms adjust to exchange rate shocks. These questions were included in quarterly surveys conducted between autumn 2003 and winter 2004–2005, except summer 2004 (Chart 1). The results

**Chart 1**

**Movements in the Exchange Rate during Survey Periods***




* The bars denote the periods during which the *Business Outlook Survey* was conducted.

1. The *Business Outlook Survey* summarizes interviews conducted by the Bank's regional offices with the senior management of 100 firms selected in accordance with the composition of Canada's gross domestic product. The survey's purpose is to gather the perspectives of these businesses on topics of interest to the Bank of Canada (such as demand and capacity pressures) and their forward-looking views on economic activity. Details of the survey and its content are discussed in Martin (2004).

of the last four surveys were published by the Bank as a supplement to the *Business Outlook Survey*.

The purpose of this article is to assess the information compiled from the various surveys. Combining the results of all of the surveys produces a larger sample, which generates more confidence than was possible with the relatively small individual surveys. Moreover, although the questions changed somewhat from survey to survey, there is enough similarity in the questions to construct a picture of how firms responded to the appreciation over time. The small size of the individual samples, the changing group of companies in the samples, and the renewed appreciation of the Canadian dollar in late 2003 and in 2004, however, suggest a need for caution in interpreting the results.

## The Survey

The questions concerning the effect of the appreciation of the Canadian dollar were asked in face-to-face discussions between Bank of Canada economists and senior company officials.[2] While the questions varied somewhat from survey to survey, they typically requested information about: (i) whether the firm was affected by the appreciation; (ii) whether the effect was favourable or adverse and whether it was significant or moderate; (iii) what the main effects of the appreciation on that firm were; and (iv) what actions the firm had taken in response to the appreciation. In the discussions, Bank interviewers sought to understand the nature of the effect and the firm's response. The interviewers then put the responses in various categories so that they could be summarized numerically. The written reports on these surveys drew on this numerical analysis, as well as on anecdotal information collected from the senior officials of the firms surveyed.

### Firms affected by the appreciation

About half of the firms surveyed indicated that they were adversely affected by the appreciation of the currency (Table 1). These firms were evenly split between those that reported a significant effect and those that described it as moderate. Adversely affected firms tended to be clustered in sectors with a high exposure to trade (i.e., primary industries and manufacturing). In these two sectors, about 80 per cent of firms were adversely affected by the appreciation in the exchange rate. Approximately one-quarter of the firms surveyed, generally those from the service sector, were favourably affected by the appreciation. The retail and wholesale trade sectors benefited the most, with over half of the firms surveyed registering a favourable effect. Firms that were not affected by the appreciation were mainly in sectors focused on the domestic market, such as construction, financial institutions, and real estate.

**Table 1**

**Sectoral Reports of the Effects of the Canadian-Dollar Appreciation**

Per cent of firms surveyed in that sector

| Firms, by sector* | Adverse effect | | No effect | Favourable effect | | Balance of opinion** |
|---|---|---|---|---|---|---|
| | Significant | Moderate | | Moderate | Significant | |
| Primary (50) | 39 | 39 | 12 | 8 | 2 | -68 |
| Manufacturing (149) | 51 | 26 | 6 | 11 | 5 | -61 |
| Construction (28) | 0 | 18 | 71 | 11 | 0 | -7 |
| Utilities (16) | 0 | 19 | 44 | 13 | 25 | 19 |
| Trade: Retail and wholesale (69) | 6 | 12 | 29 | 43 | 10 | 35 |
| Financial institutions and real estate (61) | 7 | 25 | 51 | 13 | 5 | -14 |
| Transportation (30) | 13 | 17 | 27 | 23 | 20 | 13 |
| Communications (17) | 18 | 12 | 41 | 29 | 0 | -1 |
| Business services (47) | 19 | 23 | 43 | 15 | 0 | -27 |
| Personal services (39) | 0 | 21 | 49 | 26 | 5 | 10 |
| Total (504) | 24 | 23 | 29 | 18 | 6 | -23 |

* Includes firms surveyed in autumn 2003, winter 2003-2004, spring and autumn 2004, and winter 2004-2005. Bracketed figures indicate the number of companies in that sector surveyed.

** The balance of opinion is the difference between the percentage of firms that reported being favourably affected by the appreciation of the Canadian dollar and the percentage that reported being adversely affected.

## Adversely Affected Firms

### Effects of the appreciation

The majority of adversely affected firms had significant export sales, often priced in U.S. dollars, and experienced a compression in their margins as the prices of their exports dropped in Canadian-dollar terms. Often, these firms were unable to raise their U.S.-dollar prices because of the competitive nature of their markets (many were competing with U.S. firms) or because of long-term contracts that fixed the prices of their exports in U.S. dollars.

Many primary producers, whether selling in Canada or abroad, reported being adversely affected by the appreciation of the Canadian dollar. The prices of their products are tied to the U.S.-dollar price, regardless of where the products are sold. Thus, the margins of these firms were lower than they would have been in the absence of an appreciation. Many of these firms,

2. For the format of these discussions, see Martin (2004, 5–6).

**Table 2**

**Main Effects of the Canadian-Dollar Appreciation Reported by Firms**

| Effect* | Adversely affected firms (%) |
|---|---|
| Lower profit margins from foreign sales | 77 |
| Lower export volumes | 24 |
| Lower margins on domestic sales | 22 |
| Lower domestic volumes | 16 |
| Other | 12 |

* Aggregate results from surveys conducted in winter 2003–2004, spring and autumn 2004, and winter 2004–2005

however, benefited from the substantial increases in commodity prices that coincided with the dollar's appreciation (Table 2).

*The majority of adversely affected firms . . . experienced a compression in their margins as the prices of their exports dropped in Canadian-dollar terms.*

The severity of the effect on margins for both exporters and commodity producers depended not only on the extent to which their sales were priced in U.S. dollars, but also on the import intensity of their products. Firms whose products were made with a large proportion of imported inputs experienced significant reductions in their costs and thus were better placed to withstand the effects of the appreciation. In the autumn 2003 survey, some 40 per cent of adversely affected firms said that the effects of the appreciation were mitigated by lower input costs.

A limited number of adversely affected firms (about one-quarter) experienced a reduction in export volumes following the appreciation. Companies that price on a cost-plus basis lost contracts that they might otherwise have expected to win. Some firms found it difficult to price to market and thus were not able to lower their Canadian-dollar prices for foreign customers (e.g., firms whose clients were tourists or cross-border shoppers). Other firms reported declines in export volumes only with a delay—after they started to increase their U.S.-dollar prices.

Some adversely affected firms found it more difficult to sell in Canada—either because of enhanced competition from U.S. companies or because their customers were exporters suffering from the appreciation. This effect seemed to become more significant as the appreciation persisted.

Another group of firms was adversely affected because they had assets or operations denominated in U.S. dollars. Although the operations of subsidiaries abroad were normally little affected by the appreciation, profits from these operations were lower in Canadian-dollar terms than they would have been in the absence of the appreciation, reducing the overall profits of the firms. Similarly, firms with U.S.-dollar assets reported a reduction in their Canadian-dollar value.

It should be noted that the appreciation of the Canadian dollar coincided with several other developments that also affected many Canadian firms, in particular, increased competition from Asian companies in many sectors and a significant increase in the prices of commodities and steel. Firms often had difficulty disentangling the effect of the appreciation from the impact of these other factors, especially as the appreciation persisted.

## How firms adjusted

Firms took various measures to adjust to the appreciation, including changing their hedging behaviour, cutting costs, increasing U.S.-dollar prices, and reorienting their production and sales strategies (Table 3).

**Table 3**

**Main Responses of Firms Adversely Affected by the Appreciation of the Canadian Dollar**

As a per cent of all adversely affected firms

| Response* | Autumn 2003 | Winter 2003–2004 | Spring 2004 | Autumn 2004 | Winter 2004–2005 |
|---|---|---|---|---|---|
| Raise prices | 7 | 19 | 20 | 13 | 21 |
| Lower labour costs | 21 | 30 | 24 | 30 | 18 |
| Move inputs/ processing abroad | n.a. | 13 | 8 | 20 | 25 |
| Other means to improve productivity/reduce costs | 12 | 36 | 39 | 24 | 38 |
| Reduce capital spending | n.a. | 15 | 18 | 7 | 11 |
| Increase hedging | 14 | 17 | n.a. | n.a. | 16 |
| Other** | 48 | 17 | 29 | 26 | 32 |
| None | 38 | 32 | 31 | 39 | 41 |

* Responses do not sum to 100 because firms may have taken several actions.

** This category included measures to introduce new products, reorient sales strategies, and change the currency of denomination of their prices. At times, it also included reductions in capital spending, moving inputs abroad, and changes in hedging practices.

Many firms had financial or natural hedges in place before the dollar began to appreciate, thus limiting the early effects of the appreciation. Several firms initially responded by increasing their hedging in an effort to lock in more of their revenues and profits in case the movement in the exchange rate persisted. Some companies also increased hedging to protect themselves against the greater day-to-day volatility of the exchange rate that accompanied the appreciation. By the spring 2004 survey, close to 60 per cent of adversely affected companies reported using some kind of financial instrument to help them hedge their currency exposure.

Shortly after the appreciation started, firms began to explore ways to cut costs, examining, in particular, production processes, staffing, and the sources of their inputs. The earliest measures included returning to in-house production some processes that had previously been outsourced, cutting staff levels, restraining wage increases, eliminating waste, cutting back on energy use, and reducing expenditures on overhead and travel (particularly for sales trips to the United States). By the time of the autumn 2003 survey, some firms were also closing less productive factories and consolidating their operations at more productive sites. Others were pressuring suppliers for rebates or cheaper prices and were exploring the possibility of obtaining cheaper inputs from abroad. Firms also reported trying to streamline production processes, and in some cases, were starting to make investments that would permit them to produce more efficiently. Several of the severely affected firms, however, were forced to reduce their investment expenditures, sometimes to very low levels, and to delay major projects because of worsening prospects for revenues from them, or because of low cash flow and reduced access to other sources of finance. Efforts to cut costs and increase efficiency became more widespread by the time of the winter 2003–2004 survey, partly reflecting the renewed appreciation of the Canadian dollar late in the year.

*Shortly after the appreciation started, firms began to explore ways to cut costs.*

As the appreciation persisted through 2004, firms looked for additional cost-cutting measures. Some companies increased production at existing plants abroad, particularly in the United States. This did not necessarily mean that Canadian production declined: some firms simply decided to meet additional demand from U.S. plants instead of from Canada. Some opened new facilities or acquired existing companies in the United States to serve that market. Several firms began to examine the possibility of taking advantage of emerging Asian suppliers that could supply inputs at a lower cost, while others wanted to have at least some of their manufacturing done there. Often, firms moved their less complex production processes abroad, while retaining the more complicated processing, design, and sales functions in Canada. (In some cases, firms were only speeding up a process that was already under way because of increased competition from Asian suppliers.) One-quarter of the adversely affected firms and almost half of the manufacturers questioned in the winter 2004–2005 survey had increased the import content of their inputs or were doing more processing outside of Canada. Buying more inputs or finished goods abroad not only reduced costs, but made those companies less vulnerable to exchange rate movements by creating natural hedges. In fact, changes in sourcing converted more than one company surveyed from one that suffered from the appreciation into one that would benefit from it by turning the company from a net exporter into a net importer.

An increasing number of firms also considered investing in machinery and equipment that would enhance productivity. In both the autumn 2004 and winter 2004–2005 surveys, about 10 per cent of the firms surveyed—all manufacturers—chose this response.

Another major type of response concerned pricing behaviour. When the dollar started to appreciate, some firms, particularly those with long-term contracts, converted the pricing of their contracts from U.S. dollars to Canadian dollars. By the second half of 2003, as the appreciation continued, many firms that had continued to denominate their prices in U.S. dollars started to consider increasing the prices of their exports. Some firms made modest changes to their product, adding features or improving service, so that they could increase prices. Many firms, however, raised prices without changing the product, with the knowledge that this might cause export volumes to be lower than they might otherwise have been. This group included several firms with longer-term contracts that had expired. A significant number of firms, however, were unable to increase their prices in U.S.-dollar terms, or delayed doing so until 2004 because of strong competition or continuing contracts.

Another course of action that firms took in response to the appreciation was to reorient their sales strategies. Companies withdrew from unprofitable product lines, focusing their resources on those that were likely to remain profitable. Sometimes this meant that firms ceased production of relatively low-priced goods and focused on more upscale products. Firms also speeded up the planned introduction of new products so that these goods could be sold at a higher margin than their traditional products. Several companies reported that they had begun to scrutinize their customer lists to determine whether revenues from some of these customers were sufficient to cover the costs of providing goods and services to them. Firms also reoriented sales efforts away from the United States towards Canada and other markets, such as Europe, where the movement in the bilateral exchange rate against the Canadian dollar had not been as large as in the US$/Can$ exchange rate. Firms recognized, however, that changes in sales efforts could take a long time to have an effect, especially if the company had to build a sales network.

*Slightly more than one-third of adversely affected firms decided to make no changes in their operations in response to the appreciation.*

The proportion of adversely affected firms taking actions in response to the appreciation varied considerably by sector. Some 80 per cent of adversely affected companies in the manufacturing sector, and close to 60 per cent of such companies in the resource and business service sectors, changed their operations in some way. But the proportion of firms reacting in all of the other sectors taken together was much lower—less than 40 per cent.

In total, slightly more than one-third of adversely affected firms decided to make no changes in their operations in response to the appreciation.[3] There were several reasons why firms did not respond. Many were only "moderately" affected; for example, those seeing reduced profits because of the impact of currency translation or experiencing small second-round effects. Other firms had a strong position despite being significantly affected by the appreciation: demand for their products was buoyant, they still had a cost advantage vis-à-vis competitors, and profits were robust. This group included many resource companies that were seeing lower revenues than they might have otherwise received because of the appreciation but whose revenues and profits were benefiting from the commodity boom. It also included firms that were experiencing strong demand for their products in the United States and abroad; for example, those selling technologically advanced goods for which few substitutes were available. Other firms did not respond explicitly to the appreciation, but had ongoing programs to reduce costs and increase productivity, or were adopting measures in response to other shocks (e.g., the emergence of Asian manufacturers as strong competitors) that helped to mitigate the effect of the appreciation.

Some companies in industries characterized by very large-scale investments did not react to the appreciation during the survey period. However, a number said that a continued high level of the Canadian dollar could have an impact on their decisions on where to place new large projects in the longer run.

In summary, as the appreciation began, many firms took steps to mitigate its impact through hedging activities and cost-cutting measures. As it continued, they began to review their operations thoroughly with an eye towards further reducing costs and increasing productivity. They also began to raise prices. After a year had passed, firms were taking more profound steps, including obtaining more inputs abroad, relocating some production processes to other countries, and reorienting their sales strategies.

## Favourably Affected Firms

As noted above, about one-quarter of all the companies surveyed indicated that they had benefited from the appreciation. The proportion of firms favourably affected was highest in the wholesale and retail trade sectors. The favourably affected group also included transportation and utility companies, as well as some manufacturers and service companies selling primarily to the domestic market.

The main benefit from the appreciation was lower prices for inputs whose Canadian-dollar price was favourably affected by the appreciation. Firms benefiting from cheaper inputs included those that were importing significant quantities of inputs, as well as heavy users of commodities priced in U.S. dollars (for example, utilities and transportation companies). Many firms also benefited from a decline in the cost of

3. This result seems to be broadly consistent with much larger surveys conducted by the Export Development Corporation. See Canada (various issues).

**Table 4**

**Main Effects Reported by Firms Favourably Affected by the Appreciation of the Canadian Dollar**

| Effect* | Favourably affected firms (%) |
|---|---|
| Lower input costs | 80 |
| Cheaper machinery and equipment | 28 |
| Lower Canadian-dollar value of liabilities | 11 |
| Other | 11 |

* Aggregate results from surveys conducted in winter 2003-2004, spring and autumn 2004, and winter 2004-2005

imported machinery and equipment (particularly in the transportation sector), or from a reduction in the Canadian-dollar value of their U.S.-dollar liabilities and in the cost of servicing these debts (Table 4).

Firms experiencing lower input costs were able to earn higher Canadian-dollar profits as long as the benefit was not offset by reductions in their selling prices. Surveys conducted in late 2003 and throughout 2004 indicated that slightly less than half of these firms had reduced the prices for the goods they were selling in Canada. Some of these firms, however, had not reduced their prices fully in line with the appreciation. Indeed, about three-quarters of these firms reported increasing margins. Many of the firms not adjusting their sales prices, or not adjusting them completely, explained that they had not completely passed through the previous depreciation of the Canadian dollar, and had suffered some erosion of profit margins. Now that the dollar was appreciating, they were taking advantage of it to restore margins.

*Firms experiencing lower input costs were able to earn higher Canadian-dollar profits as long as the benefit was not offset by reductions in their selling prices.*

Those firms using imported inputs that were able to maintain their domestic prices or reduce them only marginally, thereby benefiting from the appreciation, included manufacturers that were producing differentiated goods (because of a well-known brand name, for example), had European competitors in the Canadian market, or enjoyed some degree of protection in the Canadian market. Some retailers, particularly at the high end, were also able to maintain their Canadian-dollar prices unchanged. Other retailers and wholesalers, however, were forced by strong competition to pass through virtually all of the cost savings realized from the lower prices of imported goods.

Many of the favourably affected firms, especially retailers, moved very quickly to increase their imports of inputs following the appreciation. This reversed the shift to inputs from Canadian suppliers that had occurred during the depreciation of the Canadian dollar (Amirault, Kwan, and Wilkinson, forthcoming).

Very few favourably affected firms reported taking actions in response to the appreciation other than reducing their selling prices or increasing imports of inputs. Several said that they would increase the size of their firm. A few firms were increasing their investments in machinery and equipment, largely because of the appreciation.

Approximately 40 per cent of all favourably affected firms did not change their operations or pricing as a result of the appreciation. As noted above, some of these companies were using the opportunity it presented to restore profit margins eroded by the earlier depreciation of the dollar. For others, the benefit was relatively small or was offset by other factors, for example, the increase in the prices of steel and commodities.

## How Lower Prices for Capital Goods Affected Investment Decisions

In the autumn 2004 and winter 2004–2005 surveys, all firms surveyed were asked how their investment decisions had been affected by the reduction in the prices of imported capital goods that resulted from the appreciation. Only a very few reported that it had a major impact on their decisions. Most firms said that investment decisions were taken for other reasons and that any reduction in the price of equipment because of the appreciation had had no impact on their investment decisions, or had only a marginal effect. A few firms reported that the appreciation had affected the timing of purchases. Others said that it had influenced decisions on where to purchase capital goods: they were now more likely to buy from U.S. suppliers. Several firms noted that, despite the appreciation of the Canadian dollar vis-à-vis the U.S. dollar, they were not finding cheaper capital equipment, either because they bought such equipment in Canada or Europe or

because the effect of the appreciation had been more than offset by the increase in the price of steel.

## Conclusions

The *Business Outlook Survey* provides a rich perspective through which to analyze the adjustment of firms to movements in the exchange rate. It suggests that adversely affected firms initially took steps to mitigate the impact of such movements through hedging activities and some cost-cutting before moving on to measures that require significant changes to their operations. However, many firms chose to do nothing because demand for their products remained strong despite the appreciation. Many favourably affected firms reduced their selling prices, reflecting lower input costs, and increased their imports; however, a significant proportion of favourably affected firms did not make significant changes in their operations in response to the appreciation.

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# What Drives Movements in Exchange Rates?

*Jeannine Bailliu, International Department, and Michael R. King, Financial Markets Department*


- *Drawing on both macroeconomic and micro-based exchange rate models, the authors revisit the academic literature on exchange rate determination and summarize the state of knowledge about what drives movements in exchange rates. The focus is on highlighting recent advances in our understanding while identifying promising alternative approaches for future research.*
- *Models of exchange rate determination based on macroeconomic fundamentals have not had much success in either explaining or forecasting exchange rates, possibly owing to the simplifying assumptions employed. Notwithstanding this, researchers at the Bank of Canada have developed an exchange rate equation that has been relatively successful at tracking most of the major movements in the Canadian dollar over the past few decades and has proven to be stable over time.*
- *Micro-based models of exchange rates examine more complex and realistic settings where information is dispersed, investors are heterogeneous, and market trading rules and institutions affect behaviour. This line of research provides better explanations of short-term dynamics in exchange rates and has been found to provide superior forecasts of exchange rate movements over time horizons ranging from one day to one month. One avenue for future research is to apply these micro-based models to the Canadian dollar.*
- *One promising area of research involves uniting the macro- and micro-based exchange rate models in order to explain movements over short-, medium-, and long-term horizons.*


The Canadian dollar has appreciated by about 25 per cent relative to the U.S. dollar over the past two years, rising from 65 cents (U.S.) in January 2003 to over 82 cents (U.S.) in January 2005, and has since remained in this higher range (Chart 1).

This appreciation is noteworthy, not only because of its size, but also because it was the most rapid rise of the Canadian dollar in recent memory. Indeed, as shown in Chart 2, such a large and rapid rise of the dollar is unprecedented in the post-Bretton Woods period. Although there have been other periods when the Canadian dollar appreciated (such as the 1987–1992 episode), it did so at a more measured pace.

This recent appreciation of the Canadian dollar presents a puzzle for economists and policy-makers alike. Traditional exchange rate models are not able to explain such a large and rapid adjustment. From a monetary

**Chart 1**

**The Recent Appreciation of the Canadian Dollar**

Nominal exchange rate (US$ vs. Can$, monthly average)

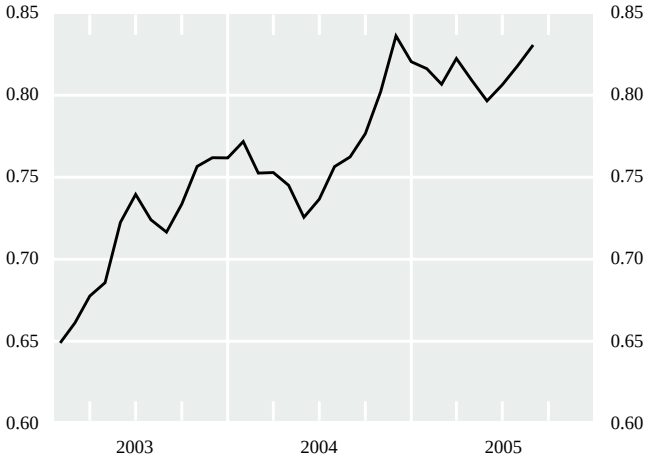
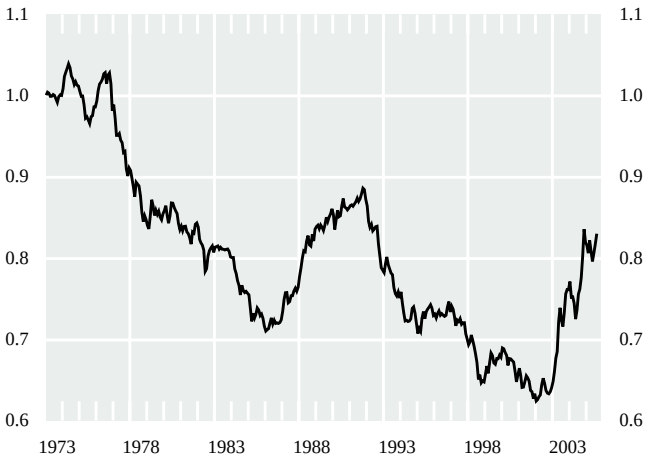


**Chart 2**

**Broad Movements in the Canadian Dollar in the Post-Bretton-Woods Period**

Nominal exchange rate (US$ vs. Can$, monthly average)




policy perspective, it is important to understand what forces are driving the currency, because the causes of the change will have different implications for the Canadian economy and may require a different monetary policy response.[1] For example, the Canadian dollar may be responding to an increase in the global demand for commodities, which would lead to an increase in Canadian aggregate demand. In this case, the monetary policy response would be muted unless some monetary accommodation was deemed useful to facilitate the reallocation of resources between the traded and non-traded sectors. Alternatively, the appreciation of the dollar may simply reflect a general weakening of the U.S. dollar. This case may call for an easing of monetary policy to offset a reduction in the foreign demand for Canadian goods and services. Finally, a movement in the Canadian dollar that is driven by non-fundamental or speculative forces would suggest that monetary policy should react to neutralize the effect of these forces so as to shelter the domestic economy.

With these questions in mind, we revisit the academic literature on exchange rate determination and summarize the state of knowledge about what drives movements in exchange rates, drawing on both macroeconomic and micro-based exchange rate models. The focus is on highlighting recent advances in our understanding while identifying promising alternative approaches.

1. For more on this, see the article by Christopher Ragan in this issue and the speech by Governor Dodge entitled "Monetary Policy and Exchange Rate Movements" given at the Vancouver Board of Trade on 17 February 2005, available on the Bank's website, www.bankofcanada.ca.

We begin by reviewing macroeconomic models of exchange rates, namely the monetary approach (with both flexible and sticky prices), the portfolio-balance approach, and approaches based on the new open-economy macroeconomics. We then review micro-structure studies that highlight the importance of trading mechanisms, information asymmetry, and investor heterogeneity for explaining short-term dynamics in exchange rates. While both approaches have had some success at explaining exchange rate movements over different time horizons, unifying these models to link the behaviour of individual agents with macroeconomic fundamentals remains a significant challenge in exchange rate modelling.

*From a monetary policy perspective, it is important to understand what forces are driving the currency, because the causes of the change will have different implications for the Canadian economy and may require a different monetary policy response.*

## Macroeconomic Determinants of Exchange Rates

The traditional empirical literature on exchange rates is based on a two-country framework where the bilateral exchange rate is viewed as the relative price of the monies of the two countries in question. There are many such models, all of which describe the evolution of the exchange rate as a function of a different set of macroeconomic fundamentals, such as prices, money, interest rates, productivity differentials, government debt, terms of trade, and net foreign assets—typically characterized as intercountry differences.

### Main models of exchange rate determination

The monetary approach to exchange rate determination emerged as an important exchange rate model in the 1970s, just as many industrialized countries began to let their exchange rates float.[2] This approach starts from the definition of the exchange rate as the relative

2. See, for example, Frenkel (1976) and Mussa (1976).

price of two monies and attempts to model that relative price in terms of the relative supply of, and demand for, those monies. This model makes several other key assumptions, including that (i) prices are perfectly flexible; (ii) domestic and foreign assets are perfect substitutes; (iii) absolute purchasing-power parity (PPP) holds at all times; and (iv) the uncovered-interest-parity (UIP) condition holds at all times.[3] The assumption that PPP holds continuously is relaxed in the sticky-price version of the monetary model that originated with Dornbusch (1976). In this approach, PPP holds only in the long run, and there are "jump variables" (i.e., exchange rates and interest rates) that compensate for stickiness in prices and account for the fact that exchange rates can "overshoot" their long-run equilibrium levels.

The portfolio-balance model is a second approach to modelling exchange rates.[4] Relative to the monetary models of exchange rate determination, the key modification of this model is that domestic and foreign assets are no longer assumed to be perfect substitutes. The result is that a currency-risk premium intrudes on the UIP condition, and the exchange rate is now determined by the supply and demand for all foreign and domestic assets, and not just by the supply and demand for money.

A third theoretical approach to modelling exchange rates that was initiated in the 1980s, and continued more recently in the context of the development of the new open-economy macroeconomics (NOEM) literature, is to formalize exchange rate determination in the context of dynamic general-equilibrium models with explicit microfoundations, nominal rigidities, and imperfect competition. Early models of this type were referred to as equilibrium models and were essentially an extension (or a generalization) of the flexible-price monetary model that allowed for multiple traded goods and real shocks across countries.[5]

The more recent NOEM models, based on the seminal work by Obstfeld and Rogoff (1995), offer a more rigorous analytical foundation based on fully specified microfoundations. The main disadvantage of using these later models as a basis for empirical work is that the models are often quite sensitive to the particular specification of the microfoundations. For instance, a key hypothesis like pricing to market is assumed in some models, but not others, and is an important factor in exchange rate behaviour (by determining whether PPP holds in the short run). As pointed out by Sarno (2001), this is problematic, given that there is not, as of yet, a consensus in the profession as to the "correct" or "preferable" specification of the microfoundations.

*Models of exchange rate determination based on macroeconomic fundamentals have not had much success in explaining, let alone forecasting, exchange rate movements.*

A final approach to modelling exchange rates that is worth mentioning is one that accords a central role to productivity differentials in explaining movements in the real exchange rate. The real exchange rate is defined as the nominal bilateral exchange rate for two countries adjusted by the relative prices of goods in those countries. Such models, based on work by Balassa (1964) and Samuelson (1964), relax the assumption of PPP and allow the real exchange rate to depend on the relative price of non-tradables, itself a function of productivity differentials.[6] Empirical evidence supports the view that productivity differentials are an important determinant of real exchange rates, where the link between these variables is typically modelled as a long-run relationship.[7]

Unfortunately, models of exchange rate determination based on macroeconomic fundamentals have not had much success in explaining, let alone forecasting, exchange rate movements.[8] Indeed, as Meese and Rogoff (1983) showed more than 20 years ago in their

3. Absolute PPP implies that goods-market arbitrage will tend to move the exchange rate to equalize national price levels between the two countries. The UIP condition, on the other hand, states that risk-neutral arbitrage will equalize the expected return on a foreign investment and the return on a domestic investment.

4. See Branson and Henderson (1985) for more details.

5. See, for instance, Stockman (1980) and Lucas (1982).

6. The Balassa-Samuelson hypothesis states that differences in labour-productivity growth in the traded-goods sectors of the two countries in question (owing to different rates of technological progress) will cause movements in the bilateral real exchange rate.

7. See, e.g., Chinn (1999).

8. Several authors have found that structural models appear to dominate the random walk's forecastability at relatively long prediction horizons. See, for example, Mark (1995). These results, however, have been questioned by others, notably Killian (1999).

## Box 1
## The Bank of Canada's Exchange Rate Equation

While several authors have purported to find stable and robust relationships linking exchange rates to various macroeconomic variables, the equations that they have constructed typically collapse soon after they are applied to new, extra-sample data. One notable exception is an exchange rate equation developed by two Bank of Canada economists in the early 1990s (Amano and van Norden 1993). This equation was capable of tracking most of the major swings in the Can$/US$ exchange rate over the 1973–1990 estimation period. More importantly, its surprisingly good performance continued through most of the next 13 years.

The Amano-van Norden equation (AvN) is based on a simple, error-correction specification. The dependent variable is the *real* Can$/US$ exchange rate (*RFX*), defined as the nominal exchange rate deflated by the gross domestic product price indices for Canada and the United States. Two world commodity prices—one for energy (*ENER*) and another for non-energy commodities (*COM*)—are used to generate the long-run equilibrium value of the exchange rate, while a third variable—the spread between Canadian and U.S. 90-day commercial interest rates (*INTDIFF*)—is used to capture the exchange rate's short-term dynamics:

$$\Delta \log RFX = \lambda(\log RFX_{-1} - \alpha - \beta_1 \log COM_{-1} + \beta_2 \log ENER_{-1}) + \gamma INTDIFF_{-1} + \varepsilon .$$

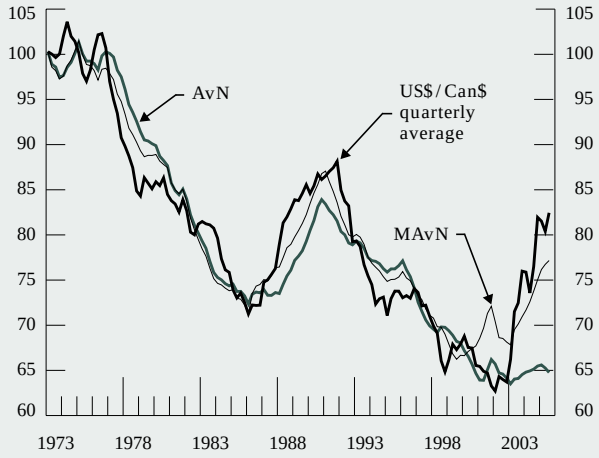
The long-run relationship that was identified between the real Can$/US$ exchange rate and the two commodity variables has considerable intuitive appeal, since Canada is known as a major commodity exporter. It is important to enter these variables separately, however, as they seem to affect the Canadian dollar in very different ways. While higher world prices for non-energy commodities typically cause the Canadian dollar to appreciate, higher world energy prices are associated with a weaker currency over most of the sample period.

Chart B1 compares the actual value of the Can$/US$ exchange rate with its predicted value, based on a dynamic simulation of the AvN equation over the entire 1973Q1 to 2005Q3 period.[1] Although the estimated equation is able to trace most of the major movements in the Canada-U.S. dollar up until 2002Q4—three years after the estimation period ends—it fails to explain the most recent run-up from roughly 65 cents (US) to 85 cents (US).

**Chart B1**

**Actual vs. Dynamic Simulation**

US cents




Different hypotheses have been advanced to explain the equation's diminished performance over the 2003–2005 period. The first hypothesis starts with the observation that exports of energy products now account for a much larger portion of Canada's trade surplus than they did in the past. Canada's net exports of energy stayed within a narrow range of zero to $3 billion over most of the 1970s and early 1980s. After 1985–1986, they seemed to shift upward and hit a new plateau of about $10 billion until the early 1990s. In 1993, energy exports began to rise dramatically, reaching record highs of nearly $50 billion. Given their increased importance from a trade perspective, it would not be surprising if the nature of their relationship with the Canada-U.S. dollar also changed over the period, with the

1. The parameters were estimated over the period 1973Q1 to 1999Q4.

## Box 1 (cont'd)

benefits realized through higher export revenues, increased investment, and greater net wealth offsetting whatever negative factors were at play in the earlier part of the sample period. Chart B1 also shows the predicted value of the exchange rate for a modified version of the AvN equation (MAvN), which includes an extra variable that allows the parameter value on the energy term to change in the second half of the sample period.[2] As shown, the equation is now able to explain a significant proportion of the latest Can$/US$ appreciation.[3]

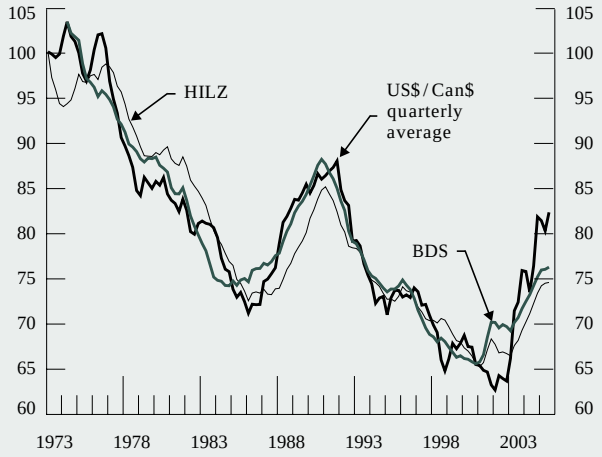
A second hypothesis focuses on global trade imbalances and the trend depreciation of the U.S. dollar against most major currencies during the past three years. This line of research concentrates on the growing U.S. current account deficit and the widespread view that significant realignment of world currencies will be necessary in order to correct it. Although the implications for individual currencies such as the Canadian dollar are not clear, consensus estimates suggest that the U.S. dollar might have to depreciate to put the U.S. balance of payments on a sustainable track. Bailliu, Dib, and Schembri (BDS) (2005) have tested for this effect by including an extra variable in the AvN equation to capture trend movements in the U.S. current account.[4] The dynamic simulations for the BDS version of the equation are shown in Chart B2. This equation outperforms the original AvN specification by a wide margin, and the observed gap between actual and simulated values towards the end of the sample is smaller.

The third and final specification is based on an paper by Helliwell, Issa, Lafrance, and Zhang (HILZ) (2005), and relies on differences in Canadian and U.S. rates

**Chart B2**

**Actual vs. Dynamic Simulation**

US cents




of productivity growth to help explain movements in the Can$/US$ exchange rate. A new variable for the relative labour productivity in the manufacturing sector between Canada and the United States manages to narrow the gap between actual and simulated values of the exchange rate over the 2003–2005 period (the dynamic simulations for the HILZ version of the equation are also shown in Chart B2).[5]

Although these three specifications all show promise and manage to reduce the simulation errors reported over the entire sample period, sizable gaps for 2003–2005 nevertheless remain in every case. Unfortunately, efforts to combine the contributions of each specification and to produce a superior, encompassing equation have so far proved unsuccessful. Perhaps future tests, based on microstructure data, will allow researchers to reduce the errors further and draw stronger conclusions about which of the above specifications comes closest to capturing the true Can$/US $ exchange rate relationship.

2. Preliminary testing indicated that 1985–1986 was the appropriate break point for the estimation.

3. For more on the role of energy prices in the determination of the Canadian dollar, see Issa, Lafrance, and Murray (2005).

4. The BDS equation used here, as well as the Helliwell, Issa, Lafrance, and Zhang (HILZ) equation discussed below, are simplified versions of more elaborate equations, presented in stylized form to draw out their major differences. The original equations contain extra variables and, as a result, do a somewhat better job of explaining movements in the Can$/US$ exchange rate. The main features of the equations are nevertheless preserved.

5. It is important to note that the original HILZ equation used the nominal Can$/US$ exchange rate, instead of the real exchange rate, as the dependent variable.

study comparing the out-of-sample explanatory power of a variety of exchange rate models, no existing structural model can systematically outperform the naïve alternative of a random walk at short and medium-run horizons, even when aided by the actual future values of the regressors. This key result has yet to be convincingly overturned in the literature, although many studies have attempted to do so.[9] And as Obstfeld and Rogoff (2000) have noted, there is generally a very weak relationship between the exchange rate and virtually any macroeconomic variable—a situation they term the "exchange rate disconnect puzzle." Notwithstanding this, researchers at the Bank of Canada have developed an exchange rate equation that has been relatively successful at tracking most of the major movements in the Canadian dollar over the past few decades and has proven to be stable over time (Murray, Zelmer, and Antia 2000). For more on the Bank of Canada's exchange rate equation, see Box 1.

### Why do exchange rates seem to be disconnected from macroeconomic fundamentals?

Four main explanations for the exchange rate disconnect puzzle have been explored in the literature. First, some authors have examined whether parameter instability could explain why macroeconomic fundamentals have so little predictive power. According to this line of thought, the poor forecasting performance of structural exchange rate models may be because the parameters in the estimated equations are unstable over time. There is some evidence to support this view.[10] As discussed by Sarno and Taylor (2002, 135), this instability could be the result of policy-regime changes, implicit instability in key equations that underlie the econometric specification (such as the money-demand or PPP equations), or agents' heterogeneity that would lead to different responses to macroeconomic developments over time.

Second, another avenue explored in the literature is the extent to which forecasting performance based on macroeconomic fundamentals can be improved if the relationship between the exchange rate and its fundamentals is modelled as non-linear. Although there is evidence that the relationship between the exchange rate and macroeconomic fundamentals is characterized by non-linearities (see, e.g., Taylor and Peel 2000), the jury is still out as to whether exchange rate models that incorporate non-linearities will improve the forecasting accuracy of structural exchange rate models.[11]

Third, it is possible that the key assumptions underlying standard exchange rate models are invalid. Two key assumptions that come to mind are PPP and UIP. With respect to the first hypothesis, evidence abounds that PPP does not hold in the short to medium run, although there is some evidence that it may hold in the very long run (i.e., using over 100 years of data) (Taylor and Taylor 2004). Similar evidence characterizes the literature that has tested UIP. Indeed, over shorter horizons, the hypothesis that interest rate differentials are unbiased predictors of future exchange rate movements is clearly rejected in empirical studies, but the results for long-horizon regressions are much more positive.[12]

Finally, Flood and Rose (1995) note that nominal exchange rates are much more volatile (at low frequencies) than the macroeconomic fundamentals to which they are linked in theoretical models. This excess volatility suggests that exchange rate models based on macroeconomic fundamentals are unlikely to be very successful either at explaining or forecasting nominal exchange rates, and that there are important variables that may be omitted from standard exchange rate models. Several potential explanations for this have been explored in the literature, including the presence of unobservable macroeconomic shocks that influence exchange rates, the irrationality of market participants, speculative bubbles, and herding behaviour. Recently, Evans and Lyons (2005a) have proposed an alternative exchange rate model based on microstructure theory that provides better out-of-sample forecasts than a random walk over periods of one day to one month. While the superior forecasting power of this model in the short term is encouraging, it still leaves unanswered the mechanism linking short-term with longer-term dynamics. We turn to this new approach in the next section.

## The Microstructure of Foreign Exchange Markets

While traditional models of exchange rate determination have had moderate success in explaining long-run

9. For example, see Cheung, Chinn, and Garcia Pascual (2005), who update Meese and Rogoff's work by comparing the forecasting performance of the major exchange rate models developed in the 1990s.

10. See, for example, Canova (1993) and Rossi (2005).

11. Clarida et al. (2003) are able to outperform a random walk across a range of horizons using a term-structure model of exchange rates based on a regime-switching vector-error-correction model.

12. See Chinn and Meredith (2005) for more details.

trends, they completely fail to predict exchange rates at short horizons or even to explain exchange rate movements ex post (Frankel and Rose 1995; Flood and Taylor 1996). Given this failure, it is only natural, as Frankel, Galli, and Giovannini (1996) point out, to ask whether the problems of standard exchange rate models would be solved if the structure of foreign exchange markets was specified in a more realistic fashion. The microstructure approach to exchange rates has been developed to address this issue.[13]

Micro-based models of exchange rates are important for macroeconomists because they have the potential to explain short-term dynamics in exchange rates and may offer better forecasts of macroeconomic variables that are important for economic activity. But while these models have shown success over time horizons of one day to one month, it is not clear that they will be able to provide explanations of exchange rate movements over 12 to 24 months—the time horizon that is important for monetary policy. Also missing is a synthesis between macro- and micro-based exchange rate models comparable with macro and micro models of the real economy.

*Whereas macroeconomic models assume that actors are identical, information is perfect, trading is costless, and the trading process itself is irrelevant, micro-based exchange rate models relax all of these assumptions.*

Market microstructure is defined as the study of the process and outcomes of exchanging assets under explicit trading rules (O'Hara 1995). Market microstructure is concerned with the transmission of information among market participants, the behaviour of market agents, the importance of order flow, the heterogeneity of agents' expectations, and the implications of such heterogeneity for trading volume and exchange rate volatility (Sarno and Taylor 2001). A central concept in microstructure is that asset prices need not equal full-information expectations of value because of a variety of frictions. Instead of being inconsequential, market structure and the rules governing the trading process are important variables modifying trading behaviour and affecting the speed and quality of price discovery, liquidity, and the cost of trading (Madhavan 2000).

The microstructure approach to exchange rates begins from a very different set of assumptions than the macroeconomic approach (Frankel, Galli, and Giovannini 1996; Lyons 2001; Sarno and Taylor 2001). Whereas macroeconomic models assume that actors are identical, information is perfect, trading is costless, and the trading process itself is irrelevant, micro-based exchange rate models relax all of these assumptions. These models examine more complex and realistic settings where information is dispersed, and heterogeneous agents have different information sets. The trading process in foreign exchange markets is not transparent and features bid-ask spreads that reflect the costs to market-makers of processing orders and managing inventories. Unlike macro models, where only public information is relevant, micro-based models suggest that some agents may have access to private information about fundamentals or liquidity that they can exploit in the short term. As a result, the trades of better-informed actors may have a greater impact on exchange rate prices than the trades of uninformed actors.

## Order flow and exchange rates

One of the key explanatory variables in micro-based models of exchange rates is order flow. Order flow is defined as the cumulative flow of signed transactions, where each transaction is signed positively or negatively, depending on whether the initiator of the transaction is buying or selling, respectively. In other words, it is transactions volume that is classified based on the direction of trading activity. A positive sum over any period indicates net buying pressure, while a negative sum indicates net selling pressure. The explanatory power or informativeness of order flow depends on the factors that cause it. Order flow is most informative when it conveys information about macroeconomic fundamentals that is dispersed among market participants. It is this information- aggregation role of order flow that provides a link between economic fundamentals—such as the state of output, inflation, and other indicators of economic performance—and the behaviour of exchange rates. Order flow is less informative, however, when it arises from the management of inventories by foreign exchange dealers in response to a liquidity shock (Lyons 2001). Distinguishing inform-

13. Summaries of the microstructure literature on exchange rates are provided in Lyons (2001), Vitale (2004), and Sarno and Taylor (2001). The broader microstructure literature is summarized in O'Hara (1995) and Madhavan (2000).

ative from non-informative order flow is a challenge for microstructure research.

Judging from publications written for their clients, foreign exchange market-makers monitor order flow and use it to forecast near-term movements in exchange rates. Academic research has followed, with a large number of empirical studies and a smaller number of theoretical models of order flow appearing over recent years.

*Numerous microstructure studies have empirically established the ability of order flow to explain movements in exchange rates at short time horizons.*

Evans (2002) develops and estimates a model of foreign exchange trading that demonstrates the relationship between market-wide order flow and exchange rate movements at high frequencies. Evans and Lyons (2004a) subsequently develop a dynamic general-equilibrium model that provides a structural interpretation for the correlation between order flow and exchange rates at longer time horizons. Numerous microstructure studies have empirically established the ability of order flow to explain movements in exchange rates at short time horizons. For example, Evans and Lyons (2002) find that about 60 per cent of the daily changes in the Deutschmark / US$ exchange rate and about 40 per cent of daily changes in the Japanese yen / US$ dollar exchange rate can be explained by daily order flow, with similar levels reported for other currencies.[14] Of greater importance to macroeconomists, Evans and Lyons (2005a) use order flow to explain exchange rate movements for periods up to one month and provide out-of-sample forecasts that outperform both standard macroeconomic models and a random walk.

Micro-based models of exchange rates stress the information role of order flow in a trading setting with heterogeneous agents. In this setting of information asymmetry, order flow is a proxy variable that captures the markets' reaction to macroeconomic announcements and other news that anticipate future shifts in economic conditions. As the macroeconomic fundamentals underlying exchange rates change, traders adjust their future expectations and rebalance their portfolios accordingly, leading to a change in exchange rates. In other words, order flow is a transmission mechanism for public information about fundamentals and private information that affect exchange rates. This view of order-flow data as a tool to learn about the fundamental information of others is supported by a survey of foreign exchange market participants (Gehrig and Menkhoff 2004). It also has empirical support. Evans and Lyons (2003) estimate that at least half of the response of exchange rates to macroeconomic news announcements is transmitted to exchange rates via order flow.

While microstructure researchers emphasize this information-aggregation role of order flow, critics argue that order flow reflects a variety of liquidity effects that are temporary and unrelated to macroeconomic fundamentals, such as momentum trading, trend-chasing behaviour, or other types of feedback trading (Dominguez 2003; Froot and Ramadorai 2005). Breedon and Vitale (2004), for example, develop and test a structural model featuring heterogeneous agents and information asymmetry that allows for both of these characteristics to have effects on exchange rates. They find that order flow explains very little in terms of fundamentals. Instead, they argue that the relationship between order flow and exchange rates is almost totally the result of liquidity effects and not of any information contained in order flow.

Supporters of order flow dismiss the view that order flow represents only temporary liquidity shocks and feedback trading. Payne (2003) conducts an event study of interdealer transactions for the Deutschmark / US$ where the information content of order flow is identified based on the long-run response of exchange rates to trades. His results suggest that around 40 per cent of exchange rate variability is attributed to unpredictable trading activity. Despite this high percentage, order flow continues to have a statistically significant and economically important impact on exchange rates. Even when the possibility of feedback-trading rules is taken into account, order-flow imbalance is still a fundamental determinant of exchange rate movements. Evans and Lyons (2004b) provide more

14. The impact of order flow on exchange rates has been established empirically for the German Deutschmark (Evans and Lyons 2002; Lyons 2001; Payne 2003), the euro (Breedon and Vitale 2004; Evans and Lyons 2005a), the Japanese yen (Evans and Lyons 2002), the British pound sterling (Evans and Lyons 2002), and several other European currencies (Evans and Lyons 2002; Rime 2001). Order flow has also been linked to other exchange rate characteristics, such as bid-ask spreads (Payne 2003), liquidity (Moulton 2005; Breedon and Vitale 2004), and volatility (Cai et al. 2001; Killeen, Lyons, and Moore 2001).

support for the view that order flow aggregates information and reflects agents' expectations for future fundamentals. They find that order flow from end-customer trades provides better forecasts of spot exchange rates than traditional exchange rate models. End-customer order flows also directly forecast macroeconomic variables such as output growth, money growth, and inflation. This finding is significant because it provides a direct link between order flows and macroeconomic fundamentals.

While the research on order flow remains promising, the issue of whether it represents dispersed information about fundamentals or temporary liquidity shocks continues to be debated. It is safe to assume that aggregate order flow arises from both sources, and microstructure researchers are developing methods and models to extract the signal from the noise. Researchers remain cautious, however, since the explanatory power of order flow for forecasting macro variables may vary over time, depending on the focus of market agents at any given point in time. But this line of research remains promising, since it may offer a means to introduce better microfoundations into macro models of exchange rates. At the very least, it demonstrates a link between macrofundamentals and short-term exchange rate movements and suggests that the exchange rate does not simply follow a random walk. And it may provide a means for policy-makers to extract more information out of short-term exchange rate movements.

## Market participants and speculation

Another focus of the microstructure approach is on the market participants themselves. Foreign exchange markets consist of three types of agents: market-makers (also termed dealers), brokers, and end-customers. Market-makers are typically traders employed by the large commercial and investment banks who make markets to buy and sell an exchange rate at posted prices for a given size and are willing to take positions in the currencies they trade. Market-makers are portrayed as either risk-neutral or risk-averse agents who manage their inventories carefully and make a large portion of their profits from the bid-ask spread (Lyons 2001). Many of the studies discussed above focus on interdealer trades, where market-makers deal directly with each other. These direct inter-dealer trades represent about half of total foreign exchange trading activity (Bank for International Settlements 2005).[15] Brokers, by contrast, do not make markets themselves but facilitate anonymous trading between counterparties. The traditional voice brokers who transacted by telephone have been increasingly replaced over recent years by electronic trading platforms, such as Electronic Broking Systems (EBS) and Reuters Dealing systems. Evans and Lyons (2005b), for example, distinguish between non-financial customers (such as corporations), unleveraged financial institutions (such as mutual funds), and leveraged financial institutions (such as hedge funds).

Several studies explain short-term exchange rate dynamics with reference to the type of actors who are dominating trading at any given point in time. For instance, the foreign exchange market can be viewed as populated by two types of agents: chartists and fundamentalists (Frankel and Froot 1988). Chartists are assumed to operate on the basis of a mechanical trading rule that is linked to past movements in the exchange rate, whereas fundamentalists are assumed to trade on the basis of changes in macroeconomic fundamentals. Djoudad et al. (2001) estimated such a model for Canada and found that fundamentalists typically dominate the foreign exchange market during more turbulent periods, while chartists have been active during more tranquil periods. This distinction, however, may be less relevant, since modern foreign exchange trading incorporates both approaches, with individual traders choosing how much weight to assign to fundamentals versus technical patterns in the data.

Trading by chartists and other short-term speculative activity may partly explain the disconnect between exchange rate movements and fundamentals, as well as other exchange rate puzzles. Osler (1998) develops a model in which rational, short-term speculation in response to a shock disperses the shock's exchange rate effects over time and generates a response that is more accurately forecast by a random walk than by a structural model. In subsequent papers, Osler (2003, 2005) examines the role of technical trading rules, such as stop-loss orders, in the development of rapid, self-reinforcing price movements (or "price cascades") and increased volatility of exchange rates. Carlson and Osler (2005) develop a model of short-run exchange rate dynamics with heterogeneous agents and demonstrate this model's ability to explain why spot rates do not tend to rise as much as predicted by forward rates (the "forward-bias puzzle"). As well, the authors join other researchers in highlighting the potential relevance of micro-based models for explaining exchange rate dynamics at macroeconomic horizons.

15. Trades between market-makers and financial customers or non-financial customers represent 33 per cent and 15 per cent of turnover, respectively (Bank for International Settlements 2005).

The most interesting segment of the currency market from a macroeconomist's point of view is the end-customer segment (such as corporations that hedge their exports or imports), since their activity is most closely related to the real economy. Fan and Lyons (2003) provide a description of end-customer activity for a leading global market-maker and find that customer order flow closely tracks exchange rate movements at lower frequencies (for example, at annual frequency). Bjønnes, Rime, and Solheim (2005) provide more evidence of the behaviour of end-customers using a very rich database of trading in the Swedish krona market. They find that non-financial customers are the main liquidity providers in the overnight foreign exchange market, because market-makers do not want to hold risky positions overnight. Their work provides empirical support for the theoretical view of agent heterogeneity in micro-based exchange rate models. Taken together, these studies suggest that understanding the behaviour of end-customers will be important for explaining foreign exchange dynamics over longer time horizons.

*Understanding the behaviour of end-customers will be important for explaining foreign exchange dynamics over longer time horizons.*

## Promising Avenues for Future Research

The research outlined above demonstrates that progress is being made in exchange rate economics, although many intriguing questions and puzzles remain unanswered. The macroeconomic literature has moved forward despite the setbacks identified, and the models have become more complex, introducing microfoundations and rigidities while incorporating a wider range of variables. At the same time, researchers are addressing various empirical and theoretical issues, such as how to model an exchange rate that may have a time-varying or non-linear relationship with macroeconomic fundamentals. While the benchmark for the success of these models remains their explanatory power and forecasting ability, this line of research continues to provide theoretical insights into how the exchange rate behaves. From a macroeconomic perspective, several significant puzzles exist, such as the exchang rate disconnect puzzle, suggesting that more work remains to be done.

The microstructure approach to exchange rates relaxes the assumptions of the macroeconomic models and directs the focus to the information structure, the behaviour of agents, and the role of institutions and trading rules for influencing short-term dynamics. This line of research highlights the importance of order flow as a mechanism for aggregating dispersed information about macroeconomic fundamentals. The inclusion of order flow in exchange rate models provides forecasts that outperform a random walk over time horizons ranging from one day to one month. While researchers disagree on whether order flow reflects information asymmetry about macroeconomic fundamentals or merely transitory liquidity shocks, the ability of order flow to forecast macroeconomic fundamentals directly is supportive of the role of order flow as an aggregating mechanism for dispersed information. Disaggregating the trades of different market participants to distinguish the trades of different agents—such as the order flow of exporters vs. that of financial speculators—may reduce the noise in this order-flow data and provide a clearer link with fundamentals. Finally, research highlighting the role of technical trading rules may explain a number of macro puzzles, such as the excess-volatility puzzle and the failure of UIP to hold (Lyons 2001).

While macro researchers inside and outside the Bank are using the latest macro techniques to model the behaviour of the Canadian dollar, it is noteworthy how little of the microstructure approach is being applied to the same research. This gap may be owing to the lack of data on customer order flow that has been made available by market-makers for other currencies. While lessons for Canada can certainly be drawn from the currencies of other open economies, these micro tools and techniques may offer some insights into the forces driving recent sharp movements in the Canadian dollar described at the outset of this article.

*If the exchange rate represents the most important price in an economy, being able to explain price formation and discovery from the level of agents to the level of the economy should be a high priority.*

One promising area of research involves uniting the macroeconomic and microstructure approaches to exchange rate determination. If the exchange rate represents the most important price in an economy, being able to explain price formation and discovery from the level of agents to the level of the economy should be a high priority. Work by Evans and Lyons (2004b) and Carlson and Osler (2005) linking microstructure variables, such as order flow and heterogeneous agents, with longer-term fundamentals is a promising step in this direction. While macroeconomic models can explain exchange rate movements at time horizons of several years or more, the micro models currently only explain dynamics at the very short term. If order flow reflects the microrealizations of macroeconomic factors affecting the real economy, it should be possible to explain exchange rate behaviour over longer horizons.

An obvious next step is to develop a model that can explain exchange rate movements over a medium-term horizon that could last from one month to several years. This horizon is known to be important to businesses and households when making savings and investment decisions. It is also the most relevant to monetary policy, as it is the time horizon over which changes in monetary conditions are believed to affect the economy. At a minimum, measures of order flow and more realistic assumptions about the behaviour of agents should provide more realistic short-term dynamics in longer-horizon macroeconomic models. Any models that can help economists to extract better high-frequency signals about the economy from apparently noisy exchange rate movements would be useful. And the ultimate goal remains to provide a well-specified model of exchange rate movements over all time horizons.

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# The Exchange Rate and Canadian Inflation Targeting

*Christopher Ragan**

- *An essential part of the Bank of Canada's inflation-control strategy is a flexible exchange rate that is free to adjust to various developments in the Canadian and world economies. The Bank of Canada does not set a target for the exchange rate.*
- *A change in the Bank's target for the overnight interest rate generally leads to a change in the exchange rate which, in turn, alters international relative prices and changes net exports and aggregate demand. The exchange rate is an integral part of the transmission mechanism.*
- *When the exchange rate changes for reasons unrelated to a change in domestic monetary policy, the cause of the change must be identified in order to determine the appropriate monetary policy action. A central challenge for the Bank is to determine the cause and persistence of the change in the exchange rate and the likely net effect on aggregate demand. The Bank can then design the appropriate policy action consistent with its objective of keeping inflation low, stable, and predictable.*
- *A complication of monetary policy is that observed changes in the exchange rate are often the result of multiple changes in the Canadian or world economies. In these situations, the Bank must determine the relative importance of the various forces affecting the exchange rate and their combined effect on the Canadian economy.*

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Fluctuations in Canada's exchange rate are a popular topic in discussions of the Canadian economy and of the Bank of Canada's monetary policy. Movements in the exchange rate have important implications for the Canadian economy, but views differ as to how the Bank should respond to them. Those apparently in favour of a strong currency argue that the Bank should prevent substantial depreciations of the Canadian dollar. Others appear to favour a weaker currency when they argue that the Bank should act to prevent significant appreciations of the dollar. Both arguments assume that there is a "right" value for the Canadian exchange rate and that the Bank should prevent the actual exchange rate from straying too far from this value.

A non-technical explanation of how the exchange rate fits into the Bank's framework for monetary policy is presented in this article.[1] Four key points are made. First, a flexible exchange rate is an essential part of the Bank's overall policy framework—within which it acts to keep inflation low, stable, and predictable. Second, the Bank does not target any specific value for the exchange rate. Third, changes in the exchange rate are very important for the conduct of monetary policy because (i) such changes often reflect events in Canada or abroad that have a direct influence on the Canadian economy; and (ii) changes in the exchange rate cause adjustments in relative prices that, in turn, influence the Canadian economy. Fourth, following any given change in the exchange rate, the appropriate response

1. This article is a much condensed version of a forthcoming Bank of Canada Working Paper, "The Exchange Rate and Canadian Inflation Targeting," which provides background to a speech made by Governor Dodge on 17 February 2005 (available at www.bankofcanada.ca). Both were written while I was the visiting Special Adviser at the Bank of Canada. I wish to thank many people for very valuable comments on earlier drafts, including Bob Fay, Donna Howard, Peter Howitt, Paul Jenkins, Tiff Macklem, John Murray, Dale Orr, and James Powell. This article and the Working Paper represent my own view on the topic and should not be interpreted as the official view of the Bank of Canada. All errors are mine.

for monetary policy depends crucially on the cause of the change. Only by identifying the reason for the change is it possible to determine the net impact on Canadian aggregate demand and thus the appropriate response, if any, for monetary policy.

# A Review of Canada's Monetary Policy Framework

## Why target inflation?

The Bank's ultimate objective is to make the best possible contribution to the overall well-being of Canadians. Based on a large body of theoretical and empirical research, the Bank's policies (and those of most other central banks) are grounded in two essential propositions:

1. high inflation is damaging to the economy and costly for individuals and firms; and
2. monetary policy is unable to have systematic and *sustained* effects on any economic variables other than the rate of inflation.

These two propositions are the basis for the Bank's policy objective of maintaining low, stable, and predictable inflation. Specifically, the Bank aims to keep the annual rate of inflation of the consumer price index (CPI) at 2 per cent, the midpoint of a target range of 1 to 3 per cent. In practice, given the volatility of the prices of specific products, the Bank pays particularly close attention to the behaviour of "core" inflation, which is derived by stripping out the eight most volatile elements[2] from the broader measure of CPI inflation and adjusting the remaining components for the effects of changes in indirect taxes.

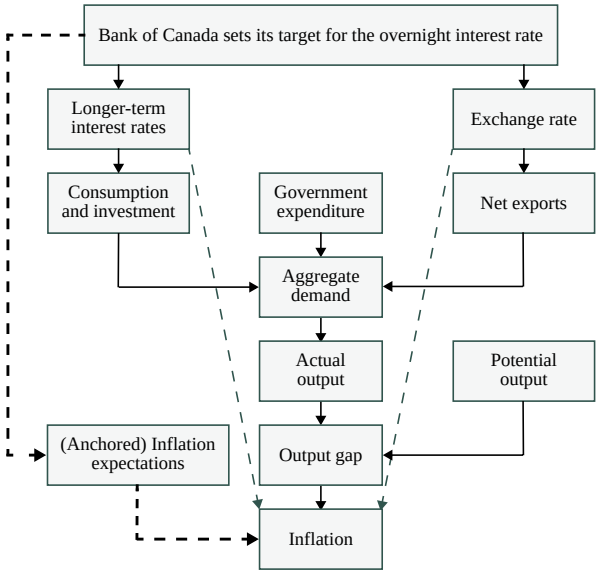
## The transmission mechanism

The Bank's commitment to maintaining low, stable, and predictable inflation is essential for influencing firms' and households' *expectations* of future inflation. Faced with a shock that pushes inflation either above or below the inflation target, Canadian firms and households are confident that the Bank will take actions to bring inflation back to the 2 per cent target. As a result, they are less likely to allow the current shock to alter their expectations of future inflation—their expectations tend to be well anchored.

The importance of well-anchored inflation expectations is best illustrated by recalling what happens when such anchoring is not present, as in the 1970s and 1980s. During those years, inflation was difficult to control because economic shocks led to adjustments in expectations which, in turn, led to behaviour that influenced actual inflation. An important lesson learned since the early 1990s, in Canada and elsewhere, is that keeping inflation expectations anchored at the 2 per cent target is important for keeping actual inflation low and relatively stable.

Chart 1

**The Transmission Mechanism of Monetary Policy**




*The Bank's commitment to maintaining low, stable, and predictable inflation is essential for influencing firms' and households'* expectations *of future inflation.*

Chart 1 is a simplified illustration of the transmission mechanism for monetary policy. To illustrate how it works, consider a situation where the Bank expects strong demand growth to push inflation above the 2 per cent target. The Bank's appropriate policy response is to tighten monetary policy in order to slow the growth of aggregate demand and prevent inflation from rising

2. The eight most volatile components are fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs.

above the target. How does the Bank achieve this objective?

It begins by increasing the target for the overnight interest rate. Two responses are expected, assuming no other economic shocks occur. First, there will generally be an increase in longer-term interest rates. Second, rising interest rates in Canada attract mobile financial capital, which increases the demand for the Canadian dollar and causes it to appreciate relative to other currencies.

The policy-driven increase in interest rates slows the growth in demand for consumer durables and business investment; the associated appreciation of the Canadian dollar reduces the expansion of exports and boosts imports. The combined effect is a reduction in the growth of aggregate demand for Canadian goods and services. Since the economy's level of total output, gross domestic product (GDP), is determined in the short run by the level of aggregate demand, the reduction in the growth of demand caused by the Bank's policy action causes a slowing of aggregate output. With some underlying trend growth rate of the economy's level of productive capacity ("potential output"), the reduction in the growth rate of GDP implies a widening of the *output gap*—the difference between actual output and potential output.

The final step in the transmission mechanism is the link from the output gap to the rate of inflation. If the slowing of actual output causes the level of actual GDP to fall below potential output, firms are producing below their capacity. This state of excess supply is eventually felt in the markets for labour and other inputs, and it leads to reductions in wages and other factor prices (or reductions in their rate of growth). These lower costs for inputs then contribute to a reduction in the rate of inflation relative to what would have occurred had the Bank not tightened its policy.

The increase in longer-term interest rates and the appreciation of the Canadian dollar also have a more immediate effect on inflation unrelated to their influence on aggregate demand. As interest rates rise, the cost of home mortgages increases, pushing up the prices of some components of the CPI. As the Canadian dollar appreciates, the price of imported consumer goods falls, reducing the prices of other components of the CPI, an effect known as *exchange rate pass-through*. Both effects are observed relatively quickly but are also quite modest in magnitude. They are shown with dashed lines in Chart 1.

Considerable time lags exist between the time of the Bank's policy actions; changes in quantities such as consumption, investment, and net exports; the full impact on aggregate output; and the eventual effect on the rate of inflation. The Bank currently estimates that it takes between 12 and 18 months before most of the effect from a policy action on aggregate output is observed, and between 18 and 24 months before most of the effect on inflation occurs. And even these estimates are subject to considerable variation.

## The role of the exchange rate

It is clear from Chart 1 that policy actions by the Bank will have their intended effect on aggregate demand and inflation only if they also have their intended effect on interest rates and the exchange rate. In other words, monetary policy works, in part, through its effect on the exchange rate.

Exchange rates do not change only because of monetary policy actions, however. Shocks to foreigners' demand for Canadian goods or services, as well as shifts in global asset portfolios away from or towards Canadian assets, can also cause the exchange rate to change. In general, it is helpful to remember that exchange rates are simply the price of one country's currency in terms of the currency of another country, and this relative price is determined in the world's foreign exchange markets, which in turn are influenced by the global demand for supplies of goods, services, and assets. Changes in flexible exchange rates are therefore market adjustments to underlying changes in some element of the world economy, changes that may be driven by monetary policy or by numerous other factors.

## The exchange rate is not a policy target

The exchange rate is important to monetary policy for two reasons. First, monetary policy works partly through its effect on the exchange rate, as Chart 1 illustrates. Second, most changes in the exchange rate are caused by economic shocks of various types, and the change in the exchange rate therefore provides valuable information about developments in the Canadian and global economies.

Under the Canadian regime of *flexible* exchange rates, the value of the exchange rate is determined by market forces. As a result, there is no time-invariant "right" value for the exchange rate—or, more correctly, the current value of the exchange rate *is* the right value in the sense that it reflects changes in demand or supply conditions in the world's foreign exchange markets. The

exchange rate may rise or fall in the future as events or policies change, both in Canada and abroad. But when the exchange rate is determined in free markets by the actions of millions of participants in hundreds of countries, it makes little sense to think of today's rate as being either "too low" or "too high."

*There is no time-invariant "right" value for the exchange rate—or, more correctly, the current value of the exchange rate* is *the right value in the sense that it reflects changes in demand or supply conditions.*

The Bank views any change in the exchange rate as a reflection of some underlying change in world markets and also recognizes that the change will itself have effects on the Canadian economy. Since the Bank's policy goal is to keep inflation at its 2 per cent target, it must determine the source of any persistent change in the exchange rate in order to understand how the underlying shock will affect the future path of aggregate demand, output, and inflation. Only then can it hope to design a policy that can, if necessary, offset the effects of the shock in an attempt to meet its inflation objectives. But the exchange rate is not a policy target for the Bank of Canada.

## Type One Exchange Rate Movements

In what follows, it is useful to remember that exchange rates change when shocks have *different* effects on one country than on another. For example, when we consider a shock that increases the demand for Canadian goods and services, and argue that it will tend to cause the Canadian dollar to appreciate, we really mean that the shock increases the demand for Canadian products *relative* to those from other countries.

### Defining Type One exchange rate movements

We define Type One appreciations of the Canadian dollar as those caused by economic shocks that effect a direct increase in the demand for Canadian goods and services. Similarly, Type One depreciations are caused by shocks that directly reduce the demand for Canadian products. Three examples, each leading to an appreciation of the Canadian dollar, illustrate the point (the opposite shock in each case would cause a Type One depreciation):

1. an increase in world demand for Canadian-produced goods and services;
2. an increase in the world prices of raw materials (caused by either growing world demand or reductions in supply by non-Canadian producers), which leads to an increase in the income of Canadian commodity exporters; and
3. a flow of financial capital into Canada that finances new investment in Canadian physical capital ("greenfield" investment).

The first example is the simplest. An increase in world demand for Canadian products *relative to the demand for other countries'* products creates an increase in the relative demand for the Canadian dollar, causing it to appreciate against other currencies. The second example involves an increase in the prices of many of the products exported by Canada; it is an improvement in Canada's terms of trade and a special case of the first example. This increase in income to Canada's exporters again represents a direct positive shock to Canadian aggregate demand, and it will cause an appreciation of the Canadian dollar. The third example illustrates that not all Type One exchange rate changes originate on the current account of the balance of payments. Suppose entrepreneurs rely on foreign financial capital to finance new investment projects in Canada. The new investment is a direct positive shock to Canadian aggregate demand; the inflow of financial capital increases the demand for domestic currency and causes an appreciation of the Canadian dollar.

### Direct and relative-price effects on aggregate demand

An appreciation of the Canadian dollar, by changing the relative prices of domestic and foreign products, leads to *substitution* in spending. Both Canadian and foreign consumers are led to substitute away from the now relatively more expensive Canadian goods and services towards the now relatively less expensive foreign products. In other words, by changing international relative prices, an appreciation of the Canadian dollar leads to a decrease in Canadian exports and an increase in Canadian imports.

Thus there are two distinct effects on Canadian aggregate demand with a Type One appreciation. At the initial

value of the exchange rate, the shock itself represents a direct increase to aggregate demand—the *direct effect*. But the shock also causes an appreciation which, by changing relative prices, leads to a reduction in net exports and aggregate demand. This is the *relative-price effect*. The overall net effect on aggregate demand is given by the sum of the direct and relative-price effects, which is generally not zero.

*A defining characteristic of Type One exchange rate movements is that the direct effect and the relative-price effect push aggregate demand in* opposite *directions.*

A defining characteristic of Type One exchange rate movements, therefore, is that the direct effect and the relative-price effect push aggregate demand in *opposite* directions; the movements in the exchange rate help to dampen or absorb the effects of the initial shock to aggregate demand.

### Implications for monetary policy

Owing to the time lags in the transmission mechanism, it is undesirable for the Bank to respond to exchange rate movements that are expected to be short lived. The effects on the economy are likely to be small, and any effects from a monetary policy response would probably occur only after the effects of the shock had disappeared. For this reason, as difficult as it is to do in practice, the Bank attempts to "see through" short-lived exchange rate changes and to focus only on persistent changes.

The appropriate policy response to a change determined to be persisent and Type One depends on the overall net effect on aggregate demand. Consider the case of an increase in world commodity prices that causes the Canadian dollar to appreciate. The direct effect is a positive shock to aggregate demand; the relative-price effect crowds out net exports and thus dampens the direct effect. In the typical case, the overall net effect on aggregate demand will still be positive, and thus monetary tightening by the Bank of Canada will be appropriate.

Chart 2 shows the results of simulating the effects of a temporary 10 per cent increase in real commodity prices in the Bank's new projection model, TOTEM (for Terms of Trade Economic Model). TOTEM can be used to predict the effects of shocks on the Canadian economy and to analyze the effects of monetary policy actions. The model can also be used to examine the aggregate demand consequences of external shocks to the demand for goods and services or shocks to the risk premium on Canadian assets—that is, it can be used to explore the different consequences of Type One and Type Two forces.[3]

Panel A shows the time path of the underlying shock to commodity prices: a sharp 10 per cent increase that dissipates fully over four years. Panel B shows the resulting appreciation of the Canadian dollar. (The nominal exchange rate is measured as the Canadian-dollar price of one unit of foreign currency, so a reduction in the exchange rate is an appreciation of the Canadian dollar.) Panels C and D show that commodity exports rise significantly, whereas manufactured exports, facing the headwinds of the stronger currency, are adversely affected. Total exports nonetheless increase markedly in Panel E, and this increase contributes to a boost in GDP, which leads to an increase in the output gap, as seen in Panel F (imports, not shown, rise in response to the appreciation, but net exports increase). Since output is determined by demand in the short run, the increase in GDP reveals that the net effect on aggregate demand of the Type One appreciation is indeed positive. The opening of a positive output gap implies the creation of excess demand in the Canadian economy. Monetary policy responds to this shock by raising the target for the overnight interest rate (Panel G). Despite the policy action, the excess demand results in an increase in the rate of core CPI inflation (Panel H), but the effect is reversed relatively quickly as inflation returns to its initial level within three years.

## Type Two Exchange Rate Movements

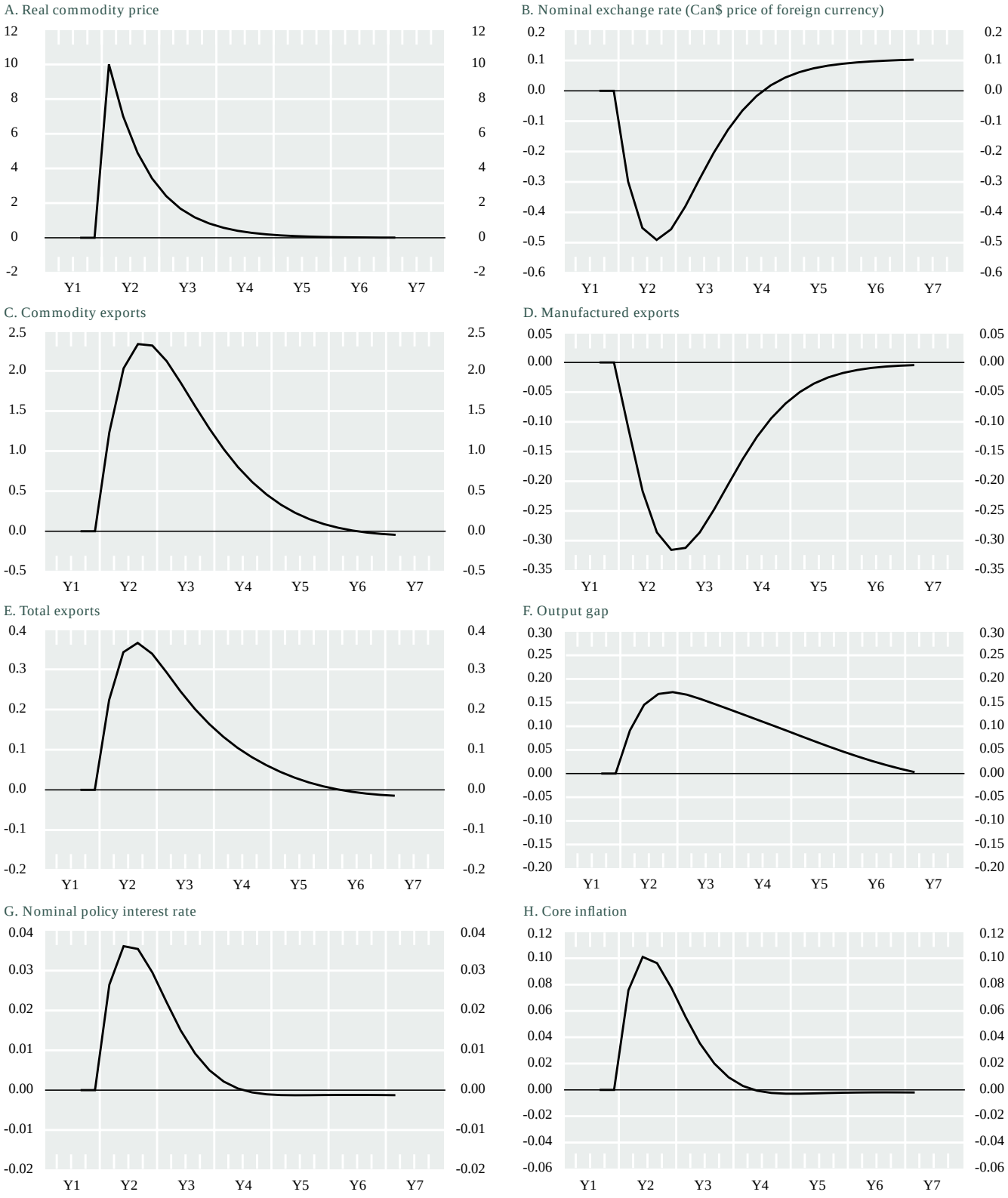
### Defining Type Two exchange rate movements

A Type Two exchange rate movement is associated with an underlying economic shock that *does not* impinge directly on the Canadian market for goods and services. Rather, any effect on Canadian aggregate demand or supply works through the exchange rate change itself. To illustrate, we consider three examples

3. TOTEM is currently a candidate for replacing the Quarterly Projection Model (QPM), the Bank's main model for projection and policy analysis.

**Chart 2**

## Type One Appreciation Caused by a Temporary Increase in Commodity Prices



of shocks that would cause the Canadian dollar to appreciate (the opposite shock in each case would cause a Type Two depreciation):

1. an adjustment in domestic or international financial portfolios away from foreign assets and towards Canadian assets;
2. a flow of financial capital into Canada to finance the purchase of existing physical capital ("brownfield" investment); and
3. a multilateral depreciation of the currency of a major trading partner required to resolve its existing current account deficit.

In the first two examples, the increase in demand for Canadian assets—either financial assets or existing physical assets—leads to an increase in the demand for Canadian dollars on foreign exchange markets, causing the Canadian dollar to appreciate. Both involve flows of financial capital and transactions in the capital account of Canada's balance of payments. In the third example, an appreciation of the Canadian dollar may be driven by the expectations of financial market participants, who see a Canadian-dollar appreciation as part of a global realignment of currencies required to resolve existing current account imbalances. Note that such adjustments may reflect less about the sustainability of Canada's international position than about the multilateral currency adjustments required to resolve imbalances among other countries. Note also that such expectations-driven currency adjustments need not involve actual financial flows between countries.

*A Type Two exchange rate movement is associated with an underlying economic shock that* does not *impinge directly on the Canadian market for goods and services.*

## Only relative-price effects on aggregate demand

In none of these three examples is there a direct impact on the demand for Canadian goods and services and hence on Canadian aggregate demand. This absence of any direct effect is the defining feature of Type Two movements in the exchange rate. But, as with Type One changes, the appreciation of the Canadian dollar in each case leads to a change in international relative prices, increasing the relative price of Canadian products while decreasing the relative price of foreign products. Thus, consumers in Canada and the rest of the world are led to substitute away from relatively more expensive Canadian goods towards relatively less expensive foreign goods. This relative-price effect leads to a fall in Canadian net exports and thus to a reduction in Canadian aggregate demand.

Type One exchange rate changes create two distinct effects—the direct effect on aggregate demand is partially offset by the relative-price effect. Type Two changes, however, have only one effect—the relative-price effect. With no direct effect on aggregate demand, the overall net effect on aggregate demand is determined solely by the relative-price effect.

## Implications for monetary policy

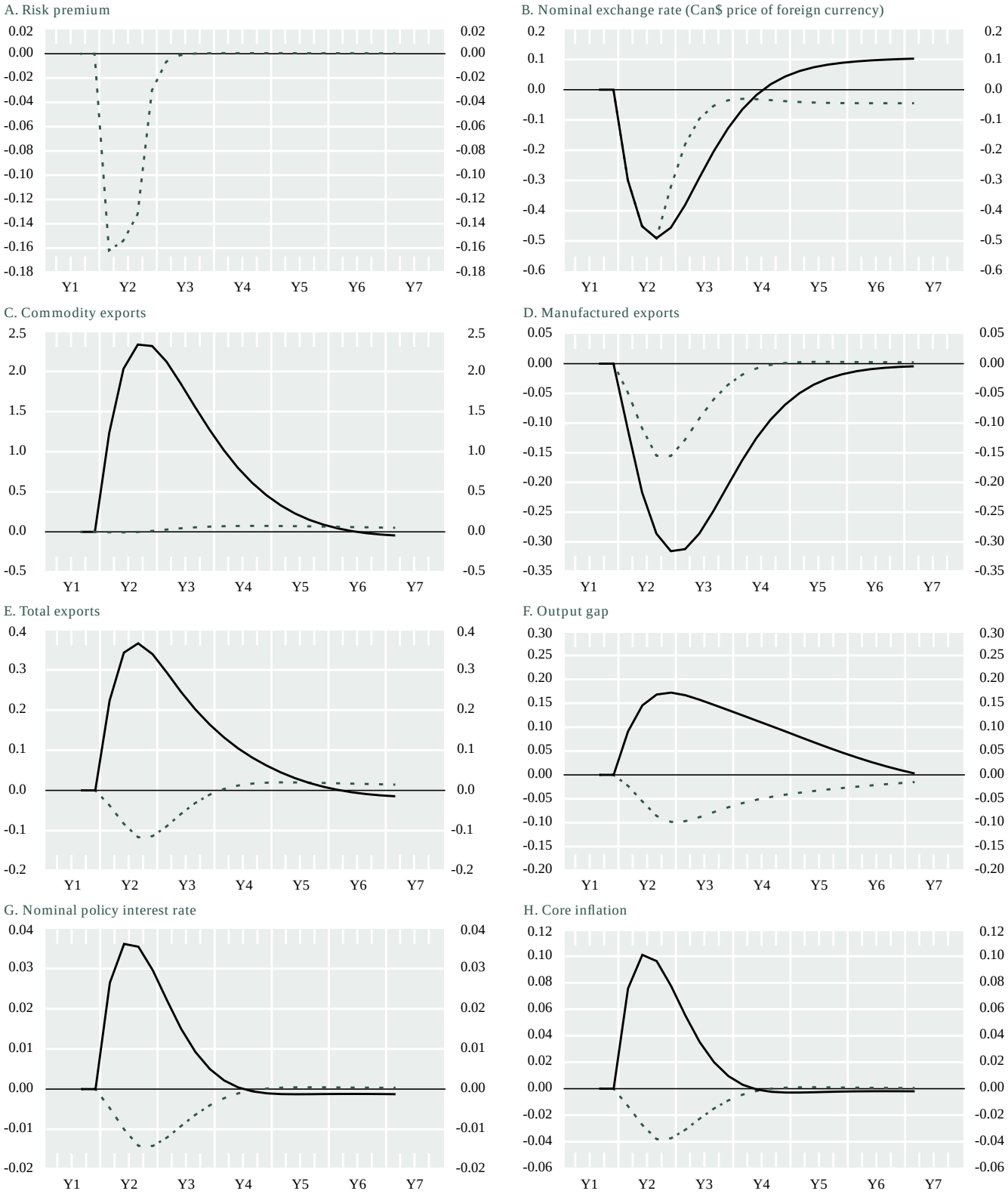
As we said in our discussion of Type One changes, it is undesirable for the Bank to respond to short-lived changes in the exchange rate. And changes caused by Type Two forces, which often derive from changes in investors' perceptions about relative asset qualities, frequently last for only short periods before being reversed. Thus, faced with an apparent Type-Two-induced change, it is especially important for the Bank to assess the likely persistence of the shock.

Chart 3 shows a simulation from the TOTEM model in which the underlying economic shock is a *decrease* in the perceived risk premium on Canadian financial assets. This shock reflects a special Type Two appreciation constructed to give the same initial exchange rate path as for the Type One appreciation shown in Chart 2 (also pictured), which allows us to compare the effects of equal-size currency appreciations that differ only with respect to their underlying causes. The solid lines show the effects of the commodity-price increase; the dashed lines show the effects of the decline in the risk premium on Canadian assets.

Panel A shows the time path of the underlying shock to the risk premium, a significant decrease that persists for two years; Panel B shows the effect on the nominal exchange rate, an initial path identical to that for the Type One appreciation. Panels C and D show the path of exports—commodity exports are only slightly affected because the Canadian-dollar appreciation has little or no effect on the world prices of these products (expressed in U.S. dollars). In contrast, the appreciation of the Canadian dollar clearly hampers economic

**Chart 3**

## Type One and Type Two Appreciations Compared



prospects for exporters of manufactured products. Total exports fall in Panel E, and this reduction contributes to a slump in GDP, and thus the opening of a negative output gap, as seen in Panel F. This negative output gap implies a state of excess supply. Monetary policy responds to this shock by lowering the target for the overnight interest rate (Panel G), but a reduction in core CPI inflation still occurs (Panel H) for a little over two years.

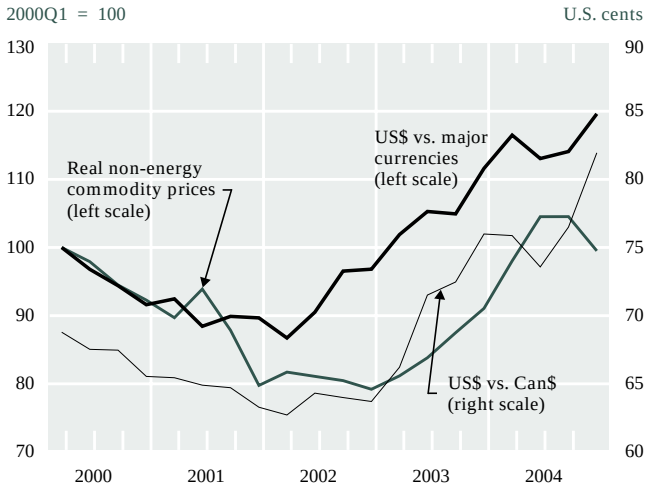
## The Ongoing Challenge for Monetary Policy

While changes in the exchange rate become apparent almost instantly, it is not easy to determine what events are causing the change. And here lies the central policy challenge, for without identifying the cause of the change, it is not possible to determine the net effect on aggregate demand and thus the appropriate policy response. This challenge is frequently made even more difficult by the simultaneous occurrence of several shocks, so that an observed movement in the exchange rate may have more than one driving source. In such a situation, opposing forces would likely be acting on Canadian aggregate demand, and the task for the Bank would be to determine the relative importance of each force.

Consider a hypothetical, but realistic, example. Suppose the economic environment in Canada—including taxation, regulation, productivity growth, and inflation—improves in such a way that Canada is viewed as being a more favourable location in which firms can invest and operate. This improvement could lead to two different shocks for the Canadian economy. First, foreign or multinational firms may choose to locate more of their productive facilities or head offices in Canada, and they may bring the financial capital necessary to finance the construction of such facilities. The resulting inflow of financial capital will cause an appreciation of the Canadian dollar, and the new construction will represent new investment in physical capital. This is a Type One appreciation of the Canadian dollar, as there is a direct positive effect on aggregate demand. Second, global investors would choose to rebalance their portfolios towards Canadian financial assets. The inflow of financial capital used to make such purchases would lead to an appreciation of the Canadian dollar, but there would be no direct effect on Canadian aggregate demand. This is a Type Two appreciation. In this example, the Canadian dollar would likely appreciate in response to *both* Type One and Type Two forces, and the task for monetary policy would be complicated by the need to determine the *relative* contribution to the overall appreciation from each force.

**Chart 4**

**Two Forces Behind Movements in the Canadian Dollar**




### An example from recent history

Consider how the distinction between Type One and Type Two exchange rate changes can be used to interpret economic developments and the Bank of Canada's policy actions during 2003 and 2004, a time when the Canadian dollar appreciated sharply against the U.S. dollar. Both types of exchange rate movements appear to have been operating during this period, although their relative importance shifted over time, as shown in Chart 4.

In 2003, the Canadian dollar appreciated against the U.S. dollar by just under 20 per cent, from below 65 cents (US) in January to over 75 cents (US) in December. What caused this appreciation? Real non-energy commodity prices increased by about 12 per cent, a clear Type One force. At the same time, the U.S. dollar weakened against the currencies of all major countries (including other large commodity importers) by roughly 15 per cent, suggesting the presence of powerful Type Two forces. Net exports made a significant negative contribution to Canada's economic growth in 2003, and this slowdown is consistent with the possibility that Type Two forces were dominant at that time. The Bank's decision to reduce its target for

the overnight interest rate in early 2004 might be explained by the prospect that this slowdown in net exports was expected to continue.

By the late summer of 2004, however, rising world commodity prices and fast-growing world demand had been a key feature of the economic environment for several months. Though the U.S. dollar continued to weaken during this period, net exports made a substantial positive contribution to Canadian GDP growth in the first half of 2004. These developments are consistent with Type One forces playing the dominant role. With the Canadian economy fast approaching its capacity limits, the Bank of Canada raised its policy interest rate in September.

*Not all changes in the exchange rate are created equal. The cause of any given change is as important for monetary policy as the change itself.*

Late in 2004, however, the balance of economic forces shifted again, with an increase in the relative importance of Type Two factors. The U.S. dollar weakened sharply against all the major floating currencies, and the Canadian dollar appreciated to a 13-year high of over 85 cents (US). This appreciation occurred despite a decline in commodity prices and a weakening outlook for global economic growth. Thus, Type Two forces were likely driving the strength in the Canadian dollar, offsetting the neutral or even negative Type One forces. The Bank left its target for the overnight rate constant at the time of its December 2004 policy decision. (By July 2005, the Bank's target for the overnight rate was still at the level from October 2004, unchanged for nine months.)

## Conclusion

Not all changes in the exchange rate are created equal. The cause of any given change is as important for monetary policy as the change itself. The central point of this article has been to explain the difference between two important types of changes to the exchange rate, and to explain why they are associated with different net effects on Canadian aggregate demand. Determining the cause and persistence of exchange rate changes is an important ongoing challenge for the Bank of Canada. But such determination is essential if the Bank is to take the appropriate policy action, consistent with its objective of keeping inflation low, stable, and predictable.

# Speeches

## Introduction

Governor Dodge spoke about the policies that governments around the world need to adopt in order to bring about an orderly resolution to global economic imbalances in a speech to the Canada-U.K. Chamber of Commerce on 28 June.

On 22 September, Mr. Dodge described for the Toronto Society of Chartered Financial Analysts ways that policy-makers can build a regulatory framework that enhances financial system efficiency, including by promoting competition. He stressed that, for the framework to be effective, it is important that regulations are enforced and are seen to be enforced.

The two speeches are reproduced in this issue of the *Review*. The full text of other speeches given by the Governor can be found on the Bank's website at www.bankofcanada.ca, including:

| | |
|---|---|
| 14 July 2005 | Opening statement following the release of the *Monetary Policy Report Update* |
| 28 June 2005 | Remarks to the Canada-U.K. Chamber of Commerce, London, U.K. |
| 15 June 2005 | Remarks to the Winnipeg Chamber of Commerce, Winnipeg, Manitoba |
| 8 June 2005 | Remarks to the Canadian Chamber of Commerce in Japan, Tokyo, Japan |
| 2 June 2005 | Remarks to the Canada China Business Council, Beijing, China |
| 30 May 2005 | Remarks by David Dodge to la Conférence de Montréal, Montréal, Quebec |
| 27 May 2005 | Remarks to the Canadian Economics Association, Hamilton, Ontario |
| 6 May 2005 | Remarks to the Ottawa Chamber of Commerce, Ottawa, Ontario |
| 20 April 2005 | Opening statement to the Senate Committee on Banking, Trade and Commerce |
| 19 April 2005 | Opening statement to the House of Commons Finance Committee |
| 15 April 2005 | Remarks to the Canadian Association of New York, New York, N.Y. |
| 14 April 2005 | Opening statement following the release of the *Monetary Policy Report* |
| 30 March 2005 | Remarks to Humber College Institute of Technology & Advanced Learning, Toronto, Ontario |
| 21 March 2005 | Remarks to the National Association for Business Economics, Washington, D.C., U.S.A. |
| 17 February 2005 | Remarks to the Vancouver Board of Trade, Vancouver, British Columbia |
| 27 January 2005 | Opening statement following the release of the *Monetary Policy Report Update* |
| 9 December 2004 | Remarks to the Empire Club of Canada and the Canadian Club of Toronto, Toronto, Ontario |

# Financial System Efficiency: Getting the Regulatory Framework Right

*Remarks by David Dodge*
*Governor of the Bank of Canada*
*to the Toronto Society of Chartered Financial Analysts*
*Toronto, Ontario*
*22 September 2005*

I am happy to have the opportunity today to follow up on a speech I gave here in Toronto last December. In that speech, I talked about the need for Canada to improve its financial system efficiency. Today, I want to focus my remarks on how regulation can, and must, contribute to that important goal. When I talk about an efficient financial system, I mean a system that helps to allocate scarce economic resources to the most productive uses. By making our financial system more efficient, we can help generate sustained economic growth and prosperity.

The Bank of Canada has been contributing to the goal of an efficient financial system in a number of ways. The Bank's monetary policy aims to keep inflation low, stable, and predictable. By doing so, we enhance Canadians' confidence in the value of their money, thus reducing the need for people to spend resources either anticipating or coping with inflation. We also contribute to efficiency through our role as overseer of major payments, securities, and foreign exchange clearing and settlement systems, and by providing liquidity in times of financial stress. By reducing risks to the safety and stability of the financial system, we increase certainty about the robustness of the system, thus supporting efficiency. Our semi-annual *Financial System Review* promotes awareness of financial system issues, looks at developments and trends in the system, and addresses issues that affect its safety, soundness, and efficiency. As well, the Bank works actively with market participants and regulators to develop and promote an efficient financial system. And we conduct research that helps inform the decisions of policy-makers in terms of promoting this goal.

Today, what I want to talk about is how policy-makers can support efficiency by getting the regulatory framework right. I will start with some brief remarks about regulation in general. I'll then discuss how our regulatory framework can support financial system efficiency, and how we can best make sure that our framework is an effective one. I'll conclude with a look at some current issues in financial system regulation and the various ways in which the Bank is involved in them.

## How Regulation Can Promote Financial System Efficiency

Let me start with a basic premise. For any market economy to operate efficiently and achieve an optimal allocation of resources, there needs to be a solid legal and regulatory framework. Basic legal concepts, such as property rights, the rule of law, and the honouring of contracts, must be in place in order for market forces to work and to generate wealth.

Once this is done, policy-makers have a number of overlapping motivations for further regulation. I'll spend much of my time today talking about the promotion of efficiency. But regulators also act to improve the safety and stability of the financial system, and to protect investors and savers.

Let me set out three principles that policy-makers should apply in deciding when regulation is appropriate. First, regulation is appropriate to correct a market failure or, to put it in economic jargon, to deal with "externalities." The second principle is that regulation must be effective. Even when a market failure is recog-

nized, regulators should act only if there is a reasonable chance that they will actually address the failure in question. The third principle is that the benefits of a particular regulation must be greater than the costs it imposes. In trying to solve one problem, regulators must avoid causing even greater problems.

With these principles in mind, let me now describe three ways in which regulators can enhance the efficiency of the financial system. The first is to **promote competition** in domestic and international markets. Competition unleashes the forces that drive financial institutions and markets to become more innovative and efficient. That doesn't mean that regulators should "just get out of the way." Appropriate regulation can enhance competition. For example, an important goal of the Competition Bureau is to prevent firms from unfairly restricting competition.

*Competition unleashes the forces that drive financial institutions and markets to become more innovative and efficient.*

Canada became a world leader in promoting competition in financial markets when it adopted many of the recommendations of the Porter Commission of the 1960s. At a time when policy-makers worldwide favoured extensive government controls on economic activity, particularly within the financial system, Porter broke new ground by coming out strongly in favour of enhancing efficiency through the promotion of competition and freer markets.

Competition is enhanced by expanding the scope of a given market. One way to do this is to have our markets and institutions compete with those in other countries and to have foreign enterprises compete in our markets. Therefore, regulation needs to take international considerations and developments into account. I'll have more to say on this point in a few minutes. For now, the point I want to stress is that competition leads to greater efficiency.

A second way that good financial system regulation can promote efficiency is by working to **correct "information asymmetries"** that sometimes occur, and that can lead to market failures and a suboptimal allocation of funds. Most often, these failures arise when there are significant differences in the quantity or quality of relevant information available to market participants.

Regulation should be designed so that investors are able to adequately gauge the risks and potential returns of an investment. To be clear, I'm not saying that the goal of regulation should be *full* disclosure of *all* information. Rather, the aim should be to reduce information asymmetries to the point that the benefits of disclosure still outweigh the costs of compliance. In that way, regulation can lead to a more efficient financial system.

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The third way that financial system regulation can support efficiency is to **promote overall financial stability**, which essentially means limiting systemic risk. The idea that regulation can support efficiency at the same time as it promotes stability may strike some as counterintuitive. But these objectives are not mutually exclusive. If the regulation is carried out in the right way, enhancing stability can lead to increased efficiency through the saving of resources that would otherwise be dedicated to guarding against systemic risk.

Let me elaborate. I noted earlier that the Bank's monetary policy supports efficiency by increasing certainty about the future value of money. This reduces the need for Canadians to spend resources on activities intended to protect them from inflation. Similarly, enhancing the safety of the financial system reduces the need for Canadians to unnecessarily spend resources to guard against the risk of a financial crisis.

Policy-makers are more likely to successfully promote both stability and efficiency if they bring market players into the picture when addressing a particular issue. Canada's Large Value Transfer System (LVST) provides a good example of how systemic risk can be mitigated in the most efficient way. The LVST processes Canada's large-value or time-critical payments. It

gives participants the certainty that once a payment has been processed, the transaction will settle on the same day, regardless of what might later happen to any of the participants. This certainty enhances efficiency on its own. But, in addition, the design of the LVST minimizes the amount of collateral that each institution needs to pledge to the system, compared with the gross settlement systems used in other countries. This reduction in collateral frees up resources that can then be put to more efficient uses elsewhere.

## Building an Effective Framework

That's a look at three ways in which a sound regulatory framework can improve the efficiency of the financial system—by promoting competition, by reducing information asymmetries where practical, and by reducing systemic risk. But to further our goal of improving efficiency, it is also important that our regulatory framework be *effective*. What makes a framework effective? I would highlight three factors.

First, our regulations should provide incentives that encourage markets to reinforce and reward the right behaviour. These incentives should be sufficient to motivate market participants without the constant intervention of regulators or the imposition of detailed rules that dictate to firms not just what must be done, but *how* it must be done. The right incentives can help regulators achieve their goals without imposing process costs that outweigh the benefits of the regulation.

*Our regulatory framework needs to be—and needs to be seen to be—as good as, if not better, than that of other countries.*

Second, to achieve an effective regulatory framework, we need to take international developments into account. Countries can gain a comparative advantage by developing a superior regulatory framework. For our financial markets and institutions to be internationally competitive, our regulatory framework needs to be—and needs to be seen to be—as good as, if not better, than that of other countries.

But at the same time, Canadian rules and their application should be tailored to our domestic needs and should reflect domestic realities. This tension between domestic and international considerations leads to some challenges for Canadian policy-makers. A case in point is the Sarbanes-Oxley law. Canadian policy-makers embrace the general principles behind this legislation in terms of promoting good governance and financial practices. But the extreme level of detail in the application of its rules, as well as its focus on process instead of outcomes, creates costs for many of our firms that likely exceed the benefits to the system. Large Canadian corporations that want access to U.S. capital markets have no choice—they must follow both the spirit and the letter of Sarbanes-Oxley. But Canadian regulators are right to take a made-in-Canada approach that accommodates the needs of Canadian issuers and investors.

Let me be clear. The goal is not to mimic U.S. regulations, despite that market's size and proximity. The *principles* behind our regulations must be as good as, or better than, those of other countries. But we must apply those principles in a way that develops a comparative advantage for our firms and our markets.

Finally, and very importantly, an effective regulatory framework is one where the rules are enforced and are perceived to be enforced. Even the most coherent and efficient regulatory framework won't be effective unless it is followed. Participants must be appropriately monitored. And when the rules are broken, offenders must be prosecuted, and adequate penalties must be strictly applied. A framework with strong monitoring, prosecution, and application of penalties provides the incentives for firms to follow the rules, and this adds to the framework's credibility. When everyone is playing by the rules—and everyone is confident that others have the incentives to do the same—then markets operate with greater efficiency.

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I've said before that regulation should be designed to enhance confidence and support trust in markets and institutions. Let me talk about one issue as an example. Canadian-listed firms can sometimes have a lower market valuation than similar firms listed in the United States. Why? Bank of Canada research has pointed to concerns about governance as a possible cause. And one of the main concerns appears to be a perception that Canadian enforcement of insider-trading laws is not as strong as it could be. We are continuing our research to better understand the root of this perception.

The key point here is that to improve the effectiveness of our regulatory framework, investors must have confidence that they will be treated fairly. To repeat: we must have, and be perceived to have, proper enforcement in Canada.

## Current Issues in Financial System Regulation

That's a look at how a sound regulatory framework can improve the efficiency of the financial system. Now let's turn to some current issues, a number of which the Bank of Canada has some involvement in.

The Bank has been active in terms of research and commentary on developments aimed at improving efficiency. We have worked alongside the private sector to improve the safety and efficiency of clearing, payment, and settlement systems. For example, we've recently worked with various groups to make sure that participants are continuing to pursue more robust business-continuity plans, especially from a system-wide perspective. By increasing the degree of certainty that critical systems will be operational in times of disruption, the development of appropriate business-continuity plans can improve the overall efficiency of the financial system.

With respect to fixed-income markets, the Bank is also playing a role in helping to develop regulations regarding transparency and alternative trading systems. We are promoting innovations such as electronic trading systems, because they provide opportunities to reduce transactions costs and increase transparency to appropriate levels. This will increase liquidity and lead to better-functioning markets. And through our research, our commentary, and, in some cases, our direct involvement, we contribute to the design of rules and codes of conduct that improve the functioning of both fixed-income and foreign exchange markets.

Of course, one ongoing issue in the financial system is the question of consolidation among financial institutions. In my speech here in Toronto last December, I noted that Canada is facing a difficult policy challenge as we try to keep up with other countries that have enthusiastically adopted the competition-based regulatory philosophy espoused by the Porter Commission. We need to strive for a policy framework that continues to provide incentives for innovation and efficiency by encouraging competition. At the same time, we need to consider how to allow our financial institutions the scope to improve efficiency through economies of scale.

Recent research at the Bank of Canada that examined economies of scale in banking concluded that there could be untapped efficiency gains for Canadian financial institutions. The benefits from these efficiency gains could flow across the economy, through lower-cost business and retail lending. But there are other relevant public policy questions here as well, including foreign ownership and concerns about the concentration of market power among very few players. Striking a balance between these interests is not a simple task. But in terms of competition, we should keep in mind that the level of competition can be maintained or enhanced by new entrants in the marketplace or by the threat of new entrants.

Another issue that is being hotly debated relates to the ideal structure for securities regulators in Canada. What I said about this issue last year remains true today. Efficiency dictates that Canada should have uniform securities laws and regulations based on principles that apply to everyone.

But the question is how to apply these rules in a tiered way to take into account the differing needs of issuers. For example, one tier could apply to large, complex firms that want access to international capital markets. Rules for these firms would be similar to those that are applied in New York or London. At the other end of the spectrum, another tier could apply to small, speculative resource firms that have historically relied on Canadian equity markets for financing. A third tier in the middle could apply to the bulk of Canadian "mid-cap" firms, which choose to access only Canadian cap-

ital markets, and which very often are smaller and less complex than U.S. "mid-cap" firms.

These different tiers of firms exist in all major provincial jurisdictions. And investors in every jurisdiction have similar needs. So the key point is that, while the application of rules needs to take into account the size and complexity of firms, there is no need for different rules to be applied based on the province or territory of the issuer or investor.

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## Conclusion

In closing, let me say that I hope you've found my comments to be topical. Many important decisions about our regulatory framework are currently being considered, and these will profoundly affect the Canadian economy. In making those decisions, it is very important that policy-makers keep in mind the goal of efficiency. They can support this goal by promoting competition, by correcting market imperfections where practical, and by promoting financial stability through reduced systemic risk.

But it is even more important to remember why the goal of efficiency must be followed. Ultimately, policy-makers must strive to provide the best possible environment for achieving optimal allocation of economic resources. This is how policy-makers and regulators of the financial system can best serve the public and contribute to sustainable economic growth and prosperity in Canada.

# The International Monetary Order and the Canadian Economy

*Remarks by David Dodge*
*Governor of the Bank of Canada*
*to the Canada-U.K. Chamber of Commerce*
*London, United Kingdom*
*28 June 2005*

As business people with ties to Canada and the United Kingdom, you are keenly interested in the economic prospects of both countries. When we look closely at our economies, it is striking how much they have in common in terms of policies and outlook.

The United Kingdom may have roughly twice the population of Canada, but our economies share some very important characteristics. Both are relatively small compared with our respective neighbours—the euro zone and the United States. From a macroeconomic perspective, we both operate with an inflation-targeting regime, backed by a flexible currency. We have had a record of sound fiscal policy, certainly in comparison with our large neighbours. We are relatively open economies and depend greatly on international trade for economic growth. This means that global developments are central to our own domestic economic performance. So I will begin my remarks today by talking about international issues—particularly global economic imbalances—before discussing how the Canadian economy is adjusting to international events.

## Global Imbalances—Origins and Solutions

When I say "global imbalances," I am referring to the persistent and growing current account deficit in the United States that is mirrored by large current account surpluses elsewhere, especially in Asia. While Canada and the United Kingdom have not contributed in a major way to the creation of these imbalances, we *will* be part of the solution, whatever that solution turns out to be. And given our dependence on international trade and global financial stability for economic growth, we both have a major stake in seeing that global imbalances are resolved in an orderly way.

These imbalances reflect the financial flows associated with mismatches in savings and investment on a global scale. Since the latter part of the 1990s, many economies outside the United States have increased their national savings by a very large amount for various reasons. At the same time, the United States has reduced its savings and has become increasingly reliant on foreign borrowing.

Why should we care about global imbalances? After all, isn't it a good thing that markets allow investors in Asia and elsewhere to fill the savings gap in the United States? In theory, yes. But there are three concerns with the current situation. First, these financial flows are not sustainable indefinitely, and there are risks that markets could adjust in an abrupt way. Second, it seems clear that the excess savings in Asia could be put to better use in Asia itself. And third, there is concern that imbalances are contributing to rising protectionist sentiment.

So how can we achieve an orderly resolution of these imbalances? Within domestic economies, savings flow across sectors and regions without much risk of disruption, because market-based mechanisms—such as changes in relative wages, prices, and returns on capital—are allowed to work. These market-based mechanisms should also be allowed to work internationally. Unfortunately, a number of inappropriate national policies are preventing these mechanisms from working effectively, and so imbalances are growing unchecked. We know that U.S. external indebtedness—even with that country's reserve-currency status—cannot keep growing indefinitely as a share of its GDP. Eventually, investors will balk at increasing

their exposure to the United States. Should that occur suddenly, we could see economic growth plummet and world financial markets become disorderly, threatening global financial stability.

Global imbalances are a global problem, and we need to think about them collectively. There is no simple solution to these saving-investment mismatches. But we must deal with the fact that the amount that citizens and businesses in the euro zone and much of Asia currently want to save exceeds the amount that firms there want to invest. And with current policies, this situation may persist for some time. As well, most oil-exporting countries are now generating large net savings. At the same time, desired investment in the United States exceeds desired national savings by a considerable amount, although it is not certain that this situation will persist.

*Global imbalances are a global problem, and we need to think about them collectively.*

Thus, as we look out over the next decade or so, there is a risk that we will find ourselves in a situation of global excess supply. This could happen if policy-makers fail to take appropriate measures, and the risk will increase if policy-makers resort to protectionism. Should these risks materialize, the global economy would then be headed for a period of very slow growth, perhaps punctuated by periods of outright recession.

I hasten to add that this is *not* a prediction on my part. I am only saying that such an outcome would be the consequence of inappropriate policies in many economies. And this outcome would hurt us all—including Canada and the United Kingdom—even if in our own case we are following appropriate policies. So it is clearly in everyone's interest to discuss these issues, not only domestically, but most importantly in international forums, such as the International Monetary Fund, the G–7, and the G–20.

Ironically enough, the key to changing global savings and investment flows rests with each country doing what is right for itself. If all countries followed a framework of appropriate domestic policies, this would go a long way towards defusing the danger posed by global imbalances. These policies go well beyond the responsibilities of a central banker. But I am raising them because it is important that they be discussed more broadly. So let me take a few minutes to review some of these policies. I'll start with issues outside of central banking before turning to monetary policy.

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## Appropriate Policies Support Confidence

The way to ensure that global demand continues to grow over time is for all policy-makers to follow frameworks that give households the confidence to spend and businesses the confidence to invest. Let's look at how this applies to fiscal policy. There is a clear need for countries to pursue a fiscal policy aimed at producing a sustainable ratio of public debt to GDP. Such a policy gives businesses and consumers confidence that the value of their money will not be eroded over time, either by high inflation or by excessive rates of taxation. Where a sustainable public debt-to-GDP ratio is now absent, it should be achieved; where it is present, it should be maintained. Clearly, fiscal consolidation is in the best interest of the U.S. economy and would also be helpful in resolving global imbalances. More generally, sound fiscal policies help support investor and household confidence in all economies.

The second point is that authorities everywhere need to ensure that domestic policies are promoting well-functioning markets for goods, services, capital, and labour. In particular, labour markets need to be flexible enough to facilitate the movement of workers from sector to sector as the economy adjusts to events. This is especially true in the euro zone, where rigid labour markets have been undermining confidence. Businesses hesitate to hire when labour market rules are so restrictive, and households lack the confidence to spend when unemployment rates are so high. By promoting domestic flexibility, policy-makers everywhere could

support confidence and boost growth. This would be good for national economies, and it would also help to resolve global imbalances.

*By promoting domestic flexibility, policy-makers everywhere could support confidence and boost growth.*

There is also a need for policy-makers to recognize the positive role played by a well-functioning social safety net. Here, I am referring to unemployment insurance, public health care, and public pension systems. The benefits of a well-functioning safety net should not be underestimated. Consider the countries of emerging Asia, where such systems are lacking. Because there is no social safety net, citizens in those countries need very high levels of savings to mitigate the risk of job loss and illness, and to provide for the years after they leave the workforce. A well-functioning social safety net pools risk, so that citizens can have increased confidence about the future and reduce their need for precautionary savings. Boosting consumption in Asia would certainly help with the resolution of imbalances. Of course, the key to a well-functioning safety net is that it actually functions well. We have seen examples where safety nets become so unwieldy that they act as a hindrance, holding back prospects for growth. Certain Asian economies also face the particular challenge of ensuring that the benefits of increased growth and higher incomes are spread more widely throughout the economy. I'll return to this point in a moment.

Authorities everywhere also need to follow policies that help a country's financial system work well. This is critical if the financial system is to carry out its vital role of helping to match savings with productive investments. The financial system can also support confidence by giving households appropriate access to credit. So it is essential that emerging-market economies have sound and efficient banking systems. The Asian crisis of 1997–98 illustrated this point clearly. International institutions, such as the Financial Stability Forum, have been working on this issue. While a number of emerging-market economies still have some distance to go, I am happy to say that we have seen some progress in many countries over the past few years.

Finally, appropriate monetary policy is very important. It can help instill confidence among consumers and businesses alike. Canada's monetary policy is anchored by an inflation-targeting system—a system that has also been adopted by the Bank of England. The Bank of Canada aims to keep inflation at 2 per cent, the midpoint of a 1 to 3 per cent range. Under this regime, not only has inflation in Canada remained near the target in recent years, but inflation expectations are now anchored near 2 per cent. As a result, market signals can be sent and received more clearly, and Canadian businesses and consumers are more confident about the future value of their money.

A critical feature of our inflation-targeting system is that we operate *symmetrically* around our target. This means that we care just as much about inflation falling below target as we do about inflation rising above it. This symmetric approach helps keep the Canadian economy near its production potential, thus encouraging strong, sustained growth in output and employment. I'm not arguing that all countries should copy every detail of our inflation-targeting regime. But it is important that central banks follow policies that anchor inflation expectations and thus prevent a buildup of deflationary as well inflationary pressures.

As I mentioned before, both Canada and the United Kingdom operate with a flexible exchange rate. Much has been said recently about floating exchange rates in relation to certain Asian economies—China in particular—and global imbalances. The policies of some Asian economies to encourage export-led growth, including the fixing of their exchange rates to the U.S. dollar, have caused a buildup of large foreign exchange reserves, thus exacerbating global imbalances.

*Floating exchange rates are not the whole answer to the problem of global imbalances, but they are an important part of the solution.*

It's important to point out that, in theory, there is nothing wrong with countries having fixed exchange rates. But in practice, there is a major problem. Through "sterilization," certain Asian countries—including China—have been trying to offset the domestic price effects of their foreign exchange intervention. This is inhibiting economic adjustment.

At the Bank of Canada, we have argued that it is very much in China's own economic interest to float its currency. By having a flexible currency, China could gear its own monetary policy to its own domestic considerations. If the external value of the renminbi were allowed to rise, the global purchasing power of Chinese citizens would also rise. This, in turn, would help to spread the gains from integrating into the world trading order throughout Chinese society and would allow that country to boost its consumption, thus helping to resolve global imbalances. Floating exchange rates are not the whole answer to the problem of global imbalances, but they are an important part of the solution.

As I just said, when countries offset the effects of intervention, they delay domestic economic adjustment. They also delay global adjustment. Just as worrying, such intervention is provoking threats in certain political quarters of protectionist measures. Such wrong-headed measures could choke off the growth of international trade that has led to rising incomes worldwide.

*It is critical that we get on with the job of building an international monetary order for the 21st century.*

And so it is very important that all countries work to protect and enhance the free flow of goods and services by pushing the Doha round of trade talks to a successful conclusion, and by strengthening the World Trade Organization to ensure proper compliance with the rules of trade. All of us need to support these efforts and to be vocal in resisting calls for protectionism.

In addition, it is critical that we get on with the job of building an international monetary order for the 21st century. A more effective International Monetary Fund (IMF) has a crucial role to play in this regard. This issue is extraordinarily important, and I spoke at length on this topic in a speech I gave last month in Montréal. You can find that speech on the Bank of Canada's website.

## Current Economic Developments in Canada

Against that backdrop, what specific policies are needed to help the Canadian economy adjust to global developments? While imbalances pose risks ahead, recent economic growth in the global economy has been quite strong, led by the United States and China. This growth has increased the world prices of oil and of many other commodities that we produce in Canada. As a result, there has been a marked improvement in our terms of trade—that is, the ratio of the prices that we receive for our exports to the prices we pay for our imports. This improvement has helped to raise real incomes and stimulate domestic demand in Canada. We have also been importantly affected by the sharp appreciation of the Canadian dollar against the U.S. dollar over the past couple of years—an appreciation that has had a major impact in many sectors.

The Canadian economy has been adjusting to these economic forces. We have seen increased business investment spending in sectors that are benefiting from higher world prices. We are also seeing rising investment in sectors that are not very exposed to international trade, as such firms react to strong growth in domestic demand. And we've had very strong investment in housing. But in other sectors that are highly exposed to international trade, mainly goods-producing sectors, prices are either falling or rising very slowly. Firms in these industries are feeling the pressure of the higher Canadian dollar, and they are also facing increased competition from other regions of the world.

The good news is that many Canadian firms are making the necessary adjustments. Investment spending is being directed towards increased specialization, higher productivity, and lower costs. Since much of the productivity-enhancing machinery and equipment is priced in U.S. dollars, the stronger Canadian dollar has made it easier for firms to make investments. A growing number of firms are looking to cut costs by importing more inputs, particularly from Asia. Other firms are phasing out production lines with low profit margins.

Through its monetary policy, the Bank of Canada is helping these adjustments by keeping inflation low, stable, and predictable, and by aiming to keep the

economy operating close to its production potential. With the recent sharp appreciation of the Canadian dollar, net exports have been acting as a drag on economic growth. So growth has been driven by domestic demand, supported by monetary stimulus. In our April *Monetary Policy Report*, we projected that final domestic demand would grow by almost 4 per cent in 2005. According to recently released data, it grew by more than expected during the first quarter of the year. So we continue to see evidence that strong domestic demand is offsetting the weakness in net exports.

On 14 July, we will publish our *Monetary Policy Report Update*, in which we will spell out our latest views on the Canadian economy. The Bank is now in the process of gathering and analyzing the full set of information on the global and the Canadian economies that will feed into our next interest rate decision, and into the *Update*.

On our last policy announcement date in May, we decided to keep the target for the overnight rate at 2 1/2 per cent. At that time, we indicated that global and Canadian economic developments had been unfolding broadly in line with our expectations and that our outlook for the Canadian economy through to the end of 2006 was unchanged from the one presented in our April *Monetary Policy Report*. The analysis in that *Report* is still relevant. So is our statement that, in line with this outlook for growth and inflation, a reduction of monetary stimulus—that is, an increase in our key policy interest rate—will be required over time.

## Conclusion

Let me conclude. On the one hand, I'm bringing you a hopeful message: Canada's economy, backed by a sound policy framework, is adjusting to forces at work in the global economy. This adjustment is not painless, but it is taking place, leaving Canada well placed to thrive in the years ahead.

*Collective action is needed now to minimize the chances of a major crisis down the road.*

On the other hand, I want to leave you with a caution against complacency. We are all part of the global economy and, as such, we can do little to shield ourselves from a major economic disruption, such as a disorderly resolution of global imbalances. Collective action is needed now to minimize the chances of a major crisis down the road. The task won't be easy, but it is up to policy-makers—whether they gather at the Bank for International Settlements in Basel, at the IMF in Washington, or around the G–7 table at Gleneagles in a few days—to work towards an environment that will support sustained economic growth worldwide.

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# Summary Tables

# A1 Summary of Key Monetary Policy Variables

| Monthly | | Inflation-control target (12-month rate) | | | Policy instrument | | | Monetary conditions | | | Monetary aggregates (12-month growth rate) | | | Inflation indicators | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Target range | CPI | Core CPI* | Operating band for overnight rate (end of month) | | Overnight money market rate | Monetary conditions index (January 1987=0) | 90-day commercial paper rate | C-6 trade-weighted exchange rate (1992=100) | Gross M1 | M1++ | M2++ | Yield spread between conventional and Real Return Bonds | Total CPI excluding food, energy, and the effect of changes in indirect taxes | CPIW | Unit labour costs | IPPI (finished products) | Average hourly earnings of permanent workers |
| | | | | | Low | High | | | | | | | | | | | | | |
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| 2001 | O | 1-3 | 1.9 | 2.2 | 2.50 | 3.00 | 2.7412 | -10.59 | 2.45 | 78.28 | 12.1 | 10.9 | 7.8 | 1.71 | 1.8 | 2.1 | 2.9 | 1.4 | 2.5 |
| | N | 1-3 | 0.7 | 1.7 | 2.00 | 2.50 | 2.5955 | -10.78 | 2.17 | 78.50 | 13.8 | 13.2 | 8.6 | 1.91 | 1.4 | 1.7 | 2.2 | 0.6 | 3.0 |
| | D | 1-3 | 0.7 | 1.6 | 2.00 | 2.50 | 2.2444 | -10.94 | 2.08 | 78.33 | 14.4 | 14.0 | 7.7 | 1.93 | 1.3 | 1.6 | 2.7 | 1.0 | 3.3 |
| 2002 | J | 1-3 | 1.3 | 1.8 | 1.75 | 2.25 | 1.9923 | -10.82 | 2.07 | 78.63 | 14.4 | 15.6 | 8.0 | 1.95 | 1.4 | 1.8 | 1.9 | 2.0 | 3.5 |
| | F | 1-3 | 1.5 | 2.2 | 1.75 | 2.25 | 1.9926 | -11.07 | 2.16 | 77.84 | 12.6 | 15.7 | 7.6 | 1.96 | 1.4 | 2.1 | 1.0 | 1.5 | 3.4 |
| | M | 1-3 | 1.8 | 2.1 | 1.75 | 2.25 | 1.9933 | -10.61 | 2.36 | 78.45 | 12.4 | 15.7 | 7.1 | 2.30 | 1.8 | 2.1 | 0.8 | 1.1 | 3.2 |
| | A | 1-3 | 1.7 | 2.2 | 2.00 | 2.50 | 2.2440 | -10.07 | 2.46 | 79.48 | 11.6 | 15.3 | 7.0 | 2.29 | 1.9 | 2.1 | - | 0.6 | 2.8 |
| | M | 1-3 | 1.0 | 2.2 | 2.00 | 2.50 | 2.2471 | -9.31 | 2.68 | 80.79 | 11.8 | 14.3 | 6.7 | 2.24 | 2.0 | 1.9 | 1.0 | -0.3 | 2.4 |
| | J | 1-3 | 1.3 | 2.1 | 2.25 | 2.75 | 2.4964 | -9.12 | 2.78 | 80.99 | 12.9 | 15.6 | 6.8 | 2.32 | 2.1 | 1.9 | 0.5 | 0.6 | 2.7 |
| | J | 1-3 | 2.1 | 2.1 | 2.50 | 3.00 | 2.7418 | -10.40 | 2.88 | 77.71 | 13.3 | 14.7 | 6.7 | 2.28 | 2.1 | 2.0 | 0.1 | 0.5 | 2.8 |
| | A | 1-3 | 2.6 | 2.5 | 2.50 | 3.00 | 2.7448 | -9.68 | 3.09 | 78.90 | 13.8 | 15.1 | 6.7 | 2.18 | 2.2 | 2.4 | 1.1 | 1.3 | 3.0 |
| | S | 1-3 | 2.3 | 2.5 | 2.50 | 3.00 | 2.7447 | -10.27 | 2.90 | 77.97 | 10.8 | 12.6 | 6.1 | 2.18 | 2.3 | 2.3 | 0.6 | 0.9 | 2.8 |
| | O | 1-3 | 3.2 | 2.5 | 2.50 | 3.00 | 2.7449 | -10.06 | 2.83 | 78.63 | 11.5 | 12.6 | 5.6 | 2.18 | 2.5 | 2.4 | 1.0 | 2.1 | 2.7 |
| | N | 1-3 | 4.3 | 3.1 | 2.50 | 3.00 | 2.7431 | -10.21 | 2.85 | 78.24 | 9.5 | 10.3 | 4.8 | 2.15 | 3.1 | 3.0 | 1.9 | 1.8 | 2.5 |
| | D | 1-3 | 3.9 | 2.7 | 2.50 | 3.00 | 2.7439 | -9.80 | 2.83 | 79.24 | 7.0 | 8.2 | 3.9 | 2.09 | 3.3 | 2.4 | 1.2 | 2.1 | 1.9 |
| 2003 | J | 1-3 | 4.5 | 3.3 | 2.50 | 3.00 | 2.7439 | -9.34 | 2.91 | 80.15 | 7.4 | 7.3 | 3.7 | 2.27 | 3.3 | 2.9 | 1.7 | 1.1 | 1.9 |
| | F | 1-3 | 4.6 | 3.1 | 2.50 | 3.00 | 2.7469 | -8.61 | 2.97 | 81.78 | 6.9 | 6.5 | 3.4 | 2.40 | 3.3 | 2.9 | 2.1 | 1.1 | 2.1 |
| | M | 1-3 | 4.3 | 2.9 | 2.75 | 3.25 | 2.9920 | -7.72 | 3.28 | 83.22 | 6.2 | 5.5 | 3.3 | 2.50 | 3.1 | 2.7 | 2.1 | 0.1 | 1.8 |
| | A | 1-3 | 3.0 | 2.1 | 3.00 | 3.50 | 3.2373 | -6.92 | 3.35 | 85.07 | 6.6 | 5.2 | 3.1 | 2.28 | 2.8 | 2.1 | 3.0 | -1.5 | 1.3 |
| | M | 1-3 | 2.9 | 2.3 | 3.00 | 3.50 | 3.2416 | -6.02 | 3.27 | 87.60 | 7.2 | 5.3 | 3.5 | 2.12 | 2.5 | 2.2 | 2.2 | -2.7 | 1.8 |
| | J | 1-3 | 2.6 | 2.1 | 3.00 | 3.50 | 3.2449 | -5.11 | 3.11 | 90.45 | 7.7 | 5.3 | 3.3 | 2.04 | 2.1 | 2.0 | 2.1 | -3.7 | 1.4 |
| | J | 1-3 | 2.2 | 1.8 | 2.75 | 3.25 | 2.9947 | -6.60 | 2.89 | 87.07 | 10.0 | 6.6 | 3.5 | 2.25 | 1.7 | 1.9 | 2.3 | -2.1 | 2.1 |
| | A | 1-3 | 2.0 | 1.5 | 2.75 | 3.25 | 2.9972 | -6.68 | 2.80 | 87.11 | 9.5 | 6.6 | 3.5 | 2.29 | 1.7 | 1.7 | 2.4 | -2.6 | 2.1 |
| | S | 1-3 | 2.2 | 1.7 | 2.50 | 3.00 | 2.7490 | -5.93 | 2.64 | 89.52 | 8.5 | 6.5 | 3.4 | 2.15 | 1.8 | 1.9 | 1.6 | -3.8 | 2.7 |
| | O | 1-3 | 1.6 | 1.8 | 2.50 | 3.00 | 2.7492 | -4.85 | 2.71 | 92.25 | 7.3 | 6.1 | 3.0 | 2.38 | 1.8 | 1.8 | 1.5 | -5.5 | 2.7 |
| | N | 1-3 | 1.6 | 1.8 | 2.50 | 3.00 | 2.7481 | -4.73 | 2.73 | 92.54 | 8.8 | 6.8 | 3.1 | 2.38 | 1.8 | 1.7 | 0.7 | -6.0 | 2.3 |
| | D | 1-3 | 2.0 | 2.2 | 2.50 | 3.00 | 2.7481 | -4.68 | 2.66 | 92.87 | 9.9 | 7.6 | 3.9 | 2.41 | 1.5 | 2.1 | 0.7 | -5.4 | 2.7 |
| 2004 | J | 1-3 | 1.2 | 1.5 | 2.25 | 2.75 | 2.4951 | -5.77 | 2.37 | 90.68 | 10.7 | 8.3 | 3.8 | 2.66 | 1.5 | 1.5 | 1.1 | -5.3 | 2.7 |
| | F | 1-3 | 0.7 | 1.1 | 2.25 | 2.75 | 2.4953 | -6.21 | 2.25 | 89.82 | 13.2 | 9.8 | 4.4 | 2.53 | 1.0 | 1.2 | 1.4 | -4.3 | 2.8 |
| | M | 1-3 | 0.7 | 1.3 | 2.00 | 2.50 | 2.2482 | -5.72 | 2.10 | 91.55 | 14.2 | 10.4 | 4.7 | 2.65 | 1.1 | 1.2 | 0.7 | -3.5 | 3.0 |
| | A | 1-3 | 1.6 | 1.8 | 1.75 | 2.25 | 1.9959 | -6.98 | 2.05 | 88.28 | 15.6 | 12.0 | 5.1 | 2.85 | 1.2 | 1.7 | 1.0 | -1.3 | 3.2 |
| | M | 1-3 | 2.5 | 1.5 | 1.75 | 2.25 | 1.9985 | -7.08 | 2.07 | 87.98 | 16.2 | 13.1 | 5.1 | 3.00 | 1.2 | 1.8 | 1.0 | 2.8 | 3.0 |
| | J | 1-3 | 2.5 | 1.7 | 1.75 | 2.25 | 2.0005 | -6.36 | 2.10 | 89.81 | 14.4 | 13.0 | 5.7 | 2.96 | 1.4 | 1.8 | 1.3 | 3.1 | 3.3 |
| | J | 1-3 | 2.3 | 1.9 | 1.75 | 2.25 | 1.9973 | -6.03 | 2.12 | 90.65 | 11.1 | 11.6 | 5.4 | 2.98 | 1.4 | 1.9 | 1.1 | 0.6 | 2.5 |
| | A | 1-3 | 1.9 | 1.5 | 1.75 | 2.25 | 1.9979 | -5.28 | 2.22 | 92.43 | 10.6 | 10.6 | 5.1 | 2.93 | 1.0 | 1.7 | - | 0.3 | 2.3 |
| | S | 1-3 | 1.8 | 1.5 | 2.00 | 2.50 | 2.2496 | -4.22 | 2.50 | 94.63 | 10.3 | 10.4 | 5.1 | 2.72 | 1.0 | 1.6 | 1.1 | - | 2.1 |
| | O | 1-3 | 2.3 | 1.4 | 2.25 | 2.75 | 2.4960 | -3.03 | 2.60 | 97.77 | 11.2 | 10.6 | 5.7 | 2.72 | 0.8 | 1.7 | 0.9 | 0.7 | 2.3 |
| | N | 1-3 | 2.4 | 1.6 | 2.25 | 2.75 | 2.4977 | -1.82 | 2.74 | 100.95 | 10.3 | 9.9 | 5.3 | 2.73 | 1.1 | 1.8 | 1.1 | -0.6 | 3.1 |
| | D | 1-3 | 2.1 | 1.7 | 2.25 | 2.75 | 2.4999 | -3.02 | 2.57 | 97.89 | 11.5 | 10.8 | 5.6 | 2.81 | 1.3 | 1.7 | 2.0 | -0.7 | 2.6 |
| 2005 | J | 1-3 | 2.0 | 1.6 | 2.25 | 2.75 | 2.4980 | -3.35 | 2.56 | 96.96 | 11.1 | 10.4 | 5.8 | 2.71 | 1.2 | 1.6 | 0.8 | - | 3.1 |
| | F | 1-3 | 2.1 | 1.8 | 2.25 | 2.75 | 2.4971 | -3.54 | 2.57 | 96.37 | 10.2 | 9.9 | 5.8 | 2.69 | 1.4 | 1.7 | 1.0 | -0.5 | 2.2 |
| | M | 1-3 | 2.3 | 1.9 | 2.25 | 2.75 | 2.4794 | -2.74 | 2.68 | 98.39 | 10.0 | 9.3 | 5.6 | 2.69 | 1.4 | 1.9 | 2.7 | -0.7 | 2.8 |
| | A | 1-3 | 2.4 | 1.7 | 2.25 | 2.75 | 2.4954 | -3.69 | 2.58 | 95.92 | 10.1 | 8.5 | 5.7 | 2.67 | 1.2 | 1.8 | 2.3 | -0.5 | 2.8 |
| | M | 1-3 | 1.6 | 1.6 | 2.25 | 2.75 | 2.4866 | -4.02 | 2.59 | 94.93 | 9.2 | 7.5 | 5.3 | 2.60 | 1.2 | 1.6 | 1.6 | -2.2 | 2.0 |
| | J | 1-3 | 1.7 | 1.5 | 2.25 | 2.75 | 2.4936 | -2.88 | 2.58 | 98.28 | 10.0 | 7.0 | 5.0 | 2.42 | 1.3 | 1.7 | 2.1 | -1.5 | 2.7 |
| | J | 1-3 | 2.0 | 1.4 | 2.25 | 2.75 | 2.4922 | -2.95 | 2.64 | 97.88 | 10.2 | 6.6 | 4.6 | 2.38 | 1.1 | 1.7 | | -0.7 | 2.8 |
| | A | 1-3 | 2.6 | 1.7 | 2.25 | 2.75 | 2.4882 | -1.63 | 2.83 | 101.27 | 10.1 | 6.3 | | 2.39 | 1.5 | 1.9 | | -0.4 | 3.1 |
| | S | | | | 2.50 | 3.00 | 2.7421 | -1.07 | 2.98 | 102.51 | | | | 2.57 | | | | | 3.4 |

* New definition for core CPI as announced on 18 May 2001: CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the remaining CPI components

# A2 Major Financial and Economic Indicators

Rates of change based on seasonally adjusted data, percentage rates unless otherwise indicated

| | Year, quarter, and month | | Money and credit | | | | | | | | | Output and employment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Monetary aggregates | | | | | Business credit | | Household credit | | GDP in current prices | GDP volume (millions of chained 1997 dollars, quarterly) | GDP by industry (millions of 1997 dollars, monthly) | Employment (*Labour Force Information*) | Un-employment rate |
| | | | Gross M1 | M1+ | M1++ | M2+ | M2++ | Short-term business credit | Total business credit | Consumer credit | Residential mortgages | | | | | |
| | | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| | 1992 | | 7.1 | 4.2 | 0.2 | 5.8 | 7.1 | -3.4 | 1.8 | 1.3 | 8.4 | 2.2 | 0.9 | | -1.0 | 11.2 |
| | 1993 | | 9.4 | 5.1 | -0.7 | 4.2 | 6.6 | -6.3 | 0.7 | 2.3 | 7.6 | 3.8 | 2.3 | | 0.5 | 11.4 |
| | 1994 | | 13.2 | 8.4 | 1.4 | 1.9 | 6.8 | 1.6 | 4.7 | 7.9 | 6.4 | 6.0 | 4.8 | | 2.1 | 10.4 |
| | 1995 | | 6.6 | 0.8 | -2.6 | 3.8 | 4.1 | 5.5 | 5.0 | 7.5 | 3.7 | 5.1 | 2.8 | | 1.7 | 9.6 |
| | 1996 | | 12.2 | 8.2 | 3.3 | 4.4 | 6.8 | 1.5 | 5.5 | 6.5 | 4.2 | 3.3 | 1.6 | | 0.9 | 9.7 |
| | 1997 | | 16.9 | 11.2 | 7.2 | 0.9 | 7.2 | 7.7 | 10.0 | 10.0 | 5.6 | 5.5 | 4.2 | | 2.1 | 9.2 |
| | 1998 | | 10.3 | 7.0 | 3.1 | -1.1 | 5.5 | 11.5 | 11.6 | 10.1 | 4.9 | 3.7 | 4.1 | 3.8 | 2.5 | 8.4 |
| | 1999 | | 7.6 | 6.0 | 4.3 | 3.6 | 5.3 | 2.4 | 6.3 | 7.1 | 4.3 | 7.4 | 5.5 | 5.6 | 2.6 | 7.6 |
| | 2000 | | 14.7 | 10.6 | 8.8 | 5.9 | 7.0 | 6.5 | 7.4 | 12.6 | 4.8 | 9.6 | 5.2 | 5.5 | 2.6 | 6.8 |
| | 2001 | | 12.1 | 10.3 | 9.6 | 6.6 | 7.6 | -1.5 | 5.7 | 6.8 | 4.0 | 2.9 | 1.8 | 1.6 | 1.3 | 7.2 |
| | 2002 | | 11.7 | 10.9 | 13.7 | 7.4 | 6.4 | -6.0 | 3.8 | 6.5 | 7.4 | 4.2 | 3.1 | 3.2 | 2.4 | 7.7 |
| | 2003 | | 8.0 | 5.1 | 6.3 | 4.7 | 3.4 | -3.1 | 1.3 | 9.1 | 8.1 | 5.4 | 2.0 | 2.1 | 2.3 | 7.6 |
| | 2004 | | 12.4 | 9.1 | 10.9 | 4.7 | 5.1 | -0.5 | 3.9 | 10.3 | 9.6 | 6.1 | 2.9 | 3.1 | 1.8 | 7.2 |
| Annual rates | 2001 | III | 8.5 | 7.9 | 11.2 | 5.1 | 5.7 | -4.3 | 5.8 | 4.6 | 6.5 | -5.1 | -0.6 | -0.1 | 0.5 | 7.2 |
| | | IV | 23.7 | 17.6 | 22.8 | 13.9 | 10.5 | -0.2 | 6.5 | 2.0 | 7.2 | -1.4 | 3.5 | 1.7 | 0.4 | 7.7 |
| | 2002 | I | 11.9 | 14.5 | 18.6 | 8.5 | 6.9 | -11.0 | 3.5 | 6.3 | 7.4 | 7.7 | 4.9 | 5.9 | 2.9 | 7.9 |
| | | II | 5.1 | 5.5 | 8.2 | 3.5 | 4.4 | -6.4 | 1.8 | 9.7 | 8.8 | 11.0 | 3.4 | 4.8 | 4.3 | 7.7 |
| | | III | 10.5 | 7.7 | 7.8 | 5.7 | 4.3 | -3.5 | 2.5 | 9.6 | 8.2 | 5.7 | 3.8 | 3.0 | 4.2 | 7.6 |
| | | IV | 9.9 | 7.0 | 7.1 | 4.9 | 3.4 | 0.9 | 2.4 | 9.6 | 7.5 | 7.4 | 2.3 | 1.9 | 2.5 | 7.5 |
| | 2003 | I | 2.1 | 0.6 | 2.7 | 4.7 | 1.8 | -1.7 | 0.4 | 6.4 | 7.8 | 9.6 | 3.1 | 2.2 | 2.5 | 7.4 |
| | | II | 6.4 | 2.6 | 3.5 | 5.2 | 3.7 | -2.9 | -0.1 | 10.7 | 7.8 | -3.3 | -1.2 | -0.1 | 0.5 | 7.7 |
| | | III | 19.5 | 12.3 | 13.2 | 4.7 | 5.0 | -7.6 | 1.2 | 11.5 | 9.0 | 4.9 | 1.3 | 2.0 | 1.1 | 7.8 |
| | | IV | 7.4 | 6.1 | 8.2 | 1.3 | 3.0 | -8.2 | 2.6 | 8.2 | 9.7 | 5.2 | 3.6 | 4.8 | 3.5 | 7.5 |
| | 2004 | I | 18.2 | 11.2 | 13.2 | 5.4 | 5.5 | -2.4 | 3.7 | 10.2 | 9.0 | 6.7 | 2.6 | 2.5 | 1.2 | 7.3 |
| | | II | 16.8 | 14.2 | 16.3 | 8.1 | 7.8 | 10.0 | 6.3 | 11.4 | 10.5 | 10.6 | 5.0 | 4.0 | 2.4 | 7.2 |
| | | III | 1.0 | 3.4 | 5.9 | 4.0 | 4.5 | 6.9 | 6.5 | 11.5 | 10.6 | 6.8 | 3.5 | 4.0 | 1.3 | 7.1 |
| | | IV | 8.8 | 6.9 | 6.6 | 2.9 | 4.3 | 3.9 | 5.3 | 9.2 | 10.4 | 4.1 | 2.1 | 1.8 | 1.7 | 7.1 |
| | 2005 | I | 15.8 | 11.6 | 10.9 | 6.8 | 6.3 | 5.7 | 6.9 | 11.0 | 8.4 | 3.6 | 2.1 | 2.3 | 0.6 | 7.0 |
| | | II | 14.2 | 9.1 | 7.4 | 5.6 | 6.2 | 4.0 | 4.5 | 14.8 | 8.8 | 5.3 | 3.2 | 2.9 | 1.7 | 6.8 |
| | | III | | | | | | | | | | | | | 1.1 | 6.8 |
| Last three months | | | 6.9 | 2.7 | 3.3 | 3.0 | 4.7 | 7.5 | 6.1 | 14.2 | 9.3 | | | 3.6 | 1.1 | 6.7 |
| Monthly rates | 2004 | S | - | 0.2 | 0.4 | 0.2 | 0.3 | -0.1 | 0.2 | 0.7 | 0.7 | | | 0.1 | 0.2 | 7.0 |
| | | O | 1.0 | 0.9 | 0.7 | 0.5 | 0.5 | 0.2 | 0.1 | 0.9 | 1.0 | | | -0.1 | 0.3 | 7.1 |
| | | N | 0.6 | 0.2 | 0.3 | -0.3 | 0.1 | 0.9 | 0.9 | 0.6 | 0.7 | | | 0.3 | - | 7.2 |
| | | D | 2.1 | 1.6 | 1.4 | 0.9 | 0.8 | 1.4 | 1.0 | 0.7 | 0.9 | | | 0.2 | 0.1 | 7.0 |
| | 2005 | J | 0.9 | 1.0 | 0.9 | 0.8 | 0.5 | 0.1 | 0.3 | 0.8 | 0.5 | | | 0.3 | - | 7.0 |
| | | F | 1.3 | 0.5 | 0.9 | 0.5 | 0.7 | -0.1 | 0.4 | 1.2 | 0.7 | | | 0.2 | 0.2 | 7.0 |
| | | M | 0.8 | 0.8 | 0.4 | 0.1 | 0.2 | 0.6 | 0.4 | 1.1 | 0.6 | | | -0.2 | - | 6.9 |
| | | A | 1.6 | 0.9 | 0.7 | 1.0 | 0.8 | 0.4 | 0.3 | 1.2 | 0.7 | | | 0.4 | 0.2 | 6.8 |
| | | M | 0.7 | 0.7 | 0.5 | 0.1 | 0.3 | 0.1 | 0.3 | 1.3 | 0.7 | | | 0.4 | 0.2 | 6.8 |
| | | J | 0.8 | 0.5 | 0.4 | 0.4 | 0.5 | 0.8 | 0.6 | 0.9 | 0.9 | | | 0.3 | 0.1 | 6.7 |
| | | J | -0.1 | -0.5 | -0.2 | -0.7 | -0.2 | 1.4 | 0.6 | 0.9 | 0.7 | | | 0.2 | - | 6.8 |
| | | A | -0.2 | -0.6 | -0.3 | | | -0.1 | 0.4 | | | | | | 0.2 | 6.8 |
| | | S | | | | | | | | | | | | | - | 6.7 |

# A2 (Continued)

| Capacity utilization rate | | Prices and costs | | | | Wage settlements | | Bank of Canada commodity price index (unadjusted) | | Securities mid-market yield | | | Year, quarter, and month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total industrial | Manufacturing industries | CPI | Core CPI* | GDP chain price index | Unit labour costs | Public sector | Private sector | Total | Non-energy | Treasury bills 3-month | Canada 10-year benchmark bonds | Canada 30-year Real Return Bonds | |
| (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | |
| 78.8 | 76.4 | 1.5 | 1.8 | 1.3 | | 2.0 | 2.6 | -0.3 | 0.6 | 7.01 | 7.86 | 4.62 | 1992 |
| 80.6 | 79.9 | 1.8 | 2.1 | 1.4 | | 0.6 | 0.8 | 0.5 | 3.0 | 3.87 | 6.57 | 3.78 | 1993 |
| 83.0 | 83.5 | 0.2 | 1.8 | 1.1 | | - | 1.2 | 3.3 | 7.5 | 7.14 | 9.07 | 4.92 | 1994 |
| 82.1 | 83.9 | 2.2 | 2.3 | 2.3 | | 0.7 | 1.4 | 8.3 | 11.1 | 5.54 | 7.11 | 4.42 | 1995 |
| 82.0 | 82.8 | 1.6 | 1.7 | 1.6 | | 0.5 | 1.8 | 3.8 | -1.2 | 2.85 | 6.37 | 4.09 | 1996 |
| 83.6 | 83.6 | 1.6 | 1.9 | 1.2 | | 1.1 | 1.9 | -3.7 | -4.3 | 3.99 | 5.61 | 4.14 | 1997 |
| 84.6 | 84.3 | 0.9 | 1.3 | -0.5 | 1.0 | 1.6 | 1.7 | -15.3 | -12.6 | 4.66 | 4.89 | 4.11 | 1998 |
| 85.9 | 85.8 | 1.7 | 1.4 | 1.7 | 0.1 | 1.9 | 2.7 | 6.7 | 1.5 | 4.85 | 6.18 | 4.01 | 1999 |
| 87.0 | 86.1 | 2.7 | 1.3 | 4.2 | 3.0 | 2.5 | 2.4 | 18.4 | 3.5 | 5.49 | 5.35 | 3.42 | 2000 |
| 84.4 | 81.8 | 2.6 | 2.1 | 1.1 | 3.1 | 3.3 | 3.0 | -5.2 | -6.9 | 1.95 | 5.44 | 3.76 | 2001 |
| 84.2 | 82.6 | 2.2 | 2.3 | 1.1 | 0.9 | 2.9 | 2.6 | -5.9 | -6.6 | 2.63 | 4.88 | 3.33 | 2002 |
| 83.7 | 81.4 | 2.8 | 2.2 | 3.3 | 1.9 | 2.9 | 1.3 | 20.1 | 8.8 | 2.57 | 4.66 | 2.79 | 2003 |
| 85.6 | 84.7 | 1.9 | 1.5 | 3.0 | 1.1 | 1.4 | 2.2 | 20.5 | 21.4 | 2.47 | 4.39 | 2.11 | 2004 |
| 83.6 | 80.9 | 0.5 | 2.2 | -4.4 | 2.3 | 3.7 | 3.2 | -38.1 | -22.2 | 3.05 | 5.32 | 3.68 | 2001 III |
| 82.7 | 79.9 | -2.1 | 0.6 | -4.8 | 1.4 | 3.0 | 2.6 | -41.3 | -30.8 | 1.95 | 5.44 | 3.76 | IV |
| 83.3 | 81.1 | 3.0 | 2.5 | 2.7 | -0.8 | 3.1 | 2.1 | 15.9 | 12.3 | 2.30 | 5.79 | 3.68 | 2002 I |
| 84.4 | 82.9 | 4.3 | 3.5 | 7.4 | -0.8 | 2.7 | 2.3 | 40.0 | -1.8 | 2.70 | 5.37 | 3.42 | II |
| 85.0 | 83.7 | 4.6 | 3.0 | 1.9 | 2.7 | 3.2 | 2.5 | 2.8 | -1.5 | 2.83 | 4.92 | 3.25 | III |
| 84.2 | 82.6 | 3.5 | 2.0 | 4.9 | 4.6 | 3.2 | 3.6 | 20.4 | -4.0 | 2.63 | 4.88 | 3.33 | IV |
| 84.6 | 82.8 | 5.2 | 3.9 | 6.4 | 1.4 | 2.9 | 2.4 | 82.0 | 14.1 | 3.14 | 5.13 | 3.08 | 2003 I |
| 83.0 | 80.8 | -1.8 | -0.3 | -2.1 | 1.1 | 3.1 | 0.3 | -17.4 | 14.8 | 3.07 | 4.37 | 2.99 | II |
| 82.8 | 79.9 | 1.9 | 1.3 | 3.7 | 1.3 | 3.2 | 2.4 | 0.6 | 20.8 | 2.58 | 4.64 | 3.08 | III |
| 84.3 | 82.1 | 1.6 | 2.9 | 1.4 | 0.2 | 2.3 | 1.6 | 17.6 | 19.5 | 2.57 | 4.66 | 2.79 | IV |
| 84.0 | 81.9 | 2.0 | 1.1 | 4.0 | 1.7 | 2.8 | 2.7 | 45.3 | 38.9 | 1.98 | 4.33 | 2.39 | 2004 I |
| 85.2 | 84.1 | 3.3 | 1.6 | 5.0 | 1.2 | -0.3 | 2.5 | 36.7 | 34.4 | 2.01 | 4.83 | 2.37 | II |
| 86.5 | 86.3 | 1.2 | 1.0 | 3.2 | -0.2 | 1.8 | 1.0 | 5.4 | 1.5 | 2.45 | 4.58 | 2.32 | III |
| 86.6 | 86.5 | 2.7 | 2.5 | 1.7 | 2.6 | 2.1 | 2.7 | 13.7 | -15.7 | 2.47 | 4.39 | 2.11 | IV |
| 86.5 | 87.1 | 1.2 | 1.7 | 1.7 | 2.3 | 2.6 | 2.4 | 16.3 | 25.6 | 2.56 | 4.39 | 2.08 | 2005 I |
| 86.7 | 86.7 | 2.6 | 1.2 | 2.1 | 3.2 | 2.6 | 2.6 | 23.7 | -1.2 | 2.48 | 3.81 | 1.87 | II |
| | | | | | | | | 62.5 | -10.2 | 2.86 | 3.94 | 1.64 | III |
| | | 2.7 | 1.3 | | 3.2 | | | 62.5 | -10.2 | 2.86 | 3.94 | 1.64 | |
| | | 0.2 | 0.2 | | 0.5 | | | -1.9 | -2.2 | 2.45 | 4.58 | 2.32 | 2004 S |
| | | 0.4 | 0.2 | | - | | | 6.8 | -3.6 | 2.57 | 4.52 | 2.28 | O |
| | | 0.2 | 0.4 | | 0.2 | | | -3.5 | - | 2.63 | 4.44 | 2.17 | N |
| | | 0.1 | 0.2 | | 0.9 | | | -0.2 | 2.0 | 2.47 | 4.39 | 2.11 | D |
| | | -0.1 | - | | -0.8 | | | 1.0 | 1.1 | 2.43 | 4.21 | 2.03 | 2005 J |
| | | 0.2 | 0.2 | | 0.5 | | | 2.5 | 3.8 | 2.46 | 4.28 | 2.07 | F |
| | | 0.4 | 0.1 | | 1.1 | | | 7.2 | 2.3 | 2.56 | 4.39 | 2.08 | M |
| | | 0.3 | 0.1 | | - | | | 1.6 | -1.0 | 2.45 | 4.14 | 1.92 | A |
| | | -0.2 | 0.1 | | -0.4 | | | -5.2 | -3.0 | 2.46 | 4.02 | 1.86 | M |
| | | 0.3 | 0.2 | | 0.4 | | | 5.5 | 0.1 | 2.48 | 3.81 | 1.87 | J |
| | | 0.3 | - | | | | | 1.5 | -2.1 | 2.59 | 3.91 | 1.93 | J |
| | | 0.4 | 0.2 | | | | | 8.6 | -0.1 | 2.72 | 3.78 | 1.73 | A |
| | | | | | | | | 9.7 | 1.3 | 2.86 | 3.94 | 1.64 | S |

* New definition for core CPI as announced on 18 May 2001: CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the remaining CPI components

# A2 (Continued)

| | Year, quarter, and month | Government surplus or deficit (-) on a national accounts basis (as a percentage of GDP) | | Balance of payments (as a percentage of GDP) | | U.S. dollar, in Canadian dollars, average noon spot rate |
|---|---|---|---|---|---|---|
| | | Government of Canada | Total, all levels of government | Merchandise trade | Current account | |
| | | (28) | (29) | (30) | (31) | (32) |
| | 1992 | -5.1 | -9.1 | 1.3 | -3.6 | 1.2083 |
| | 1993 | -5.5 | -8.7 | 1.8 | -3.9 | 1.2898 |
| | 1994 | -4.6 | -6.7 | 2.6 | -2.3 | 1.3659 |
| | 1995 | -3.9 | -5.3 | 4.4 | -0.8 | 1.3726 |
| | 1996 | -2.0 | -2.8 | 5.1 | 0.5 | 1.3636 |
| | 1997 | 0.7 | 0.2 | 2.9 | -1.3 | 1.3844 |
| | 1998 | 0.8 | 0.1 | 2.6 | -1.2 | 1.4831 |
| | 1999 | 0.9 | 1.6 | 4.3 | 0.3 | 1.4858 |
| | 2000 | 1.9 | 2.9 | 6.2 | 2.7 | 1.4852 |
| | 2001 | 1.1 | 0.7 | 6.4 | 2.3 | 1.5484 |
| | 2002 | 0.8 | -0.1 | 5.0 | 1.8 | 1.5704 |
| | 2003 | 0.1 | - | 4.7 | 1.5 | 1.4015 |
| | 2004 | 0.6 | 0.7 | 5.1 | 2.2 | 1.3015 |
| Annual rates | 2001 III | 0.9 | 0.1 | 5.5 | 1.4 | 1.5453 |
| | IV | 0.2 | -0.8 | 5.4 | 1.1 | 1.5803 |
| | 2002 I | 0.6 | -0.5 | 5.5 | 2.7 | 1.5946 |
| | II | 0.7 | -0.2 | 4.8 | 2.0 | 1.5549 |
| | III | 0.7 | -0.2 | 4.9 | 1.5 | 1.5628 |
| | IV | 1.1 | 0.5 | 4.7 | 1.2 | 1.5698 |
| | 2003 I | 0.7 | 0.5 | 5.2 | 1.5 | 1.5102 |
| | II | -1.1 | -0.6 | 4.0 | 0.8 | 1.3984 |
| | III | 0.3 | - | 4.9 | 1.8 | 1.3799 |
| | IV | 0.3 | 0.1 | 4.7 | 1.9 | 1.3160 |
| | 2004 I | 0.2 | 0.1 | 5.1 | 2.1 | 1.3179 |
| | II | 0.2 | 0.5 | 5.9 | 3.0 | 1.3592 |
| | III | 0.9 | 0.8 | 5.1 | 2.2 | 1.3072 |
| | IV | 1.1 | 1.3 | 4.4 | 1.6 | 1.2203 |
| | 2005 I | -1.4 | 1.2 | 3.9 | 1.0 | 1.2267 |
| | II | 1.0 | 1.4 | 4.2 | 1.4 | 1.2439 |
| | III | | | | | 1.2012 |
| Last three months | | | | | | 1.2012 |
| Monthly rates | 2004 S | | | | | 1.2878 |
| | O | | | | | 1.2469 |
| | N | | | | | 1.1961 |
| | D | | | | | 1.2191 |
| | 2005 J | | | | | 1.2253 |
| | F | | | | | 1.2397 |
| | M | | | | | 1.2161 |
| | A | | | | | 1.2360 |
| | M | | | | | 1.2555 |
| | J | | | | | 1.2402 |
| | J | | | | | 1.2227 |
| | A | | | | | 1.2040 |
| | S | | | | | 1.1776 |

# Notes to the Tables

## Symbols used in the tables

R Revised

– Value is zero or rounded to zero.

Note:

Blank spaces in columns indicate that data are either not available or not applicable.

A horizontal rule in the body of the table indicates either a break in the series or that the earlier figures are available only at a more aggregated level.

## A1

(1) In February 1991, the federal government and the Bank of Canada jointly announced a series of targets for reducing inflation to the midpoint of a range of 1 to 3 per cent by the end of 1995. In December 1993, this target range was extended to the end of 1998. In February 1998, it was extended again to the end of 2001. In May 2001, it was extended to the end of 2006.

(2-3) Year-to-year percentage change in consumer price index (Table H8). The core CPI is the CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the other CPI components

(4–5) The *operating band* is the Bank of Canada's 50-basis-point target range for the average overnight rate paid by investment dealers to finance their money market inventory.

(6) The *overnight money market financing rate* is an estimate compiled by the Bank of Canada. This measure includes overnight funding of the major money market dealers through general collateral buyback arrangements (repo) including special purchase and resale agreements with the Bank of Canada. Prior to 1996, data exclude all repo activity with the exception of those arranged directly with the Bank of Canada. These latter have been included in the calculation since 1995.

(7) The *monetary conditions index* is a weighted sum of the changes in the 90-day commercial paper rate and the C–6 trade-weighted exchange rate (see technical note in the Winter 1998–1999 issue of the *Bank of Canada Review*, pages 125 and 126). The index is calculated as the change in the interest rate plus one-third of the percentage change in the exchange rate. The Bank does not try to maintain a precise MCI level in the short run. See *Monetary Policy Report*, May 1995, p.14.

(8) *90-day commercial paper rate*. The rate shown is the Bank of Canada's estimate of operative market trading levels on the date indicated for major borrowers' paper.

(9) The C–6 exchange rate is an index of the weighted-average foreign exchange value of the Canadian dollar against major foreign currencies. (See technical note in the Winter 1998–1999 issue of the *Bank of Canada Review*, pages 125 and 126.) Weights for each country are derived from Canadian merchandise trade flows with other countries over the three years from 1994 through 1996. The index has been based to 1992 (i.e., C–6 = 100 in 1992). The C–6 index broadens the coverage of the old G–10 index to include all the countries in the EMU.

(10) Gross M1: Currency outside banks plus personal chequing accounts plus current accounts plus adjustments to M1 described in the notes to Table E1 *(Bank of Canada Banking and Financial Statistics)*.

(11) M1++: M1+ plus non-chequable notice deposits held at chartered banks plus all non-chequable deposits at trust and mortgage loan companies, credit unions, and caisses populaires less interbank non-chequable notice deposits plus continuity adjustments.

(12) M2++: M2+ plus Canada Savings Bonds plus cumulative net contributions to mutual funds other than Canadian-dollar money market mutual funds (which are already included in M2+).

(13) Yield spreads between *conventional* and *Real Return Bonds* are based on actual mid-market closing yields of the selected long-term bond issue. At times, some of the change in the yield that occurs over a reporting period may reflect switching to a more current issue. Yields for *Real Return Bonds* are mid-market closing yields for the last Wednesday of the month and are for the 4.00% bond maturing 1 December 2031. Prior to 24 September 2001, the benchmark bond was 4.25% maturing 1 December 2026. Prior to 7 December 1995, the benchmark bond was 4.25% maturing 1 December 2021.

(14–15) CPI excluding food, energy, and the effect of changes in indirect taxes. CPIW adjusts each of the CPI basket weights by a factor that is inversely proportional to the component's variability. For more details, see "Statistical measures of the trend rate of inflation." *Bank of Canada Review,* Autumn 1997, 29–47

(16) *Unit labour costs* are defined as aggregate labour income per unit of output (real GDP at basic prices).

(17) IPPI: Industrial product price index for finished products comprises the prices of finished goods that are most commonly used for immediate consumption or for capital investment.

(18) Data for average hourly earnings of permanent workers are from Statistics Canada's *Labour Force Information* (Catalogue 71-001).

## A2

The majority of data in this table are based on, or derived from, series published in statistical tables in the *Bank of Canada Banking and Financial Statistics.* For each column in Table A2, a more detailed description is given below, as well as the source table in the *Banking and Financial Statistics,* where relevant.

(1) Gross M1: Currency outside banks plus personal chequing accounts plus current accounts plus adjustments to M1 described in the notes to Table E1.

(2) M1+: Gross M1 plus chequable notice deposits held at chartered banks plus all chequable deposits at trust and mortgage loan companies, credit unions, and caisses populaires (excluding deposits of these institutions) plus continuity adjustments.

(3) M1++: M1+ plus non-chequable notice deposits held at chartered banks plus all non-chequable despoits at trust and mortgage loan companies, credit unions, and caisses populaires less interbank non-chequable notice deposits plus continuity adjustments.

(4) M2+: M2 plus deposits at trust and mortgage loan companies and government savings institutions, deposits and shares at credit unions and caisses populaires, and life insurance company individual annuities and money market mutual funds plus adjustments to M2+ described in notes to Table E1.

(5) M2++: M2+ plus Canada Savings Bonds plus cumulative net contributions to mutual funds other than Canadian-dollar money market mutual funds (which are already included in M2+).

(6) Short-term business credit (Table E2)

(7) Total business credit (Table E2)

(8) Consumer credit (Table E2)

(9) Residential mortgage credit (Table E2)

(10) Gross domestic product in current prices (Table H1)

(11) Gross domestic product in chained 1997 dollars (Table H2)

(12) Gross domestic product by industry (Table H4)

(13) Civilian employment as per labour force survey (Table H5)

(14) Unemployment as a percentage of the labour force (Table H5)

(15-16) Data for capacity utilization rates are obtained from the Statistics Canada quarterly publication *Industrial Capacity Utilization Rates in Canada* (Catalogue 31-003), which provides an overview of the methodology. *Non-farm goods-producing industries* include logging and forestry; mines, quarries and oil wells; manufacturing; electric power and gas utilities; and construction.

(17) Consumer price index (Table H8)

(18) Consumer price index excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the other CPI components. (Table H8)

(19) Gross domestic product chain price index (Table H3)

(20) Unit labour costs are defined as aggregate labour income per unit of output (real GDP at basic prices).

(21–22) The data on wage settlements are published by Human Resources and Skills Development Canada and represent the effective annual increase in base wage rates for newly negotiated settlements. These data cover bargaining units with 500 or more employees. Contracts both with and without cost-of-living-allowance clauses are included.

(23–24) Bank of Canada commodity price indexes: Total and total excluding energy (Table H9)

(25) *Treasury bills* are mid-market rates for typical quotes on the Wednesday shown.

(26–27) *Selected Government of Canada benchmark bond yields* are based on actual mid-market closing yields of selected Canada bond issues that mature approximately in the indicated term areas. At times, some of the change in the yield occurring over a reporting period may reflect a switch to a more current issue. Yields for *Real Return Bonds* are mid-market closing yields for the last Wednesday of the month and are for the 4.00% bond maturing 1 December 2031. Prior to 24 September 2001, the benchmark bond was 4.25% maturing 1 December 2026. Prior to 7 December 1995, the benchmark bond was 4.25% maturing 1 December 2021.

(28-29) The data on the government surplus or deficit on a national accounts basis are taken from Statistics Canada's *National Income and Expenditure Accounts* (Catalogue 13-001), where the government surplus or deficit is referred to as "net lending."

(30) Merchandise trade balance, balance of payments basis (Table J1)

(31) Current account balance, balance of payments basis (Table J1)

(32) U.S. dollar in Canadian dollars, average noon spot rate (Table I1)