The Canadian Dollar and Commodity Prices: Has the Relationship Changed over Time?

by Philipp Maier and Brian DePratto

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Acknowledgements

Abstract

The authors examine the impact of the recent run-up in energy and non-energy commodity prices on the Canadian dollar. Using the Bank of Canada's exchange rate equation, they find that the differences between the actual value of the Canadian exchange rate and the simulated values observed in 2007 are not historically large. Still, given that there is some evidence that the sensitivity of the standard exchange rate equation to changes in energy and non-energy commodities may have changed over time, the authors explore different ways of modelling the impact of energy and non-energy commodity prices. Their results indicate that specifications that explicitly consider the importance of energy and non-energy commodities in Canada's export or production basket may yield more stable coefficient estimates, particularly over recent periods. Future research should investigate the robustness of these findings, particularly if, at some point, price increases for energy and non-energy commodities were to moderate.

JEL classification: F31
Bank classification: Exchange rates

Résumé

Nous étudions l'incidence de la récente escalade des prix des produits de base énergétiques et non énergétiques sur le dollar canadien. Les écarts observés pour 2007 entre la valeur effective du dollar et sa valeur calculée à l'aide de l'équation de taux de change de la Banque du Canada ne sont pas très supérieurs à ceux constatés dans le passé. Mais comme certains éléments incitent à croire que la sensibilité de l'équation de taux de change traditionnelle à l'évolution des cours des produits énergétiques et non énergétiques pourrait avoir changé avec le temps, nous avons décidé d'explorer différentes façons de modéliser les effets associés aux prix de ces produits. Les résultats obtenus montrent que les équations qui tiennent expressément compte du poids des produits énergétiques et non énergétiques dans le panier des biens exportés ou fabriqués par le Canada peuvent donner lieu à des estimations plus stables des coefficients, notamment pour les périodes récentes. La robustesse de ces résultats devra être analysée plus à fond, surtout en cas de ralentissement de la hausse des cours des produits de base.

Classification JEL : F31
Classification de la Banque : Taux de change

1   Introduction

The aim of this study is to better understand the consequences of the recent run-up in energy and non-energy commodity prices for the Canadian exchange rate. We revisit the link between commodity prices and the Canadian dollar during this period of high volatility, since it helps us to identify the key factors driving the value of the Canadian dollar. Our exploration is also related to the stability of the relationship over different time horizons – this assumption underlies standard econometric techniques.

Our results indicate that the increase in the value of the Canadian dollar in response to increases in prices for energy and non-energy commodities over the past five years is not fundamentally different than in previous decades. However, regarding the magnitude of the effect, our results cannot exclude the possibility that the parameters in the exchange rate equation may have shifted over time. We examine various avenues to model the impact of energy and non-energy commodity prices differently. While we do not find a clear solution to account for possible non-linearities in the relationship, it seems that the exchange rate's coefficients become more stable when we account for the changing share of energy and non-energy commodities in Canada's export or production basket.

2   Analysis

2.1   The exchange rate equation

The Bank of Canada's exchange rate equation is one of the tools used to analyze movements in the Can\$/US\$ exchange rate. The exchange rate equation is based on Amano and van Norden (1993). In their model, a cointegration approach links the real exchange rate to real energy and non-energy commodity prices, and the nominal short-term interest rate differential between Canada and the United States.

These main elements remain in the current version of the Bank's exchange rate equation, as derived and tested in Issa, Lafrance, and Murray (2006). Formally, long-run movements in the bilateral real Can\$/US\$ exchange rate, rfx_t, are explained by movements in real non-energy commodity prices (com_t), real energy commodity prices (ene_t), and the nominal bilateral interest rate differential (int_t). The following specification is used:

$$\Delta rfx_t = \alpha(rfx_{t-1} - \mu - \beta_c com_{t-1} - \beta_e ene_{t-1} - \delta_e I(t > \tau)ene_{t-1} - \delta_\mu I(t > \tau)) + \phi \, \text{int}_{t-1} + \varepsilon_t,$$

where $I(t>\tau)$ is an indicator function, equalling 1 since 1993Q3 (and 0 otherwise).[1] β_c and β_e are estimated parameters indicating the effects of non-energy and energy commodities on the real exchange rate, respectively, while δ_e and δ_u indicate how the changing relationship between energy commodities and the exchange rate affects the slope and the intercept of the equation, respectively. In what follows, we refer to this specification as the baseline model. The equation explains contemporaneous fluctuations using past movements in the independent variables.

Chart 1 provides an estimation of the exchange rate equation, as well as the actual values of the Can\$/US\$ exchange rate. Overall, the equation tracks the broad currency movements very well. Gaps between actual and simulated values are not uncommon, but, in the spirit of an error-correction model, the simulated values revert to the actual exchange rate within reasonable time frames. The largest deviation to date occurred in 2001, when the gap between the two increased temporarily to up to 9 cents U.S. Judged against this benchmark, the gap between actual and simulated values in the autumn of 2007 – typically around 4–5 cents U.S. – does not seem particularly large.

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1. The free trade agreement between Canada and the United States, as well as deregulation of the North American natural gas market, affected the relationship between the Canadian dollar and energy commodity prices. Over the 1990s, natural gas exports increased substantially (see Issa, Lafrance, and Murray 2006 for details). Consequently, while rising energy commodity prices used to cause a depreciation of the Canadian dollar, the effect changed in 1993. Since 1993, rising energy commodity prices have resulted in an appreciating Canadian currency. Issa, Lafrance, and Murray (2006) introduce the indicator function $I(t>\tau)$ to account for this shift.

Chart 1
Actual Exchange Rate and Dynamic Simulation of the Canadian Dollar

Actual exchange rate — Bank of Canada exchange rate equation
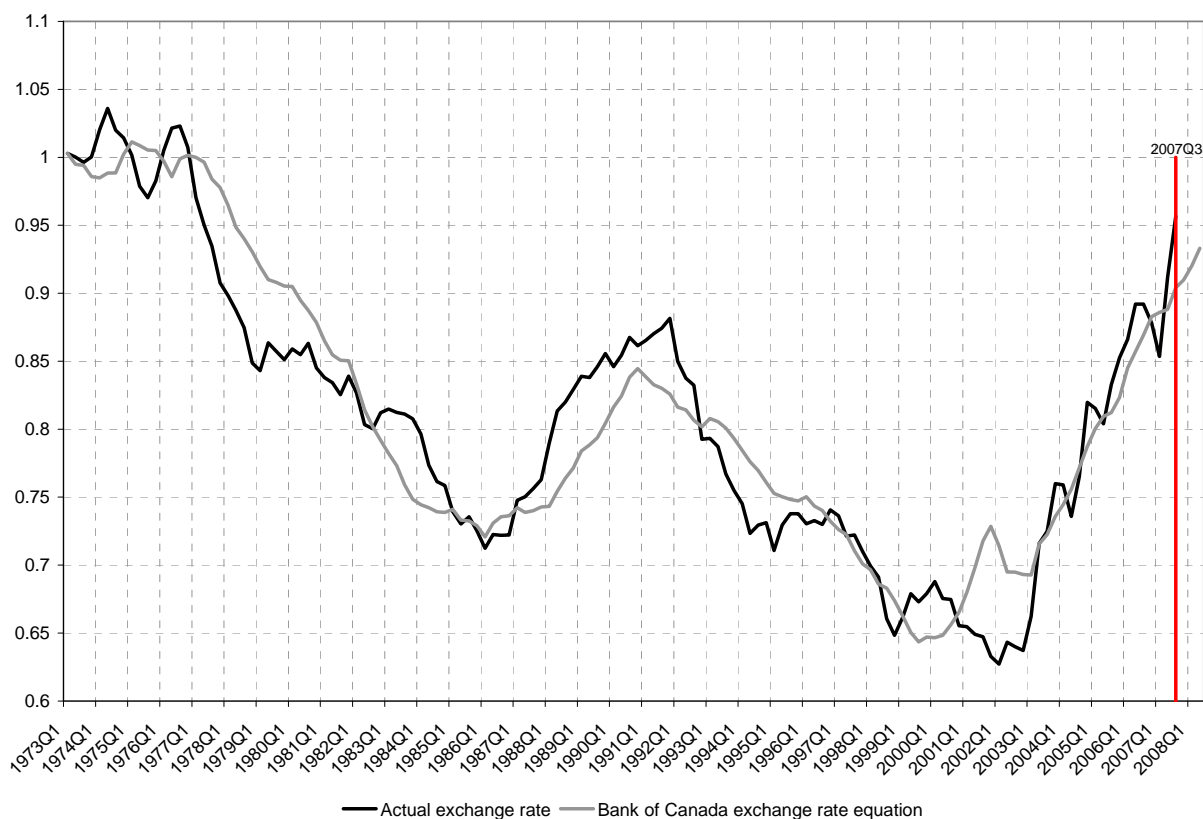
2.2   Parameter stability

For practical purposes, parameter stability means that the sensitivity of the exchange rate to the explanatory variables does not change over time. Loosely speaking, this implies that the estimated parameters are not sensitive to the sample period. Table 1 shows simple correlations between the Canadian dollar and energy and non-energy commodity prices for different periods. From this table, it seems that the relationship between these prices and the Canadian dollar may have become stronger during more recent years.

Note that the Bank's exchange rate equation is a model of a long-run relationship; it is not aimed at explaining short-term variations in the exchange rate. An error-correction model assumes that deviations between the actual exchange rate and the model's predicted value revert to zero over time, but it is not clear how persistent deviations are (in fact, the longest gap between the actual and predicted exchange rate lasted for 12 quarters). Using the equation over short time horizons should, therefore, be viewed as pushing the boundaries of what is statistically meaningful. This

exercise to examine the stability of the equation's parameters should be seen as using extreme scenarios to better understand the properties of the exchange rate equation in situations where, say, energy prices increase very rapidly.

In Chart 2, we show two sets of simulations of the exchange rate equation, differing only in one regard: to estimate the coefficients, the full sample runs from 1973Q1 to 2007Q3, while the truncated sample runs from 1973Q1 to 2003Q2.[2] Then, we use actual data on energy and non-energy commodity prices to simulate the exchange rate, using the coefficients of the truncated sample. Clearly, the shorter samples yield a substantially lower predicted exchange rate than the full sample. This means that, even if the exact future price path of energy and non-energy commodities was known in 2003, the exchange rate equation – as estimated until 2003 – would have underpredicted the actual exchange rate. Using a forward predictive failure test (Brooks 2002), the differences between the actual exchange rate and the simulated series from the equation are also statistically significantly different at the 1 per cent level.

Table 1
Correlation between the Exchange Rate and Energy and
Non-Energy Commodity Prices

Period	Correlation between Can$ and energy prices	Correlation between Can$ and non-energy commodity prices
1973Q1–1979Q4	-0.78	-0.57
1980Q1–1989Q4	0.27	0.62
1990Q1–2000Q1	0.55	-0.21
2000Q1–2007Q2	**0.89**	**0.93**
1973Q1–1986Q1 (Depreciation)	-0.82	-0.65
1986Q1–1991Q4 (Appreciation)	0.43	0.64
1991Q4–2002Q1 (Depreciation)	-0.33	0.05
2002Q1–2007Q3 (Appreciation)	**0.88**	**0.93**

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2.   The simulation starts in 2003Q3, but, given that the equation uses a lag, the first predicted value is 2003Q2.

To explore the factors behind these results, we start by testing parameter stability in a more formal way. This helps identify the most sensitive parameters. Then, we explore different alternatives for modelling the effect of changing energy production and exports. We test for non-linear effects, and we consider whether the Canadian dollar could have strengthened recently because of "multilateral adjustment" effects.

2.3 Empirical tests for parameter stability

Issa, Lafrance, and Murray (2006) find that the equation's parameters over the period 1973–2005 are stable. Using the longer sample until 2007Q3, which includes the recent appreciation of the Canadian dollar, we can test for possible breaks since 2002. We run tests for each of the years between 2002 and 2004 individually, by adding a time dummy variable and testing its significance. As Table 2 shows, there is evidence in favour of breaks occurring around 2002/2003 (similar results are obtained using rolling regressions).

Chart 2
Simulated Exchange Rate Equation, Estimated using Data until 2003 and 2007
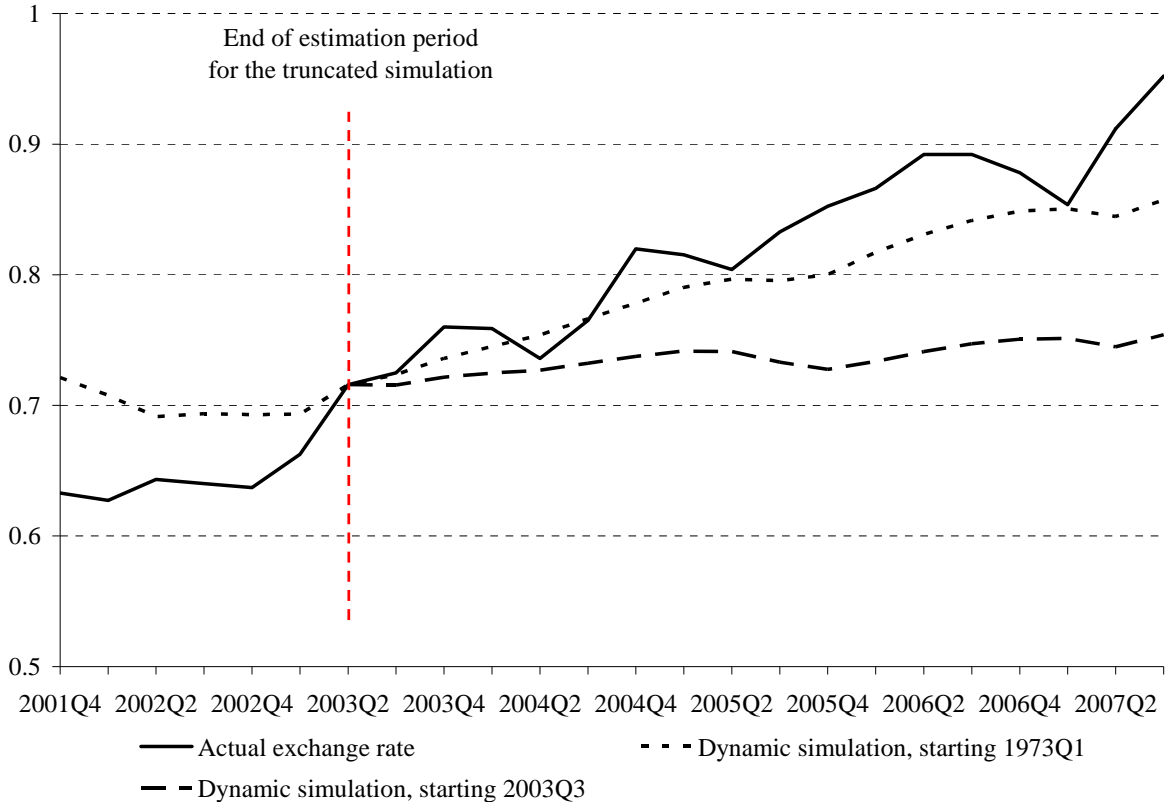
To examine the possibly changing relationship further, we split the sample into four subperiods, which correspond to those reported in Table 1: 1973Q1–1986Q1 (a period of depreciation); 1986Q1–1991Q4 (appreciation); 1991Q4–2002Q1 (depreciation); and 2002Q1–2007Q2 (appreciation). The coefficient estimates for each of these samples are shown in Chart 3. The parameter for non-energy commodities, β_c, varies between -0.2 and more than -0.5, and the energy commodity parameter increases from 1991–2001 to 2002–2007. [3] Similarly, the adjustment parameter, α, is stronger over the recent period. Loosely speaking, this indicates that the currency reacts more quickly to energy and non-energy price changes than it did in the past (this finding is statistically significant).
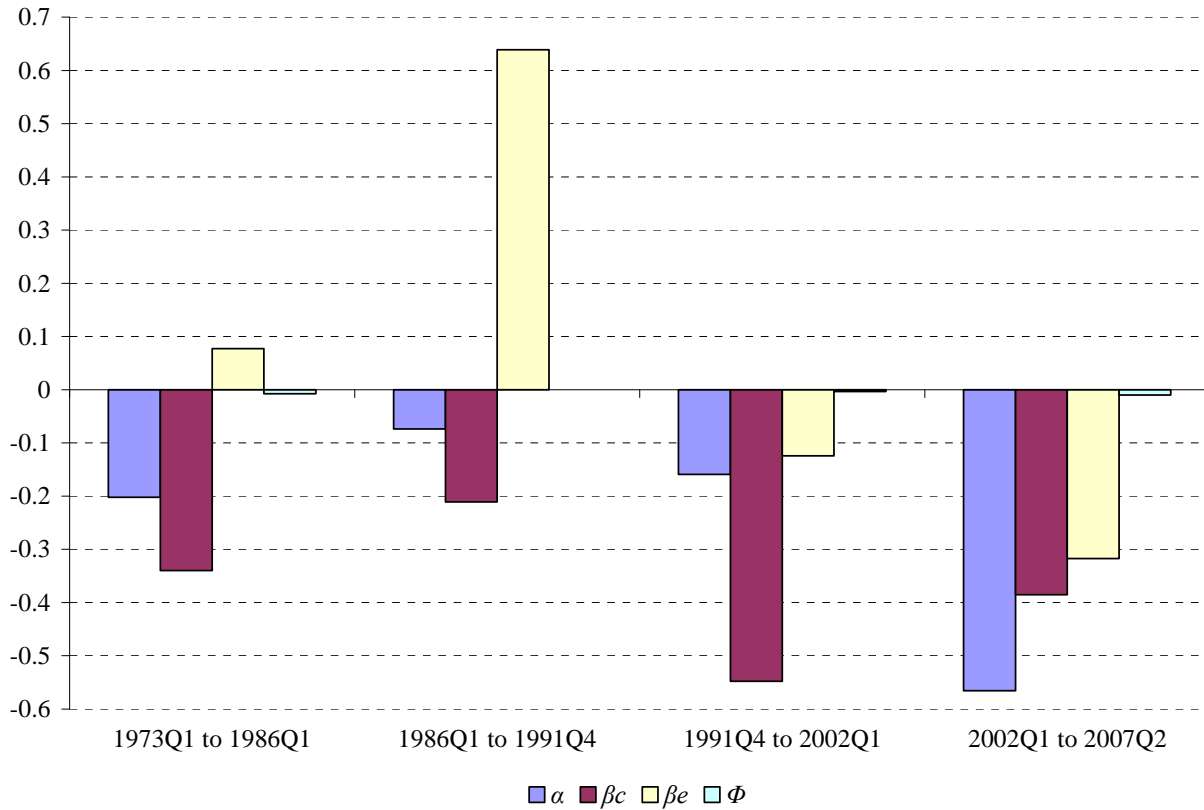
Table 2
Structural Break Tests (since 2002, *p*-values in brackets)

Year	Wald test	Year	Wald test
2002	10.83 (0.00)	2005	1.11 (0.29)
2003	10.05 (0.00)	2006	0.35 (0.55)
2004	1.31 (0.25)	2007	4.95 (0.03)

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3. In line with Issa, Lafrance, and Murray (2006), the energy parameter changes sign in the early 1990s. Most differences between parameters estimated over different periods are statistically significant (detailed results are available upon request).

Chart 3
Parameter Stability during Appreciation/Depreciation

Legend: α βc βe Φ

2.4   Different ways of modelling Canada's energy exports/consumption

The importance of energy and non-energy commodities, indicated by their shares in total
Canadian exports and shares of GDP, has not been stable over the sample period (see Chart 4).
From an economics perspective, one could imagine that the sensitivity of the Canadian dollar to
changes in their prices has therefore changed as well. From a purely statistical point of view, it is
not clear how best to model the energy component of Canadian exports. Issa, Lafrance, and
Murray (2006) use energy prices as an explanatory variable, and capture the increasing
importance of energy prices for Canada by introducing a dummy variable in 1993Q3. This
allows the energy coefficient to vary. In the face of ongoing changes to energy production and
consumption, we explore alternative ways to model the importance of energy and non-energy
commodities.

Chart 4
Shares of Energy and Non-Energy Commodities in Total Exports and GDP
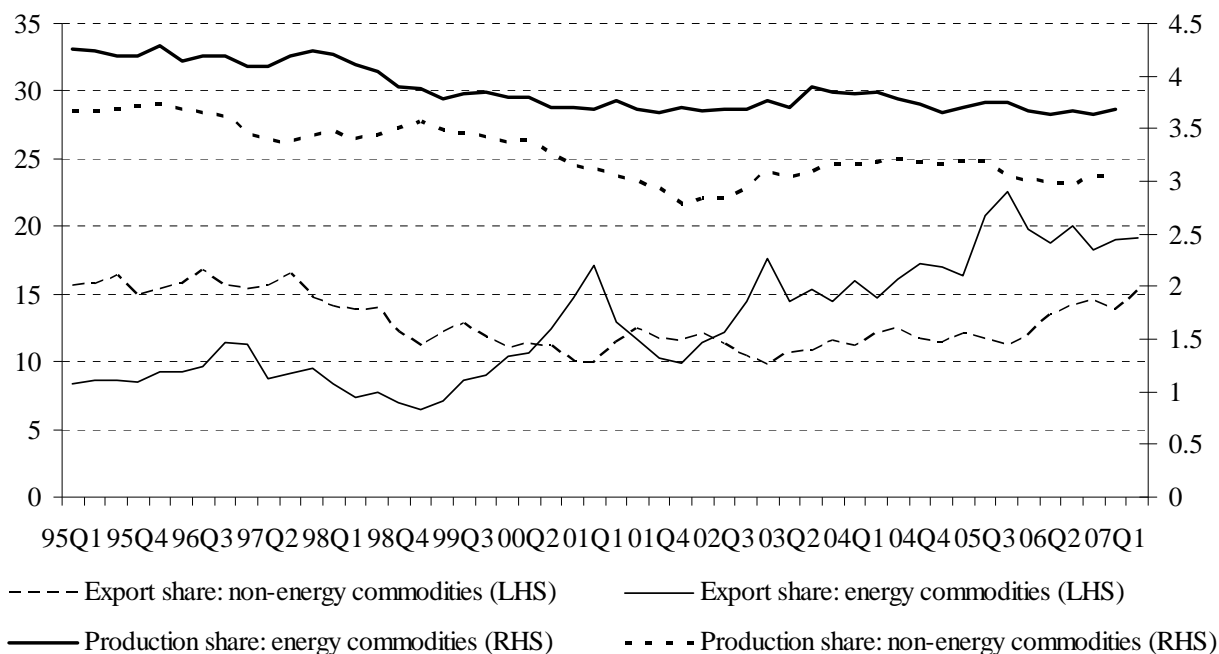
Our basic idea is to pre-multiply the price indexes for energy and non-energy commodities by appropriate "scaling factors," to acknowledge that their importance for determining the exchange rate is related to their weight in Canada's export and production basket. Formally,

$$\Delta rfx_t = \alpha(rfx_{t-1} - \mu - \beta_c com^*_{t-1} - \beta_e ene^*_{t-1} - \delta_e I(t > \tau)ene^*_{t-1} - \delta_u I(t > \tau)) + \phi \operatorname{int}_{t-1} + \varepsilon_t,$$

where com^*_{t-1} and ene^*_{t-1} are the adjusted price indexes for non-energy and energy commodities. We employ two different approaches:

- First, following Bayoumi and Mühleisen (2006), we scale energy and non-energy commodities by their shares in Canada's export basket. This approach focuses on the composition of Canadian exports, reflecting the notion that if the importance of energy and non-energy commodities increases in Canada's export basket, the exchange rate should become relatively more sensitive to their price movements. We refer to this specification as controlling for "export intensity." As scaling factors, we use the ratio of energy exports to total exports for the energy variable, and the ratio of commodity exports to total exports for the non-energy commodity variable.

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- Second, we scale energy and non-energy commodities by a continuous series, indicating the degree to which Canada is a net importer or exporter of energy and non-energy commodities.[4] While the first approach focused exclusively on the export basket, this specification considers the dependency of the Canadian economy as a whole on energy and non-energy commodities (we refer to this specification as controlling for "commodity dependency"). For this specification, the scaling factors are a four-period moving average of the ratio of energy exports minus energy imports to GDP for the energy variable, and a four-period moving average of the ratio of non-energy commodity exports minus non-energy commodity imports to GDP (both in real terms).

Table 3 reports the results for the baseline specification (Issa, Lafrance, and Murray 2006) and the "export intensity" and "commodity dependency" specifications.[5] Compared with the baseline, controlling for export intensity or commodity dependency seems to improve the statistical properties, because we no longer find evidence that the coefficients differ statistically significantly between different periods; i.e., they seem to be more stable than in the baseline specification. When we split the sample into the same four subperiods as in section 2.3, we see that the parameters are still not very stable for the first two subperiods, but the parameter estimates for the specifications "export intensity" and "commodity dependency" show much less instability for the recent period since 1991 (compare Chart 5 with Chart 3).

This translates into more accurate estimates of recent exchange rate movements. We can visualize the difference between the Issa, Lafrance, and Murray (2006) baseline specification and the two modified equations by estimating them until 2003Q2, and simulating the exchange rate using actual values for energy and non-energy commodity prices (this is analogous to the construction of Chart 2). Chart 6 shows that the dynamic simulations of the two modified specifications seem to capture the recent exchange rate movements better than the baseline specification (qualitatively similar results are found for the static simulation). This supports the notion that our assessment of exchange rate movements may not be independent of changes in Canada's export or production patterns.

4. We thank David Longworth for this suggestion.
5. Given that the results for the coefficients β_c, β_e, δ_e, and ϕ are not directly comparable, we report the effects of a one-standard deviation shock for these coefficients.

Table 3
Testing for Export Intensity and Commodity Dependency

Variable	Baseline	Export intensity	Commodity dependency
α	-0.14**	-0.13**	-0.15**
μ	0.44**	0.41**	0.43**
β_c	-0.09**	-0.07**	-0.08**
β_e	0.05**	0.04*	0.07*
δ_e	-0.16**	-0.15**	-0.18**
δ_u	-0.32**	-0.27**	-0.29**
ϕ	-0.01**	-0.01**	-0.01**
	R^2 0.24	R^2 0.22	R^2 0.25

Note: ** and * indicate statistical significance at the 1% and 5% level, respectively.

Chart 5
Parameter Stability during Appreciation/Depreciation – Adjusted Specifications

Export Intensity

Commodity Dependency
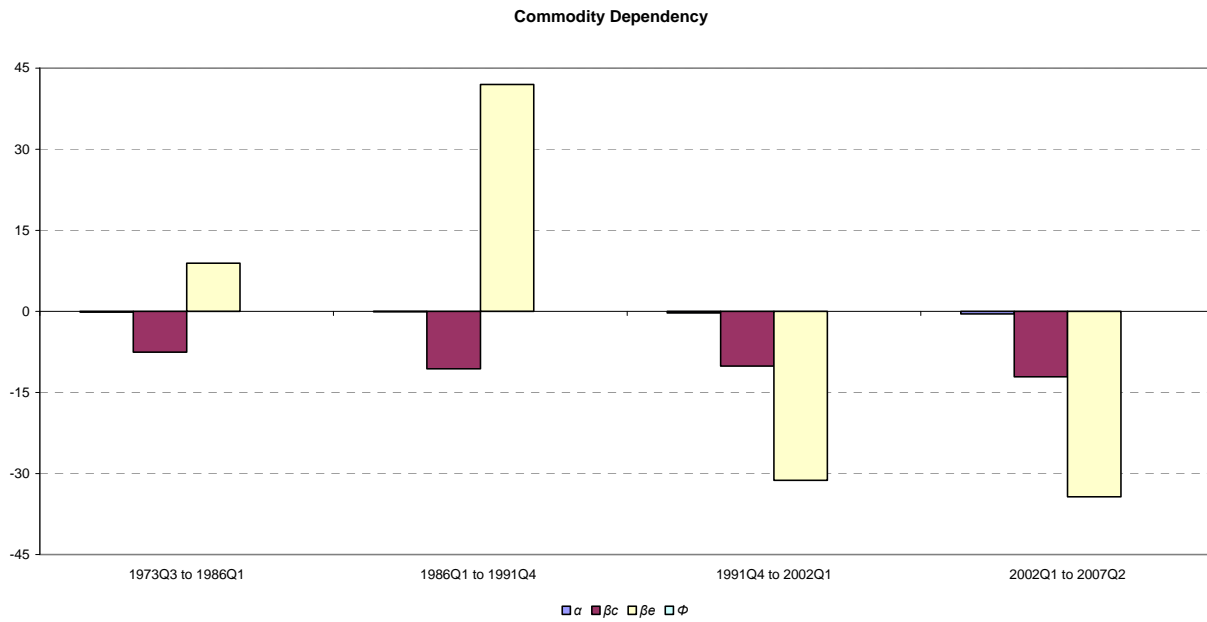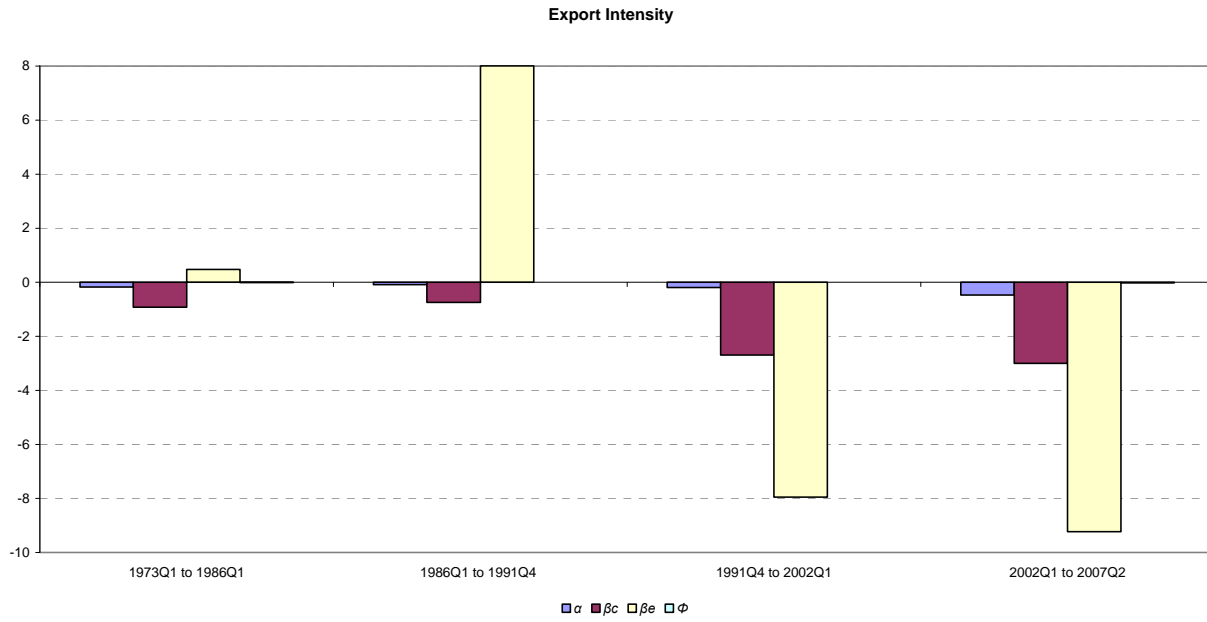
Chart 6
**Simulated Exchange Rate Equations: Issa, Lafrance, and Murray (2006);
and the Export Intensity and Commodity Dependency Specifications,
All Estimated until 2003Q2**

Actual exchange rate
- - - Dynamic simulation (Issa, Lafrance, and Murray, 2006), starting 2003Q3
— Dynamic simulation (export intensity), starting 2003Q3
— Dynamic simulation (commodity dependency), starting 2003Q3
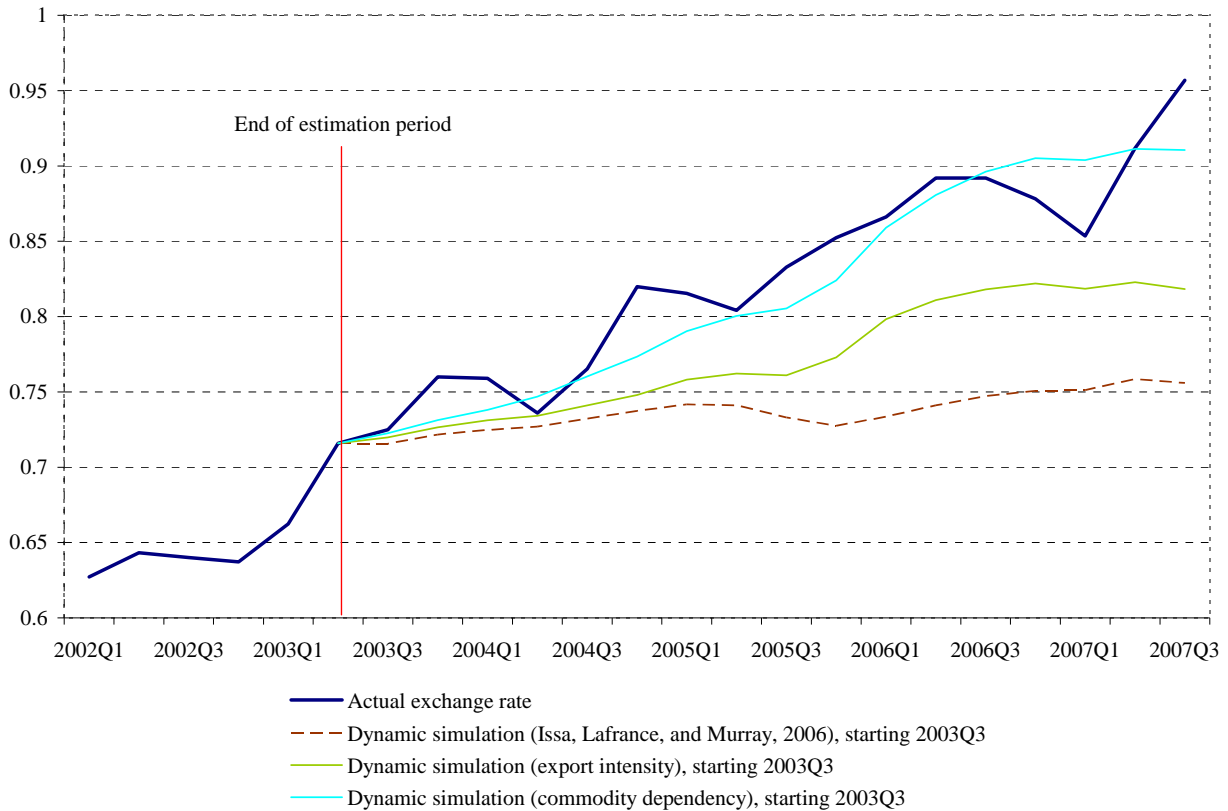
2.5   Non-linear effects

In the context of energy and non-energy commodity prices, non-linear effects can arise; e.g., if mining in certain locations becomes profitable only once prices have crossed a certain threshold. One obvious example is Canadian oil sands: only if oil prices are high enough – and projected to stay above a certain threshold – is exploitation commercially viable.

We test for non-linear effects in energy commodities by adding the squared value of the energy price series (and pre-multiplying it with the indicator function to account for the structural break). We estimate the following:

$$\Delta rfx_t = \alpha(rfx_{t-1} - \mu - \beta_c com_{t-1} - \beta_e ene_{t-1} - \delta_e I(t > \tau)ene_{t-1} - \delta_{NL} I(t > \tau)ene^2_{t-1} - \delta_\mu I(t > \tau))$$
$$+ \phi \operatorname{int}_{t-1} + \varepsilon_t.$$

The results are shown in Table 4. The coefficient for the non-linear effect has the right sign, and is significant at the 10 per cent level.[6] Additional tests – not reported – underscore the notion of non-linear effects in energy prices. However, these non-linear effects are not likely to be stable over time.[7] In addition, while we find evidence for non-linear effects, the coefficients are not very robust, and modified equations still fail the predictive failure test. Taken together, it is not evident that the statistical fit of the equation can be improved substantially by explicitly modelling non-linear effects.

Table 4
Testing for Non-Linear Effects

Variable	Baseline coefficient	Non-linear specification coefficient
α	-0.15**	-0.17**
μ	0.43**	0.42**
β_c	-0.38**	-0.35**
β_e	0.12**	0.11**
δ_e	-0.40**	-0.55**
δ_{NL}	-	-0.21*
δ_u	-0.29**	-0.25**
ϕ	-0.01**	-0.01**
	R^2 0.24	R^2 0.26

Note: ** and * indicate statistical significance at the 1% and 10% level, respectively.

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6. In this specification, the non-linear variable is multiplied by the indicator function. Effectively, this means that we restrict the non-linear effect to occur after 1993Q3. This is somewhat unsatisfactory, since there is no economic basis for non-linear effects to start in 1993Q3. We also experimented with including a non-linear variable for the entire sample period. This variable turned out to be insignificant.

7. Consider again the possibility that they are driven by threshold effects related to the Alberta oil sands. The price at which oil sands production starts to become profitable is not likely to be stable, because of the technological process, but also because oil sands produce bitumen, which is sold as a separate product. The market for bitumen is not very transparent, and prices are very volatile. Therefore, the threshold price for oil sands production to become commercially viable is not stable over time.

2.6   Multilateral adjustment

Because of the parsimonious approach chosen in the baseline specification, it is not clear whether changes in the overall economic environment are adequately reflected in estimates of the exchange rate equation. Consider a situation of general weakness of the U.S. dollar: owing to the large U.S. fiscal or current account deficit, many economists believe that a lower value of the U.S. exchange rate might be required to resolve this imbalance (Obstfeld and Rogoff 2004). Bailliu et al. (2007) propose a way to model such "multilateral adjustment" econometrically. Their model allows separate identification of two factors that might have contributed to the recent increase in the Canadian dollar: the recent increase in commodity prices, and a general weakness of the U.S. dollar in response to the large U.S. current account deficit. In theory, this could be a challenge for the exchange rate equation, because these factors are not directly captured in the equation.

We can use Bailliu et al.'s (2007) model and compare the multilateral adjustment specification with the baseline exchange rate model. Chart 7 plots the actual value of the exchange rate, as well as the estimated values using (i) the baseline specification and (ii) Bailliu et al.'s (2007) multilateral adjustment equation. For 2007Q3, the two specifications provide virtually identical estimates. Overall, it therefore seems that Bailliu et al.'s (2007) approach yields results that are relatively similar to the comparatively more parsimonious Issa, Lafrance, and Murray (2006) baseline specification.[8]

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8.   Aside from the statistical evidence, an *economic* argument can be made that the recent general weakness in the U.S. dollar in recent months could reflect an earlier-than-expected adjustment to the U.S. current account deficit. This is likely to be due, at least in part, to a reduced willingness to hold U.S.-dollar assets, as a consequence of financial uncertainty in the U.S. subprime mortgage market.

Chart 7
Issa, Lafrance, and Murray's (2006) Baseline Specification vs.
Multilateral Adjustment Equation (since 1990)

Actual exchange rate ····· Multilateral adjustment equation − − − Baseline specification
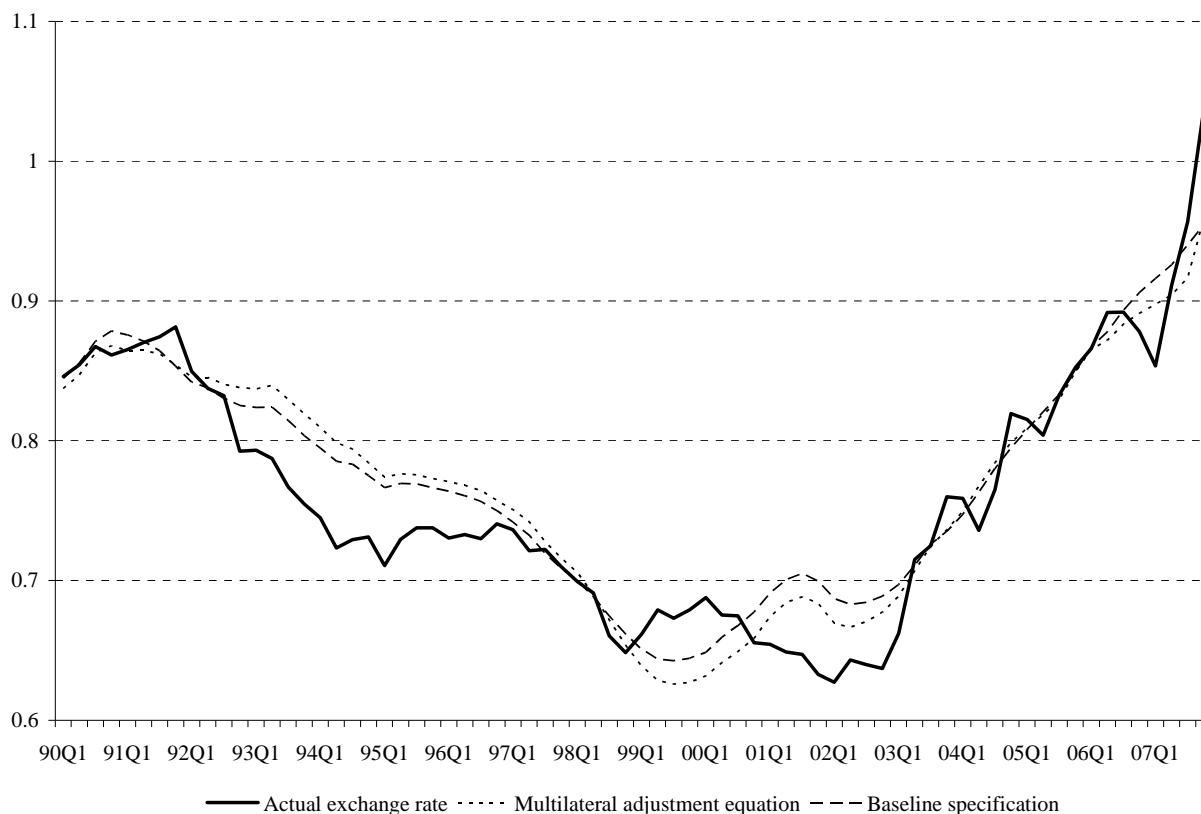
3   Discussion

Interpreting the exchange rate movements is a difficult task. One approach followed at the Bank of Canada is to employ a reduced-form equation. The equation has a proven record in tracking the broad movements of the Canadian dollar.[9] Current differences between the actual value of the Canadian exchange rate and the simulated values using the exchange rate equation are not historically large, and, in the past, deviations have at times been persistent. This is in the spirit of an error-correction model.

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9.   The current equation performs exceptionally well for Canada, when compared with other countries. We estimated a similar equation for three other commodity-exporting countries: Australia, New Zealand, and Norway. While the baseline equation is able to explain about 20 per cent of the exchange rate variation in Canada, a similar specification is not able to explain more than 6 or 7 per cent of the exchange rate variation for the other three countries, even after controlling for differences in their export baskets.

We probe the stability of some of the parameters in the Bank's exchange rate equation. Overall, we find evidence that the sensitivity of the standard exchange rate equation to changes in energy and non-energy commodities may have changed recently, but, given that the current shocks to these prices are very large, it may simply take some time before the error-correction specification adjusts to these shocks. Alternatively, one way of obtaining more stable coefficients could be to apply a weighting scheme for energy and non-energy commodities content in Canada's exports and production. Our results indicate that specifications that explicitly consider the importance of energy and non-energy commodities in Canada's export or production basket may yield more stable coefficient estimates, particularly over recent periods. Future research should investigate whether these findings would continue to hold even if, say, the growth of energy and non-energy commodities were to slow down.

There are several other avenues for future research. A weakness of our exploration is that we do not explicitly account for the possibility that the level of the exchange rate could depend on the source of the shock.[10] A more explicit modelling of economic dynamics could test whether the source of the commodity price shocks – i.e., whether a commodity supply or a demand shock – matters. As an illustration, consider the following scenarios, simulated using the Bank of Canada's Global Economy Model (BoC-GEM)[11]:

- A negative supply shock: a reduction in the supply of energy and non-energy commodities in commodity-exporting countries.

- A positive demand shock: an increase in productivity in emerging Asia, boosting demand for energy and non-energy commodities.

This corresponds to investigating the economic consequences of commodity prices in a situation where world economic growth is falling (first case), or where commodity prices rise because the world economy is thriving (second case). Both shocks are assumed to be permanent, and we calibrate them such that they show similar price movements for energy and non-energy commodity prices after 10 quarters.

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10. To some extent, general economic conditions are captured in the independent variables: in recent years, for example, strong commodity prices indicated a thriving world economy. However, the same was not true in the 1970s, when strong commodity prices reflected supply constraints.
11. The BoC-GEM is the Bank of Canada's version of the Global Economy Model, originally developed at the International Monetary Fund, and adapted to the Bank of Canada's needs. A description of the BoC-GEM is given in Lalonde and Muir (2007).

Table 5 (columns 3 to 5) shows simulated effects after 10 quarters for the prices of oil, non-energy commodities, and the bilateral nominal Can$/US$ exchange rate.[12] In the BoC-GEM, a negative supply shock leads to lower GDP growth in the United States, while the Canadian economy benefits from higher commodity prices. Consequently, the Canadian dollar appreciates strongly, reflecting the relatively better performance of the Canadian economy. In contrast, if commodity prices increase because of strong world growth, the Canadian economy will still be strong, but an important difference occurs for U.S GDP: growth in the United States will be more resilient than in the negative supply scenario if commodity price increases are driven by strong demand. Consequently, the growth differential between the two economies is much smaller. The Canadian dollar will still benefit from high commodity prices, but, given that the U.S. economy stays strong, the U.S. dollar will also maintain its value. Hence, the value of the Canadian currency, relative to the U.S. currency, will not increase by as much as in the case of a negative supply shock.

Table 5
Simulating Different Energy and Non-Energy Commodity Price Shocks in the Boc-GEM (effects after 10 quarters)

Type of shock	Source of the shock	Oil prices	Non-energy commodities	Bilateral Can$/US$ exchange rate
Negative supply shock	Fall in the stock of energy and non-commodities in commodity-exporting countries	9.74	0.34	Can$ appreciates by 1.45
Positive demand shock	Positive productivity shock in emerging Asia	9.72	0.26	Can$ appreciates by 0.37

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12. More specifically, the shocks are calibrated to yield similar price movements for energy and non-energy commodities after 10 quarters (we chose a relatively long period to reflect the longer-term nature of the exchange rate equation). In terms of the shock, this implies a reduction in the stock of non-energy commodities by about 15 percentage points and a fall in the stock of oil by about 10 percentage points for the negative supply shock (both occur in commodity-exporting countries); the positive demand shock corresponds to an increase in productivity in emerging Asia in the tradable and non-tradable goods sector by about 9.8 percentage points. More details on the shocks are available upon request.

Note lastly that, at a more fundamental level, it is perhaps not unexpected that parameters could change over a sample of more than 30 years. A perfect econometric model of the exchange rate would, for instance, incorporate the rationale for the rapid increase in energy and non-energy commodity prices during the past years, but, in practice, limitations in the data and difficulties in correctly identifying the source of the shock in a timely manner pose statistical challenges. In this regard, it is also worth mentioning that the existing equation has a very important advantage, in that it is parsimonious. This is helpful as a communication tool. If one were to add variables to incorporate more structural changes or to account for non-linear effects, this would improve the fit of the regression, but, at the same time, it makes it more difficult to interpret the changes economically.

Overall, our analysis helps improve the understanding of the properties and limits of the Bank's exchange rate equation. Our results indicate that situations can arise when the differences between the actual exchange rate and the value explained by the Bank's exchange rate equation can be large in the short term. However, it is important to remember that the exchange rate equation is built on a long-run empirical relationship, and is therefore less well suited for the interpretation of short- and medium-term fluctuations in the Canadian dollar.

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