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The Share of Systematic Variations in the Canadian Dollar—Part I

by Jean-Sébastien Fontaine and Guillaume Nolin

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Abstract

In this analytical note we show that the share of the systematic variations in the Canadian dollar has risen significantly in the past two decades. Systematic variations in the exchange rate are shared with other currencies. This parallels the equity market, where variations in the price of a given stock are shared with variations in the prices of other stocks. In the simplest case—the capital asset pricing model—the amount of systematic variations is given by the covariance of this stock with the equity market index. In the context of currencies, exchange rate variations that are systematic originate from common international economic or financial conditions affecting all exchange rates. These systematic variations contrast with domestic changes in economic or financial conditions specific to one country and affecting only that country's exchange rate. Separating systematic variations is useful and essential to identify the effect of domestic economic news or policy decisions on the exchange rate.

Bank topic: Exchange rates
JEL code: F31

Résumé

Dans cette note analytique, nous montrons que la part des variations systématiques dans les fluctuations du dollar canadien a largement augmenté en vingt ans. Les variations systématiques du taux de change sont communes au dollar canadien et à d'autres monnaies. Ces variations ressemblent à celles du marché boursier, où les prix des actions suivent les mêmes mouvements. Dans le cas le plus simple — le modèle d'équilibre des actifs financiers — l'ampleur des variations systématiques est mesurée par la covariance d'une action de référence et de l'indice boursier. Les variations systématiques du taux de change procèdent de conditions économiques ou financières internationales qui influent sur tous les taux de change bilatéraux. Ces variations sont différentes des variations internes causées par une conjoncture économique ou financière propre à un pays et qui touche uniquement la valeur de la monnaie de ce pays. Il est à la fois utile et essentiel de savoir repérer les variations systématiques : cela permet de reconnaître l'effet que des nouvelles économiques ou des décisions de politique qui concernent un seul pays ont sur le taux de change.

Sujet : Taux de change
Code JEL : F31

Introduction

In this analytical note we show that the share of the systematic variations in the Canadian dollar has risen significantly in the past two decades. Systematic variations in the exchange rate are shared with other currencies. This parallels the equity market, where variations in the price of a given stock are shared with variations in the prices of other stocks. In the simplest case—the capital asset pricing model—the amount of systematic variations is given by covariance of this stock with the equity market index. In the context of currencies, exchange rate variations that are systematic originate from common international economic or financial conditions affecting all exchange rates. These systematic variations contrast with domestic changes in economic or financial conditions specific to one country and affecting only that country's exchange rate. Separating systematic variations is useful and essential to identify the effect of domestic economic news or policy decisions on the exchange rate.

Measuring Systematic Variations in Exchange Rates

To measure systematic variations in bilateral exchange rates against the US dollar, Verdelhan (2015) introduces two global risk factors—carry and dollar—that account for a large share of exchange rate variations. Both factors are constructed from currency portfolios. The carry factor corresponds to the difference between a portfolio of currencies with high short-term interest rates and one with low short-term interest rates. Carry is itself a portfolio of currencies that captures the performance of a typical carry trade, borrowing from low interest rate "funding" currencies and investing in high interest rate "lending" currencies. The dollar factor corresponds to the equally weighted portfolio of exchange rates relative to the US dollar. Together, the contemporaneous variations in carry and dollar portfolios account for up to 80 per cent of daily exchange rate variations across developed countries, relative to the US dollar.[1]

The Increasing Share of Systematic Variations in the Canadian Dollar

The carry and dollar portfolios, however, account for only 16 per cent of the daily variations in the Canadian dollar between 1983 and 2016. In fact, the Canadian dollar exhibits one of the lowest shares of systematic variations in a panel of 53 currencies. We argue that the low share of systematic variations of the Canadian dollar over the entire sample hides substantial changes over time.[2] These changes could stem from a greater integration of Canadian financial markets and economic activity with the global economy over time. If Canadian dollar exposures to carry and dollar portfolios have increased, then the estimates based on the entire sample underestimate the share of systematic variations in the Canadian dollar today.
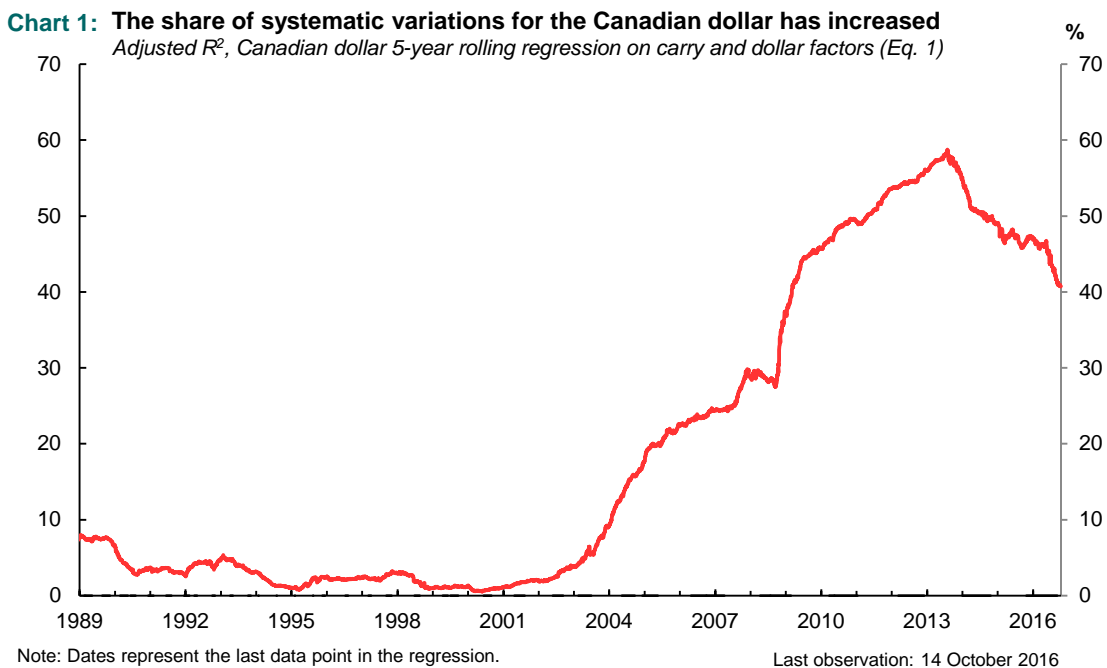
To check whether Canadian dollar exposures have changed over time, we use exactly the same model as in Verdelhan (2015), but we estimate using five years of data, starting in 1983 and rolling

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[1] Cayen et al. (2010) identify similar common variations between the Canadian dollar and a panel of currencies.

[2] The R^2 for the Canadian dollar is also the lowest in the original sample from 1983–2010 in Verdelhan (2015).

this five-year window forward until the end of our sample.[3] Hence, the last estimation covers a five-year sample from 2011–16. The share of systematic variations can be measured using the adjusted R^2 from these rolling estimates. The R^2s reveal that systematic variations in the Canadian dollar have increased substantially over the sample period (**Chart 1**). The R^2 never exceeds 10 per cent before 2003. Between 1983 and 2003, the Canadian dollar exhibited little common variation with carry and dollar portfolios. In other words, the results suggest that essentially none of the Canadian dollar variations were systematic but instead reflected changes of economic or financial conditions specific to Canada.

In contrast, systematic variations explain as much as 60 per cent of daily changes in the Canadian dollar exchange rate in recent years. Almost two-thirds of the variations in the Canadian dollar are shared with the carry and dollar portfolios, reflecting the influence of international economic or financial conditions also affecting other currencies.

Chart 1: **The share of systematic variations for the Canadian dollar has increased**
Adjusted R^2, Canadian dollar 5-year rolling regression on carry and dollar factors (Eq. 1)

Note: Dates represent the last data point in the regression.

Last observation: 14 October 2016

We find that the largest contributor to the increase of systematic variations in the Canadian dollar is the growing influence of the dollar portfolio. The regression coefficient on the dollar portfolio rose
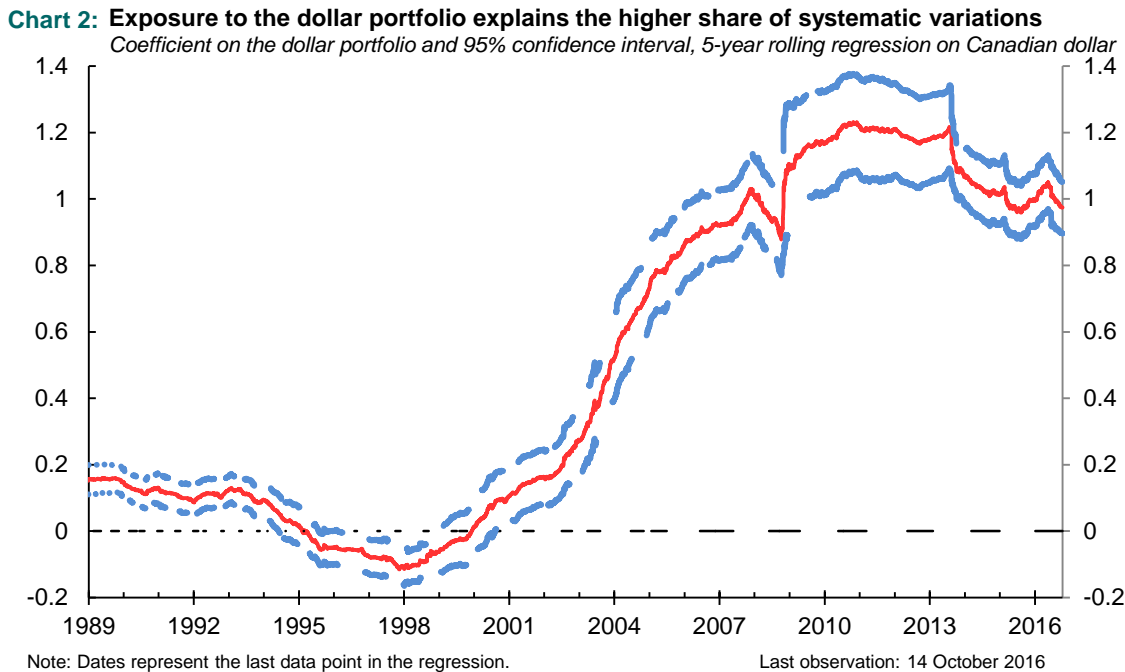
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[3] The specification in Verdelhan (2015) is given by

$$\Delta s_{t+1} = \alpha + \beta(i_t^* - i_t) + \gamma(i_t^* - i_t)Carry_{t+1} + \delta Carry_{t+1} + \tau Dollar_{t+1} + \varepsilon_{t+1}, \qquad (1)$$

which we estimate every day from November 1983 to April 2016 using a rolling five-year window. The dependent variable Δs_{t+1} is the log-change in the spot exchange and $(i_t^* - i_t)$ is the log-difference between one-month interest rates relative to the United States. We construct the carry and dollar portfolios as in Verdelhan (2015), using a panel of 53 spot and forward exchange rates representing the world's most actively traded currencies based on the Bank for International Settlement's Triennial Central Bank Survey of foreign exchange and derivatives market activity in 2013. The sample includes some former European currencies until the introduction of the euro. We exclude observations with large deviations from covered interest rate parity.

from essentially zero for most of the 1990s to 0.8 in the 2000s, reaching approximately 1.0 after 2008 (**Chart 2**).[4]

To interpret the results, recall that the dollar portfolio mirrors the average change across international currencies relative to the US dollar. A coefficient of 0 on the dollar portfolio—as in the early part of the sample—means that the Canadian dollar shared none of the average variations observed in other exchange rates (relative to the US dollar). A coefficient of 1, as observed in the more recent period, indicates that the Canadian dollar's daily variations against the US dollar closely mirror those of the average world currency.

Chart 2: **Exposure to the dollar portfolio explains the higher share of systematic variations**
Coefficient on the dollar portfolio and 95% confidence interval, 5-year rolling regression on Canadian dollar

Note: Dates represent the last data point in the regression.   Last observation: 14 October 2016

The Recent Depreciation of the Canadian Dollar is Largely Systematic

The Canadian dollar depreciated from US$1.00 at the start of 2013 to below 70 cents US for a short time at the beginning of 2016. Such a change in the exchange rate is historically significant—the Canadian dollar has not depreciated by as much over a similar horizon for more than 35 years.[5] We use our results based on a five-year rolling estimation to produce the path for the Canadian dollar, as if it had been influenced solely by dollar and carry. The difference between this implied path and the actual behaviour of the exchange rate may be due to the impact of domestic news on the currency. We report results starting on 21 July 2011, at which point the Canadian dollar reached its post-crisis high: US$1.06. We perform an out-of-sample exercise from this point: we calculate the contribution of dollar and carry, keeping coefficients fixed at the values estimated between 2006 and 2011 (**Chart 3**).

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[4] The Canadian dollar exposure to the carry portfolio is not statistically different from zero (unreported).

[5] This depreciation is greater in level and percentage terms than any other two-, three- or four-year window in the past 35 years. It is also greater than in any one-year window, excluding the financial crisis (2008–09).

Chart 3: **Systematic variations explain most of the Canadian dollar depreciation**

Out-of-sample model-implied exchange rate and actual exchange rate, daily data $

Sources: Reuters and Bank of Canada calculations   Last observation: 14 October 2016
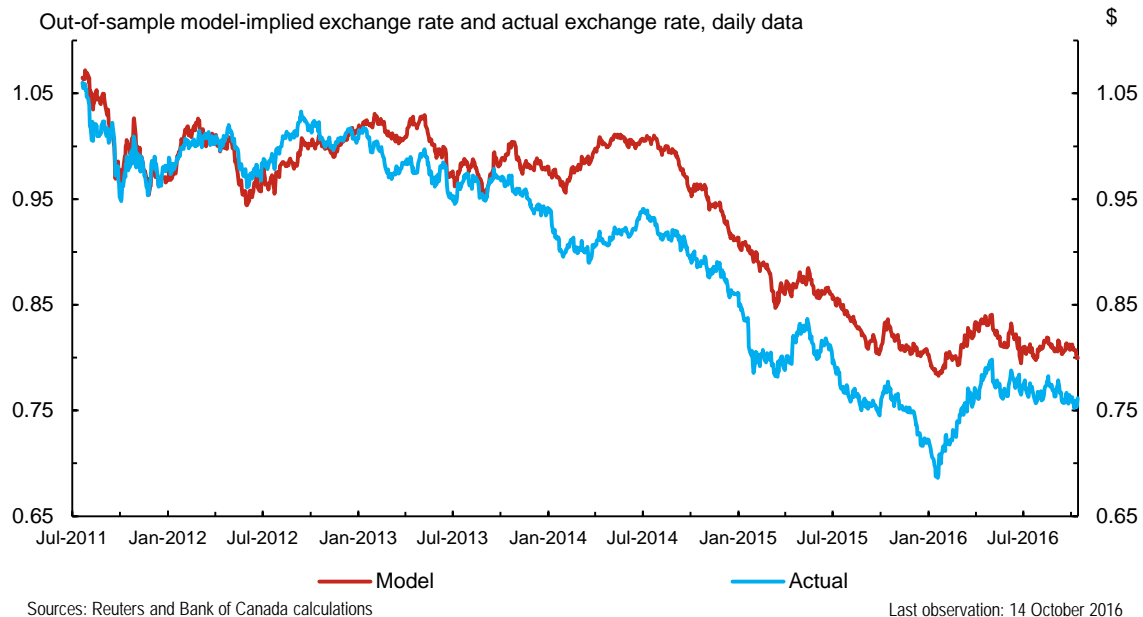
Chart 3 demonstrates the importance of systematic variations. Most of the depreciation in the Canadian dollar against the US dollar between 2011 and 2016 is systematic. The model tracks the Can$/US$ exchange rate over this long out-of-sample period, with a final deviation of less than 4 cents. The sensitivity of the Canadian currency to the dollar portfolio alone was associated with a depreciation of more than 28 cents.

Why Have Systematic Variations Increased?

It would seem that the role of international economic or financial conditions in Canadian dollar variations has increased over time. This closer integration with global markets is not unique to the Canadian dollar. **Chart 4** shows the increase of the regression-adjusted R^2 for several currencies. We compare the share of systematic variations for the five-year window ending in January 2000 with the share of systematic variations for the period ending in April 2016. Most observations lie above the 45-degree line; this implies that the share of systematic variations has increased over this period.

The increase in systematic variations is shared by some of the Canadian dollar's peers

X-axis represents R^2 for regression ending in January 2000
Y-axis represents R^2 for regression ending in April 2016

Source: Bank of Canada calculations   Last observation: 20 April 2016
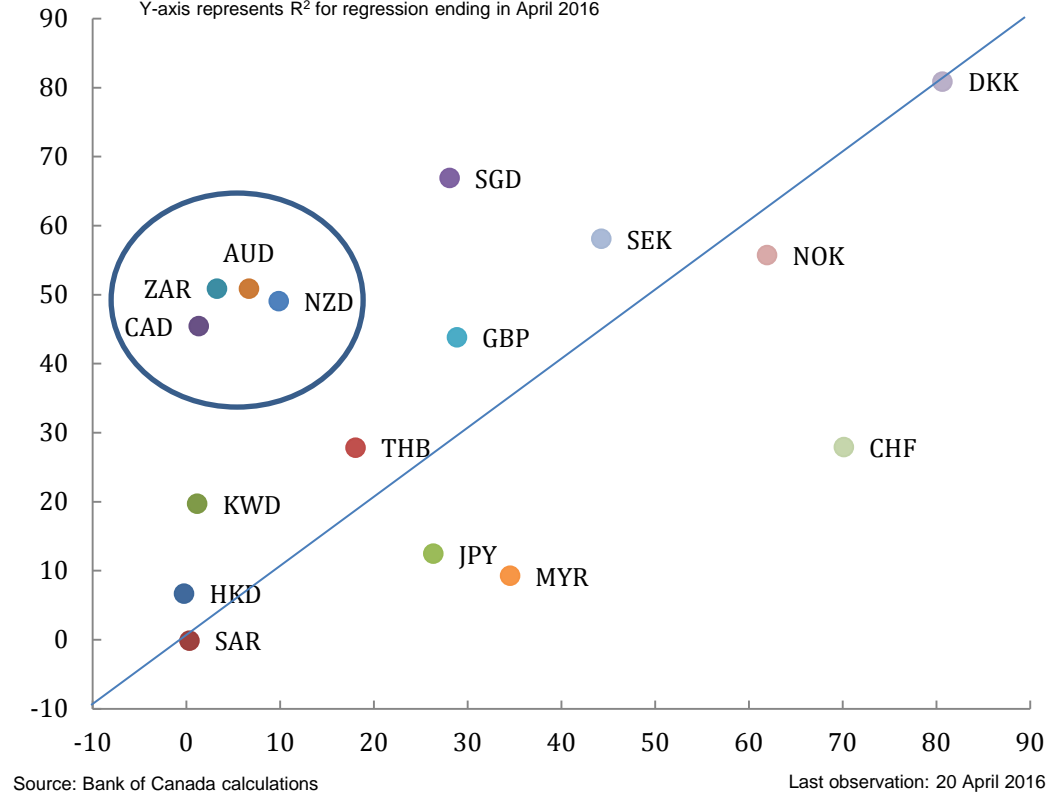
Looking more closely, we can see that the Australian dollar, the New Zealand dollar and the South African rand exhibit an increase in the share of systematic variations that is similar to that seen for the Canadian dollar. These currencies are often grouped together in a "commodity bloc." We will assess the potential role of commodity prices in a follow-up staff analytical note.
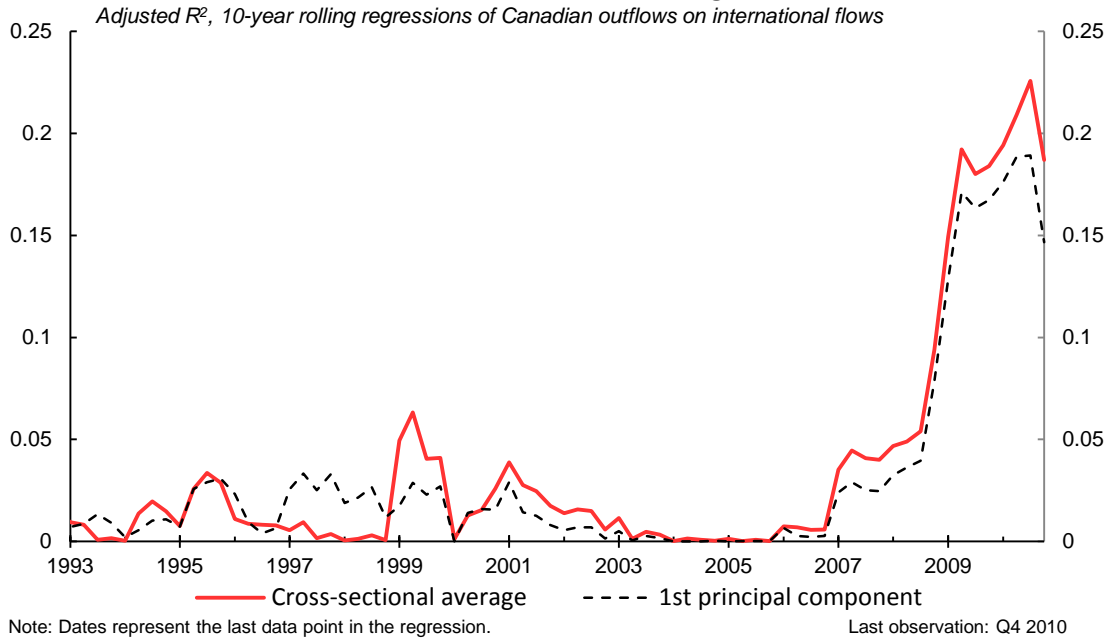
Here we explore one hypothesis put forward in Verdelhan (2015), who suggests that the larger role of the dollar portfolio is associated with a greater correlation between monthly financial flows. Specifically, Verdelhan relates the coefficient on the dollar portfolio to co-movement between a country's gross financial flows and the variations in the gross financial flows of other countries.[6] In other words, countries whose financial flows are correlated with global financial flows tend to have a higher dollar portfolio coefficient.

Consistent with this observation, we find that Canada's gross financial flows became more integrated. To confirm this, we ask by how much are Canada's gross financial outflows explained by the cross-country average of financial outflows. We find that the R^2 in this regression is essentially zero until the mid-2000s (**Chart 5**)—which is the period when the exposure to the dollar portfolio is essentially zero—and then it rises rapidly. Hence, financial flows to Canada became more

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[6] Verdelhan (2015) uses quarterly data on countries' gross financial outflows from the International Monetary Fund, compiled by Bluedorn et al. (2013), and available until the end of 2010.

correlated with international flows precisely when the influence of the dollar portfolio rapidly increased. Repeating this exercise but replacing the cross-country average with the first principal component produces essentially the same results.

Chart 5: Canadian financial flows are more correlated with global financial flows

Adjusted R^2, 10-year rolling regressions of Canadian outflows on international flows

Note: Dates represent the last data point in the regression.
Last observation: Q4 2010

Legend: Cross-sectional average — — — 1st principal component

Conclusion

Measuring the systematic component of exchange rate allows us to identify the effect of domestic news releases and policy announcements. Our results show that the share of systematic variations in the Canadian dollar has increased significantly. In other words, variations in the Canadian dollar relative to the US dollar are increasingly similar to the average variations across other currencies relative to the US dollar. These systematic variations seem to explain most of the depreciation between 2011 and 2016.

Several reasons may explain this increased role of systematic variations. We suggest that the higher integration of gross financial flows across countries plays an important role. Nonetheless, the share of systematic variations has increased for currencies of large commodity exporters (**Chart 4**) and in a period sometimes labelled as a "commodity boom." This suggests that the sensitivity of exchange rates to commodity prices may be missing from our decomposition of exchange rate variations. We will discuss this alternative in a follow-up staff analytical note.

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