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# International Transmission Channels of U.S. Quantitative Easing: Evidence from Canada

**by**

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# Abstract

The U.S. Federal Reserve responded to the great recession by reducing policy rates to the effective lower bound. In order to provide further monetary stimulus, they subsequently conducted large-scale asset purchases, quadrupling their balance sheet in the process. We assess the international spillover effects of this quantitative easing program on the Canadian economy in a factor-augmented vector autoregression (FAVAR) framework, by considering a counterfactual scenario in which the Federal Reserve's long-term asset holdings do not rise in response to the recession. We find that U.S. quantitative easing boosted Canadian output, mainly through the financial channel.



*JEL classification: C32, E52, E58, F42, F44*
*Bank classification: Transmission of monetary policy; International topics; Monetary policy framework*



# Résumé

En réaction à la Grande Récession, la Réserve fédérale américaine a réduit son taux directeur à sa valeur plancher. Afin d'accentuer la détente monétaire, la banque centrale américaine a par la suite mis en œuvre des achats massifs d'actifs, ce qui a eu pour effet de quadrupler la taille de son bilan. Les auteurs évaluent les effets de débordement de ce programme d'assouplissement quantitatif à l'international par le prisme de l'économie canadienne, à l'aide d'un modèle vectoriel autorégressif enrichi de facteurs (FAVAR). Ils examinent ainsi un scénario hypothétique dans le cadre duquel les actifs à long terme détenus par la Réserve fédérale n'auraient pas augmenté en réponse à la récession. Les auteurs constatent que les mesures d'assouplissement quantitatif adoptées par les États-Unis ont stimulé la production canadienne, principalement par le canal de l'activité financière.



*Classification JEL : C32, E52, E58, F42, F44*
*Classification de la Banque : Transmission de la politique monétaire; Questions internationales; Cadre de la politique monétaire*

# 1 Introduction

In the aftermath of the global financial crisis, many central banks turned to quantitative easing (QE), or large-scale purchases of long-term assets, as a means to provide monetary stimulus when their conventional policy interest rates became stuck at their respective effective lower bounds. The U.S. Federal Reserve, in particular, responded to the post-crisis recession by reducing its short-term policy rate to near zero, and subsequently attempting to bring down long-term interest rates by purchasing long-term assets in an unprecedented scale, effectively quadrupling the size of its balance sheet by the end of 2013 in the process (see Figure 1).[1] Since then, the economic literature has focused on explaining the transmission mechanism of QE (Bernanke [2012]), and quantifying its impact on the domestic economies of countries implementing such policies (Lenza et al. [2010], Kapetanios et al. [2012], Baumeister and Benati [2013]). Given the globally interconnected markets in which the crisis unfolded, however, it is reasonable that the unprecedented policy reaction to the crisis may also have large international spillovers. Yet, there is a dearth of analysis on the international transmission of QE to the real economies of countries that did not adopt such programs. In this paper, we address this gap by assessing the spillover of the Fed's QE program to the real economy of a non-QE country, namely, Canada.

Specifically, we (a) quantify the effect of the Fed's long-term asset purchases on the Canadian economy, and (b) identify the principal channels of international transmission in a two-country factor-augmented vector autoregression (FAVAR) framework by considering a counterfactual scenario where the Fed's long-term asset holdings do not rise in response to the recession.

Although the effect of QE on the U.S. domestic economy is thought to be stimulative under the zero lower bound, it is unclear whether its effect on foreign economies would be unambiguously expansionary. Whether by signaling the Fed's intention to keep short-term rates low for an extended period (Woodford [2012]), or by rebalancing imperfectly substitutable financial assets in investor portfolios (Bernanke [2012]), large-scale purchases of long-maturity assets by the Fed would increase asset prices and reduce bond yields. Higher asset prices would then boost consumption through wealth effects. At the same time, a rise in asset prices relative to the replacement cost of capital would boost investment, as would a reduction in the user cost of capital due to a drop in long-term interest rates.

Standard economic theory, however, provides ambiguous implications for the international spillover of monetary easing (Rogoff [2002]). Through the expenditure-switching effect, a monetary expansion in the United States would depreciate the home currency and deteriorate its terms of trade, making home goods cheaper for foreigners. The re-

[1] Although the first wave of asset purchases was aimed at preventing the seizing up of credit markets and included short-term emergency lending to financial firms, purchases of agency debt and asset-backed securities, subsequent programs targeted long-term mortgage-backed securities and government bonds in an effort to reduce long-term interest rates. In this paper, we assess the effects of the latter aspect of QE. For a discussion on the difference between the two aspects of balance-sheet expansion, see Lenza et al. [2010], and Kozicki et al. [2011].

sulting increase in home country net exports would then detract from the real output of the foreign economy. The income-absorption effect, on the other hand, implies that as long as expansionary monetary policy in the home country drives up domestic income, home demand for imports would rise, boosting the economy of foreign exporters. Finally, in the presence of global financial market integration, any increase in asset prices and reductions in yields in the domestic financial market resulting from QE may be reflected by similar movements in corresponding foreign financial market variables,[2] which in turn would boost foreign consumption and investment through the same mechanism as it does in the domestic case. Therefore, whether Canada benefits from the U.S. expansion through QE depends on which of these effects dominate, and is an empirical question that we attempt to answer here.

Our interest in identifying the international transmission channels of QE makes FAVAR (Bernanke et al. [2005], Boivin and Giannoni [2007], Charnavoki and Dolado [2014]) the appropriate framework to consider, since it allows us to simultaneously assess the dynamic interactions between a large number of financial and real variables.

We choose Canada as an important case to highlight international transmission channels for a number of reasons. First, its strong trade and financial ties with the United States makes it reasonable to expect spillovers to be strong and easily observable. Second, the Bank of Canada did not implement QE, since the pre-crisis resilience of the Canadian financial sector prevented severe financial contagion during the crisis.[3] Figure 1 shows, however, that despite virtually no change in the amount of long-term assets in the Bank of Canada's balance-sheet holdings,[4] long-term spreads in Canada fell at the same time as its U.S. counterpart. Third, Canada is a small open economy with a floating exchange rate, with a long tradition of independent monetary policy, and availability of quality data. The latter is of particular practical importance when considering a FAVAR analysis. Finally, Canada is also a commodity exporter, allowing for a richer exploration of possible spillover channels of QE. For example, even when the income-absorption effect dominates in the United States, higher import demand for Canadian energy products may drive up the Canadian exchange rate, putting the non-energy sectors at a disadvantage from an export price point of view.[5]

[2]Indeed, Fratzscher et al. [2013] find that QE boosted equity prices worldwide, including in Canada, while Bauer and Neely [2012] show that long-term Canadian yields decreased following U.S. large-scale asset purchase announcements.

[3]Note that Canada provided direct qualitative signals on the future path of short-term rates through forward guidance statements, as did the United States (Fay and Gravelle [2008]). Moreover, the Bank of Canada provided term-liquidity facilities to financial market participants to stabilize the financial system and limit the repercussions of the crisis to the Canadian economy (Zorn et al. [2009]).

[4]The increase in the other-asset category seen from 2011 onwards reflects the Canadian federal government's debt management strategy. Specifically, in the 2011 federal budget, the government decided to hold prudential assets in the form of cash and short-term treasuries that would allow it to operate for one month in case its regular access to financial markets were hindered. For details, see the government's prudential liquidity-management plan delineated in the budget document, `http://www.budget.gc.ca/2011/plan/anx2-eng.html`. Taking a purely monetarist approach, however, one might interpret the rise in the total assets of the Bank of Canada's balance sheet as a monetary expansion (Gambacorta et al. [2012]).

[5]Using a FAVAR approach, Charnavoki and Dolado [2014] find that a higher exchange due to high

Since the beginning of the foray into unconventional policy, a number of studies have attempted to quantify the effects of QE on domestic financial markets (Gagnon et al. [2011], Krishnamurthy and Vissing-Jorgensen [2011]), and domestic real economies of countries conducting such policies (cf. Lenza et al. [2010] for an analysis on the euro area, Kapetanios et al. [2012] for the United Kingdom, Baumeister and Benati [2013] for the United States and United Kingdom, Schenkelberg and Watzka [2013] for Japan, and Gambacorta et al. [2012] for an international comparison), as well as on the spillovers of QE to international financial markets (Fratzscher et al. [2013], Bauer and Neely [2012]). To the best of our knowledge, this is the only paper that attempts to assess the effects of international spillovers of QE on the real economy. In this sense, it complements the literature on the real spillovers of conventional monetary policy (Kim [2001], Kazi et al. [2013]).

Our approach differs from existing studies on the effects of QE in two important ways. First, while earlier studies proxy U.S. policy through its intended, but unobserved, effects on long-term rates, we directly measure policy action through the observable expansion of the Fed's balance sheet. With limited information available at the onset of the implementation of QE, early papers on the topic take findings from event studies on financial market reactions to Fed announcements as given, and construct counterfactual scenarios where the absence of QE is proxied through higher long-term rates.[6] We, on the other hand, measure QE as the Fed's balance-sheet holdings of long-term assets, and construct a counterfactual scenario where these holdings are not increased in reaction to the great recession. Our measure takes advantage of 19 quarters of observable data, and is agnostic about the effect on long-term rates. Note, however, that we retain the focus on long-term asset purchases, rather than the increase in the monetary base or the total size of the Fed's balance sheet as considered by Gambacorta et al. [2012].[7]

Second, we estimate a two-country FAVAR with coefficient restrictions which allows us to study the transmission of U.S. policy through dynamic interactions between a large number of financial and real variables, while at the same time restricting U.S. policy from being influenced by movements in Canadian economic variables. We believe this is the appropriate framework for studying relationships between a large country such as the United States and a small open economy such as Canada (Charnavoki and Dolado

energy prices negatively impacts the non-energy sector output only after a negative energy supply shock, while it positively impacts non-energy sector output following a positive global demand shock. This finding is mirrored by Dorich et al. [2013], who use an estimated dynamic stochastic general-equilibrium (DSGE) framework.

[6]Looking at financial market reaction within a short time-window of the Fed announcements regarding QE, Gagnon et al. [2011] and Krishnamurthy and Vissing-Jorgensen [2011] suggest that QE lowered long-term treasury yields by between 30 and 100 basis points. Baumeister and Benati [2013] accordingly construct their counterfactual scenario of a world without QE as one where long-term yields are 100 basis points higher. In a similar event study, Joyce et al. [2011] find that QE announcements in the United Kingdom reduced long-term government bond rates by 100 basis points. This, in turn, serves as the basis for the counterfactual scenario considered by Kapetanios et al. [2012].

[7]Interpreting QE as an increase in the total size of the Fed's balance sheet or monetary base espouses a purely monetarist view that relies on the structural stability of the money multiplier and the velocity of money (Woodford [2012]).

[2014]).

We find that the implementation of QE increases U.S. output by about 2.3 percent and Canadian output by 2.2 percent on average between 2008Q4 and 2013Q3, when compared with the no-QE counterfactual scenario. Because of QE, U.S. long-term spreads decline, and asset prices rise, boosting both investment and consumption, though the latter is not statistically significant. The transmission to Canada occurs mostly through the financial market. Although Canada did not implement QE, long-term spreads in Canada fall, and asset prices in the Canadian stock market rise. QE also leads to higher oil prices, an improvement in the Canadian terms of trade and an appreciation of the Canadian nominal exchange rate vis-à-vis the United States, consistent with the commodity currency effect documented by Charnavoki and Dolado [2014] and Dorich et al. [2013].

In other words, financial market integration results in Canadian interest rates and asset prices moving in the same direction as those in the United States following the implementation of QE. Along with the effects of improved terms of trade, spillovers from the financial channel bolster the domestic Canadian economy, driving up Canadian demand for imports, while the appreciation of the Canadian dollar makes imports cheaper. As a consequence, net exports fall, despite the fact that Canadian exports increase in most product categories, consistent with a stronger U.S. economy. Our finding that the financial channel dominates the trade channel in transmitting positive spillovers from a U.S. monetary expansion is consistent with the transmission of conventional monetary policy documented by Kim [2001] using a small structural vector autoregression.

The rest of the paper is organized as follows. Section 2 describes the two-country FAVAR set-up, as well as the data and estimation process. Section 3 describes the counterfactual set-up and the results of the exercise for both aggregate real and financial variables, as well as some disaggregated variables. We provide some robustness analysis in section 4, including a qualitative look at the transmission mechanism for a conventional monetary policy shock to the U.S. policy rate. Section 5 concludes.

# 2 Empirical Framework

We choose a FAVAR approach (Bernanke et al. [2005] and Boivin and Giannoni [2007]) to assess the different international transmission channels of QE. This is the appropriate framework to consider, since it allows us to simultaneously compare the effect of QE on a broad set of financial and real variables from Canada and the United States, while taking into account the dynamic interactions between them. We explain our empirical set-up, describe the data and discuss the estimation method below.

## 2.1 Empirical model

Our FAVAR specification contains two country-specific blocks. Following Charnavoki and Dolado [2014], we impose two restrictions to reflect the small open-economy nature of Canada. First, by imposing block-zero restrictions on the VAR coefficients, we ensure that movements in Canadian factors do not influence movements in U.S. factors. Second,

by specifying that Canadian time series load onto both U.S. and Canadian factors, we allow for a strong co-movement between real and financial variables of both countries, while keeping unobserved factors orthogonal to each other.

The one-directional nature of the relationship between these two countries inherent in our modeling choice is motivated by the following observations from international trade and financial flow data. First, Canada is highly dependent on the United States for its international trade, while the reverse is not true. On average, 84 percent of total Canadian exports between 2000 and 2007 were destined for the United States. However, this accounted for only 17 percent of total U.S. imports. Table 1 shows that this disparity is true for Canadian imports as well, and holds across all product categories. International financial flows between the two countries show a similar pattern. Table 2 shows that 47 percent of Canadian portfolio and direct investments abroad are in the United States, while almost 60 percent of foreign direct and portfolio investments in Canada come from the United States. In particular, about 80 percent of foreign investments in Canadian equity are held by U.S. investors. Finally, Table 3 shows that both financial markets and real economies of the two countries are strongly and persistently correlated in business cycle frequencies. This suggests that the Canadian economy is highly responsive to movements in U.S. economic and policy variables, while the reverse may not be true. This is reflected in our empirical framework described below.

The first block in our FAVAR model contains a vector of unobservable factors, $\mathbf{F}_t^{US,F}$, that summarizes information about the U.S. economy, and a vector of observable policy variables, $\mathbf{Y}_t^{US}$, that summarizes the U.S. monetary policy stance. $\mathbf{F}_t^{US} = (\mathbf{F}_t^{US,F},\ \mathbf{Y}_t^{US})$. In our case, the policy variables are the effective federal funds rate and our measure of QE – total long-term asset holdings in the Fed's balance sheet. The second block consists of Canada-specific unobservable factors, $\mathbf{F}_t^{CA}$, that are orthogonal to the U.S. factors.

The U.S. and Canadian data load onto the factors as follows:

$$\begin{bmatrix} \mathbf{X}_t^{US} \\ \mathbf{X}_t^{CA} \end{bmatrix} = \begin{bmatrix} \mathbf{\Lambda}_{US}^{US} & \mathbf{0} \\ \mathbf{\Lambda}_{US}^{CA} & \mathbf{\Lambda}_{CA}^{CA} \end{bmatrix} \begin{bmatrix} \mathbf{F}_t^{US} \\ \mathbf{F}_t^{CA} \end{bmatrix} + \begin{bmatrix} \mathbf{u}_t^{US} \\ \mathbf{u}_t^{CA} \end{bmatrix}, \tag{1}$$

where $\mathbf{X}_t^{US}$ and $\mathbf{X}_t^{CA}$ are data for the U.S. and Canadian economies, $\mathbf{\Lambda}_{US}^{j} = (\mathbf{\Lambda}_{US,F}^{j}\ \mathbf{\Lambda}_{US,Y}^{j})$ are the loading matrices corresponding to the unobservable and observable U.S. factors, and $\mathbf{\Lambda}_{CA}^{CA}$ denotes the loading matrix for the Canadian factors that are orthogonal to the U.S. ones. As we can see, the Canadian data load onto both U.S. and Canada-specific factors. $\mathbf{u}_t^{US}$ and $\mathbf{u}_t^{CA}$ are vectors of idiosyncratic disturbances.

We model the dynamics of the factors as a restricted VAR (see, e.g., Charnavoki and Dolado [2014]):

$$\begin{bmatrix} \mathbf{F}_t^{US} \\ \mathbf{F}_t^{CA} \end{bmatrix} = \begin{bmatrix} \mathbf{b}_{11}(L) & \mathbf{0} \\ \mathbf{b}_{21}(L) & \mathbf{b}_{22}(L) \end{bmatrix} \begin{bmatrix} \mathbf{F}_{t-1}^{US} \\ \mathbf{F}_{t-1}^{CA} \end{bmatrix} + \mathbf{e_t}, \tag{2}$$

where $\mathbf{b}_{ij}(L)$ are lag polynomials of finite order $p$ and $\mathbf{e}_t$ denotes the reduced-form residuals. The block of zeros in the coefficient matrix prevents movements in Canadian factors to influence those in the United States. As argued above, we believe that this restriction adequately captures the small open-economy nature of Canada. Relaxing this restriction, however, does not alter our main findings presented below. Combining equations (1) and

(2), one-step-ahead forecasts for each series contained in the data set can be obtained from the following equation:

$$\begin{bmatrix} \mathbf{X}_t^{US} \\ \mathbf{X}_t^{CA} \end{bmatrix} = \begin{bmatrix} \mathbf{\Lambda}_{US}^{US} & \mathbf{0} \\ \mathbf{\Lambda}_{US}^{CA} & \mathbf{\Lambda}_{CA}^{CA} \end{bmatrix} \begin{bmatrix} \mathbf{b}_{11}(L) & \mathbf{0} \\ \mathbf{b}_{21}(L) & \mathbf{b}_{22}(L) \end{bmatrix} \begin{bmatrix} \mathbf{F}_{t-1}^{US} \\ \mathbf{F}_{t-1}^{CA} \end{bmatrix} + \epsilon_{\mathbf{t}}. \tag{3}$$

## 2.2 Data

We use quarterly data from 122 U.S. and 149 Canadian series ranging from 1983Q1 through 2013Q3. The start date is restricted by the availability of Canadian disaggregated data. The U.S. series include real data from national income, industrial production, employment by industry, as well as data on housing starts and sales, manufacturers' orders and inventory, and a number of different price indexes. Movements in the financial sector are captured through stock prices, nominal and real exchange rates, interest rates of varying maturity, bond prices, monetary aggregates, and commercial bank balance-sheet and lending conditions. We also include confidence indexes from the Conference Board and University of Michigan surveys on business sentiment. The QE variable represents the Federal Reserve's balance-sheet holdings of mortgage-backed securities and treasury bonds with maturities of more than five years. A more detailed discussion on the choice of this variable is provided in section 3 while describing the counterfactual set-up.

The Canadian series include real data on national accounts, Canadian exports and imports by product and by regional destination, flows from the balance of payments account, and industry-level GDP and employment. We also include Canadian house prices and housing starts, and a number of relative price and oil price indexes. Movement in the financial sector is captured through the Toronto Stock Exchange (TSX) price index, nominal and trade-weighted real exchange rates, interest rates of various maturities, as well as balance-sheet conditions from commercial banks and private industry. We capture Canadian business confidence by the Conference Board confidence index.

Most of our data series, both U.S. and Canadian, are downloaded via HAVER analytics. We construct the industry-level GDP for Canada by combining information from tables 379-0027 and 379-0031 from the Canadian Socioeconomic Information Management (CANSIM) database maintained by Statistics Canada.[8] The series are transformed to induce stationarity, and standardized before estimation. For the benchmark case presented in section 3.2, we transform our measure of QE by taking differences in levels, and consider differences in logs in section 4. The appendix provides detailed descriptions, sources and transformation codes for all series considered.

[8]Statistics Canada discontinued table 379-0027 in 2012Q4, where real industry-level GDP is measured in 2002 Canadian dollars, and replaced it with table 379-0031, where data were measured in 2007 dollars and start in 1997Q1. We construct our GDP series by taking data from the latter table, and growing them out backwards using the growth rate of corresponding variables from the former table.

### 2.3 Estimation

Following Bernanke et al. [2005], we estimate the FAVAR in two steps. First, the unobserved factors $\mathbf{F}_t^{US,F}$ and $\mathbf{F}_t^{CA}$ are estimated through principal components from our data sets $\mathbf{X}_t^{US}$ and $\mathbf{X}_t^{CA}$. Second, both unobserved and observed policy variables are then cast into a restricted VAR model.

The unobservable U.S. factors are rotated to be orthogonal to the observed policy variables as follows. First, we start by extracting $K^{US}$ factors from the U.S. data set $\mathbf{X}_t^{US}$ as the largest $K^{US}$ principal components. We then extract the same number of factors from a subset of our data set that contain variables which do not respond to policy changes contemporaneously, i.e., slow-moving variables. The full set of factors are then regressed on the set of slow-moving factors and the set of fast-moving policy variables, $\mathbf{Y}_t^{US}$. The final set of factors, $\hat{\mathbf{F}}_t^{US,F}$, are estimated as a rotation of the original factors that are orthogonal to $\mathbf{Y}_t^{US}$.[9]

We allow Canadian data, $\mathbf{X}_t^{CA}$, to load onto both U.S. and Canadian factors, with loading matrices $\mathbf{\Lambda}_{US}^{CA}$ and $\mathbf{\Lambda}_{CA}^{CA}$, respectively. We estimate the Canadian factors following the iterative procedure employed by Charnavoki and Dolado [2014] in order to control for the effect of the U.S. factors in the Canadian block. Again, we start by extracting $K^{CA}$ factors from the Canadian data set as the largest $K^{CA}$ principal components. Given this initial estimate of the Canadian factors, $\hat{\mathbf{F}}_t^{CA(0)}$, we iterate through the following steps until convergence is achieved:

1. Regress $\mathbf{X}_t^{CA}$ on $\hat{\mathbf{F}}_t^{CA(j)}$ and the estimates of the U.S. factors, $\hat{\mathbf{F}}_t^{US} = \left[\hat{\mathbf{F}}_t^{US,F}, \mathbf{Y}_t^{US}\right]$, to obtain $\hat{\mathbf{\Lambda}}_{US}^{CA(j)}$.
2. Calculate $\tilde{\mathbf{X}}_t^{CA(j)} = \mathbf{X}_t^{CA} - \hat{\mathbf{\Lambda}}_{US}^{CA(j)}\hat{\mathbf{F}}_t^{US}$.
3. Obtain $\hat{\mathbf{F}}_t^{CA(j+1)}$ as the first $K^{CA}$ principal components of $\tilde{\mathbf{X}}_t^{CA(j)}$.
4. Return to step 1. The algorithm stops when the difference between $\hat{\mathbf{F}}_t^{CA(j+1)}$ and $\hat{\mathbf{F}}_t^{CA(j)}$ is sufficiently small.

Different versions of the Bai and Ng [2002] criteria suggest between six and ten factors for the U.S. block and four to eight factors for the Canadian block. We choose six factors for the U.S. block (including the policy variables) and four factors for the Canadian block. Our main message below, however, is robust to any combination of four to ten factors. Using these factors, we estimate equation (2) via restricted ordinary least squares to incorporate the block-zero restriction. We choose only one lag for the VAR to take into account our relatively small sample size.

## 3 International Transmission of QE

Using the empirical set-up described above, we estimate the effect of QE as the difference between two conditional forecasts: one corresponding to the policy scenario, where

[9] See Bernanke et al. [2005] for details.

the Fed's long-term asset holdings follow the path observed in data, and the other, the counterfactual no-policy scenario, where the Fed's holding of long-term assets does not increase in response to the great recession. In this section, we first describe our counterfactual set-up, and then discuss the results of our analysis.

## 3.1 Counterfactual set-up

Although the Federal Reserve announced purchases of mortgage-backed and long-term treasury securities in a staggered manner since the beginning of the financial crisis,[10] actual purchases occurred gradually. Figure 1 shows the rise in long-term asset holdings (holdings of mortgage-backed securities and treasury securities of maturity higher than five years) in the Fed balance sheet, along with the policy rate and the 10-year treasury yield.

For our counterfactual, we construct a no-policy scenario where this increase in long-term asset holdings does not occur. We therefore espouse a view that anticipated increases in long-term asset holdings have an effect on the economy. We believe that this view is somewhere between Gambacorta et al. [2012], who focus on an unanticipated increase in the Fed's balance sheet, and Woodford [2012], who considers that the announcements themselves contain all relevant information about the Fed's policy actions. In our benchmark case, we generate an unconditional forecast of the Fed's long-term asset holdings from equation (2) using pre-recession values of the factors. This gives us a path for the QE variable that is consistent with pre-recession dynamics, but one that does not increase in response to the recession. Our no-policy counterfactual is then generated as the expected value of our variables of interest conditional upon this counterfactual path of the Fed's asset holdings. This approach is similar to Lenza et al. [2010].[11] We also consider an alternative scenario where the QE variable is projected using its pre-recession trend growth rate, and find similar results as our benchmark case. The benchmark conditional forecasts for the policy and the no-policy scenarios are calculated as follows.

1. **Policy scenario:** Using a full-sample estimate of equations (1) and (2), produce a forecast from 2008Q4 until 2013Q3, conditional on the actual path of both the

[10] In November 2008, the Federal Reserve announced purchases of $600 billion worth of mortgage-backed securities. By March 2009, the Fed's holdings of bank debt, mortgage-backed securities and treasury notes reached $1.75 trillion. Purchases of long-term treasury securities worth $600 billion were announced in November 2010, and a rebalancing of the Fed's portfolio away from short-term and toward long-term treasury securities worth $400 billion was announced in September 2011. In September 2012, the Fed announced purchases of mortgage-backed securities worth $40 billion per month, and renewal of the portfolio rebalancing scheme toward long-term securities. In December 2012, the Fed increased purchases of mortgage-backed securities from $40 to $85 billion per month. Finally, in June 2013, the Fed announced a "tapering" of the Fed's asset purchases.

[11] In contrast, Kapetanios et al. [2012] and Baumeister and Benati [2013] consider a counterfactual set of coincident structural shocks, identified through sign restrictions, that move spreads a certain amount higher than observed, while keeping the federal funds rate at the zero lower bound. By conditioning on a particular path of a policy variable, we are spared from imposing a structural interpretation on the set of shocks that represent the Fed's observed policy action.

QE variable $x_t^{*,QE}$ and the effective federal funds rate, $x_t^{*,FF}$:

$$\hat{\mathbf{X}}_{T+h} = E_T\left(\mathbf{X}_{T+h}|\mathbf{B}(L), \mathbf{F}_0...\mathbf{F}_{T+h}, x_{T+h}^{*,QE}, x_{T+h}^{*,FF}\right)$$

for $T+h =$ 2008Q4...2013Q3. This is the policy scenario.

2. **No-policy scenario:** To produce forecasts under the no-policy scenario, first generate a counterfactual path of the QE variable. Second, obtain conditional forecasts using this path and a full sample estimate of equations (1) and (2).

   (a) We generate the counterfactual path of the QE variables in two alternative ways.

      i. Estimate the restricted regression (Equation (2)) using estimated factors through 2008Q3:

$$\begin{aligned} \mathbf{F}_t &= \mathbf{B}^1(L)\mathbf{F}_{t-1} + \mathbf{e}_t \\ t &= \text{1983Q1...2008Q3.} \end{aligned}$$

      Produce an unconditional forecast for the remainder of the sample, and save the path of the QE variable $\tilde{x}_{T+h}^{QE} \in \tilde{\mathbf{X}}_{T+h} = E_T\left(\mathbf{X}_{T+h}|\mathbf{B}^1(L), \mathbf{F}_0...\mathbf{F}_{T+h}\right)$ for $T+h =$ 2008Q4...2013Q3. This gives us the counterfactual path of the QE variable, which is used as our benchmark.

      ii. Construct a counterfactual path for the QE variable where it grows according to a linear and quadratic pre-QE time trend. That is, to obtain a path for $T+h =$ 2008Q4...2013Q3 apply the trend for $t =$ 1983Q1...2008Q3. This gives us the counterfactual path of the QE variable, which is used for robustness.

   (b) Construct a counterfactual forecast from 2008Q4 until 2013Q3, conditional on the actual path of the effective federal funds rate, $x_{T+h}^{*,FF}$, and the counterfactual path of the QE variable, $\tilde{x}_{T+h}^{QE}$, constructed above:

$$\tilde{\mathbf{X}}_{T+h} = E_T\left(\mathbf{X}_{T+h}|\mathbf{B}, \mathbf{F}_0...\mathbf{F}_{T+h}, \tilde{x}_{T+h}^{QE}, x_{T+h}^{*,FF}\right)$$

   for $T+h =$ 2008Q4...2013Q3. This is the no-policy counterfactual scenario.

3. The difference between $\hat{\mathbf{X}}_{T+h}$ and $\tilde{\mathbf{X}}_{T+h}$ is then the effect of QE.

Note that, while we directly measure policy action through 19 quarters of observable expansion of the Fed's balance sheet, we remain agnostic about the quantitative effect (or, even, the direction of change) of QE on long-term rates. In contrast, early studies estimating the effect of QE proxy central bank policy through its intended, but unobserved, effect on long-term rates. Gagnon et al. [2011] and Krishnamurthy and Vissing-Jorgensen [2011] use event-study methods on financial markets to estimate that early Fed announcements related to QE reduced long-term yields by 30 to 107 basis points

(bps). With limited information available at the onset of the implementation of this novel policy paradigm, early studies on the effect of QE take these estimates of announcement effects on long-term yields as given, and construct counterfactual scenarios where, in the absence of QE, long-term spreads are higher by the same amount (Baumeister and Benati [2013], Kapetanios et al. [2012]).

## 3.2 Results

Figures 2 and 3 show the effect of QE for a key set of variables for the United States and Canada, respectively. The solid line represents the difference between the two conditional point forecasts, and the dashed lines show the 68 percent residual bootstrap bands from the counterfactual exercise described above. Note that although these figures resemble traditional impulse responses, they are not so. Instead, they represent the difference between the policy scenario and the no-policy scenario at each quarter of the forecast horizon. When noted, results are expressed in percentage difference from the no-policy scenario.

A number of key results emerge from our exercise. First, as Figure 2 suggests, QE boosts domestic U.S. GDP by lowering long-term spreads. Compared to the counterfactual scenario, on average between 2008Q4 and 2013Q3, the increase in long-term asset holdings in the Fed balance sheet reduces the 10-year treasury spread by 82 bps, and increases GDP by 2.3 percent and the personal consumption expenditure price index by 0.5 percent. Note that our result of a positive impact of QE on U.S. GDP is not derived from an explicit assumption of a reduced long-term spread. Rather, the latter arises as an endogenous response to an increase in the Fed's long-term asset holdings. The magnitude of decline in long-term spreads is comparable to Neely [2010], Krishnamurthy and Vissing-Jorgensen [2011], and Bauer and Neely [2012], who find, using different empirical techniques, that long-term treasury yields fell by 88, 107, and 123 bps, respectively, due to the Fed's 2009 asset purchases, and to Gagnon et al. [2011], who find that the same purchases resulted in a reduction in the 10-year term premium by 30 to 100 bps. Our effect on GDP is also in the same order of magnitude as Chung et al. [2012], who find that a cumulative 70 bps drop in the term premium due to QE resulted in real GDP being higher by 3 percentage points by early 2012. Moreover, the higher personal consumption price under the QE scenario than under the no-policy scenario suggests that our counterfactual exercise does not generate a price puzzle for QE that is often found in the literature on conventional monetary policy shocks.

The domestic transmission of QE occurs largely along the lines explained by Bernanke [2012]. Asset prices (the S&P 500 index), consumer confidence (Conference Board indicator), the banking sector's willingness to lend (Federal Reserve's senior loan officer survey), and commercial and industrial loans all increase, while corporate spreads (BAA - AAA) decline. This raises U.S. investment, and, to a lesser extent, consumption.[12]

[12]To put our quantitative results into better perspective, consider the following two examples: in 2013Q3, real investment and the S&P price index in our QE scenario are estimated to be 38 and 162 percent higher than in our no-policy scenario, respectively. Data show that in 2013Q3, investment was

Second, Figure 3 shows that the spillover effect of QE on Canada is positive, and of the same order of magnitude as in the United States. In the financial market, the increase in the Fed's long-term asset holdings reduces the 10-year Canadian government bond spread by 30 bps on average between 2008Q4 and 2013Q3, compared to the counterfactual. In the goods market, Canadian GDP increases by 2.2 percent, and the consumer price index by 0.5 percent, on average in the same period. In comparison, Bauer and Neely [2012] find that the 2009 asset purchases by the Fed reduced Canadian 10-year yields by 66 bps.

Third, the transmission of QE to Canada occurs mainly through financial channels. Due to strong financial integration, the Canadian corporate spread (Canadian 3-month corporate bond yield - Canadian 3-month government bond yield) falls, while both Canadian asset prices (TSX index), and consumer confidence (Conference Board index) rise alongside their U.S. counterparts. Consequently, both Canadian consumption and investment increase. Our finding that QE in the U.S. transmits to Canada through the financial rather than the trade channel complements a similar finding by Kim [2001] for a conventional monetary policy shock.

Importantly, compared with the no-policy scenario, QE leads to higher oil prices (Brent prices are shown in Figure 3), an improvement in the Canadian terms of trade and an appreciation of the Canadian nominal exchange rate vis-à-vis the United States. This is consistent with the commodity currency effect documented by Charnavoki and Dolado [2014] and Dorich et al. [2013]. Positive spillovers from improved terms of trade bolster Canadian income and wealth, and work in the same direction as the spillovers from the financial channel in raising Canadian consumption and investment.

Finally, net exports fall. However, this is due to higher imports from a comparatively stronger Canadian domestic demand, rather than lower exports to the United States. Looking closer at net exports, however, we find two important trends that contradict a purely expenditure-switching view. First, as we see in Figure 3, although Canadian global net exports decline compared to the counterfactual, net exports destined to the United States increase, or at least stay the same, during that period, suggesting that the decline in net exports is due to trade with the rest of the world. Second, Figures 4 and 5 show that the decline in Canadian net exports is due not to a fall in exports, but rather to stronger imports in almost all product categories.

In other words, financial market integration results in Canadian interest rates and asset prices moving in the same direction as those in the United States following the implementation of QE. Along with the effects of improved terms of trade, spillovers from the financial channel bolster the domestic Canadian economy, driving up Canadian demand for imports, while the appreciation of the Canadian dollar makes imports cheaper. As a consequence, net exports fall, despite the fact that Canadian exports increase in most product categories, consistent with a stronger U.S. economy.

Finally, Figure 6 shows the impact of QE on Canadian GDP by industry. As a commodity-exporting country, Canada generally benefits from a rise in global oil prices. At the same time, the commodity currency effect implies that increased demand for

45.6 percent and the S&P index was 107 percent higher than their recessionary troughs, which occurred in 2009Q3 and 2009Q1, respectively.

oil also appreciates the Canadian exchange rate, which may make other industries non-competitive. Thus, the gains in the oil-producing industry might come at the expense of other industries. This trade-off is often referred to as Dutch disease. As Figure 6 shows, however, GDP in all industries, except for the arts, entertainment and recreation, increase due to the implementation of QE. As such, we do not find any evidence of Dutch disease due to unconventional U.S. monetary policy.

To summarize, we find that the implementation of QE in the United States benefits Canada almost to the same extent as it does the U.S. domestic economy. This spillover into Canada occurs mainly from the financial channel, as integrated financial markets make Canadian asset prices and interest rates move in the same direction as their U.S. counterparts. This effect is also bolstered through stronger Canadian terms of trade. The Canadian exchange rate appreciates, generating leakages through reduced net exports. However, these leakages were a consequence of stronger Canadian demand for imports, and not due to a decline in exports. Despite the coincident rise in oil prices and the Canadian exchange rate, we find no evidence of Dutch disease as a consequence of QE, since GDP in almost all industries shows gains.

# 4 Robustness

The qualitative findings documented in section 3.2 are robust to changes in the number of factors between four and ten, relaxing the coefficient restriction in the VAR from equation (2), a log-difference transformation of the QE variable, or minor changes in the way the counterfactual path for the QE variable is calculated.

In this section, we first provide an alternative specification that includes a combination of changes. Specifically, we include eight U.S. factors and six Canadian factors (instead of six and four, respectively), and remove any coefficient restriction in equation (2), so that Canadian factors can influence movements in U.S. factors and policy variables. Furthermore, we take the log difference of the QE variable instead of the level difference, as in the benchmark case, and consider a counterfactual path where the QE variable grows according to a linear and quadratic time trend. The results are shown in Figure 7.

Although the point estimates of the quantitative effect of QE on the two economies have changed slightly, qualitatively the story remains the same. Namely, the effect of QE on the U.S. domestic economy is expansionary, and brought forth by a reduction in long-term yields. The spillover effect on Canada is also stimulative, and of the same order of magnitude as the domestic effect. The international transmission of QE occurs through the financial channel with lower spreads and higher asset prices, as net trade provides a source of leakage for Canada.

Second, we ask whether the transmission of U.S. monetary easing occurs through different channels for the case of QE than conventional monetary policy. To this end, we estimate Cholesky-ordered impulse-response functions for a 100 bps reduction in the effective federal funds rate in our benchmark FAVAR specification with pre-crisis data, to avoid including the period of the zero lower bound, which is uninformative for shocks to the effective funds rate. The results are shown in Figure 8. Note that the exercise so far

has been to generate the difference between two conditional forecasts – one reflecting the presence of QE, and the other without. As such, they cannot be directly compared with the impulse responses shown in Figure 8. Our purpose here is to check for the direction of responses to determine whether there is a consistent story regarding the transmission channel of U.S. monetary easing.

Following a reduction in the federal funds rate, U.S. GDP increases, while the trade-weighted nominal exchange rate depreciates.[13] The transmission of the U.S. monetary easing to Canada again occurs through financial channels, as the short-term Canadian rate declines and Canadian asset prices (TSX index) increase. The trade channel, however, provides a source of leakage to Canada, as the Canadian nominal exchange rate vis-à-vis the United States appreciates and Canadian net exports fall. This result is consistent with Kim [2001], who explores the transmission of conventional U.S. monetary policy shocks to Canada using a small-scale structural VAR and finds that the financial channel is the main source of spillovers.

# 5 Conclusion

In the aftermath of the global financial crisis, the U.S. Federal Reserve provided unprecedented monetary stimulus to an ailing domestic economy by reducing long-term interest rates through quantitative easing, or large-scale purchases of long-term assets, when their conventional short-term policy rate became ineffective at the zero lower bound. Although the domestic effect of QE is largely understood to be expansionary, its international spillover effect is complicated, from a theoretical standpoint, by the countervailing effects of expenditure switching, income absorption and global financial integration.

In this paper, we empirically assess the international transmission of the Fed's QE program by looking at spillovers to Canada. We estimate the effect of QE on the Canadian economy in a two-country FAVAR framework by comparing conditional forecasts of two scenarios – one where the Fed's long-term asset holdings follow its observed path, and a counterfactual, where they do not increase in response to the great recession.

We find that the implementation of QE increases U.S. GDP by about 2.3 percent, and Canadian GDP by 2.2 percent through reductions in long-term spreads for both countries. The positive spillover of QE to Canada occurs mainly from the financial channel through synchronized asset prices and yield spreads across the two countries, while the trade channel provides leakage through a higher Canadian exchange rate and reduced net exports. However, we find evidence that these leakages are a consequence of a stronger Canadian demand for imports, rather than a reduction in exports. Moreover, despite the joint rise in oil prices and the Canadian exchange rate, we find no evidence of Dutch disease as a consequence of QE, since GDP in almost all industries shows gains.

Our results are robust to reasonable changes in our empirical framework and counterfactual assumptions, and are consistent with the existing literature on the effect of QE

[13] Note, however, that U.S. prices decline, albeit statistically insignificantly, suggesting that considering a FAVAR set-up for our specific sample does not rid us completely of the price puzzle first documented by Sims [1992].

on the U.S. domestic economy and global financial markets, as well as the literature on the international transmission of conventional U.S. monetary stimulus.

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Table 1: Goods trade between Canada and the United States (2000-2007 averages)

| | % of country's total exports or imports | | | |
|---|---|---|---|---|
| | Can exports to U.S. | U.S. imports from Can | Can imports from U.S. | U.S. exports to Can |
| All goods | 83.9 | 17.3 | 58.9 | 22.7 |
| Agriculture | 45.1 | 19.2 | 64.1 | 13.5 |
| Forestry | 84.9 | 55.1 | 71.7 | 33.6 |
| Oil and gas | 98.9 | 22.8 | 20.6 | 22.3 |
| Mining (ex. oil and gas) | 35.4 | 25.6 | 53.4 | 29.5 |
| Consumer goods | 77.7 | 14.7 | 50.0 | 25.0 |
| Chemicals | 85.1 | 16.5 | 69.4 | 20.4 |
| Metals and minerals | 80.6 | 20.3 | 61.0 | 32.2 |
| Machinery | 77.7 | 11.9 | 61.8 | 22.5 |
| Electronics | 76.4 | 5.0 | 46.2 | 15.7 |
| Autos | 97.3 | 29.9 | 77.3 | 56.0 |
| Other transportation | 71.9 | 23.1 | 56.9 | 8.7 |
| Other goods | 82.6 | 2.5 | 44.2 | 15.0 |

Notes: Calculated based on nominal annual series in CAD (industry breakdown of Canadian exports and imports) and USD (all other values). Percentages of total goods exports may not sum to 100 due to some omitted categories.
Sources: IMF Direction of Trade Statistics, WDI, U.S. Census Bureau and Industry Canada

Table 2: U.S. share of total Canadian international investment position

| | 2000-2007 | 2008-2013 |
|---|---|---|
| Total assets | 47.4 | 46.3 |
| Canadian direct investment abroad | 45.8 | 41.4 |
| Canadian portfolio investment | 54.1 | 51.0 |
| Foreign debt securities | 63.8 | 68.0 |
| Foreign equity and investment fund shares | 50.5 | 42.5 |
| Total liabilities | 58.9 | 57.7 |
| Foreign direct investment | 63.4 | 52.6 |
| Foreign portfolio investment | 60.8 | 62.1 |
| Canadian debt securities | 55.9 | 59.6 |
| Canadian equity and investment fund shares | 80.8 | 71.2 |

Note: Calculated using quarterly nominal data in CAD.
Source: Statistics Canada (table 376-0142).

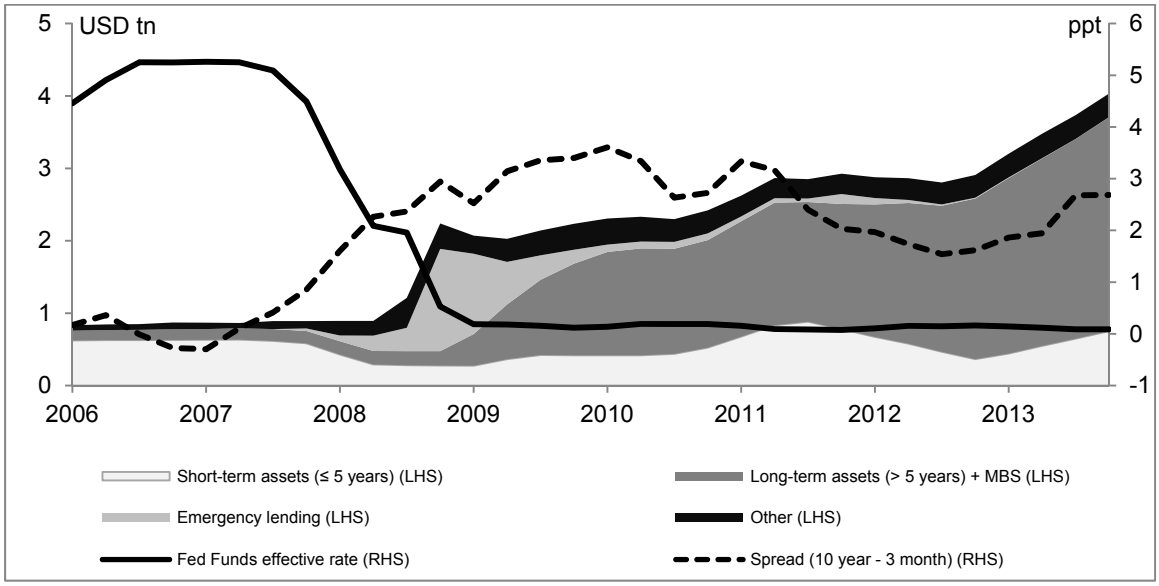
Table 3: Cross-correlations of Canadian variables with U.S. counterparts (1983Q1-2007Q4)

| | Cross-correlations with (leads/lags of) US variables | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | leads | | |
| | -4 | -2 | -1 | 0 | 1 | 2 | 4 |
| Real economy | | | | | | | |
| GDP | 0.352 | 0.640 | 0.721 | 0.737 | 0.641 | 0.481 | 0.095 |
| Consumption | 0.339 | 0.451 | 0.498 | 0.532 | 0.466 | 0.354 | 0.108 |
| Investment | 0.173 | 0.236 | 0.304 | 0.345 | 0.391 | 0.366 | 0.110 |
| Financial markets | | | | | | | |
| TSX/ S&P 500 | 0.184 | 0.440 | 0.549 | 0.724 | 0.621 | 0.405 | 0.108 |
| 3-m Treasury yields | 0.364 | 0.694 | 0.795 | 0.800 | 0.660 | 0.481 | 0.135 |
| 10-y Spreads | 0.058 | 0.457 | 0.639 | 0.773 | 0.697 | 0.484 | 0.051 |

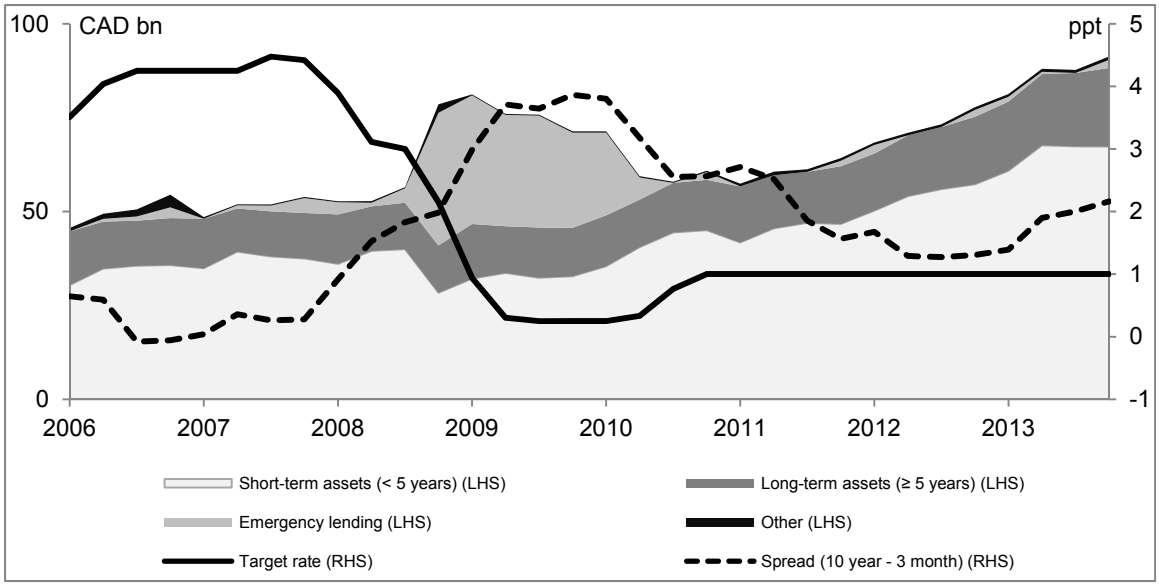
Notes: All variables except yields and spreads are in logarithms. All variables are filtered with HP-filter ($\lambda = 1600$).
Sources: Statistics Canada, Bank of Canada, U.S. Bureau of Economic Analysis, Wall Street Journal and Federal Reserve Board

Figure 1: Central bank assets, policy rate and long-term spreads (2006Q1-2013Q4)

U.S.

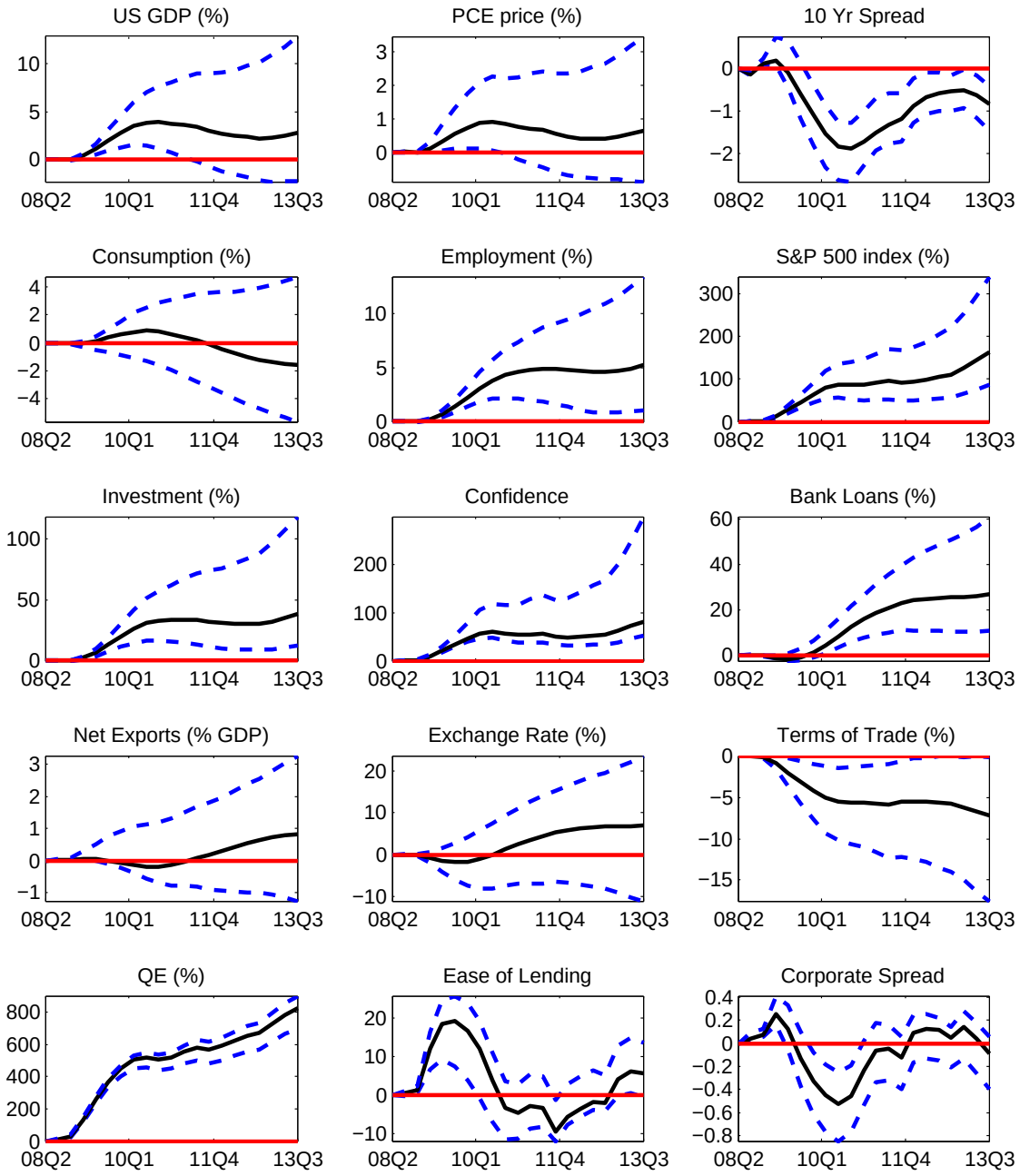



Canada



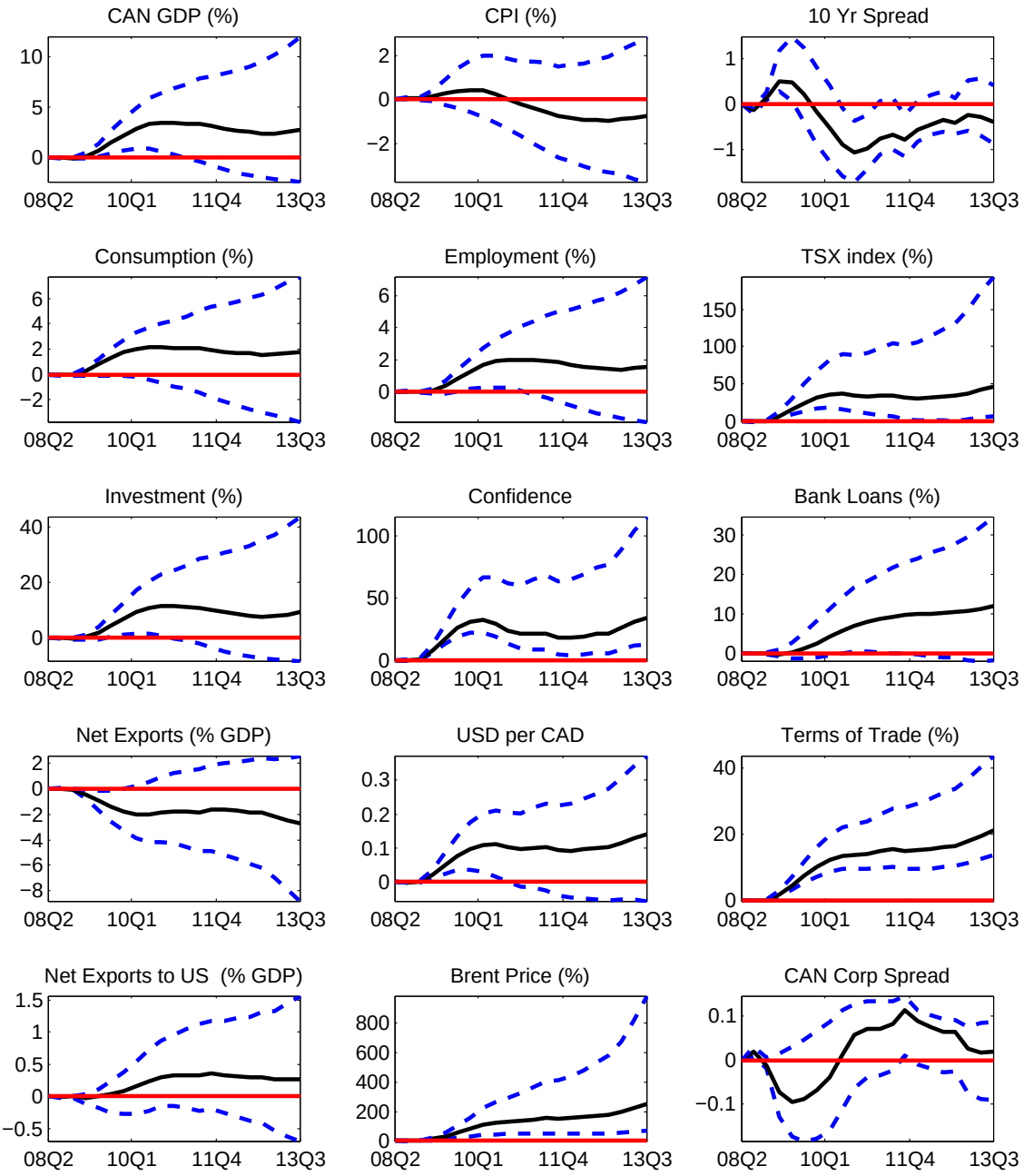

Notes: The top (U.S.) chart reports quarterly averages. The bottom (Canada) chart reports end-of-period data or balance-sheet assets, and quarterly averages for remaining series.
Sources: U.S. Federal Reserve Board, U.S. Treasury and Bank of Canada

Figure 2: Impact of QE on the U.S. economy



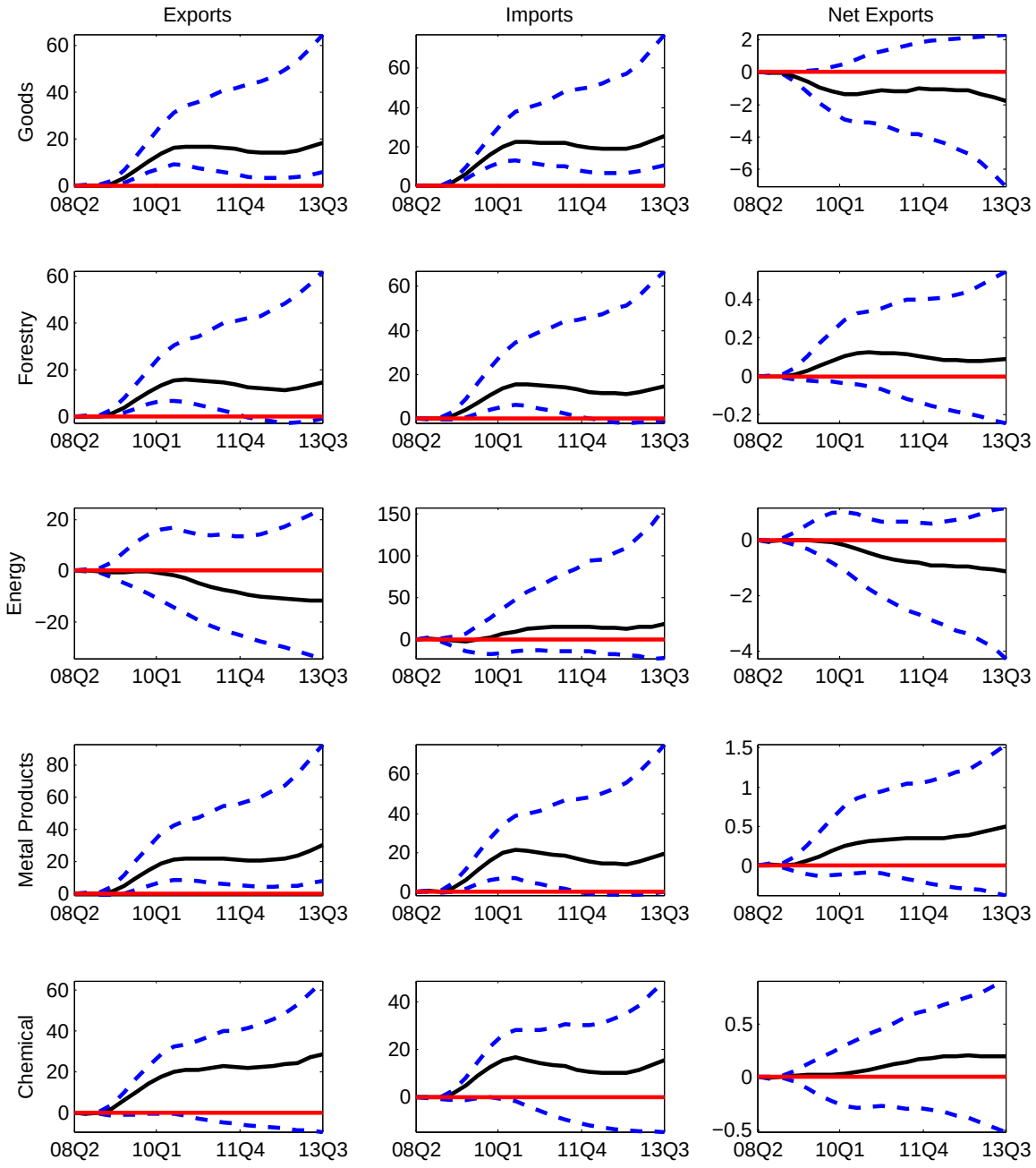

Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 3: Impact of QE on the Canadian economy



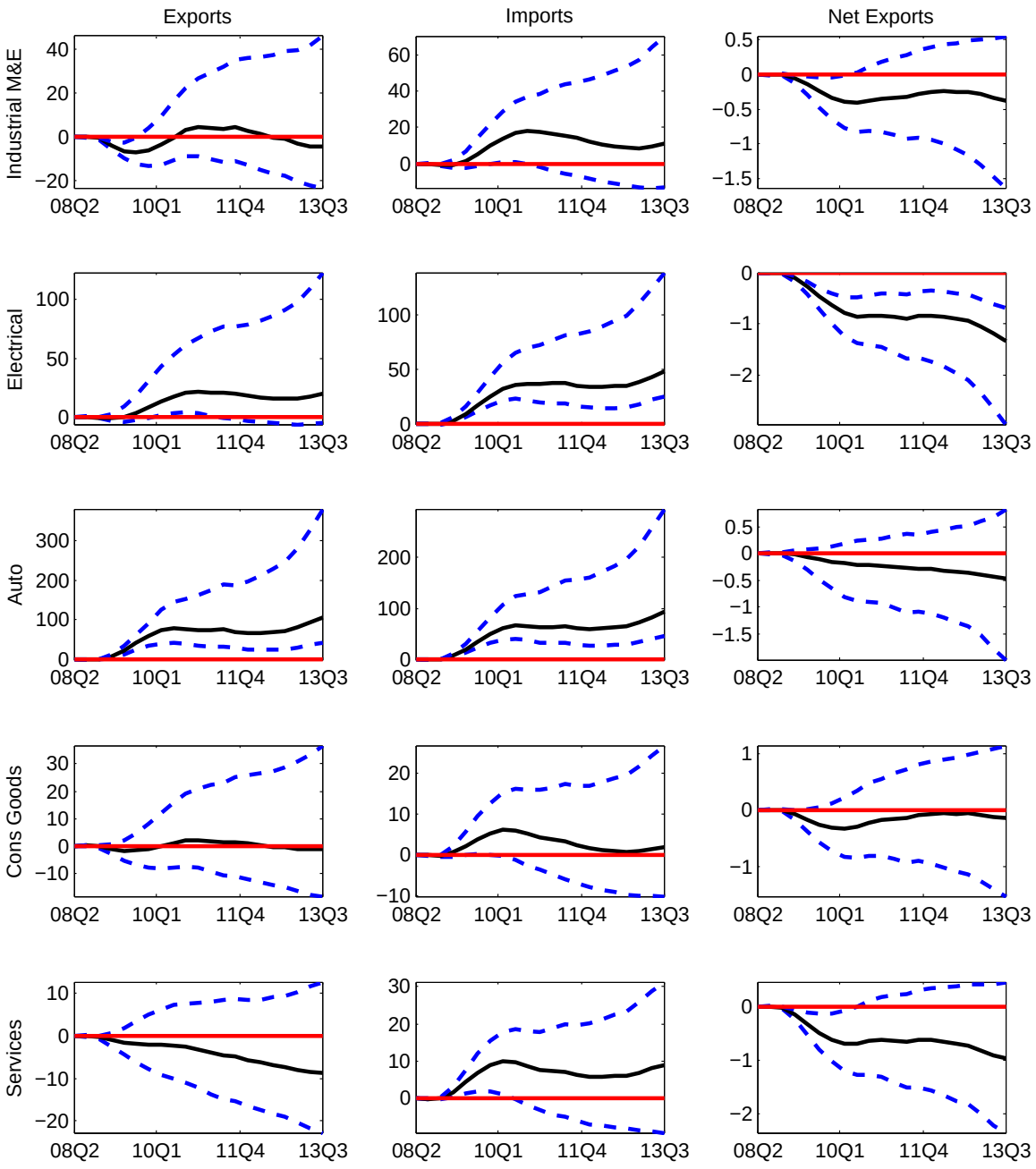

Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 4: Impact of QE on Canadian global trade by product



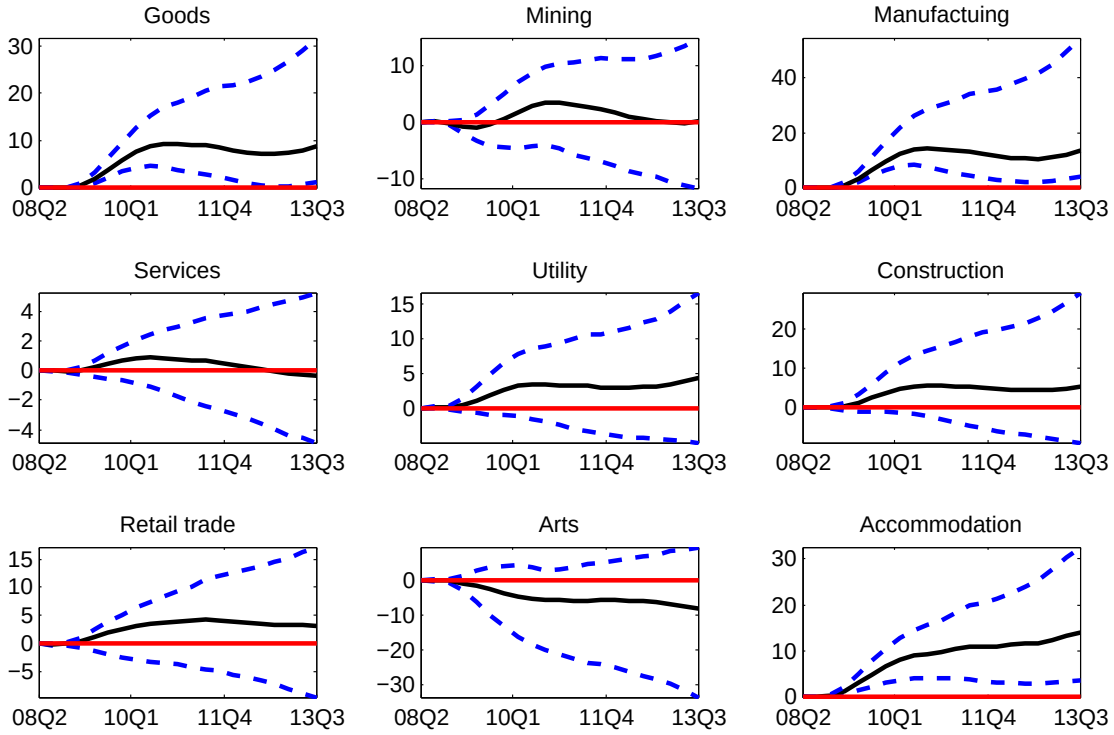

Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 5: Impact of QE on Canadian global trade by product



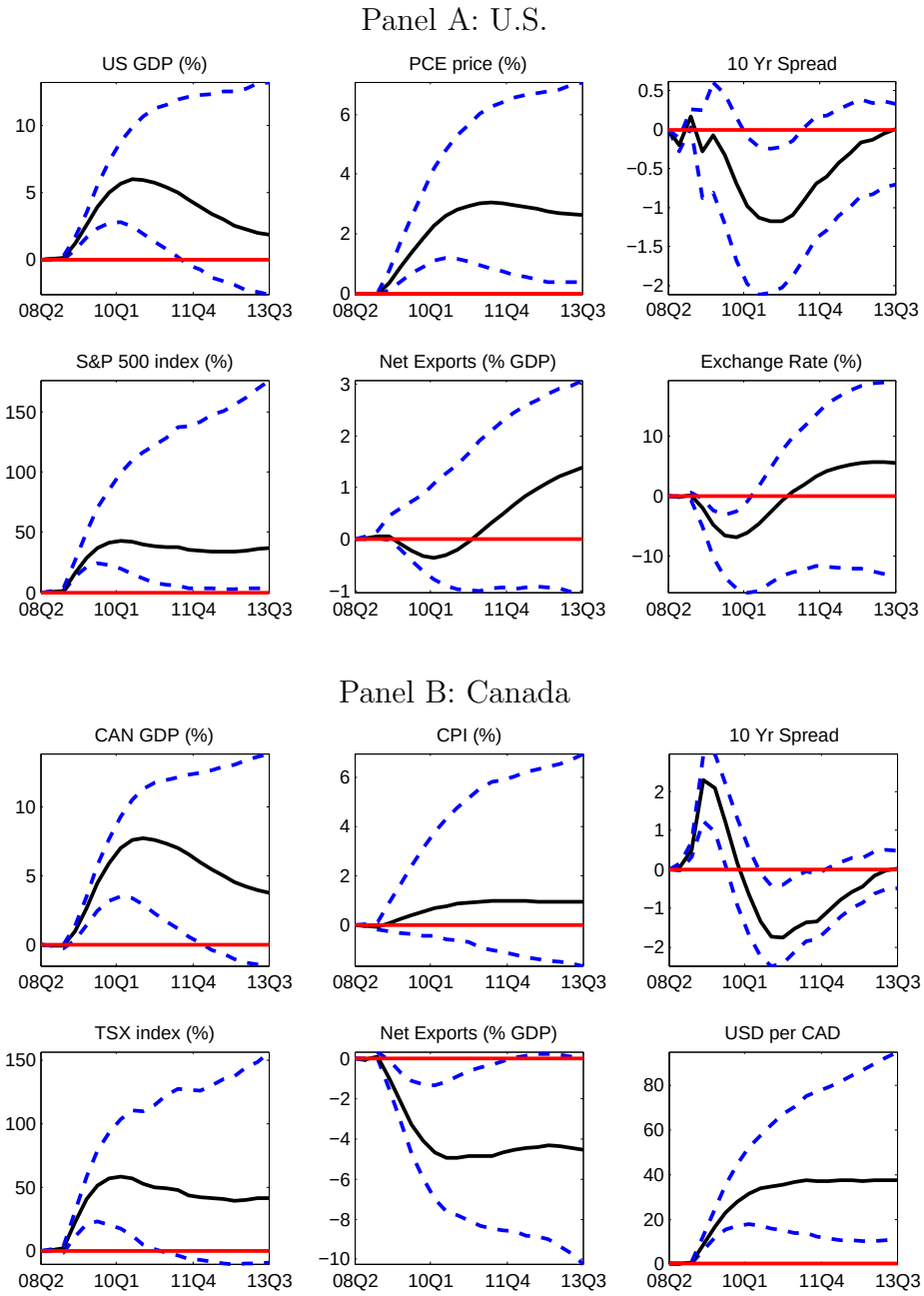

Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 6: Impact of QE on the Canadian GDP by industry



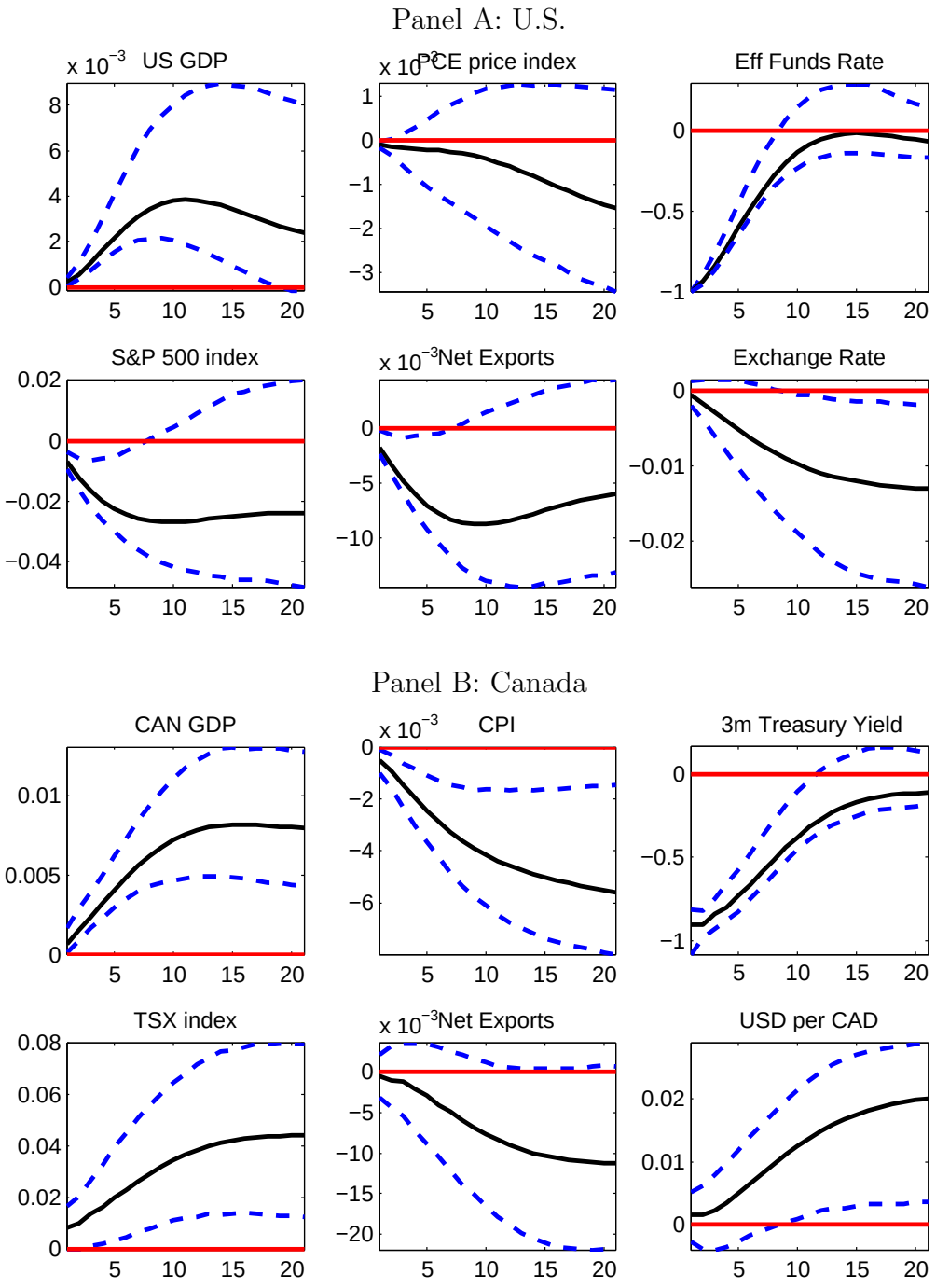

Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 7: Impact of QE on the U.S. and Canadian economy – alternative case




Notes: Difference between the policy scenario and the counterfactual scenario without QE. Point estimate of counterfactual difference along with 68% confidence intervals. Results in percentage difference from the no-QE scenario when noted, and in level differences otherwise.

Figure 8: Impulse responses of a 100 bps reduction in the effective federal funds rate




Notes: Impulse-response functions along with 68% confidence bands. Data span from 1983Q1 through 2008Q2.

## Appendix: Data Description

Format is: series number, series mnemonic, transformation code, series description, source, and the degree to which factors included in the baseline specification explain the variation of the variable (R-squared). All data available from 1983Q1-2013Q3. The transformation codes are: 1 - no transformation; 2 - first difference; 4 - logarithm; 5 - first difference of logarithm. The majority of series were taken from Haver Analytics.

Sources: FRB - Federal Reserve Board, UST - U.S. Treasury, BEA - Bureau of Economic Analysis, JPM - JP Morgan, BLS - Bureau of Labor Statistics, ISM - Institute for Supply Management, CB - Census Bureau, S&P - Standard and Poor's, FRB-C - Federal Reserve Bank of Chicago, GZ - Gilchrist and Zakrajsek 2012, BoC - Bank of Canada, Statcan - Statistics Canada, TSX - Toronto Stock Exchange, IMF - International Monetary Fund, CMHC - Canada Mortgage and Housing Corporation, BIS - Bank for International Settlements

| | | | | | |
|---|---|---|---|---|---|
| **US Variables** | | | | | |
| **Monetary policy** | | | | | |
| 1 | USEffFedFundsRate | 1 | Federal Funds [Effective] Rate (% p.a.) | FRB | 1.00 |
| 2 | QE2 | 2 | Fed Res Banks: UST Security Holdings: Over 5 Yrs + Mortgage-Backed Securities Held Outright (EOP, Mil.$) | FRB | 1.00 |
| **National income and products accounts** | | | | | |
| 3 | USrGDP | 5 | Real Gross Domestic Product (SAAR, Bil.Chn.2009$) | BEA | 0.69 |
| 4 | USrC | 5 | Real Personal Consumption Expenditures (SAAR, Bil.Chn.2009$) | BEA | 0.53 |
| 5 | USrI | 5 | Real Gross Private Domestic Investment (SAAR, Bil.Chn.2009$) | BEA | 0.62 |
| 6 | USrExports | 5 | Real Exports of Goods & Services (SAAR, Bil.Chn.2009$) | BEA | 0.52 |
| 7 | USrImports | 5 | Real Imports of Goods & Services (SAAR, Bil.Chn.2009$) | BEA | 0.66 |
| 8 | USrG | 5 | Real Government Consumption Expenditures & Gross Investment(SAAR, Bil.Chn.2009$) | BEA | 0.34 |
| 9 | USnExports | 5 | Exports of Goods and Services (SAAR, Bil.$) | BEA | 0.69 |
| 10 | USnExportsReceipts | 5 | Exports: Income Receipts from ROW (SAAR, Bil.$) | BEA | 0.61 |
| 11 | USnImports | 5 | Imports of Goods and Services (SAAR, Bil.$) | BEA | 0.8 |
| 12 | USnImportsPayments | 5 | Imports: Income Payments to ROW (SAAR, Bil.$) | BEA | 0.42 |
| 13 | USnGDP | 5 | Gross Domestic Product (SAAR, Bil.$) | BEA | 0.75 |
| **Real output and income** | | | | | |
| 14 | USIPFinalNonind | 5 | Industrial Production: Final Products and Nonindustrial Supplies (SA, 2007=100) | FRB | 0.88 |
| 15 | USIPFinal | 5 | Industrial Production: Final Products (SA, 2007=100) | FRB | 0.84 |
| 16 | USIPCons | 5 | Industrial Production: Consumer Goods (SA, 2007=100) | FRB | 0.62 |
| 17 | USIPConsDur | 5 | Industrial Production: Durable Consumer Goods (SA, 2007=100) | FRB | 0.63 |
| 18 | USIPConsNonDur | 5 | Industrial Production: Nondurable Consumer Goods (SA, 2007=100) | FRB | 0.23 |
| 19 | USIPBusi | 5 | Industrial Production: Business Equipment (SA, 2007=100) | FRB | 0.81 |
| 20 | USIPMat | 5 | Industrial Production: Materials (SA, 2007=100) | FRB | 0.86 |
| 21 | USIPMatDur | 5 | Industrial Production: Durable Goods Materials (SA, 2007=100) | FRB | 0.88 |
| 22 | USIPMatNonDur | 5 | Industrial Production: Nondurable Goods Materials (SA, 2007=100) | FRB | 0.61 |
| 23 | USIPMan | 5 | Industrial Production: Manufacturing [NAICS] (SA, 2007=100) | FRB | 0.91 |
| 24 | USIPMin | 5 | Industrial Production: Mining (SA, 2007=100) | FRB | 0.27 |
| 25 | USIPUtl | 5 | Industrial Production: Electric and Gas Utilities (SA, 2007=100) | FRB | 0.06 |
| 26 | USIPindex | 5 | Industrial Production Index (SA, 2007=100) | FRB | 0.91 |
| **Employment** | | | | | |
| 27 | USLabourForce | 5 | Civilian Labor Force: 16 yr + (SA, Thous) | BLS | 0.31 |
| 28 | USUnempRate | 5 | Civilian Unemployment Rate: 16 yr + (SA, %) | BLS | 0.83 |
| 29 | USUnempLess5w | 5 | Civilians Unemployed for Less Than 5 Weeks (SA, Thous.) | BLS | 0.35 |
| 30 | USUnemp5to14w | 5 | Civilians Unemployed for 5-14 Weeks (SA, Thous.) | BLS | 0.61 |

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|---|---|---|---|---|---|
| 31 | USUnemp15to26w | 5 | Civilians Unemployed for 15-26 Weeks (SA, Thous.) | BLS | 0.55 |
| 32 | USEmpNonfarm | 5 | All Employees: Total Nonfarm (SA, Thous) | BLS | 0.89 |
| 33 | USEmpIndustry | 5 | All Employees: Total Private Industries (SA, Thous) | BLS | 0.89 |
| 34 | USEmpGoodsIndustry | 5 | All Employees: Goods-producing Industries (SA, Thous) | BLS | 0.89 |
| 35 | USEmpLog | 5 | All Employees: Logging (SA, Thous) | BLS | 0.34 |
| 36 | USEmpMin | 5 | All Employees: Mining (SA, Thous) | BLS | 0.54 |
| 37 | USEmpUtl | 5 | All Employees: Utilities (SA, Thous) | BLS | 0.2 |
| 38 | USEmpCon | 5 | All Employees: Construction (SA, Thous) | BLS | 0.82 |
| 39 | USEmpMan | 5 | All Employees: Manufacturing (SA, Thous) | BLS | 0.85 |
| 40 | USEmpManDur | 5 | All Employees: Durable Goods Manufacturing (SA, Thous) | BLS | 0.87 |
| 41 | USEmpManNonDur | 5 | All Employees: Nondurable Goods Manufacturing (SA, Thous) | BLS | 0.68 |
| 42 | USEmpSvc | 5 | All Employees: Private Service-providing Industries (SA, Thous) | BLS | 0.85 |
| 43 | USEmpTrn | 5 | All Employees: Transportation & Warehousing (SA, Thous) | BLS | 0.68 |
| 44 | USEmpRet | 5 | All Employees: Retail Trade (SA, Thous) | BLS | 0.74 |
| 45 | USEmpWht | 5 | All Employees: Wholesale Trade (SA, Thous) | BLS | 0.77 |
| 46 | USEmpFin | 5 | All Employees: Financial Activities (SA, Thous) | BLS | 0.55 |
| 47 | USEmpInf | 5 | All Employees: Information Services (SA, Thous) | BLS | 0.25 |
| 48 | USEmpGov | 5 | All Employees: Government (SA, Thous) | BLS | 0.33 |
| 49 | USEmpIndex | 1 | ISM Mfg: Employment Index (SA, 50+ = Econ Expand) | ISM | 0.76 |
| **Housing starts and sales** | | | | | |
| 50 | USHousingStarts | 4 | Housing Starts (SAAR, Thous.Units) | CB | 0.84 |
| 51 | USHousingStartsNE | 4 | Housing Starts: Northeast (SAAR, Thous.Units) | CB | 0.81 |
| 52 | USHousingStartsMidwest | 4 | Housing Starts: Midwest (SAAR, Thous.Units) | CB | 0.69 |
| 53 | USHousingStartsSouth | 4 | Housing Starts: South (SAAR, Thous.Units) | CB | 0.77 |
| 54 | USHousingStartsWest | 4 | Housing Starts: West (SAAR, Thous.Units) | CB | 0.84 |
| 55 | USNewHousingPermits | 4 | New Pvt Housing Units Authorized by Building Permit (SAAR, Thous.Units) | CB | 0.82 |
| **ISM (NAPM) manufacturing survey** | | | | | |
| 56 | USInventories | 1 | ISM Mfg: Inventories Index (SA, 50+ = Econ Expand) | ISM | 0.49 |
| 57 | USNewOrders | 1 | ISM Mfg: New Orders Index (SA, 50+ = Econ Expand) | ISM | 0.8 |
| 58 | USDeliveries | 1 | ISM Mfg: Supplier Deliveries Index (SA, 50+ = Slower) | ISM | 0.39 |
| **Stock prices** | | | | | |
| 59 | USSP500index | 5 | S&P 500 Stock Price Index (1941-43=10) | WSJ | 0.26 |
| 60 | USSP500IndusIndex | 5 | S&P 500 Industrial Stock Price Index (1941-43=10) | S&P | 0.24 |
| **Exchange rates** | | | | | |
| 61 | USNEER | 5 | JP Morgan Narrow Nominal Effective Exchange Rate Index: U.S. (2000=100) | JP Morgan | 0.27 |
| 62 | CHFzUSD | 5 | Foreign Exchange Rate: Switzerland (Swiss Franc/US$) | FRB | 0.12 |
| 63 | JPYzUSD | 5 | Foreign Exchange Rate: Japan (Yen/US$) | FRB | 0.09 |
| 64 | USDzGBP | 5 | Foreign Exchange Rate: United Kingdom (US$/Pound) | FRB | 0.21 |
| **Interest rates** | | | | | |
| 65 | US3mYield | 1 | 3-Month Treasury Bills, Secondary Market (% p.a.) | FRB | 0.99 |
| 66 | US6mYield | 1 | 6-Month Treasury Bills, Secondary Market (% p.a.) | FRB | 0.99 |
| 67 | US1yYield | 1 | 1-Year Treasury Bill Yield at Constant Maturity (%) | UST | 0.99 |
| 68 | US5yYield | 1 | 5-Year Treasury Note Yield at Constant Maturity (%) | UST | 0.96 |
| 69 | US10yYield | 1 | 10-Year Treasury Bond Yield at Constant Maturity (%) | UST | 0.93 |
| 70 | USAAAyield | 1 | Moody's Seasoned Aaa Corporate Bond Yield (% p.a.) | FRB | 0.91 |
| 71 | USBAAyield | 1 | Moody's Seasoned Baa Corporate Bond Yield (% p.a.) | FRB | 0.89 |
| 72 | ShadowRate | 1 | Shadow rate | Wu and Xia 2013 | 0.99 |
| 73 | US6mSpread | 1 | US6mYield - US3mYield | FRB | 0.16 |
| 74 | US1ySpread | 1 | US1yYield - US3mYield | UST, FRB | 0.54 |
| 75 | US5ySpread | 1 | US5yYield - US3mYield | UST, FRB | 0.65 |
| 76 | US10ySpread | 1 | US10yYield - US3mYield | UST, FRB | 0.65 |
| 77 | USCorporateSpread | 1 | USBAAyield - USAAAyield | FRB | 0.5 |
| **Balance of payments** | | | | | |
| 78 | USCurrAcctBal | 2 | BOP: Balance on Current Account (SA, Mil.$) | BEA | 0.38 |
| 79 | USKInflows | 2 | BOP: For Assets in the U.S., Net: Cap Inflow Ex Fin Derivatives + (SA, Mil.$) | BEA | 0.05 |
| 80 | USKOutflows | 2 | BOP: U.S. Assets Abroad, Net: Outflow Excl Financial Derivatives (-) (SA, Mil.$) | BEA | 0.03 |
| **Price indexes** | | | | | |
| 81 | USGDPprices | 5 | Gross Domestic Product: Chain Price Index (SA, 2009=100) | BEA | 0.48 |
| 82 | USPCEprices | 5 | Personal Consumption Expenditures: Chain Price Index (SA, 2009=100) | BEA | 0.88 |

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|---|---|---|---|---|---|
| 83 | USGPDIprices | 5 | Gross Private Domestic Investment: Chain Price Index (SA, 2009=100) | BEA | 0.36 |
| 84 | USExportPrices | 5 | Exports of Goods & Services: Chain Price Index (SA, 2009=100) | BEA | 0.76 |
| 85 | USImportPrices | 5 | Imports of Goods & Services: Chain Price Index (SA, 2009=100) | BEA | 0.88 |
| 86 | USGprices | 5 | Govt Consumption Expenditures & Gross Investment: Chain Price Index(SA,2009=100) | BEA | 0.63 |
| 87 | USPPIFinGoods | 5 | PPI: Finished Goods (SA, 1982=100) | BLS | 0.89 |
| 88 | USPPIFinConsGoods | 5 | PPI: Finished Consumer Goods (SA, 1982=100) | BLS | 0.89 |
| 89 | USPPIIntGoods | 5 | PPI: Intermediate Materials, Supplies and Components (SA, 1982=100) | BLS | 0.89 |
| 90 | USPPICrude | 5 | PPI: Crude Materials for Further Processing (SA, 1982=100) | BLS | 0.7 |
| 91 | USCPIindex | 5 | CPI-U: All Items (SA, 1982-84=100) | BLS | 0.9 |
| 92 | USCPIapparel | 5 | CPI-U: Apparel (SA, 1982-84=100) | BLS | 0.19 |
| 93 | USCPIhealth | 5 | CPI-U: Medical Care Commodities (SA, 1982-84=100) | BLS | 0.63 |
| 94 | USCPIxFood | 5 | CPI-U: All Items Less Food (SA, 1982-84=100) | BLS | 0.89 |
| 95 | USCPIxHouse | 5 | CPI-U: All Items Less Shelter (SA, 1982-84=100) | BLS | 0.89 |
| 96 | USCPIxHealth | 5 | CPI-U: All Items Less Medical Care (SA, 1982-84=100) | BLS | 0.89 |
| 97 | USToT | 2 | Terms of trade index (exports/imports; ratio of chain price indexes for goods and services, SA 2009=100) | BEA | 0.65 |
| **Monetary aggregates** | | | | | |
| 98 | USM1 | 5 | Money Stock: M1 (SA, Bil.$) | FRB | 0.34 |
| 99 | USM2 | 5 | Money Stock: M2 (SA, Bil.$) | FRB | 0.27 |
| 100 | USMonBase | 5 | Monetary Base (NSA, Mil.$) | FRB | 0.4 |
| **Bank credit (FRB)** | | | | | |
| 101 | USCommCredit | 5 | Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.61 |
| 102 | USCommSecurites | 5 | Securities in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.2 |
| 103 | USCommLoans | 5 | Loans & Leases in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.71 |
| 104 | USCommCILoans | 5 | C & I Loans in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.61 |
| 105 | USCommRELoans | 5 | Real Estate Loans in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.61 |
| 106 | USCommConsLoans | 5 | Consumer Loans in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.07 |
| 107 | USCommOtherLoans | 5 | Other Loans & Leases in Bank Credit: All Commercial Banks (SA, Bil.$) | FRB | 0.36 |
| **Other FRB indicators** | | | | | |
| 108 | USWillingnessToLend | 1 | FRB Sr Officers Survey: Banks Willingness to Lend to Consumers (%) | FRB | 0.51 |
| 109 | USNatActIndex | 1 | Chicago Fed National Activity Index (+=Growth Above Trend) | FRB Chicago | 0.96 |
| 110 | USConsAndHousing | 1 | CFNAI: Personal Consumption & Housing (+=Growth Above Trend) | FRB Chicago | 0.83 |
| 111 | USEmpUnempHours | 1 | CFNAI: Employment, Unemployment, & Hours (+=Growth Above Trend) | FRB Chicago | 0.93 |
| 112 | USProdAndIncome | 1 | Chicago Fed National Activity Index: Production & Income (+=Growth Above Trend) | FRB Chicago | 0.86 |
| 113 | USSalesOrdersInventories | 1 | CFNAI: Sales, Orders, & Inventories (+=Growth Above Trend) | FRB Chicago | 0.78 |
| **Confidence, expectations and uncertainty** | | | | | |
| 114 | USConfidence | 5 | Conference Board: Consumer Confidence (SA, 1985=100) | Conference Board | 0.39 |
| 115 | USConfidencePresent | 5 | Conference Board: Consumer Confidence Present Situation (SA, 1985=100) | Conference Board | 0.62 |
| 116 | USConfidenceExpectations | 5 | Conference Board: Consumer Expectations (SA, 1985=100) | Conference Board | 0.26 |
| 117 | USMichConfidence | 1 | U Michigan: Consumer Sentiment (NSA, Q1-66=100) | U Michigan | 0.66 |
| 118 | USMichConfidenceCurr | 1 | U Michigan: Current Economic Conditions (NSA, Q1-66=100) | U Michigan | 0.73 |
| 119 | USUMichConfidenceExp | 1 | U Michigan: Consumer Expectations (NSA, Q1-66=100) | U Michigan | 0.58 |
| 120 | USVIX | 5 | CBOE Market Volatility Index, VIX; extended with standard deviation of SP index | WSJ | 0.18 |
| 121 | USVXO | 5 | CBOE Market Volatility Index, VXO; extended with Bloom uncertainty measure | WSJ | 0.19 |
| **Other** | | | | | |
| 122 | GZLT | 1 | Excess Bond Premium (values after Sep-10 are forecast by us) | GZ | 0.56 |
| **Canada Variables** | | | | | |
| **National accounts** | | | | | |

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|---|---|---|---|---|---|
| 123 | CANrGDP | 5 | Canada: Gross Domestic Product at Market Prices (SAAR, Mil.Chn.2007.C$) | Statcan | 0.76 |
| 124 | CANrExports | 5 | Canada: GDP: Exports of Goods and Services: Total (SAAR, Mil.Chn.2007.C$) | Statcan | 0.67 |
| 125 | CANrImports | 5 | Canada: GDP: Imports of Goods and Services: Total (SAAR, Mil.Chn.2007.C$) | Statcan | 0.65 |
| 126 | CANrC | 5 | Canada:GDP: Household Final Consumption Exp: Total (SAAR, Mil.Chn.2007.C$) | Statcan | 0.44 |
| 127 | CANrI | 5 | Canada: GDP: Business Gross Fixed Capital Formation (SAAR, Mil.Chn.2007.C$) | Statcan | 0.57 |
| 128 | CANrGC | 5 | Canada:GDP: General Govt Final Consumption Expenditure (SAAR,Mil.Chn.2007.C$) | Statcan | 0.22 |
| 129 | CANrGI | 5 | Canada: GDP: Gross Fixed Capital Form: General Government(SAAR, Mil.Chn.2007.C$) | Statcan | 0.28 |
| **GDP by NAICS** | | | | | |
| 130 | CANryGoods | 5 | Canada: GDP: Goods-Producing Industries (SAAR, Mil.2007.C$) | Statcan | 0.77 |
| 131 | CANryAgr | 5 | Canada: GDP: Agriculture, Forestry, Fishing and Hunting (SAAR, Mil.2007.C$) | Statcan | 0.1 |
| 132 | CANryMin | 5 | Canada: GDP: Mining, Quarrying, and Oil and Gas Extraction (SAAR, Mil.2007.C$) | Statcan | 0.27 |
| 133 | CANryUtl | 5 | Canada: GDP: Utilities (SAAR, Mil.2007.C$) | Statcan | 0.11 |
| 134 | CANryCon | 5 | Canada: GDP: Construction (SAAR, Mil.2007.C$) | Statcan | 0.41 |
| 135 | CANryMan | 5 | Canada: GDP: Manufacturing (SAAR, Mil.2007.C$) | Statcan | 0.79 |
| 136 | CANrySvc | 5 | Canada: GDP: Service-Producing Industries (SAAR, Mil.2007.C$) | Statcan | 0.54 |
| 137 | CCANryWht | 5 | Canada: GDP: Wholesale Trade (SAAR, Mil.2007.C$) | Statcan | |
| 138 | CANryRet | 5 | Canada: GDP: Retail Trade (SAAR, Mil.2007.C$) | Statcan | 0.16 |
| 139 | CANryTrn | 5 | Canada: GDP: Transportation and Warehousing (SAAR, Mil.2007.C$) | Statcan | 0.48 |
| 140 | CANryInf | 5 | Canada: GDP: Information and Cultural Industries (SAAR, Mil.2007.C$) | Statcan | 0.32 |
| 141 | CANryPro | 5 | Canada: GDP: Professional, Scientific and Technical Services(SAAR, Mil.2007.C$) | Statcan | 0.31 |
| 142 | CANryAdm | 5 | Can:GDP:Admin\Support, Waste Management & Remediation Service(SAAR,Mil.2007.C$) | Statcan | 0.16 |
| 143 | CANryEdu | 5 | Canada: GDP: Educational Services (SAAR, Mil.2007.C$) | Statcan | 0.1 |
| 144 | CANryHlt | 5 | Canada: GDP: Health Care and Social Assistance (SAAR, Mil.2007.C$) | Statcan | 0.18 |
| 145 | CANryArt | 5 | Canada: GDP: Arts, Entertainment and Recreation (SAAR, Mil.2007.C$) | Statcan | 0.1 |
| 146 | CANryAcc | 5 | Canada: GDP: Accommodation and Food Services (SAAR, Mil.2007.C$) | Statcan | 0.19 |
| 147 | CANryOth | 5 | Canada: GDP: Other Services (Except Public Administration) (SAAR, Mil.2007.C$) | Statcan | 0.28 |
| 148 | CANryPub | 5 | Canada: GDP: Public Administration (SAAR, Mil.2007.C$) | Statcan | 0.25 |
| **Trade flows by NAPCS** | | | | | |
| 149 | CANrGoodsExports | 5 | Canada: Total Exports of Goods (SAAR, Mil.Chn.2007.C$) | Statcan | 0.64 |
| 150 | CANrAgrExports | 5 | Canada: Exports of Farm, Fishing & Intermed Food Products(SAAR, Mil.Chn.2007.C$) | Statcan | 0.07 |
| 151 | CANrEnergyExports | 5 | Canada: Exports of Energy Products (SAAR, Mil.Chn.2007.C$) | Statcan | 0.09 |
| 152 | CANrOreExports | 5 | Canada: Exports of Metal Ores and Nonmetallic Minerals (SAAR, Mil.Chn.2007.C$) | Statcan | 0.17 |
| 153 | CANrMetalExports | 5 | Canada: Exports of Metal and Nonmetallic Mineral Products(SAAR, Mil.Chn.2007.C$) | Statcan | 0.17 |
| 154 | CANrChemExports | 5 | Canada: Exp of Basic & Ind Chem, Plastics & Rubber Prods(SAAR, Mil.Chn.2007.C$) | Statcan | 0.28 |
| 155 | CANrForExports | 5 | Canada: Exports of Forestry Prods & Bldg & Packaging Mtls(SAAR, Mil.Chn.2007.C$) | Statcan | 0.32 |
| 156 | CANrIndExports | 5 | Canada: Exports of Industrial Machinery, Equip & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.47 |
| 157 | CANrElecExports | 5 | Canada: Exports of Electronic & Electrical Equip & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.42 |
| 158 | CANrAutoExports | 5 | Canada: Exports of Motor Vehicles and Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.46 |
| 159 | CANrTranspExports | 5 | Canada: Exports of Aircraft & Other Transp Eqpt & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.19 |

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|---|---|---|---|---|---|
| 160 | CANrConsGoodsExports | 5 | Canada: Exports of Consumer Goods (SAAR, Mil.Chn.2007.C$) | Statcan | 0.35 |
| 161 | CANrSpExports | 5 | Canada: Exports of Special Transactions (SAAR, Mil.Chn.2007.C$) | Statcan | 0.14 |
| 162 | CANrServiceExports | 5 | Canada: Total Exports of Services (SAAR, Mil.Chn.2007.C$) | Statcan | 0.21 |
| 163 | CANrGoodsImports | 5 | Canada: Total Imports of Goods (SAAR, Mil.Chn.2007.C$) | Statcan | 0.62 |
| 164 | CANrFoodImports | 5 | Canada: Imports of Farm, Fishing & Intermed Food Products(SAAR, Mil.Chn.2007.C$) | Statcan | 0.02 |
| 165 | CANrEnergyImports | 5 | Canada: Imports of Energy Products (SAAR, Mil.Chn.2007.C$) | Statcan | 0.21 |
| 166 | CANrOreImports | 5 | Canada: Imports of Metal Ores and Nonmetallic Minerals (SAAR, Mil.Chn.2007.C$) | Statcan | 0.09 |
| 167 | CANrMetalImports | 5 | Canada: Imports of Metal and Nonmetallic Mineral Products(SAAR, Mil.Chn.2007.C$) | Statcan | 0.37 |
| 168 | CANrChemImports | 5 | Canada: Imp of Basic & Ind Chem, Plastics & Rubber Prods(SAAR, Mil.Chn.2007.C$) | Statcan | 0.27 |
| 169 | CANrBldgImports | 5 | Canada: Imports of Forestry Prods & Bldg & Packaging Mtls(SAAR, Mil.Chn.2007.C$) | Statcan | 0.2 |
| 170 | CANrIndImports | 5 | Canada: Imports of Industrial Machinery, Equip & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.42 |
| 171 | CANrElecImports | 5 | Canada: Imports of Electronic & Electrical Equip & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.43 |
| 172 | CANrAutoImports | 5 | Canada: Imports of Motor Vehicles and Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.45 |
| 173 | CANrTranspImports | 5 | Canada: Imports of Aircraft & Other Transp Eqpt & Parts (SAAR, Mil.Chn.2007.C$) | Statcan | 0.11 |
| 174 | CANrConsGoodsImports | 5 | Canada: Imports of Consumer Goods (SAAR, Mil.Chn.2007.C$) | Statcan | 0.42 |
| 175 | CANrSpImports | 5 | Canada: Imports of Special Transactions (SAAR, Mil.Chn.2007.C$) | Statcan | 0.1 |
| 176 | CANrServiceImports | 5 | Canada: Total Imports of Services (SAAR, Mil.Chn.2007.C$) | Statcan | 0.4 |
| **Trade flows by partner country** | | | | | |
| 177 | CANrExportstoUS | 5 | Canada: Total Merchandise Exports: United States (NSA, Mn. 2007 C$) | Statcan | 0.87 |
| 178 | CANrDomExportstoUS | 5 | Canada: Domestic Merchandise Exports to the U.S. (NSA, Mn. 2007 C$) | Statcan | 0.85 |
| 179 | CANrReexportsToUS | 5 | Canada: Merchandise Re-Exports to the U.S. (NSA, Mn. 2007 C$) | Statcan | 0.42 |
| 180 | CANrExportstoChina | 5 | Total merch. exports to China (NSA, Mn.C$ 2007) | Statcan | 0.27 |
| 181 | CANrExportstoJapan | 5 | Total merch. exports to Japan (NSA, Mn.C$ 2007) | Statcan | 0.26 |
| 182 | CANrExportstoLatAm | 5 | Total merch. exports to Latin America (NSA, Mn.C$ 2007) | Statcan | 0.15 |
| 183 | CANrExportstoEurope | 5 | Total merch. exports to Europe (NSA, Mn.C$ 2007) | Statcan | 0.4 |
| 184 | CANrExportstoEmAsia | 5 | Total merch. exports to Emerging Asia ex. China (NSA, Mn.C$ 2007) | Statcan | 0.41 |
| 185 | CANrImportsFromUS | 5 | Total merch. imports from the US (NSA, Mn.C$ 2007) | Statcan | 0.73 |
| 186 | CANrImportsFromChina | 5 | Total merch. imports from China (NSA, Mn.C$ 2007) | Statcan | 0.59 |
| 187 | CANrImportsFromJapan | 5 | Total merch. imports from Japan (NSA, Mn.C$ 2007) | Statcan | 0.19 |
| 188 | CANrImportsFromLatAm | 5 | Total merch. imports from Latin America (NSA, Mn.C$ 2007) | Statcan | 0.36 |
| 189 | CANrImportsFromEurope | 5 | Total merch. imports from Europe (NSA, Mn.C$ 2007) | Statcan | 0.28 |
| 190 | CANrImportsFromEmAsia | 5 | Total merch. imports from Emerging Asia ex. China (NSA, Mn.C$ 2007) | Statcan | 0.34 |
| **Real output and income** | | | | | |
| 191 | CANIP | 5 | Canada: GDP: Industrial Production (SAAR, Mil.2007.C$) | Statcan | 0.77 |
| **Employment** | | | | | |
| 192 | CANEmp | 5 | Canada: Employment: Both Sexes, 15 Years and Over (SA, Thous) | Statcan | 0.75 |
| 193 | CANEmpGoods | 5 | Canada: Employment: Goods Producing Sector (SA, Thous) | Statcan | 0.68 |
| 194 | CANEmpAgr | 5 | Canada: Employment: Agriculture (SA, Thous) | Statcan | 0.14 |
| 195 | CANEmpMinFor | 5 | Canada: Employment: Forestry, Fishing, Mining, Oil & Gas (SA, Thous) | Statcan | 0.22 |
| 196 | CANEmpCon | 5 | Canada: Employment: Construction (SA, Thous) | Statcan | 0.52 |
| 197 | CANEmpMan | 5 | Canada: Employment: Manufacturing (SA, Thous) | Statcan | 0.55 |
| 198 | CANEmpUtl | 5 | Canada: Employment: Utilities (SA, Thous) | Statcan | 0.16 |
| 199 | CANEmpSvc | 5 | Canada: Employment: Service Producing Sector (SA, Thous) | Statcan | 0.52 |
| 200 | CANEmpTrade | 5 | Canada: Employment: Trade (SA, Thous) | Statcan | 0.31 |
| 201 | CANEmpTrn | 5 | Canada: Employment: Transport and Warehousing (SA, Thous) | Statcan | 0.23 |
| 202 | CANEmpFin | 5 | Canada: Employment: Finance, Insurance, Real Estate (SA, Thous) | Statcan | 0.12 |

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|---|---|---|---|---|---|
| 203 | CANEmpPro | 5 | Canada: Employment: Professional, Scientific & Technical (SA, Thous) | Statcan | 0.22 |
| 204 | CANEmpAdm | 5 | Canada: Employment: Business, Building & Other Support Services (SA, Thous) | Statcan | 0.15 |
| 205 | CANEmpEdu | 5 | Canada: Employment: Educational Services (SA, Thous) | Statcan | 0.19 |
| 206 | CANEmpHlt | 5 | Canada: Employment: Health Care and Social Assistance (SA, Thous) | Statcan | 0.11 |
| 207 | CANEmpInf | 5 | Canada: Employment: Information, Culture and Recreation (SA, Thous) | Statcan | 0.11 |
| 208 | CANEmpAcc | 5 | Canada: Employment: Accommodation and Food Services (SA, Thous) | Statcan | 0.08 |
| 209 | CANEmpOth | 5 | Canada: Employment: Other Services (SA, Thous) | Statcan | 0.09 |
| 210 | CANEmpPub | 5 | Canada: Employment: Public Administration (SA, Thous) | Statcan | 0.13 |
| **Housing** | | | | | |
| 211 | CANNewHousePrice | 5 | Canada: New Housing Price, Total House & Land (NSA, 2007=100) | Statcan | 0.53 |
| 212 | CANHousingStarts | 4 | Canada: Housing Starts: All Areas (NSA, Units) | CMHC | 0.35 |
| **Stock prices** | | | | | |
| 213 | CANTSXindex | 5 | Canada: S&P/TSX: Composite, Close (EOP, 1975=1000) | BoC | 0.24 |
| 214 | CANTSXDivYield | 1 | Canada: S&P/TSX Composite Index, Dividend Yield (EOP, %) | TSX | 0.61 |
| **Exchange rates** | | | | | |
| 215 | CANNEER | 5 | Canada: Nominal Narrow Effective Exch Rate (Avg, 2010=100) | BIS | 0.78 |
| 216 | USDzCAD | 5 | Canada: US Dollar Exchange Rate: Close (AVG, US$/C$) | BoC | 0.86 |
| **Interest rates** | | | | | |
| 217 | CAN3mYield | 1 | Canada: Treasury Bills: 3-Months (AVG, %) | BoC | 0.94 |
| 218 | CAN6mYield | 1 | Canada: Treasury Bills: 6-Months (AVG, %) | BoC | 0.94 |
| 219 | CAN1to3yYield | 1 | Canada: 1 to 3 Year Bond Yield Average (Last Wednesday, %) | BoC | 0.94 |
| 220 | CAN3to5yYield | 1 | Canada: 3 to 5 Year Bond Yield Average (Last Wednesday, %) | BoC | 0.94 |
| 221 | CAN5to10yYield | 1 | Canada: 5 to 10 Year Bond Yield Average (Last Wednesday, %) | BoC | 0.93 |
| 222 | CAN10yYield | 1 | Canada: 10-Year & Over Bond Yield Average (Last Wednesday, %) | BoC | 0.92 |
| 223 | CAN3mCorpYield | 1 | Canada: Prime Corporate Paper: 3-Months (AVG, %) | BoC | 0.94 |
| 224 | CAN6mSpread | 1 | CAN6mYield - CAN3mYield | BoC | 0.45 |
| 225 | CAN1to3ySpread | 1 | CAN1to3yYield - CAN3mYield | BoC | 0.6 |
| 226 | CAN3to5ySpread | 1 | CAN3to5yYield - CAN3mYield | BoC | 0.68 |
| 227 | CAN5to10ySpread | 1 | CAN5to10yYield - CAN3mYield | BoC | 0.71 |
| 228 | CAN10ySpread | 1 | CAN10yYield - CAN3mYield | BoC | 0.71 |
| 229 | CAN3mCorpSpread | 1 | CAN3mCorpSpread - CAN3mYield | BoC | 0.51 |
| **Balance of payments** | | | | | |
| 230 | CANCurrAcctBal | 2 | Canada: BOP: Balances: Total Current Account: All Countries (NSA, Mil.C$) | Statcan | 0.16 |
| 231 | CANFDIassets | 2 | Canada: BOP: Canadian Direct Investment Abroad: Total (NSA, Mil.C$) | Statcan | 0.07 |
| 232 | CANPortfolioAssets | 2 | Canada: BOP: Canadian Portfolio Investment: Total (NSA, Mil.C$) | Statcan | 0.11 |
| 233 | CANFDIliabilities | 2 | Canada: BOP: Foreign Direct Investment in Canada: Total (NSA, Mil.C$) | Statcan | 0.05 |
| 234 | CANPortfolioLiabilities | 2 | Canada: BOP: Foreign Portfolio Investment: Total (NSA, Mil.C$) | Statcan | 0.06 |
| 235 | CANFDIassetsUS | 2 | Canada: BOP: Canadian Direct Investment Abroad: United States (NSA, Mil.C$) | Statcan | 0.08 |
| 236 | CANPortfolioAssetsUS | 2 | Canada: BOP: Canadian Portfolio Investment: United States (NSA, Mil.C$) | Statcan | 0.07 |
| 237 | CANFDIliabilitiesUS | 2 | Canada: BOP: Foreign Direct Investment in Canada: United States (NSA, Mil.C$) | Statcan | 0.06 |
| 238 | CANPortfolioLiabilitiesUS | 2 | Canada: BOP: Foreign Portfolio Investment: United States (NSA, Mil.C$) | Statcan | 0.07 |
| **Price indexes** | | | | | |
| 239 | CANIndPriceIndex | 5 | Canada: Industrial Product Price Index: Total (NSA, 2010=100) | Statcan | 0.76 |
| 240 | CANIntGoodsPriceIndex | 5 | Canada: Industrial Price Index: Intermediate Goods (NSA, 2002=100) | Statcan | 0.71 |
| 241 | CANFinGoodsPriceIndex | 5 | Canada: Industrial Price Index: Finished Goods (NSA, 2002=100) | Statcan | 0.74 |
| 242 | CANBCPI | 5 | Canada: Chain Fisher BoC Commodity Price Index (NSA, Jan-72=100) | BoC | 0.74 |
| 243 | CANCPI | 5 | Canada: Consumer Prices (2005=100, NSA) | IMF | 0.46 |
| 244 | CANcoreCPI | 5 | Canada: BoC Core CPI [V41690925] (SA,2002=100) | Statcan | 0.47 |

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|---|---|---|---|---|---|
| 245 | CANExportPrices | 5 | Canada: Implicit Price Index: Exports of Goods and Svcs(SA, 2007=100) | Statcan | 0.8 |
| 246 | CANExportPricesGoods | 5 | Canada: Implicit Price Index: Exports of Goods (SA, 2007=100) | Statcan | 0.79 |
| 247 | CANExportPricesServices | 5 | Canada: Implicit Price Index: Exports of Services (SA, 2007=100) | Statcan | 0.46 |
| 248 | CANToT | 5 | Canada: Terms of Trade Index (SA, 2007=100) | Statcan | 0.67 |
| **Monetary aggregates** | | | | | |
| 249 | CANM1Plus | 5 | Canada: M1+ (SA, Mil.C$) | BoC | 0.23 |
| 250 | CANM2Gross | 5 | Canada: M2 Gross [V41552796] (SA, Avg, Mil.C$) | BoC | 0.53 |
| 251 | CANM3Gross | 5 | Canada: M3 Gross [V41552794] (SA, Avg, Mil.C$) | BoC | 0.63 |
| 252 | CANMonBase | 5 | Canada: Monetary Base (SA, Mil.C$) | BoC | 0.16 |
| 253 | CANMonBaseExRR | 5 | Canada: Monetary Base Excluding Required Reserves (SA, Mil.C$) | BoC | 0.12 |
| **Chartered banks** | | | | | |
| 254 | CANBankAssets | 5 | Canada: Chartered Banks: Major Assets (Avg, SA, Mil.C$) | BoC | 0.35 |
| 255 | CANBankLiquidAssets | 5 | Canada: Chartered Banks: Canadian Dollar Assets, Liquid Assets (Avg, SA, Mil.C$) | BoC | 0.22 |
| 256 | CANBankLessLiquidAssets | 5 | Canada: Canadian Dollar Assets, Less Liquid Assets (Mil.C$) | BoC | 0.47 |
| 257 | CANBankResidMtgLoans | 5 | Canada: Chartered Bank Assets: Residential Mortgage Loans (SA, Mil.C$) | BoC | 0.35 |
| 258 | CANBankLoans | 5 | Canada: Chartered Bank Assets: Bank Loans (SA, Mil.C$) | BoC | 0.43 |
| 259 | CANBankGeneralLoans | 5 | Canada: Genl Loans incl Grain Dealers/Installment Finance Companies (Mil.C$) | BoC | 0.42 |
| 260 | CANBankBusinessLoans | 5 | Canada: Chartered Bank Assets: Business Loans (SA, Avg Weds, Mil.C$) | BoC | 0.36 |
| 261 | CANBankPersonalLoans | 5 | Canada: Chartered Bank Assets: Total Personal Loans (SA, Avg Weds, Mil.C$) | BoC | 0.36 |
| **Private credit** | | | | | |
| 262 | CANPrivateCredit | 5 | Canada: Business and Household Credit (SA, Mil.C$) | BoC | 0.71 |
| 263 | CANHHCredit | 5 | Canada: Household Credit (SA, Mil.C$) | BoC | 0.71 |
| 264 | CANConsCredit | 5 | Canada: Consumer Credit at Month-End (EOP, SA, Mil.C$) | BoC | 0.51 |
| 265 | CANMtgCredit | 5 | Canada: Residential Mortgage Credit at Month-End (EOP, SA, Mil.C$) | BoC | 0.63 |
| 266 | CANBusCredit | 5 | Canada: Business Credit (SA, Mil.C$) | BoC | 0.57 |
| 267 | CANBusCreditST | 5 | Canada: Short-Term Business Credit (SA, Mil.C$) | BoC | 0.65 |
| 268 | CANBusCreditLT | 5 | Canada: Long-Term Business Credit (SA, Mil.C$) | BoC | 0.34 |
| **Confidence and uncertainty** | | | | | |
| 269 | CANConfidence | 5 | Conference Board Consumer Confidence Index | BoC | 0.34 |
| 270 | CANVIX | 5 | standard deviation of TSX index | BoC | 0.08 |
| **Oil prices** | | | | | |
| 271 | Brent | 5 | Brent (backcast with WTI), dollar/barrel | BoC | 0.58 |