Speeches, Press Conferences and Minutes: The International Transmission of Federal Reserve Communication*

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Abstract

Using a high-frequency event-study framework from January 1997 to July 2023, this paper examines the effects of Fed communications – including speeches, press conferences, minute releases, and FOMC policy rate announcements – on Canadian interest rates, stock market futures, and exchange rates. By comparing these impacts with analogous communications from the Bank of Canada, we provide new insights into cross-border monetary policy transmission. Our findings show that the combined spillover effects of Fed communication events are often greater than those of FOMC policy rate announcements, particularly for long-term bond yields. Although Bank of Canada policy changes and communication play a larger role in shaping short- and medium-term interest rates and exchange rates, Fed spillovers dominate at longer maturities, largely driven by changes in bond risk premia. Additionally, FOMC press conferences have recently become the most impactful Fed event on Canadian interest rates. While the covered interest rate parity condition explains some of these effects, it does not consistently hold following either FOMC or Bank of Canada announcements. This study provides new insights into the international influence of central bank communications, offering implications for other open economies with close financial ties to major central banks.

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> *"When I was at the Federal Reserve, I occasionally observed that monetary policy is 98 percent talk and only two percent action. The ability to shape market expectations of future policy through public statements is one of the most powerful tools the Fed has."*
>
> — Ben Bernanke

1 Introduction

Starting in 2022, the Federal Reserve (hereafter Fed), alongside other major central banks, entered a cycle of monetary tightening to combat surging inflation. This rapid escalation in interest rates fueled concerns over cross-border spillovers, given the dominant role of the U.S. dollar in global finance (Caldara, Ferrante, Iacoviello, Prestipino and Queralto, 2024). By autumn 2024, as inflationary pressures began to ease, several central banks, including the Fed, began cutting interest rates, renewing attention to the international ramifications of these policy changes.

A large body of literature has closely examined the international transmission of U.S. monetary policy, particularly through FOMC announcements. It often highlights the important role of U.S. monetary policy in shaping global financial conditions, influencing international bond yields (Albagli, Ceballos, Claro and Romero, 2019), stock and exchange rate movements (Brusa, Savor and Wilson, 2020), survey forecasts (Sutherland, 2023), and the broader global financial cycle (Miranda-Agrippino and Rey, 2020). Despite extensive evidence on the global effects of FOMC monetary policy announcements, much less is known about the international effects of other Fed communication events, such as speeches, press conferences, and minutes releases.

In this paper, we use a high-frequency events-study framework to study the international transmission of various pre-scheduled Fed monetary policy communication events, such as Fed Chair and Vice Chair speeches, post-FOMC press conferences and minutes releases to Canadian short- and long-run interest rates, stock market returns, and the CAD/USD spot, futures, and forward exchange rates. Our dataset captures various episodes of significant monetary policy volatility, covering the period from January 1997 to July 2023, with the potential to extend to more recent data. We then compare the effects of these Fed communications with FOMC policy rate announcements and similar events from the Bank of Canada (hereafter BoC). Furthermore, we explore potential transmission channels, examining whether the impact is driven more by fixed income or exchange rates, by changes in expectations or changes in risk premiums, and how covered interest rate parity (hereafter CIP) plays a role in these dynamics.

Canada provides an ideal context for this analysis due to its close economic ties and geographic proximity to the U.S., ensuring that Canadian markets are actively trading during most Fed events. This reduces data noise and enables a clearer identification strategy. In addition, the strong financial links between the two countries further support cross-market comparisons.

For example, Bankers' Acceptance (BAX) futures contracts traded on the Montreal Exchange (hereafter TMX) and the Eurodollar futures on the Chicago Mercantile Exchange (hereafter CME) share identical delivery dates, creating direct arbitrage opportunities between the two markets. By contrasting the impacts of Fed communications with analogous events from the Bank of Canada, we aim to enhance our understanding of cross-border monetary policy transmission, with insights that can be extended to other open economies.

Swanson (2023) and Swanson and Jayawickrema (2023) have shown that Fed Chair speeches often have a more significant effect on U.S. financial markets than FOMC announcements, with post-FOMC press conferences recently becoming as impactful as policy rate announcements themselves. Ignoring pre-scheduled other communication events and focusing solely on FOMC rate announcements misses a large portion of the Fed's impact on U.S. financial markets. We show that Federal Reserve monetary policy communication events are important drivers of Canadian financial markets. Often times, the joint impact of Fed Chair and Vice Chair speeches, FOMC press conferences, and minute releases sum up a larger change in Canadian interest rates and future stock markets than the ones associated with FOMC policy rate announcements. Extending this insight to an international context, our findings reveal that by ignoring these pre-scheduled Fed communication events, researchers are ignoring a large share of the international transmission of Fed monetary policy. For example, we find that FOMC press conferences have become one of the largest sources of Fed monetary policy spillovers to Canadian interest rates in recent years.

We then contrast these findings with the response of Canadian interest rates, exchange rates, and stock index futures to domestic policy rate announcements, and similar communication events by the BoC. We show that BoC policy rate announcements have a larger impact on Canadian short-term interest rates than FOMC policy rate announcements or other types of communication. However, the influence of FOMC announcements becomes more pronounced for long-term bonds and Canadian stock market futures, often equal to or exceeding the impact of analogous BoC events. As for BoC monetary policy announcements and communication, we find that BoC policy rate announcements have a stronger impact on Canadian interest rates, particularly short-term rates, compared to other BoC communication events. However, Governing Council speeches and press conferences can be nearly as influential on mid- and long-term interest rates. Our analysis, consistent with Swanson and Jayawickrema (2023) for the U.S. and Mumtaz, Saleheen and Spitznagel (2023) for the U.K., indicates that BoC communication events beyond rate announcements are a significant source of monetary policy variation in Canada.

To shed additional light on how U.S. monetary policy transmits to international fixed income markets, we decompose the effects of U.S. monetary policy spillovers on Canadian interest rates

into two components: the expectation channel and the term premium channel. Our findings suggest that BoC policy rate announcements influence the entire yield curve, with expectations dominating in short-term rates and risk premiums playing a greater role in long-term bonds. U.S. monetary policy spillovers, however, tend to influence Canadian rates through risk premiums, particularly in longer-term bonds.

For the foreign exchange channel, we analyze the response of the CAD/USD exchange rate to U.S. and Canadian monetary policy communications using spot, futures, and forward contracts. Both central banks significantly affect the exchange rate, with BoC rate announcements sometimes exerting larger influence. Beyond rate announcements, speeches and press conferences from both banks also drive exchange rate fluctuations, though their magnitude varies.

We add to the literature on covered interest rate parity (CIP) by investigating its behavior around communication events from the Fed and BoC. CIP posits that the forward exchange rate should reflect the interest rate differential between two countries, ensuring no arbitrage opportunities. Rather than focusing on pinpointing the causes behind CIP deviations, our goal is to use CIP as a lens for understanding transmission channels activated by different types of central bank events. Our high-frequency analysis reveals significant deviations from CIP during both BoC and FOMC events, particularly in the very short term. The overall patterns suggest that central bank events can introduce short-term anomalies in the exchange rate market, reflecting the complex interactions between monetary policy and financial markets.

Finally, we estimate a forward guidance factor for Canadian interest rates driven by FOMC policy rate and communication events. We also decompose the interest changes around BoC policy rate announcements into a target and forward guidance factors, as in Gürkaynak, Sack and Swanson (2005) and Swanson (2021). We use these factors to study the persistence of other Fed communication events in comparison to FOMC policy rate announcements and BoC policy rate and communication announcements. Our analysis shows that forward guidance shocks on Canadian interest rates, driven by FOMC policy rate announcements and Fed Chair speeches, are persistent but tend to fade after a few days. These shocks are approximately half the magnitude of the forward guidance effects seen from BoC policy rate announcements. Furthermore, the impact of Fed communication on Canadian financial markets has become increasingly more persistent in recent years.

The Canadian Monetary Policy Event-Study Database is a byproduct of this study. It is a rich and novel dataset of intraday monetary policy surprises for Canada, which we have assembled to the same standards of those constructed for the US (Gürkaynak et al., 2005), the Euro area (Altavilla, Brugnolini, Gürkaynak, Motto and Ragusa, 2019), and UK (Braun, Miranda-Agrippino and Saha, 2024). The dataset collects high-frequency reactions of a wide range of asset prices around the Bank of Canada's interest rate decision announcements, around press conferences

and speeches given by Bank of Canada Governing Council members. The dataset includes data on interest rate futures, treasury yields, the stock market and exchange rates. The data have been available since 1997 and we expect them to be regularly updated.

Related literature. An extensive literature explores the spillovers of FOMC policy rate changes to international financial markets and economies, including studies by Kim (2001), Canova (2005), Maćkowiak (2007), Dedola, Rivolta and Stracca (2017), Kalemli-Özcan (2019), and many others. These papers document an important role for conventional U.S. monetary policy in driving international financial markets and economies. Following the global financial crisis, a subsequent literature documents the impact of unconventional FOMC monetary policy, such as forward guidance and asset purchases, on international economies. Bauer and Neely (2014) and Gilchrist, Yue and Zakrajšek (2019), for example, show that these unconventional monetary policy had large international effects. We add to this literature by systematically examining the international spillover of pre-scheduled Fed and FOMC monetary policy communication events.

Our paper is also close to the related and growing empirical literature documenting the important of communication for the transmission of monetary policy. As previously discussed, Swanson and Jayawickrema (2023) and Swanson (2023) have shown that Fed Chair speeches often have a more significant effect on U.S. financial markets than FOMC announcements. Mumtaz et al. (2023) and Istrefi, Odendahl and Sestieri (2022) have shown that speeches by central bank governors also have important effects in the U.K. and the Euro Area, respectively. We add to this literature by considering the international spillovers of these pre-scheduled Fed and FOMC monetary policy communication events and contrasting them with the effect of domestic, namely Bank of Canada, events.

The paper is organized as follows. In Section 2 below, we discuss the construction of our Federal Reserve and Bank of Canada communication event database, and our high-frequency database of changes in Canadian interest rates and exchange rates. Then, in Section 3, we show the importance of FOMC communication events in driving Canadian short- and long-term interest rates, future returns of the stock index compare their effects with similar Bank of Canada communication events. Section 4 analyzes changes in the spot and forward exchange rates, testing the covered interest parity during central bank events and discussing the relative impact of these events on the foreign exchange market. Section 5 studies how the influence of different Fed and BoC monetary policy announcements on Canadian asset prices has evolved over time. Section 6 constructs forward guidance factors for FOMC and Bank of Canada communication events and examines their persistent impacts on the financial market. Finally, Section 7 concludes. Appendix provides further details.

2 Monetary policy communication and financial markets data

We compile four primary datasets for this paper: the date and time stamps of various central bank events for the Federal Reserve and the Bank of Canada, along with high-frequency financial market data from both Canada and the U.S. We discuss various U.S. and Canadian central bank events in subsections 2.1 and 2.2. We then elaborate on the methodology for filtering relevant events in subsection 2.3 and selecting the appropriate event window length for the various Federal Reserve and BoC communication events in subsection 2.4. Our empirical analysis leverages a range of comprehensive high-frequency datasets, covering fixed income, stock indices, and foreign exchange data between the U.S. and Canada. These datasets are constructed from multiple high-quality sources and span the period from January 1997 to July 2023. Descriptions and institutional background of Canadian and foreign exchange data are provided in subsections 2.5, and 2.6, respectively. Although U.S. financial markets are not the primary focus, it is essential for us to understand cross-border transmission. We discuss U.S. financial market data in Appendix B.

2.1 Federal Reserve communication events

We focus on four key Federal Reserve communication events: FOMC interest rate announcements, press conferences, the release of FOMC minutes, and speeches by the Fed chair and vice chair. The details of each are elaborated in the rest of this subsection.

FOMC policy rate announcements The FOMC interest rate announcement is a crucial communication that reveals any alterations to the federal funds target rate, which represents the rate at which banks lend to each other overnight. The FOMC convenes eight times a year, and these rate announcements being made on the conclusion of each of these meetings. We cross-referenced these dates and times with data we obtained from Bauer and Swanson (2023). Between 1997 and 2023, our dataset includes 212 scheduled FOMC announcements along with an extra 12 unscheduled intermeeting FOMC announcements, summing up to a total of 228 FOMC announcements.[1] Scheduled FOMC meetings took place at 2:15Pm from January 1997 to January 2013, and at 2:00 pm starting in March 2013. We follow the literature of Gürkaynak et

[1]These unscheduled meetings are October 15, 1998; January 3, 2001; April 18, 2001; September 17, 2001; August 10, 2007; August 17, 2007; January 22, 2008; March 11, 2008; October 8, 2008; October 11, 2019; March 3, 2020; March 15, 2020. We follow Gürkaynak et al. (2005) and Bauer and Swanson (2023) excludes the post-9/11 FOMC announcement on 9/17/2001. Financial markets were closed from 9/11/01 until 9/17/01 and the FOMC announcement occurred before the market opened, making it impossible to separate the effects of the FOMC announcement from the effects of the terrorist attacks.

al. (2005) and Nakamura and Steinsson (2018), we use ten minutes before announcement and twenty minutes after the announcement as the event window.

Post-FOMC press conferences Starting in April 2011, a FOMC press conference is held by the Federal Reserve Chair following every other scheduled FOMC meeting. During it, the Chair provides a deeper understanding and rationale for the committee's decisions. Starting from 2019, press conferences take place after every FOMC meeting. Initially, press conferences took place at 2:15pm on the day of FOMC rate announcement. Since March 2013, they have been scheduled for 2:30pm. Usually, they last about an hour, but can vary, spanning from 45 minutes to 1 hour and 15 minutes. We obtain the start time from Bloomberg. In our dataset, there have been 71 such press conferences — four annually from 2011 to 2018, and eight since 2019. In 2020, there were 2 unscheduled press conferences which occurred after surprise FOMC rate change decisions.[2]

FOMC meeting minutes Starting in 2005, in a move towards increased transparency, the release schedule for the FOMC meeting minutes was expedited. After being ratified by an FOMC vote, the minutes are made public roughly three weeks post-meeting, on Tuesdays at 2:00pm Eastern Time. During our sample span, there have been 201 releases of FOMC meeting minutes.

Chair and Vice-Chair speeches Throughout the year, various FOMC members, including the Chair, vice-Chair, Governors, and regional Fed Presidents, deliver speeches. These addresses offer perspectives on monetary policy, the economy, and other pertinent topics for the conduct of monetary policy. Although they are not formal policy declarations, the content of these speeches can sway market perceptions regarding potential policy shifts in the upcoming rate decisions. We retrieve the starting time of each speech from Bloomberg and also download the complete text from the Fed's website. We obtain the dates of the speech from the Federal Reserve Board website. We verified the exact times of the speech time from Bloomberg and we use the first news article about the speech on Bloomberg to validate. It's worth noting that speeches by the Federal Reserve Board Chair and Vice Chair frequently take place in various U.S. locations or sometimes even internationally. Therefore, we adjust the speech times to U.S. Eastern Time accordingly. We plot the histogram of monetary policy related speech times in the left panel of Figure A.1. In our data set that spans 1998 to 2023, the Fed Chair presented 421 speeches, while the Vice Chair delivered 323 speeches.

[2] These are March 3, 2020 and March 15, 2020.

2.2 Bank of Canada communication events

We collect the date and time stamp of three categories of BoC communication events: interest rate announcements, monetary policy report press conferences/economic progress reports, and speeches by governing council members. Since 2023, the Bank of Canada is publishing a “Summary of Governing Council Deliberations". These documents provide insights into the discussions and thought processes of the Bank of Canada’s Governing Council preceding their monetary policy decisions, similar to the FOMC meeting minutes. Since there is only 4 of such publications in our sample, we have decided not to include them in our study. In the following, we provide more details about the Bank of Canada’s monetary policy communication events.

Bank of Canada fixed announcement dates The Bank of Canada moved to a system of eight fixed-announced monetary policy decision dates, similar to the Federal Reserve, in December 2000. Before this system, policy rate changes could possibly happen at any business day. While these decisions were unscheduled, they always happened at 9am, and usually on a Thursday. From 1997-2001 there were 16 Bank of Canada policy rate changes.[3] Since the implementation of the fixed announcement dates in 2001 through the end of our dataset, there were 181 scheduled Bank of Canada rate announcements. Additionally, 3 unscheduled inter-meeting Bank of Canada announcements were recorded, leading to a combined total of 200 BoC announcements during this period.

Press conferences Beginning in 1998, Monetary Policy Report (MPR) press conferences were established and held after every alternate rate announcement. Correspondingly, a Monetary Policy Report has been released during each of these alternate scheduled announcements.

Historically, the publication of the MPR was delayed by two days, primarily for logistical reasons related to printing and distribution. However, with the shift to electronic communication, this delay became obsolete. The tradition of hosting press conferences after the Fixed Announcement Date (FAD) in line with the MPR has been long-standing.

Several significant milestones and changes in the scheduling and format of the MPRs and related press conferences have occurred. Starting in 1998 the MPRs were released two days after the announcements. In 2011, MPRs were released a day after the FAD. By 2013, MPR publications were synchronized with the FAD. In 2016, there was a shift in the focal point of the opening statement during press conferences to concentrate on policy deliberations, supplementing the economic outlook shared in MPRs and press releases. In 2018, after non-MPR FADs, the Bank introduced Economic Progress Reports (EPR) speeches to shed light on the nuances behind

[3] For more information on the rationale and the effects on financial markets of the introduction of the fixed announcement dates, see Parent, Munro and Parker (2003).

policy decisions. During the course of the conference, there was an initiative to diversify the roster of speakers. The EPR could be given by any of the Governing Council members.

Governing Council speeches Finally, we also collect the speeches by members of the BoC's Governing Council. We extract the start time of each speech from Bloomberg and obtain the full English transcript from the Bank of Canada's website or internal sources. We use the first news article about the speech on Bloomberg to validate. Significantly, many speeches are conducted in a range of Canadian areas or even overseas. It is essential to align these speech times with Eastern Time for consistency. Our finalized dataset comprises the speaker's title, speech title, location, occasion, start time in ET, duration, and the full transcript. We plot the histogram of monetary policy related speech times in the right panel of Figure A.1. During our sample period, Governing Council members delivered a total of 484 speeches: 239 were by the Governor, 79 by the Senior Deputy Governor, and 166 by other council members.

2.3 Filtering the relevant events

Not every speech has the potential to sway the financial markets in both the US and Canada. Following Swanson and Jayawickrema (2023) and Swanson (2023), we searched The Wall Street Journal and The New York Times for mentions of Fed speeches, and compared findings with The Globe and Mail or The Toronto Star for Canadian speeches, identifying those rich in monetary policy content.

For speeches from the US, we verified if they were cited in the newspapers either on the day they were delivered or the day after. Once identified, the emphasis was on content related to monetary policy or wider macroeconomic issues. In the Canadian context, our lens narrowed to matters discussing interest rates, mortgage rates, inflation, or instances suggesting market experts deduced significant intel about interest rate paths.

Furthermore, it was crucial to filter out speeches that coincided with major macroeconomic data or intertwined with events like the Treasury Note or GoC bond auctions. In such scenarios, we consulted our select newspapers to discern the extent of market upheaval on those days.

Post rigorous screening, from the total 1166 FOMC speeches between 1998 and 2023, 309 from the Chair or Vice Chair were linked to monetary policy. Eliminating 3 that overlapped with US macro news or treasury notes, our final list tallied 224 speeches by the Fed Chair, and 82 by the Vice Chair. From the 484 BoC speeches, only 208 speeches were deemed monetary policy-centric. Excluding 1 overlapping with US or Canadian macro news, US treasury note auctions, or Canadian GoC bond auctions, our dataset documented 106 speeches by the BoC Governor, 36 by the Senior Deputy Governor, and 55 by other council members.

2.4 Event window length

We follow Swanson and Jayawickrema (2023) to choose different window lengths for the various communication events. Post-FOMC meeting press conferences and Bank of Canada press conferences typically last for about one hour, so we begin the intradaily window 10 minutes before the start of the press conference and end it 80 minutes after the start of the press conference, for a total window length of 90 minutes. The FOMC meeting minutes are much longer than an FOMC statement, amounting to about 10–20 pages of text, so we use a longer intradaily window for those announcements than we do for FOMC announcements, beginning 10 minutes before the minutes release and ending 50 minutes after, for a total window length of 60 minutes. Speeches are typically 30–60 minutes long and can be followed by as much as 30 more minutes of answering questions from the audience. For these speeches, we use an intradaily window of 2 hours in length, beginning 15 minutes before the start of the speech and ending 1 hour and 45 minutes after.[4]

2.5 Canadian financial markets data

In this section, we outline the Canadian financial instruments and data, including interest rate and stock index futures from the Montreal Exchange, quotes, and trades of Government of Canada benchmark bonds.

The BAX, first listed on the Montreal Exchange (TMX), is recognized as the standard for Canadian short-term interest rates. It is one of the most liquid and frequently traded instruments in the Canadian money market. Canadian Dollar Offered Rate (CDOR) is closely tied to the overall conditions of the money market, specifically market expectations for the Bank of Canada's target overnight rate. Specifically, BAX futures mirror the three-month CDOR, conveyed as an annual interest rate. Buyers expect falling rates, taking a long position, while sellers anticipate rising rates, holding a short position.

The BAX futures contracts resemble closely the characteristics (expiration, maturity, and settlement) of Eurodollar futures traded on the Chicago Mercantile Exchange (CME).[5] BAX are quoted on an index basis: 100 minus the annualized yield of three-month CDOR. The BAX contracts mature two business days prior to the third Wednesday of the month in March, June, September, and December over a two-year period (TMX Montreal Exchange, 2013). These

[4] We also tried an alternative approach to determine the duration of the speech. We rely on the available video or audio lengths. In the absence of these, we estimate the speech's length based on its word count, taking into consideration the standard speaking rate of a native English speaker. The results are robust.

[5] Eurodollar futures were an essential instrument for gauging market expectations of future interest rates in the US. For additional context on U.S. financial instruments, including Eurodollar and SOFR futures, please refer to Appendix B.

delivery dates correspond to the delivery dates of Eurodollar futures contracts traded on the Chicago Mercantile Exchange, which helps to create arbitrage opportunities between the BAX and the Eurodollar futures markets (Harvey, 1996).

We have obtained tick-by-tick trades and quotes for all BAX contracts from TMX since January 1997. To mitigate unrepresentative trade selection risks, we utilize a five-minute interval rather than the exact minute. The yield change is in percentage points. The second through fourth BAX contracts reflect market expectations regarding the policy rate path over a horizon of roughly 5 to 14 months ahead.

In Canada, the transition from BAX futures to Canadian Overnight Repo Rate Average (CORRA) futures mirrored the U.S. shift from Eurodollar to SOFR futures, though it occurred slightly later. A new three-month CORRA futures contract was introduced for trading in June 2020. By March 2023, the open interest in the CORRA contracts was only 40% of that in BAX contracts, but by July 2023, it had reached 60%. As of September 2023, the open interest in CORRA contracts was rapidly approaching that of BAX contracts. The Montreal Exchange converted its open BAX contracts to CORRA futures in the second quarter of 2024. Our sample period ends in July 2023, so our main analysis only uses BAX futures. However, we conducted a robustness test using CORRA futures starting in January 2023, and our results remain consistent both qualitatively and quantitatively. Both BAX and CORRA futures are financially settled.

For capturing the immediate reactions of mid to long-term yields post central bank events, we use the quotes and trades of Government of Canada benchmark bonds. There are two main sources for Government of Canada bond trades. The first one is the Debt Securities Transaction Reporting System, MTRS2.0, collected by Investment Industry Regulatory Organization of Canada (IIROC). Our sample contains trade-level information on all bond trades of registered brokers or dealers from 2016 to current. We observe security identifiers (ISINs), the time, the side (buy/sell), the price, and the quantity of the trade. From the ISINs, we identify the benchmark bond. For 2002 to 2015, we collected averages of the (indicative) quotes on the CanDeal platform. We use the changes in the midquotes.[6]

Unlike in the U.S., where current-month federal funds futures are used to calculate the surprise component of the policy rate target from policy rate announcements, the Canadian financial markets lack a similar product with a long enough history. Therefore, we use changes in the daily CORRA rate before 2016 and intra-day changes in the tomorrow-next repo rate from MTRS after 2016 to capture the policy rate surprise around FADs. We use the tomorrow-next rate because the policy rate target takes effect the following day.

[6]We also have two year, five year, and ten year Government of Canada bond futures data for several years in our sample, but the quotes and transaction data has the longer and more complete history. Using bond futures' prices instead of the bond transaction prices from MTRS2.0 will not change our results.

From the TMX, we also obtain the intraday data of TSX60 stock index futures. We use log price changes to evaluate stock returns around events.

2.6 Exchange rate data

In this section, we detail the CAD/USD exchange rate data, including spot, futures, and forward contracts.

Starting in April 2006, we obtained spot CAD/USD exchange rate data from Refinitiv, specifically from the “Matching Prices with Volumes Daily (D5)" dataset, which provides real-time traded prices and volumes. Refinitiv is the leading inter-dealer platform for CAD/USD foreign exchange trading. For the period beginning in 1997 and extending to April 2006, we sourced five-minute indicative quotes for the best bid and offer from Olsen Financial Technologies. These quotes allow us to calculate mid-quotes, providing a robust measure of the exchange rate.

The CAD/USD futures contract is the fourth-largest currency futures contract traded on the CME Group, following EUR/USD, JPY/USD, and GBP/USD. We acquired trade data from TickData, starting in October 2006. Our analysis focuses on the most active contracts, typically those expiring within one to three quarters, as front-month contracts generally exhibit the highest trading volume and open interest. Additionally, we have bid and ask prices as well as transaction volumes from 2010 onward, providing consistent results. These futures contracts are listed quarterly (March, June, September, December) for 20 consecutive quarters, with serial contracts listed for three additional months. Futures prices and quotes are real-time executable and incorporate the cost of carry, reflecting the implied interest rate differential in the currency market.

We also examine nine-month outright forward foreign exchange contracts. We purchased five-minute data on the nine-month forward basis, including best bid and offer quotes, from Olsen Financial Technologies. Mid-quotes were calculated from these data. In currency trading, forward points are the number of basis points added to or subtracted from the current spot rate of a currency pair to determine the forward rate for delivery on a specific value date. When points are added to the spot rate this is called a forward premium; when points are subtracted from the spot rate it is a forward discount. Forwards are most commonly done for periods of up to one year. We calculate the outright forward rate by adding the forward points to the spot rate. Our forward data spans from 1997 to July 2023.

3 The transmission of central bank communication to Canadian fixed income and stock markets

To measure the financial market responses, we calculated the changes in assets price around various central bank communication events. Appendix C provides additional details.

3.1 Overall market reactions

We begin by providing an overview of our data with a histogram (Figure 1) that shows the changes in the BAX4 for each type of monetary policy communication from 1997 to July 2023. On the left, we present the responses to FOMC policy rate announcements and other communication events (press conferences, speeches by the Chair and Vice Chair). The right side shows the corresponding responses to Bank of Canada policy rate announcements and other communication events.

[Insert Figure 1 here.]

The impact of FOMC policy rate announcement and speeches by the Fed Chair and Vice Chair on Canadian BAX4 contracts appears to be notably similar. However, FOMC press conferences, though fewer in number, generate larger movements in Canadian BAX4 contracts. Bank of Canada policy rate announcements appear to induce significantly larger changes in Canadian BAX4 contracts, while its Governing Council speeches and press conferences lead to comparatively lower, but sill substantial, volatility in BAX4 contracts price movements.

Next in Table 1, we construct summary statistics on the effects of both Fed and Bank of Canada policy rate announcements, speeches, press conferences, and FOMC minutes release from 1997 to July 2023 on BAX contracts (the current-quarter contract rate and the contract rates for each of the next three quarters), benchmark Government of Canada bond yields (2-, 5-, 10-, and 30-year bonds), and stock returns. Panel (A) of Table 1 shows the sum of absolute changes in percentage points. Since the number of events is very heterogeneous (we have 297 Fed Chair speeches, and only 63 FOMC press conferences), Panel (B) displays the mean absolute change per event in basis points.

[Insert Table 1 here.]

Panel (A) shows that BoC policy rate announcements lead to substantial absolute changes in Canadian financial assets, particularly in short-term interest rates, where the cumulative change reaches 8.41 percentage points (pp) for 1st BAX contracts, 9.40 pp for second quarterly BAX contracts, 6.86 pp and 3.55 pp for 2-year and 10-year bonds. In contrast, the impact of FOMC announcements is relatively more pronounced at longer maturities, with cumulative effects of 4 pp in 1st BAX contract, 5.08 pp in 4th quarterly BAX contracts, 3.4 pp in 2-year Government of

Canada bonds and 3.46 pp in 10-year Government of Canada bonds.

When examining the impact of speeches and press conferences, the data further suggest that, while each type of these events generally have a smaller effect than Bank of Canada policy rate announcements, they nonetheless lead to significant movements in Canadian financial markets. For example, Fed speeches contribute to a cumulative absolute change of 2.86 pp in BAX4 contracts, while BoC speeches result in a bit more with cumulative change of 3.11 pp. Although fewer in number, press conferences from both the Fed and the BoC also result in notable market reactions.

Overall, the combined impact of BoC's speeches and press conferences has slightly smaller effects on short-term interest rates (BAX1-BAX4) but generates larger changes in Canadian long-term interest rates and stock markets than Bank of Canada policy rate announcements alone. Focusing solely on FAD rate announcements overlooks key domestic monetary policy influences on financial markets and the broader economy. Similarly, the combined effects of Fed Chair and Vice Chair speeches, FOMC press conferences, and minutes releases produce greater changes in Canadian medium-term and long-term interest rates and stock markets than FOMC policy rate announcements alone, and even larger changes than BoC policy rate announcements. Relying exclusively on FOMC rate announcements to assess U.S. monetary policy spillovers overlooks the most significant sources of these spillovers.

Given that the total number of events varies greatly across different central bank communication types, we follow Swanson and Jayawickrema (2023) and also report in Panel (B) Table 1 the mean absolute change for Canadian financial assets in response to the different types of monetary policy announcements by both the Fed and the BoC. It is clear that policy rate announcements by the BoC are the most important monetary policy announcement type for most interest rates. For BAX1, BoC policy rate announcements lead to a mean absolute change of 4.23 bps, nearly twice the size of the 2.39 bps from FOMC announcements. However, for the 5-year Government of Canada bonds, FOMC announcements generate 2.20 bps per event, accounting for 68% of the BoC's 3.23 bps change. This growing influence of the FOMC is even more pronounced in 10-year Government of Canada bonds, where the average change from FOMC announcements is 1.99 bps, nearly matching the 2.10 bps caused by BoC announcements. The findings indicate that BoC policy rate announcements exert a significant impact across a wide range of maturities. However, the influence of Federal Open Market Committee announcements becomes increasingly more pronounced as the maturity horizon extends, highlighting a notable difference in the transmission of domestic versus international monetary policy actions across different asset classes.

In terms of speeches, the BoC has a stronger impact on BAX4 contracts, with a mean change of 1.96 bps compared to the FOMC's 1.29 bps. For 5-year bonds, the influence of Fed speeches is

slightly lower at 1.61 bps, while BoC speeches are associated with a mean change of 1.72 bps.

When it comes to press conferences, although their impact is generally smaller than policy rate announcements, they still lead to significant market movements. FOMC press conferences result in a mean absolute change of 2.69 bps in fourth quarterly BAX contracts and 2.43 bps in 10-year Government of Canada bonds. In both cases, the FOMC's press conferences have a slightly larger effect compared to the BoC's, which lead to average changes of 2.47 bps for BAX4 contracts and 1.68 bps for 10-year bonds.

These results emphasize that while BoC policy rate announcements have the strongest effect on short-term interest rates, the influence of Fed events becomes more substantial as the maturity horizon extends. This highlights the broader impact of U.S. monetary policy on Canadian markets. Our study aligns with Swanson and Jayawickrema (2023) and Mumtaz et al. (2023) in identifying significant roles for Fed Chair and Vice Chair speeches and press conferences in shaping asset prices in Canada. Notably, BoC press conferences are deemed more influential than BoC Governing Council speeches for a broad array of interest rates, as well as for stock market futures. Remarkably, FOMC press conferences emerge as a critical driver for Canadian long-term bonds and stock market futures, underscoring the profound spillover effects of US monetary policy announcements into the Canadian financial landscape.[7]

3.2 Central bank communication events and placebo events

While the analysis so far highlights the significant influence of central bank communication on Canadian financial markets, we also need to ensure that these observed reactions are not coincidental. To this end, we employ a placebo analysis, testing whether market reactions to actual central bank events are distinct from those triggered by placebo events. This helps determine whether the observed effects are truly driven by central bank communications or merely reflect random market fluctuations. Details of the placebo methodology are provided in Appendix D. For speeches, placebo events are randomly sampled over 4,000 instances, while for other types of communication, we use the event time from one week prior.

For both central bank communication events and placebo events, we look at market reactions associated with event i at time t for asset a (i.e. $\Delta y_{a,i,t}$). Table D.1 presents the total and average absolute changes in asset prices, analogously to Table 1, except that it uses placebo events. We find that central bank communication events trigger unusually large market moves throughout the term structure and stock price. For example, on average, the FOMC announcement moves the five-year GoC benchmark bond yield market by 2 bps, while the placebo FOMC event moves only 0.56 bps – just 28% of the impact observed during the actual event.

[7] For an in-depth analysis of the market impact of FOMC press conferences, see Gómez-Cram and Grotteria (2022) and Narain and Sangani (2023).

To further assess the relative impact of central bank communication events, we run regressions that take placebo events as the baseline and flag actual central bank communication events with a dummy variable $D_{i,t}^{\text{actual}}$, as shown in equation (1).

$$|\Delta y_{a,i,t}| = \alpha + \beta_{a,i} D_{it}^{\text{actual}} + \epsilon_{a,i,t} \tag{1}$$

Table D.3 shows the estimates for $\beta_{a,i}$, with most of the $\beta_{a,i}$s being positive and statistically significantly different from zero, indicating that actual central bank communication events lead to significantly larger market reactions than placebo events.

3.3 Decomposition into expectation and term premium

In section 3.1, we have quantified the impacts of central bank events on the yield curve. This raises important questions about the economic interpretation of such movements. In this section, we apply an affine term structure model (ATSM) to high-frequency (HF hereafter) yield curve shifts, decomposing these HF movements into expected future interest rates and term premia.

The idea of this approach is that the yield $\tilde{Y}_t$ is linear in risk factors F_t. We can write

$$\tilde{Y}_t = C_P + B_P F_t$$

Under risk-free measures, we can write the vector of changes in the expectation component as

$$\tilde{Y}_t^E = C_Q + B_Q F_t$$

and thus the vector of term premia is given by

$$\tilde{Y}_t^{TP} = (C_P - C_Q) + (B_P - B_Q) F_t,$$

where B_P, C_P , B_Q, C_Q are derived from the parameters of the estimated models.

We first estimate the model using monthly data for Canadian zero-coupon yields at maturities of 3, 6 and 9 months and 1 through 10 years. That is, thirteen maturities in total. The data are obtained from the Bank of Canada's website. The sample runs from January 1987 to December 2019. To ensure identification, we employ the normalizing restrictions of Joslin, Singleton and Zhu (2011), leading to their canonical representation. We follow Bauer (2018) to impose restrictions on risk prices. The details can be found in Appendix E.

Following Kaminska, Mumtaz and Šustek (2021), we assume that B_P and B_Q remain constant within a narrow window, e.g., 10 minutes before and 20 minutes after central bank policy rate

announcement events. The estimated values of B_P and B_Q from the monthly ATSM are then applied to project the high-frequency changes in the yield curve. Specifically, we obtain the vector of high frequency changes in the risk factors, denoted as ΔX_t, by taking the first four principal components of the changes in the yields of the BAX2, BAX4, 2-, 5-, and 10-year GoC bond. We calculate $\Delta \tilde{Y}_t^E = B_Q \Delta X_t$ to capture the expected changes and $\Delta \tilde{Y}_t^{TP} = (B_P - B_Q)\Delta X_t$ to account for changes in the term premium.

The contributions to the HF changes in yields around the FAD announcements are illustrated in Figure 2 . Our time series start in 2002 due to the availability of the intraday government bond yield data. During Canadian interest rate announcement events, both the 1-year and 10-year yields are influenced by the expectation and term premium channels, with expectations playing a more significant role than the risk premium in both cases. However, the expectation channel has a relatively greater impact on the 1-year yield compared to the 10-year yield. Specifically, from 2002 to 2023, the estimated total absolute changes in the 1-year yield are 4.66 pp for the expectation term and 0.73 pp for the risk premium, while for the 10-year yield, the total absolute changes are 3.67 pp for the expectation term and 1.56 pp for the risk premium. To quantify the relative contribution, in Table 2, we present the ratio of total absolute change in expectation divided by total absolute change in term premium for each event, and for 1-year, 5-year and 10-year yields respectively.

[Insert Figure 2 here.]

[Insert Table 2 here.]

Figures 3, 4 and 5 illustrate the decomposition for FOMC, BoC and Fed Chair speeches, respectively. Additional results showing the contributions to HF changes in yields are illustrated in Appendix Figure F.1, F.2, F.3, corresponding to the BoC press conferences, the FOMC press conferences, and the FOMC minutes release, respectively. In these events, the 1-year yield changes are also primarily driven by expectations, and notably, U.S. events also exert a significant influence on it. For the 10-year yield, on the other hand, the term premium channel plays an equally important role, regardless of whether the event takes place in the U.S. or Canada, and regardless of whether it involves a speech, press conference, or minutes release. Specifically, during Fed speeches between 2002 and 2023, the estimated total absolute changes in the 1-year yield are 1.54 pp for the expectation term and 0.43 pp for the risk premium, while for the 10-year yield, they are 1.23 pp for the expectation term and 1.55 pp for the risk premium.

[Insert Figures 3, 4, 5 here.]

4 The transmission of central bank communication to foreign exchange markets

In this section, we discuss the relative importance and transmission channels of central bank events on the foreign exchange market.

4.1 Importance

We analyze the impact of various central bank events on the CAD/USD exchange rate market, including spot, futures, and forward contracts, as shown in Table 3. Panel A presents the total absolute changes, while Panel B displays the average absolute change per announcement for each type of monetary policy communication.

[Insert Table 3 here.]

Our analysis shows that both BoC and FOMC announcements significantly impact the CAD/USD exchange rate, with BoC announcements typically exerting a stronger influence. BoC rate announcements result in a total absolute change in the spot CAD/USD exchange rate of 65.71 pp, compared to 44.05 pp for FOMC announcements (Panel A). Similarly, in the futures and forward markets, the BoC's cumulative absolute changes are 52.73 pp and 58.57 pp for 1st CADUSD futures and 9-month forwards, respectively, while the FOMC records 34.11 pp and 40.73 pp.

For speeches, the Fed tends to have a greater effect than the BoC. Fed speeches result in a total absolute change of 41.11 pp in the spot market, compared to 28.76 pp for BoC speeches (Panel A). The mean absolute change per speech is 15.89 bps for BoC and 13.84 bps for the Fed (Panel B), with the balance shifting slightly toward the BoC in terms of average change per event. This trend is mirrored across the futures and forward markets. Press conferences from both central banks show similar impacts. FOMC press conferences lead to a total absolute change of 17.03 pp in the spot exchange rate, with BoC press conferences showing 20.07 pp (Panel A). The mean absolute change per event is 24.68 bps for FOMC and 20.91 bps for BoC (Panel B). Lastly, FOMC minutes show the smallest impact, with a total absolute change of 17.29 pp in the spot market and a mean absolute change of 9.77 bps.

We also perform a similar placebo test as in subsection 3.2. Table D.2 presents the total and average absolute changes in the CADUSD foreign exchange markets, analogously to Table 3, except that it uses placebo events. We find that central bank communication events trigger unusually large market moves. For example, on average, the FOMC announcement moves the spot CADUSD by 19.66 bps, while the placebo FOMC event moves only 5.94 bps. To further assess the relative impact of central bank communication events, we run regressions that take

placebo events as the baseline and flag actual central bank communication events, as in equation (1). Table D.4 shows that actual central bank communication events lead to significantly larger market reactions than placebo events.[8]

In summary, while both BoC and FOMC announcements significantly affect the CAD/USD exchange rate, the BoC generally shows a higher impact, particularly in rate announcements. The insights gained from our analysis of spot exchange rate dynamics in response to these monetary policy announcements set the stage for exploring the Covered Interest Parity condition, which will be the focus of the next section. This approach will provide a deeper understanding of the complex interactions between monetary policy and financial market responses, providing valuable information on the cross-border impacts of policy decisions.

4.2 Leveraging CIP to understand transmissions around different types of monetary policy announcements

The CIP condition is the fundamental pricing equation for foreign exchange-rate forward and swap contracts. Although research has shown that CIP held strongly before the Global Financial Crisis, the relationship deteriorated significantly during the crisis and did not recover afterward (Du, Tepper and Verdelhan, 2018). Our objective in this section is to use CIP as a framework to understand the transmission channels around various types of monetary policy communication event, rather than to focus on identifying the specific factors influencing its deviations.

We evaluate the behaviour of the CIP relationship around monetary policy using event studies. Unlike previous studies, such as Cerutti, Obstfeld and Zhou (2021) and Ceballos, Albagli, Claro and Romero (2023), which rely on daily data, our research adopts a narrow event window to capture immediate market reactions to central bank actions. By leveraging a unique dataset covering both U.S. and Canadian financial markets, we benefit from the simultaneous operation of these markets, thanks to their shared time zones. This synchronicity reduces external noise, such as time zone differences that often complicate analyses of European or emerging markets, and ensures that our results are based on consistently active and highly liquid trading environments. Furthermore, we exploit the institutional structure of the financial markets, which provides an ideal setting. As noted by TMX Montreal Exchange (2013), BAX contracts, which are financial instruments created to facilitate arbitrage opportunities, closely track the pricing of Eurodollar futures with matching expiration dates. We also analyze non-rate announcements, which, as

[8] In contrast, Table D.5 shows the estimates for β for the US fixed income market. Almost all βs are positive and statistically significantly different from zero for US events, indicating that actual Fed communication events lead to significantly larger market reactions than placebo events. Almost all βs are statistically insignificant, which aligns with intuition since Canadian monetary policy announcements typically have limited direct influence on US fixed income markets.

Swanson and Jayawickrema (2023) highlights, can have a larger market impact.

For the Canadian dollar and the US dollar, a deviation from covered interest rate parity refers to the wedge between two differentials: (i) the difference between the n-period forward exchange rate and spot exchange rate, which we denote by $s_t - f_{t,t+n}$, where both rates are quoted in terms of the US dollar per Canadian dollar; and (ii) the difference in the nominal interest rates from holding each currency, which we denote by $n(y_{t,t+n} - y^*_{t,t+n})$, the n-period interest rate difference between Canadian dollar and US dollar (with an asterisk) interest rates.

A basic CIP test for horizon n in this setup can be expressed by:

$$\left(s_t - f_{t,t+n}\right)/n = a_n + b_n\left(y_t^{(n)} - y_t^{*(n)}\right) + \varepsilon_t.$$

The forward rate $f_{t,t+n}$ is derived from two main sources. First, CADUSD futures, which are actively traded on the CME. However, it is noteworthy that trading is mainly concentrated in the first quarterly contract. This indicates that n ranges from 1 to 2 quarters. This data starts from 2006 October. For the nine-month horizon, we use five-minute bar bid and ask data on forward spot rate deviations from Olsen.com. The data starts from 1997. We calculate the midquote by averaging the best bid and ask prices.

We rely on Eurodollar and BAX contracts for interest rate expectations due to the lack of high-frequency, long-history interest rate swap data. The first quarterly Eurodollar and first BAX contracts reflect market expectations for the 3-month bank lending rate in the U.S. and Canada, respectively, at expiration, which is two business days before the third Wednesday of the contract's delivery month (March, June, September, or December). Similarly, the third quarterly Eurodollar and third BAX contracts capture expectations for the 3-month bank lending rate in the U.S. and Canada at expiration, also two business days prior to the third Wednesday of the delivery month.

In the presence of CIP deviations, the regression equation may have coefficients b_n different from 1, and a constant term a_n different from 0. We run regressions using data on pre- and post-event levels, we find that the that CIP does not hold in real-time. Given this, the key question becomes whether the market reaction itself aligns with CIP principles, even if the pre- and post-event levels do not. Specifically, while the post-event levels may still show CIP deviations, it is possible that the reaction to the event—the immediate adjustment—could temporarily align with the CIP framework, reflecting short-term adherence before reverting to broader deviations.

We rewrite the equation above in terms of differences around the event window, $t_1 < t < t_2$,:

$$(\Delta s_t - \Delta f_{t,t+n})/n = b_n \Delta(y_{t,t+n} - y^*_{t,t+n}) + \nu_t,$$

where $\Delta x_t = x_{t_2} - x_{t_1}$ for variable x, and $\nu_t = \Delta\varepsilon_t$. Although this specification should be valid at

any horizon n, its estimation over short horizons in response to specific events would require high-frequency measures of exchange rate expectations at said horizons around these events. For the 10-year horizon, following Ceballos et al. (2023), we assume a negligible change in the 10-year forward exchange rate over a 30-minute event window due to the limited liquidity in contracts extending beyond one year.

We estimate the following form:

$$(\Delta s_t - \Delta f_{t,t+n})/n = \alpha_n + \beta_n \Delta(y_{t,t+n} - y^*_{t,t+n}) + \nu_{n,t} \tag{2}$$

Our null hypothesis posits that the CIP holds, implying that α is 0 and β is 1. The results for specification 2, as presented in Table 4, are organized into three panels. Panel (A) presents the three-month CIP test results, Panel (B) are the findings for the nine-month horizon, and Panel (C) is the ten-year horizon analysis. Each column within these panels corresponds to a different central bank event. For each event and horizon, we provide the point estimate for α_n and β_n, accompanied by the respective t-statistics and p-values derived from testing α_n equal to 0 and β_n equal to 1.

[Insert Table 4 here.]

The empirical evidence largely suggests a departure from the CIP across various events and time horizons. Specifically, we frequently fail to reject the hypothesis that α equals zero, and conversely, we often find sufficient grounds to reject the notion that β equals one. For instance, at the three-month horizon, our estimates indicate that α is zero and the point estimates for β range from -0.5 to 0.25, statistically significantly deviating from one. We also restrict our sample to start from 2008, as shown in Appendix Table F.1, are quite robust. There are a few exceptions; for example, for Bank of Canada speeches and US speeches, at the nine-month horizon, we cannot reject the hypothesis that β_n is equal to 1.

Although CIP deviations are often attributed to factors like limited liquidity or market closures, especially in emerging markets, our research offers a different perspective. Even in highly liquid markets such as the spot FX and futures markets for CAD/USD and fixed income futures on the TMX, CIP deviations persist. This suggests that beyond trading hours and market infrastructure, other factors may influence CIP adherence, even in well-functioning markets.

Through CIP, we gain valuable insight into the transmission channels of monetary policy. Given that central bank announcements influence interest rate expectations, we treat the nominal interest rate differential $n(y_{t,t+n} - y^*_{t,t+n})$ as a known input and focus on exchange rate reactions. When the coefficient β deviates from 1, it is often observed to fall below rather than exceed this threshold. Such under-reaction in the exchange rate points to incomplete adjustments in foreign exchange markets following monetary policy announcements.

5 The time-varying importance of Fed and BoC communication events for Canadian financial markets

We next examine how the importance for Canadian asset prices of the different types of monetary policy announcements from the Fed and the BoC has changed over time. Swanson and Jayawickrema (2023) reports marked changes in importance of FOMC announcements and the different kinds of Fed communication on interest rates and the stock market in the US. Likewise, Narain and Sangani (2023) shows that there were large differences in how Fed Chair press conferences have impact markets in the U.S., particularly since the Covid-19 recession.

Figure 6 reports a three-year rolling-window estimates of the impact of the FOMC policy announcement and the three monetary policy communication types on four of our Canadian asset prices: the 4th Bankers acceptance futures (BAX4), the 10-year Government of Canada bond yield, the stock market futures, and the spot exchange rate.

[Insert Figure 6 here.]

Figure 6 shows that FOMC announcements had a pronounced effect on short-term interest rates in the early part of our sample. However, as both the U.S. and Canadian economies recovered from the Global Financial crisis, the influence of FOMC announcements diminished, only to regain prominence towards the end of 2019.

The importance of speeches and Fed press conferences also increased notably after the Covid-19 pandemic began. Speeches by the Fed Chair and Vice Chair increasingly affected BAX4 and 10-year bond yields, with their impact growing fivefold. Likewise, post-FOMC press conferences became far more impactful on Canadian asset prices, particularly after the Fed doubled the frequency of these conferences in 2019. By the end of our sample, these press conferences had become the most important Fed event for BAX4 and the CAD/USD spot exchange rate. Their influence on Canadian 10-year bond yields and stock market futures matched that of Fed Chair and Vice Chair speeches. These findings align with Narain and Sangani (2023), who documented a significant rise in the importance of press conferences for U.S. asset prices during Chair Powell's tenure and the onset of the pandemic.

Similarly, Figure 7 shows the three-year rolling-window estimates for BoC policy rate, press conference and speech's impacts on the same set of financial asset prices. From 1997-2001 there were only 16 Bank of Canada policy rate changes, which is why the effects are small. The implementation of the eight fixed announcement dates started in 2001. There are some clear differences with respect to the spillovers of Fed policy rate and communication announcements. Contrary to the evidence for the Fed spillovers, BoC policy rate announcements are generally the most important monetary policy rate announcement throughout all of our sample.

[Insert Figure 7 here.]

Interestingly, BoC press conferences following policy decisions have far less influence on Canadian asset prices compared to Fed press conferences. No clear trend emerges for the importance of BoC press conferences, even after the onset of the Covid-19 pandemic. By the end of our sample, BoC press conferences were roughly half as important as Fed press conferences for BAX4 futures and only one-eighth as impactful for Canadian 10-year bond yields. However, BoC speeches have gained prominence over time. Since 2019, and especially post-Covid-19, BoC speeches have reached roughly one-third of the impact of BoC policy rate announcements for BAX4 futures, about half for 10-year rates and the CAD/USD spot rate, and a similar magnitude of influence for Canadian stock futures.

6 Fed and BoC communication events and forward guidance

A large literature pioneered by Gürkaynak et al. (2005) (hereafter GSS) studies changes in interest rates around monetary policy announcements, breaking them down into two components: unexpected changes in the policy rate (the "target factor") and unexpected changes in forward guidance (the "path factor").[9] In this section, we employ similar methods to decompose changes in Canadian interest rates around each of our Fed and BoC monetary policy and communication events into a BoC policy rate component and a forward guidance component. We then assess the immediate financial market reactions to these components, with a particular focus on forward guidance, across various assets for both Fed and BoC communications. Finally, we use these factors to analyze the persistence of forward guidance shocks driven by both Fed and BoC communication events on Canadian financial markets.

6.1 Identification of BoC policy rate and forward guidance factors around Fed and Boc announcements

We begin by identifying target factor and forward guidance components for each of our event types. Changes in the BoC policy rate target always take place with a BoC rate announcement. None of the other central bank communication events result in a change in the policy rate. We thus define the surprise change in the BoC policy rate to be zero for all non-rate announcement events.

For the BoC policy rate announcement, we follow the methodology outlined by GSS and use five instruments in our analysis. For the first instrument, GSS employs the federal funds

[9] Swanson (2021) expands this approach to identify surprise changes in the Federal Reserve's large-scale asset purchases.

futures of the current month (FF1). However, due to the absence of a similar financial product in Canadian financial markets, we adapt our approach. Before 2016, we use the change in daily CORRA, and after 2016, we use the intraday change in the next-day tomorrow repo rate from MTRS to construct our first instrument since almost all the announced policy rates become effectively on the next business day. The other four instruments are BAX1, BAX2, BAX3, and BAX4.

For the target and forward guidance components, we adopt the GSS methodology. Let X represent a T by five matrix of short- and medium-term interest rate futures responses to FAD announcements. Each row in this matrix corresponds to an individual FAD announcement, and the columns represent changes in the target rate changed constructed by the above method, BAX1, BAX2, BAX3, and BAX4, respectively. We extract the first two principal components from X and rotate them so that the second component has no impact on policy target changes. The first factor corresponds to the surprise change in the BoC policy rate, while the second factor captures the surprise change in forward guidance, reflecting changes in expectation about interest rate path unrelated to the current policy rate. Finally, we normalize the scale of each factor (rate target and forward guidance) for both factors to have a standard deviation of unity.

There is no BoC rate change associated with all other central bank communication events, including Canadian press conferences, speeches, and all FOMC communication events. To identify the forward guidance component for each of these events, we follow Swanson and Jayawickrema (2023) and construct a matrix X^{type} with dimensions $T^{\text{type}} \times 4$, where T^{type} represents the number of announcements of that type. The four columns correspond to the futures rates BAX1–BAX4, with the surprise change in the BoC policy rate being zero. We then extract the first principal component of X^{type}, defining it as the change in forward guidance—mirroring the concept applied to FAD announcements without changes to the BoC rate. Finally, we normalize the scale of the forward guidance from each type of monetary policy announcement to have a standard deviation of unity.

6.2 Forward Guidance effects for Fed and BoC communication events

We then estimate the following high-frequency event study regression for each type of Fed and BoC monetary policy communication event

$$\Delta y_t = \alpha + \beta F_t^{type} + \epsilon_t \tag{3}$$

where, Δy_t denotes the change in Canadian interest rates, stock futures return, or CAD/USD spot exchange rate return during a narrow time window surrounding the different types of Fed and BoC monetary policy announcements. F_t^{type} captures the policy rate or forward guidance

factors associated with each type of announcement.

Table 5 reports the estimated β coefficients of these regressions. Panel (A) reports the coefficients associated with the BoC policy rate changes, or the target factor. This is the only monetary policy announcement that changes the short-term policy rate in Canada. A one-standard-deviation increase in the policy rate increases the current-quarter Bankers Acceptance Futures by 4.00 bps. The impacts of the policy rate changes are statistically significant all the way to the 2-year GoC bond yields. Increases in the BoC policy rate lead to sizable drops in Canadian stock market futures of 2.97bp and an appreciation of the CAD/USD spot exchange rate of 9.31bp. These results are in line with the findings for the effects of FOMC policy announcements on U.S. interest rates, as reported by Kuttner (2001), Gürkaynak et al. (2005), Swanson (2021) and Swanson and Jayawickrema (2023), stock market, as in Bernanke and Kuttner (2005) and Swanson (2021), and exchange rate, as in Swanson (2021).

[Insert Table 5 here.]

Next, we investigate the effects of forward guidance on Canadian asset prices. Panel (B) reports the coefficients associated with the forward guidance factors due to changes in both BoC and FOMC policy rate announcements and other communication, such as speeches, press conferences, and minutes. Forward guidance changes associated with BoC announcements result in significant adjustments across all quarters of Bankers Acceptance Futures. The most substantial impact is observed in the 2Q futures, where a one-standard-deviation change in forward guidance leads to an increase of 8.89 basis points (bp). This suggests that market participants closely monitor BoC's forward guidance to adjust their expectations for short-term interest rates, particularly in the near term. Other maturities also respond, with the 1Q, 3Q, and 4Q futures showing increases of 6.40 bps, 7.31 bps, and 7.08 bps, respectively, indicating a broad-based market response to the BoC's signaling.

In addition to short-term interest rates, forward guidance from the BoC influences medium- and long-term government bond yields. The 2-year GoC bond yield increases by 4.49 bps, while the 5-year bond yield rises by 3.41 bps. These results imply that forward guidance extends its influence beyond the immediate horizon, shaping expectations about the future path of monetary policy. Although the impact diminishes over longer maturities, with the 10-year bond yield increasing by 1.83 bps and the 30-year by 0.92 bps, the persistent effect across the yield curve highlights the potency of forward guidance in guiding market expectations.

The reaction of the Canadian stock market to BoC forward guidance is particularly pronounced. Stock market futures drop by 10.56 bps, reflecting negative sentiment and a potential reassessment of economic conditions and corporate profitability in response to anticipated monetary tightening. The CAD/USD spot exchange rate appreciates significantly by 29.26 bps, highlighting the sensitivity of the currency market to monetary policy surprises, as tighter policy

expectations often lead to currency appreciation.

Forward guidance from FOMC announcements, while also influential, generally exerts a more moderate effect on Canadian financial markets compared to BoC announcements. The 2Q Bankers Acceptance Futures see an increase of 3.97 bps, with the 3Q and 4Q futures rising by 4.10 bps and 3.00 bps, respectively, indicating that U.S. forward guidance is indeed factored into Canadian interest rate expectations, though the impact is smaller than that of domestic guidance.

The GoC bond yields respond similarly to the FOMC forward guidance, particularly in the shorter maturities. The 2-year and 5-year yields increase by 1.48 bps and 1.38 bps, respectively, showing that U.S. forward guidance is relevant to Canadian bond markets, particularly in the context of global interest rate movements. However, the effect on longer maturities, such as the 10-year and 30-year bonds, is more subdued, with increases of 1.06 bps and 0.58 bps, respectively.

Canadian stock and foreign exchange markets exhibit significant responses to FOMC forward guidance. A one-standard-deviation change in FOMC announcement forward guidance leads to a 14.88 basis point drop in Canadian stock market futures. In the foreign exchange market, the CAD/USD exchange rate depreciates by 12.38 basis points following the same magnitude of change in FOMC announcement forward guidance, 16.88 basis points after FOMC press conference forward guidance, and 3.73 basis points in response to FOMC minutes forward guidance. These reactions highlight the nuanced connections between Canadian and U.S. monetary policies, with distinct impacts on currency markets.

6.3 Persistent effects on the financial markets

The regressions above estimate the immediate responses of yields and asset prices to BoC and the Federal Reserve communication events. In this subsection, we investigate their persistent effects on the Canadian financial market. Following Swanson (2021), we run a series of regressions at multiple horizons, indexed by h, with the following specification:

$$y_{t-1+h} = \alpha_h + \beta_h y_{t-1} + \gamma_h F_t + \varepsilon_t^{(h)}$$

where t takes on the day of a CB event, y_{t-1+h} is the h-day ahead of yields or asset prices. For BoC rate announcements, F_t is a vector of target and path factors; for all other events, F_t is the path factor. The γ^h is a parameter or a vector of parameters that can vary between regressions, and $\varepsilon_t^{(h)}$ is the residual.

Then we impose α =0 and β =1 following Swanson (2021), so the regression becomes:

$$y_{t-1+h} - y_{t-1} = \gamma_h F_t + \epsilon_t^{(h)} \tag{4}$$

where $y_{t-1+h} - y_{t-1}$ is the h-day change of yields or asset prices, and $\epsilon_t^{(h)}$ is the residual. We use heteroskedasticity-consistent standard errors (HC1) to construct the 90 percent confidence interval.

We first look at the persistent effects of the BoC rate announcement. Figure 8 plots the results of these regressions for the effects of the target factor on the left column and the effects of forward guidance on the right column. For each column, we have the four assets — BAX4 for short-term interest rates, 10-year Government of Canada bond yield, the Canadian stock market return, and the spot exchange rate expressed as USD per CAD. The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90 percent confidence interval using robust standard errors.

Unsurprisingly, the target factor influences the BAX4 yield not only on the day of the announcement, but also sustains an increase of 2 to 5 basis points for a one-standard-deviation change over a period of up to two weeks. In contrast, its impact on the 10-year bond yield and stock market returns is much more subdued. The effects on the foreign exchange market also fade rapidly. In contrast, the path factor or forward guidance exhibits pronounced effects on BAX4, about 8 bps to a one-standard-deviation increase. This response lasts approximately 25 business days. The impact of the path factor on long-term bond yields is more modest, ranging between two to three basis points, with the effects lasting about two weeks. A one-standard-deviation increase in the path factor tends to depress stock returns, aligning with traditional views, and maintains persistent effects for three months. Furthermore, a one-standard-deviation increase in the path factor also leads to lasting changes in the spot CAD/USD market, with a significant magnitude of about 50 basis points for up to one month.

[Insert Figure 8 here.]

We then estimate the persistence of the impact of the BoC Governing Council speeches on Canadian financial markets. Figure 9 plots the results of these regressions for the effects of the path factor on the same four key financial instruments: BAX4, 10-year Government of Canada bond yield, Canadian stock market returns, and the CAD/USD exchange rate. BoC speeches significantly affect these markets, with an immediate increase of 4 basis points in BAX4 yields, persisting and reaching approximately 10 basis points over three months. The 10-year bond yield experiences a similar uplift of about 5 basis points, lasting more than a month. The stock market shows a large response, with a decline of up to 120 basis points at the 70-day mark following a one-standard-deviation increase in forward guidance. The impact on the exchange rate is equally significant, with a lasting effect of about 50 basis points for around 60 days.

[Insert Figure 9 here.]

Figure 10 presents the persistent effects of FOMC rate announcements on the BAX4, 10-year Government of Canada bond yield, Canadian stock market returns, and the CAD/USD exchange

rate. In response to a one-standard-deviation increase in the path factor, BAX4 yields experience an approximate 2 basis points increase, persisting only for a few days. The effects on the stock market and the foreign exchange rate are very large and persistent.

Figure 11 presents these effects from Fed speeches. The effects are short lively. In response to a one-standard-deviation increase in the path factor, BAX4 and 10-year bond yields experience an approximate 2.5 basis points and 2 bps increase only for a few days, respectively. The effects on the stock market are muted. The foreign exchange rate increases by 20 bps for a bout two weeks.

[Insert Figures 10 and 11 here.]

In Appendix G, we restrict our sample to January 2008 and July 2023 and revisit the persistent responses of Canadian financial markets to Fed and Bank of Canada communication. We observe some differences in the impulse response functions. For example, Figure G.3 presents these effects from FOMC announcements. Interestingly, the path factor during FOMC announcements shows enduring influence, albeit with a smaller magnitude. In response to one-standard-deviation increase in the path factor, 10-year bond yield increases by 5 to 7.5 basis points within two months. The effects on the stock market and foreign exchange rate are considerably large as well.

7 Conclusion

Our study has revealed distinct patterns in how Federal Reserve and Bank of Canada monetary policy communications affect Canadian financial markets. Federal Reserve Chair and Vice Chair speeches significantly impact long-term bond yields and the stock market, indicating the Fed's broad reach in shaping investor expectations over long-term horizons. In contrast, the Bank of Canada's influence is more pronounced on short- and medium-term interest rates and the exchange rate, underscoring the immediate impact of domestic monetary policy signals. In particular, FOMC press conferences have risen in importance, now eclipsing the effects of FOMC rate announcements and Federal Reserve speeches on Canadian interest rates.

Regarding the foreign exchange market, our study reveals that while fixed income markets align closely with monetary policy cues, the FX market's response is less predictable, with CIP conditions not consistently upheld. This suggests that factors beyond immediate policy changes are at play in the FX market, inviting a deeper investigation into the interplay between monetary policy signals and currency valuations.

Going forward and drawing inspiration from studies on the global financial cycle such as the work by Boehm and Kroner (2023), Martos, Sekkel and Zhang (2024) conducted a similar analysis, extending the exploration of these dynamics through U.S. and Canadian macroeconomic news,

offering promising directions for future research.

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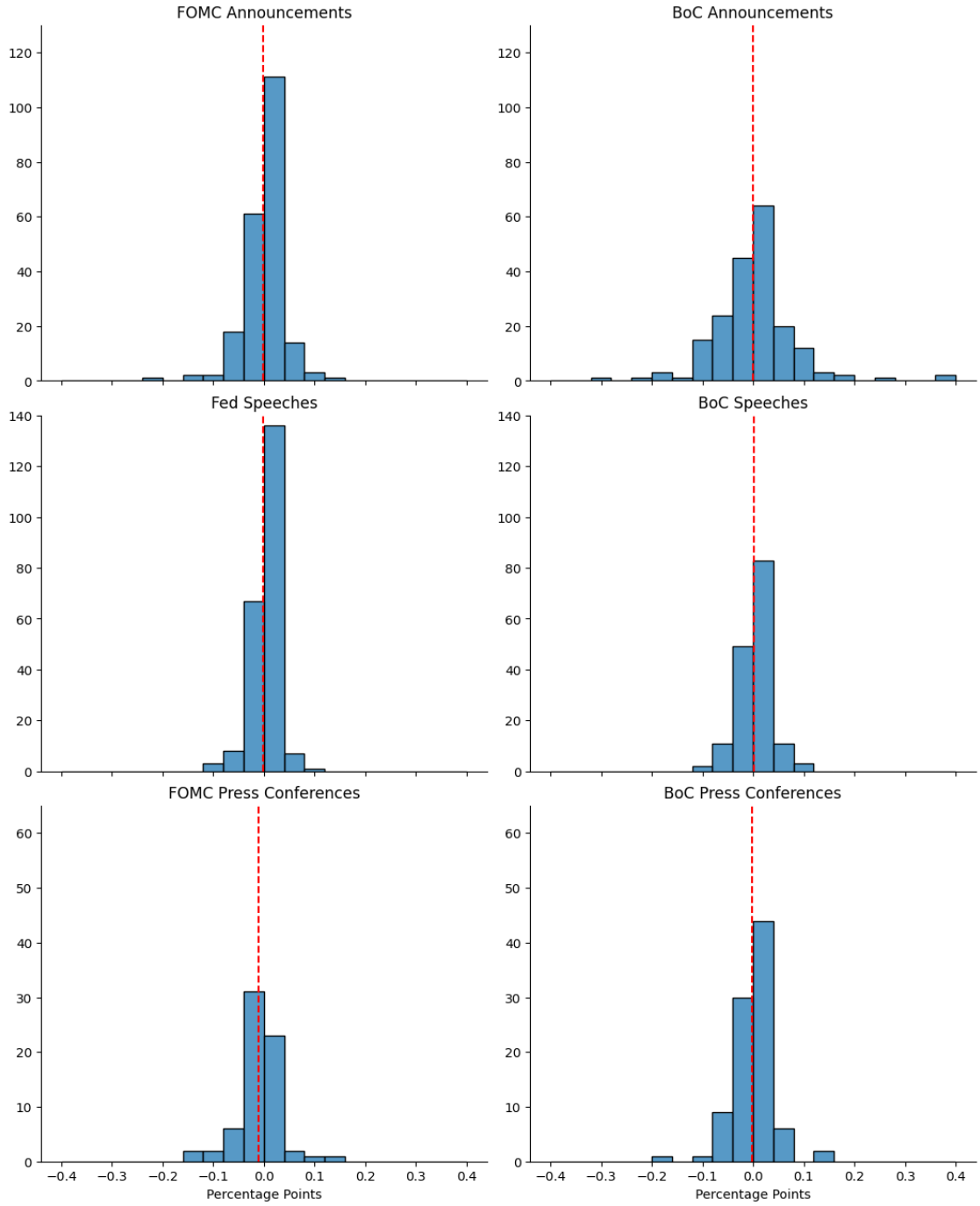
Figure 1: HISTOGRAMS OF IMPACTS OF FED AND BOC ANNOUNCEMENT TYPES ON CANADIAN BAX4



Note: This figure plots histograms for the yield changes of BAX4 around three Fed and BoC monetary policy announcements: FOMC and BoC policy rate announcements, Fed Chair and Vice-Chair speeches and BoC Governing Council speeches, and post-FOMC press conferences and BoC press conferences. Sample starts in January 1997 and ends in July 2023.

Figure 2: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND FAD ANNOUNCEMENTS (2002-2023)

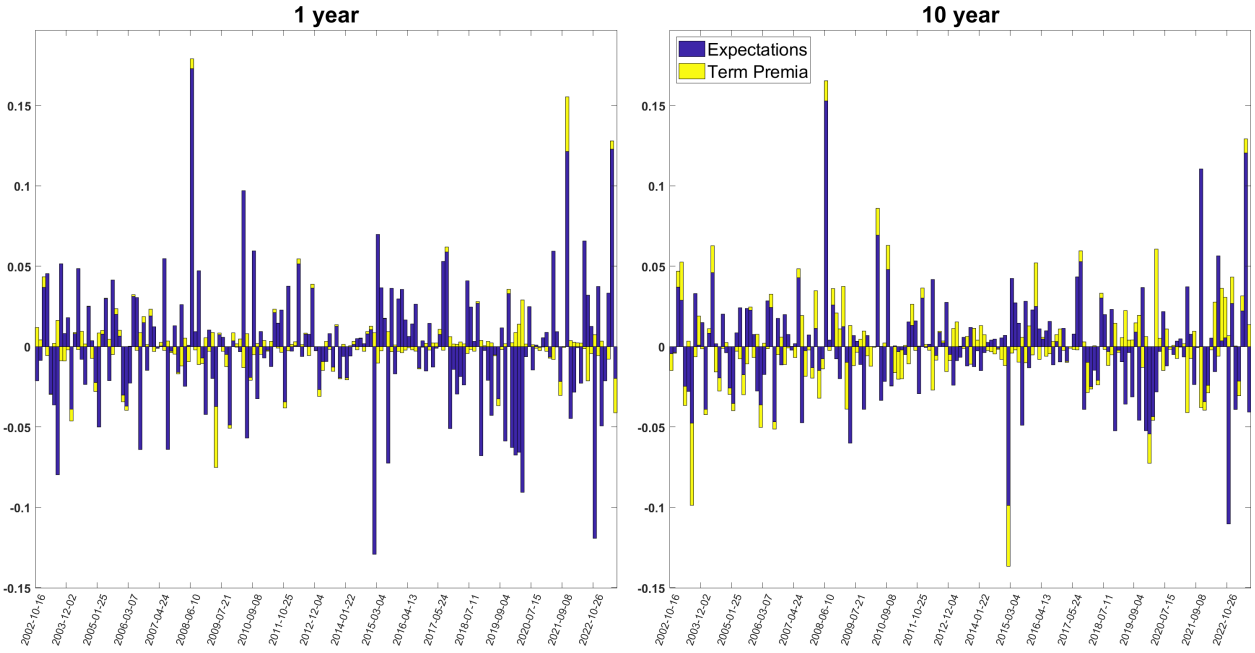


Figure 3: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND FOMC ANNOUNCEMENTS (2002-2023)

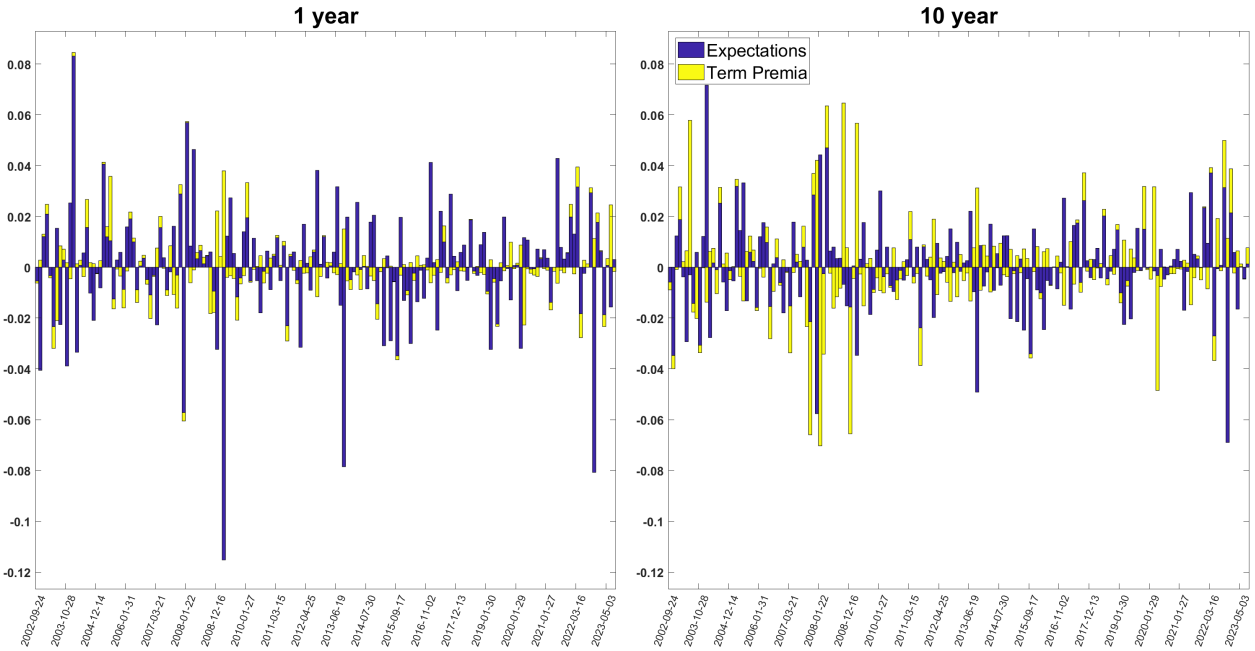


Figure 4: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND BOC SPEECHES (2002-2023)

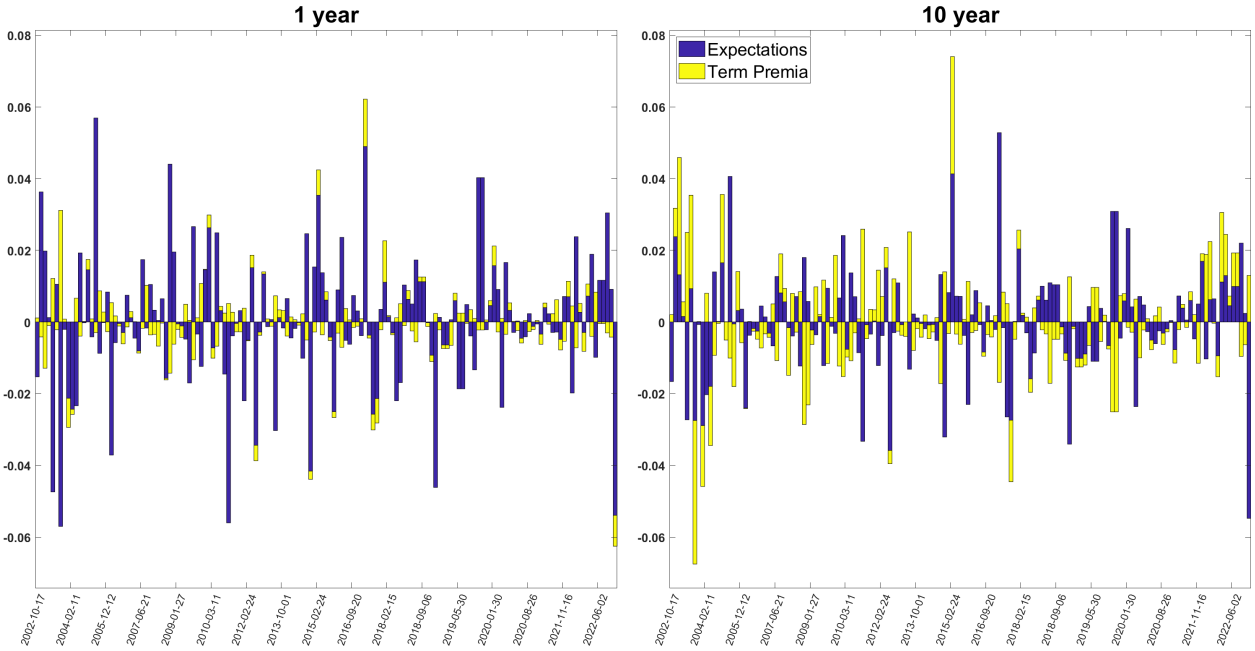


Figure 5: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND FED SPEECHES (2002-2023)

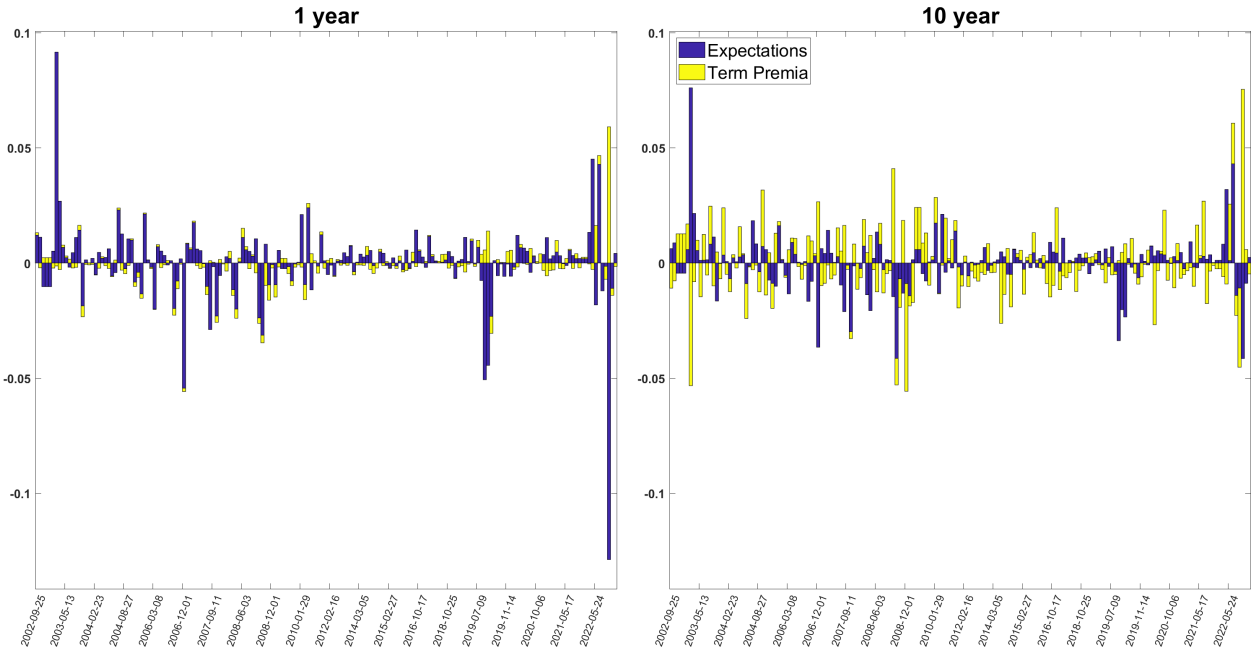
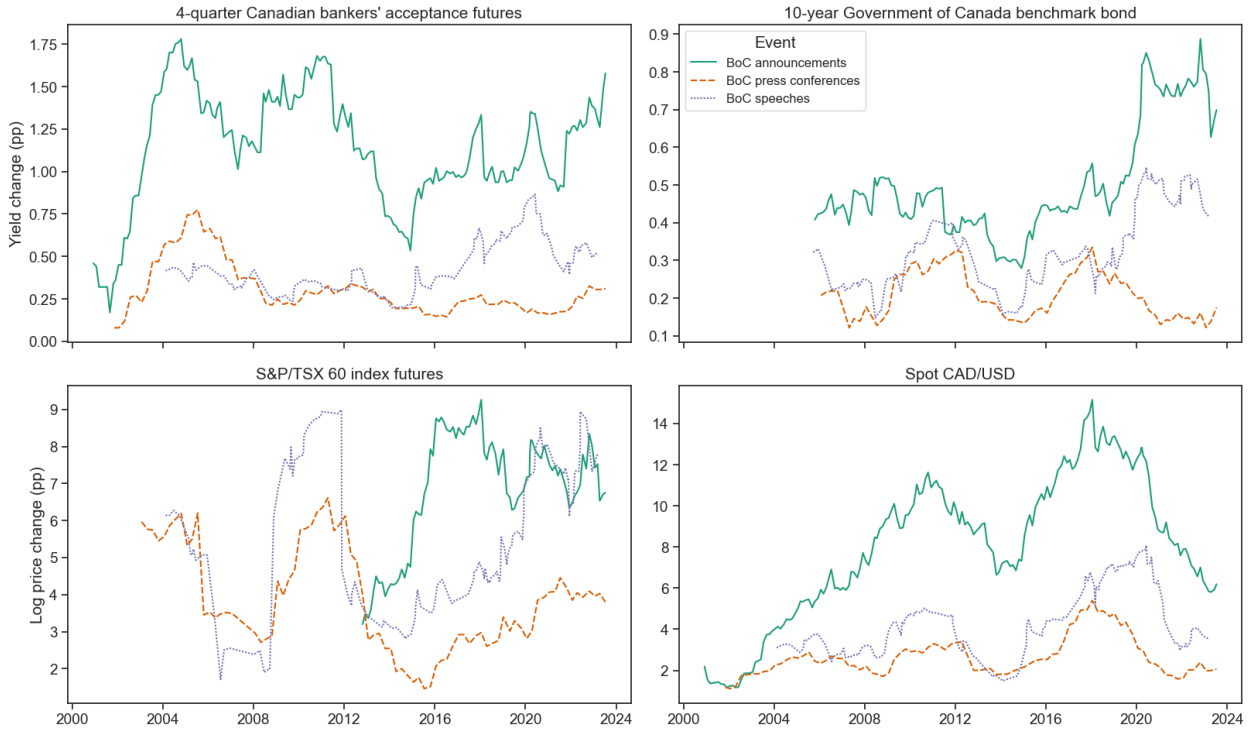


Figure 6: THE TIME-VARYING IMPORTANCE OF FED COMMUNICATION EVENTS ON CANADIAN FINANCIAL MARKETS

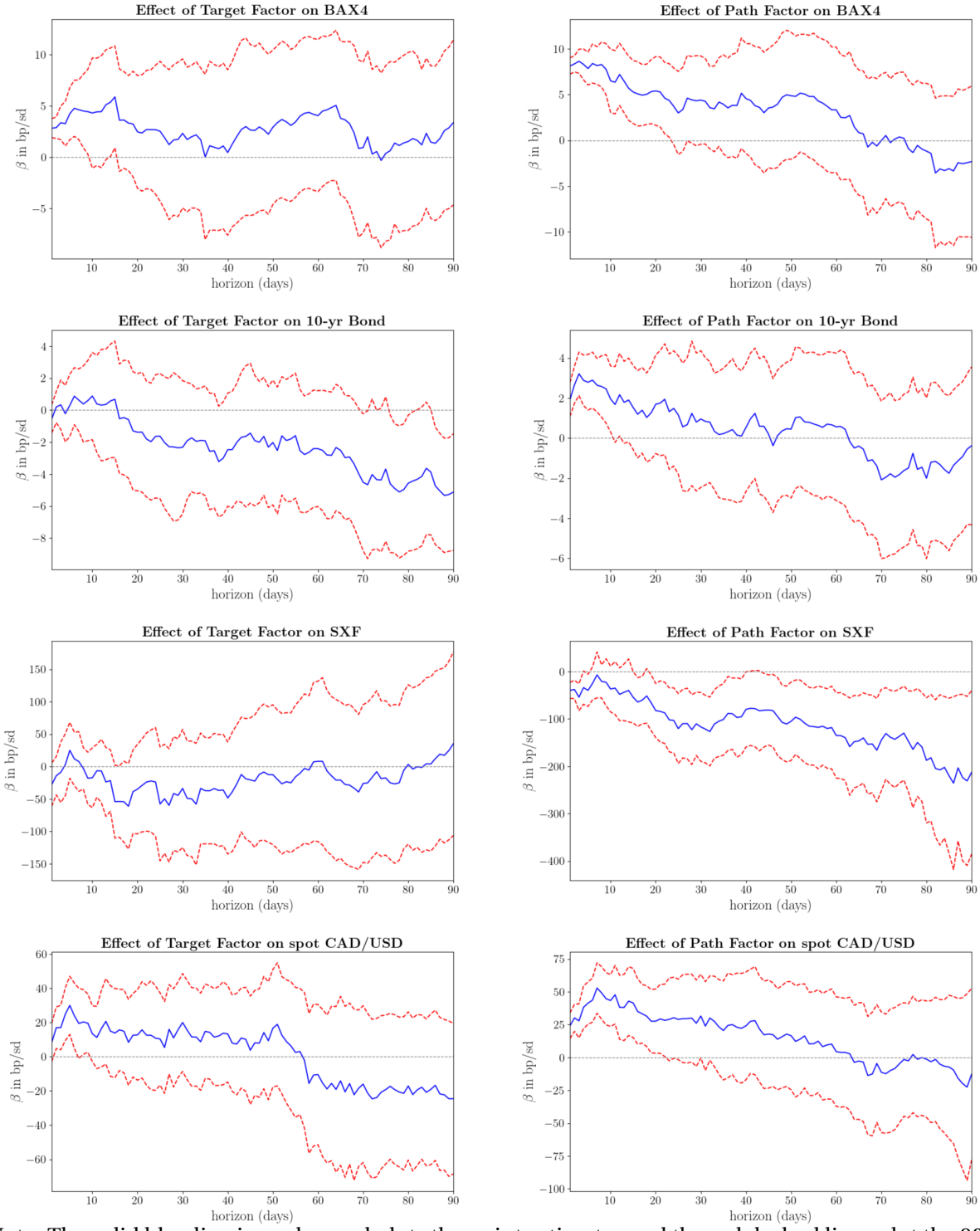
Note: Cumulative sum over 1095-day (3-year) rolling window of the absolute value of the changes in interest rate, stock price, and exchange rate. Sample periods are 1997–2023 for banker acceptance futures, 1999–2023 for stock futures, and 2002–2023 for GoC benchmark bonds.

Figure 7: THE TIME-VARYING IMPORTANCE OF BOC COMMUNICATION EVENTS ON CANADIAN FINANCIAL MARKETS



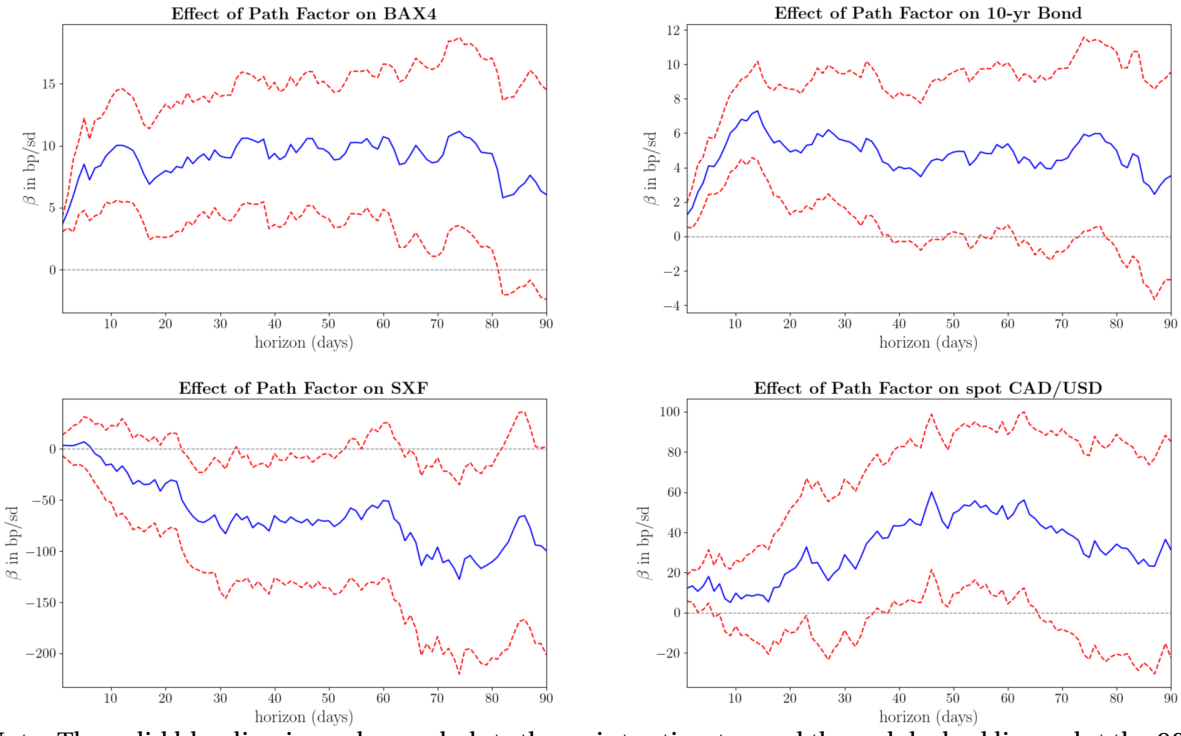
Note: Cumulative sum over 1095-day (3-year) rolling window of the absolute value of the changes in interest rate, stock price, and exchange rate. Sample periods are 1997–2023 for banker acceptance futures, 1999–2023 for stock futures, and 2002–2023 for GoC benchmark bonds.

Figure 8: PERSISTENT EFFECTS OF TARGET AND PATH FACTORS FROM BOC ANNOUNCEMENT



Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.

Figure 9: PERSISTENT EFFECTS OF PATH FACTOR FROM BOC SPEECHES



Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.

Figure 10: PERSISTENT EFFECTS OF PATH FACTOR FROM FOMC ANNOUNCEMENT

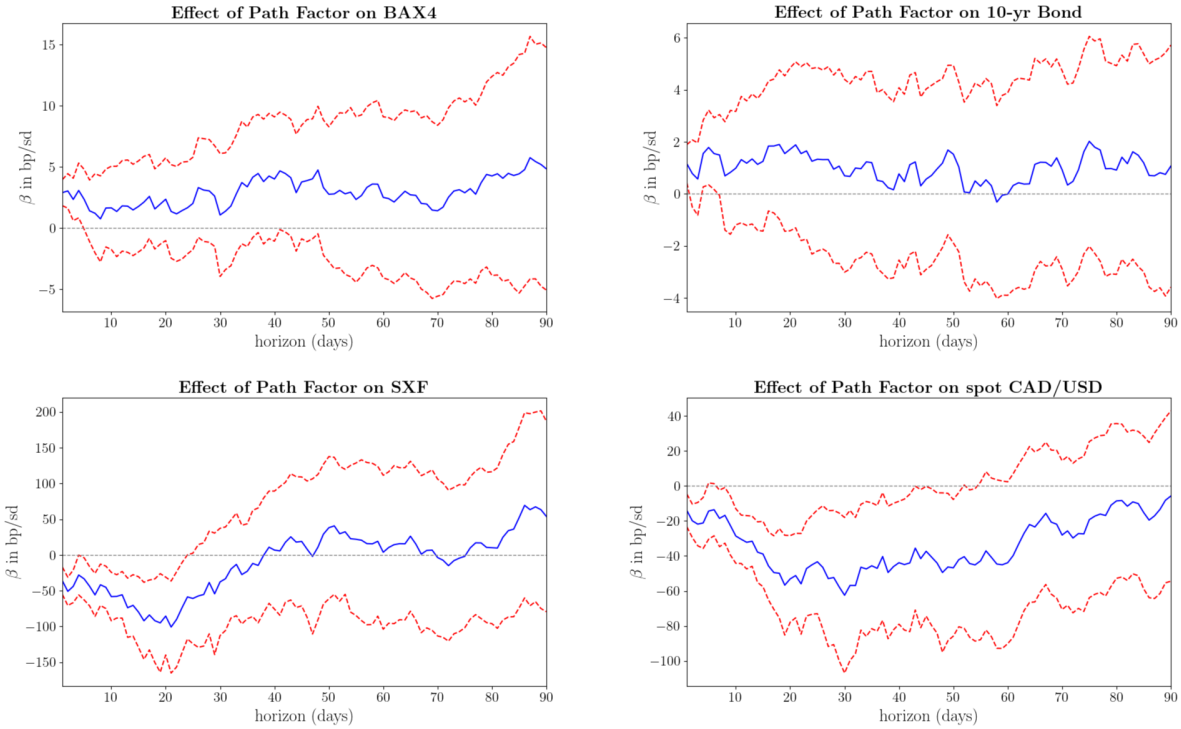
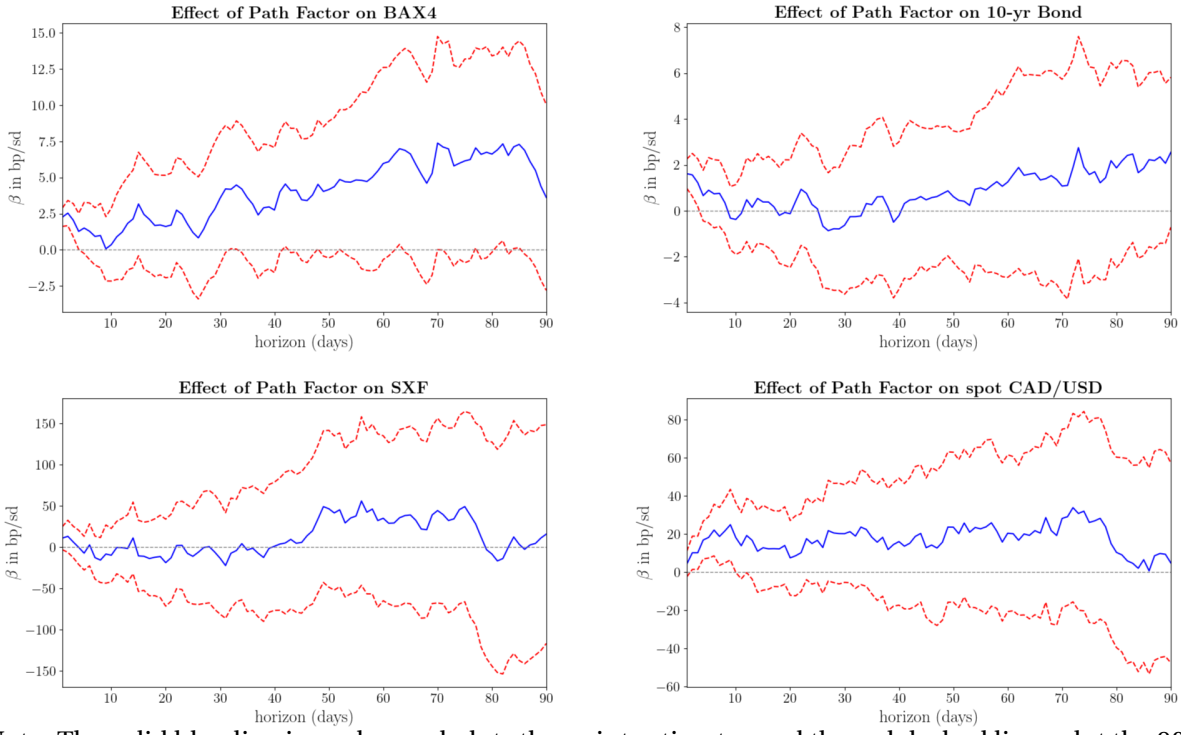


Figure 11: PERSISTENT EFFECTS OF PATH FACTOR FROM FED SPEECHES



Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.

Table 1: IMPORTANCE OF CENTRAL BANK EVENTS TO FIXED INCOME AND STOCK MARKETS

Event	Banker Acceptance Futures				GoC Benchmark Bond				Stock	N
	1Q	2Q	3Q	4Q	2yr	5yr	10yr	30yr	Futures	
(A) Sum of Absolute Changes (pp)										
FOMC Announc	4.00	5.11	5.68	5.08	3.40	3.83	3.46	2.62	50.48	219
BoC Announc	8.41	9.40	10.02	9.97	6.86	5.46	3.55	2.47	29.16	199
Fed Speeches	1.48	2.63	3.15	2.86	2.23	2.93	3.08	2.42	85.49	256
BoC Speeches	1.61	2.97	3.20	3.11	2.64	2.61	2.23	2.13	39.67	164
FOMC Press Conf	1.07	1.32	1.58	1.83	1.43	1.54	1.66	1.18	23.11	68
BoC Press Conf	1.11	1.90	2.31	2.30	1.58	1.69	1.39	0.98	28.82	96
FOMC Minutes	0.74	1.37	1.66	1.63	1.21	1.46	1.65	1.25	25.19	174
(B) Mean Absolute Change Per Event (bp)										
FOMC Announc	1.83	2.35	2.64	2.39	1.95	2.20	1.99	1.51	27.29	219
BoC Announc	4.23	4.75	5.06	5.14	4.06	3.23	2.10	1.48	25.81	199
Fed Speeches	0.63	1.15	1.39	1.29	1.22	1.61	1.65	1.29	33.39	256
BoC Speeches	1.03	1.87	2.01	1.96	1.75	1.72	1.47	1.41	24.19	164
FOMC Press Conf	1.57	1.95	2.32	2.69	2.13	2.27	2.43	1.77	33.98	68
BoC Press Conf	1.16	2.00	2.46	2.47	1.91	2.04	1.68	1.19	32.02	96
FOMC Minutes	0.42	0.79	0.95	0.94	0.75	0.91	1.02	0.77	15.08	174

Note: This table displays the cumulative absolute change and average change of Canadian Banker's Acceptance contracts, Government of Canada bond yields, and Toronto future stock returns around each of the announcement types. Sample periods are 1997–2023 for banker acceptance futures, 1999–2023 for stock futures, and 2002–2023 for GoC benchmark bonds. N is the greatest number of available observations for any of the assets.

Table 2: RELATIVE CONTRIBUTION OF EXPECTATION VS. RISK PREMIUM CHANNEL, BY EVENT AND MATURITY

Event	1-year	5-year	10-year
FOMC announcement	3.63	1.33	1.45
BoC announcement	6.43	2.34	2.36
Fed Speeches	3.61	1.04	0.79
BoC Speeches	3.78	1.32	1.31
FOMC press conference	3.49	1.35	1.29
BoC press conference	3.83	1.45	1.37
FOMC minutes	2.75	1.02	1.12

Note: This table presents the ratio of total absolute changes in expectations to total absolute changes in risk premium across each event type for the 1-year, 5-year, and 10-year yields, respectively.

Table 3: IMPORTANCE OF CENTRAL BANK EVENTS TO FOREIGN EXCHANGE MARKET

Event	CADUSD Spot	CADUSD Futures/Forward		N
		1Q	3Q	
(A) Sum of Absolute Changes (pp)				
FOMC Rate Announcement	44.05	34.11	40.73	224
BoC Rate Announcement	65.71	52.73	58.57	200
Fed Speeches	41.11	24.72	35.91	297
BoC Speeches	28.76	22.67	25.33	181
FOMC Press Conference	17.03	16.76	15.81	69
BoC Press Conference	20.07	14.92	19.44	96
FOMC Minutes	17.29	14.00	15.24	177
(B) Mean Absolute Change Per Event (bp)				
FOMC Rate Announcement	19.66	24.72	19.12	224
BoC Rate Announcement	32.86	38.21	32.36	200
Fed Speeches	13.84	14.45	14.96	297
BoC Speeches	15.89	15.74	16.67	181
FOMC Press Conference	24.68	25.01	23.96	69
BoC Press Conference	20.91	22.27	20.91	96
FOMC Minutes	9.77	10.68	9.70	177

Note: This table presents the cumulative absolute changes and average absolute changes in the log price of CAD/USD spot rates, CAD/USD futures, and the 9-month outright CAD/USD forward exchange rates, measured around various types of central bank communication events. Spot and three-quarter samples are from Jan 1997–Jul 2023. One-quarter sample is Oct 2006–Jul 2023 (earliest available date). N is the greatest number of available observations among the three assets.

Table 4: CIP REGRESSION RESULTS

Central Bank	BoC	FOMC	BoC	FOMC	BoC	FOMC	FOMC
Event	Rate	Announcement	Speeches		Press conference		Minute
Panel (A) three-month							
α							
point estimate	-0.003	-0.012	0.007	0.008	-0.008	0.020	0.008
t-stat	-0.545	-1.551	0.742	0.842	-0.870	1.387	1.691
p-value	0.587	0.123	0.460	0.401	0.388	0.170	0.093
β							
point estimate	0.048	0.094	0.155	0.068	-0.472	-0.349	0.249
t-stat	-8.354	-4.554	-1.726	-5.715	-3.388	-11	-2.855
p-value	0.000	0.000	0.087	0.000	0.001	0.000	0.005
R-squared	0.002	0.003	0.001	0.000	0.009	0.012	0.008
N	136	136	124	134	66	66	129
Panel (B) nine-month							
α							
point estimate	0.001	0.000	0.000	-0.001	0.002	0.002	0.003
t-stat	0.160	0.116	0.058	-0.374	0.330	0.517	2.672
p-value	0.873	0.907	0.954	0.709	0.742	0.607	0.008
β							
point estimate	1.029	0.330	0.972	0.933	1.296	0.384	0.542
t-stat	0.130	-2.507	-0.111	-0.299	0.985	-2.168	-4.021
p-value	0.896	0.013	0.912	0.765	0.327	0.034	0.000
R-squared	0.413	0.041	0.413	0.263	0.454	0.091	0.213
N	177	202	135	201	89	64	153
Panel (C) ten-year							
α							
point estimate	0.002	0.004	0.001	0.001	0.001	0.002	0.001
t-stat	0.717	1.542	0.405	0.712	0.499	0.544	0.933
p-value	0.475	0.125	0.686	0.477	0.619	0.589	0.352
β							
point estimate	1.193	0.714	0.191	0.290	0.750	0.130	0.332
t-stat	1.219	-1.298	-7.312	-12	-1.334	-5.828	-4.567
p-value	0.225	0.196	0.000	0.000	0.186	0.000	0.000
R-squared	0.459	0.117	0.029	0.076	0.224	0.010	0.047
N	167	171	162	209	82	67	161

Note: This table presents the CIP regression results. We provide the point estimate for α_n and β_n, accompanied by the respective t-statistics and p-values derived from testing α_n equal to 0 and β_n equal to 1, respectively. Nine-month and ten-year samples are from Jan 1997–Jul 2023. Three-month sample is Oct 2006–Jul 2023 (earliest available date).

Table 5: EFFECTS OF BOC POLICY RATE AND FORWARD GUIDANCE FOR DIFFERENT TYPES OF FED AND BOC MONETARY POLICY ANNOUNCEMENTS

	Banker Acceptance Futures				GoC Benchmark Bond				Stock	FX
	1Q	2Q	3Q	4Q	2yr	5yr	10yr	30yr	Futures	
(A) Effects of BoC policy rate change										
BoC Announc	4.00	2.65	2.16	1.87	0.92	0.49	0.04	-0.29	-2.97	9.31
	(0.42)	(0.11)	(0.12)	(0.31)	(0.56)	(0.39)	(0.21)	(0.15)	(2.88)	(3.76)
(B) Effects of Forward Guidance Changes										
FOMC Announc	3.59	3.97	4.10	3.00	1.48	1.38	1.06	0.58	-14.88	-12.38
	(0.47)	(0.18)	(0.32)	(0.6)	(0.37)	(0.34)	(0.27)	(0.2)	(5.83)	(1.86)
BoC Announc	6.40	8.89	7.31	7.08	4.49	3.41	1.83	0.92	-10.56	29.26
	(0.76)	(1.37)	(0.65)	(0.71)	(0.68)	(0.5)	(0.29)	(0.24)	(3.28)	(4.25)
Fed Speeches	1.00	1.93	2.33	1.91	1.36	1.35	0.53	0.64	3.74	-0.30
	(0.17)	(0.09)	(0.08)	(0.19)	(0.18)	(0.21)	(0.41)	(0.13)	(5.06)	(2.5)
BoC Speeches	1.55	2.89	3.16	2.90	2.21	1.75	1.17	0.63	6.38	11.40
	(0.19)	(0.1)	(0.08)	(0.19)	(0.15)	(0.17)	(0.18)	(0.19)	(3.32)	(2.97)
FOMC Press Conf	3.96	3.32	3.53	4.02	2.58	2.50	2.14	1.46	-15.78	-16.88
	(1.23)	(0.17)	(0.54)	(0.45)	(0.78)	(0.91)	(0.55)	(0.24)	(9.32)	(4.15)
BoC Press Conf	1.97	3.09	3.68	3.84	2.23	1.84	0.95	0.31	16.47	6.60
	(0.3)	(0.11)	(0.13)	(0.18)	(0.39)	(0.34)	(0.31)	(0.23)	(10.79)	(3.41)
FOMC Minutes	0.56	1.20	1.50	1.37	0.73	0.71	0.71	0.49	1.83	-3.73
	(0.09)	(0.09)	(0.05)	(0.12)	(0.13)	(0.13)	(0.15)	(0.11)	(2.22)	(1.17)

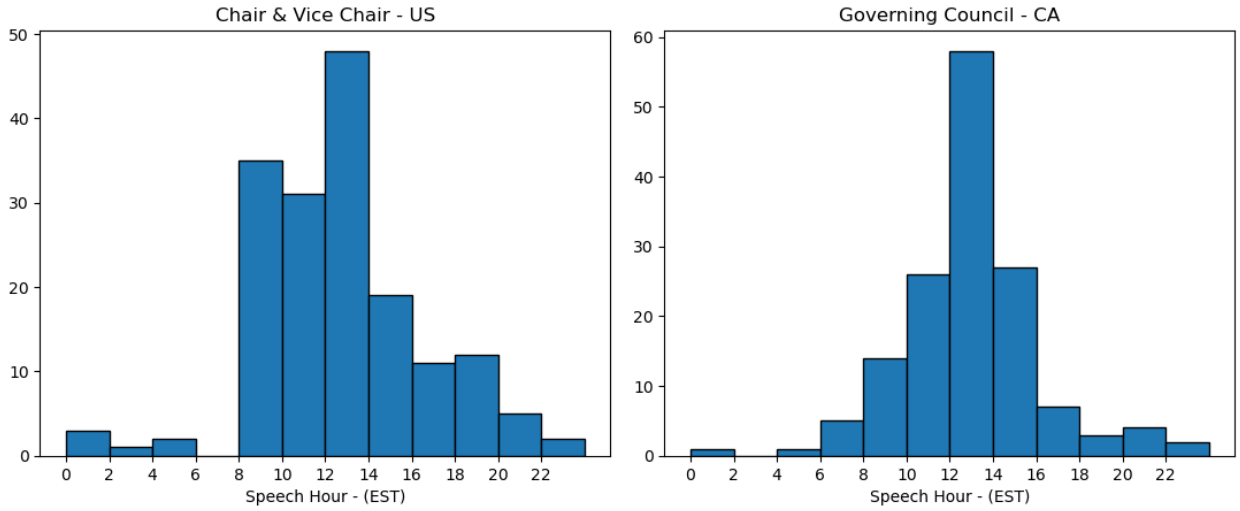
Panel (A) and (B) present the estimated coefficients β from the regression $\Delta y_t = \alpha + \beta F_t^{type} + \epsilon_t$, where, Δy_t represents the change in interest rates, returns on stock futures, and the spot exchange rate. The variable F_t^{type} denotes the factors associated with target and forward guidance changes for each announcement type. Heteroskedasticity-consistent standard errors are reported in parentheses. Sample: Jan 1997 - July 2023.

Appendix

Appendix A Time distribution of Speeches

We plot the histogram of monetary policy related speech times for both the U.S. and Canada.

Appendix Figure A.1: DISTRIBUTION OF SPEECH TIMES



Note: Sample starts in January 1997 and ends in July 2023.

Appendix B U.S. financial markets data

We obtained tick-by-tick data on Eurodollar futures from the CME Group (owner of the Chicago Board of Trade and Chicago Mercantile Exchange). Eurodollar futures were an essential instrument for gauging market expectations of future interest rates. These contracts were cash-settled based on the three-month U.S. dollar ICE LIBOR wholesale funding rate, determined two London bank business days prior to the third Wednesday of the contract's delivery month. LIBOR, the London Interbank Offered Rate, served as a benchmark interest rate at which major global banks lent to each other in the international interbank market for short-term loans. It was a critical reference rate for numerous financial products before being phased out due to reliability concerns, culminating in the cessation of U.S. dollar LIBOR publication in June 2023.

The first, second, third, and fourth Eurodollar futures contracts in our data typically had 0.25, 0.75, 1.25, and 1.75 years to expiration, respectively. For instance, the second Eurodollar futures contract could have between 0.5 and 1 year to expiration, with an average horizon of 0.75 years over our sample. Upon expiration, Eurodollar futures settled at a price derived from the spot three-month LIBOR rate, which closely reflected market expectations for the federal funds rate over the subsequent ninety-day period. Thus, these contracts were instrumental in gauging federal funds rate expectations for periods ranging from 0.5 to 1.75 years ahead.

With the phaseout of LIBOR, the Chicago Mercantile Exchange transitioned Eurodollar futures to SOFR (Secured Overnight Financing Rate) contracts. SOFR, introduced in 2017 as the recommended alternative to U.S. dollar LIBOR, reflects the cost of borrowing cash overnight, collateralized by Treasury securities. By 2022, liquidity had significantly shifted from Eurodollar to SOFR futures due to regulatory guidance and market preparations for the end of LIBOR. While CME continued to support both instruments during this transition, SOFR futures increasingly became the preferred tool for interest rate hedging. As of June 30, 2023, with the final publication of U.S. dollar LIBOR rates, Eurodollar futures were officially discontinued. In this paper, we utilize Eurodollar futures data from 1997 to 2021 and SOFR contracts from 2022 onward, although we refer to Eurodollar futures throughout the discussion for simplicity. The choice of starting year for the use of SOFR futures is consistent with the recommendation of Acosta, Brennan and Jacobson (2024). Both Eurodollar and SOFR futures are financially settled.

Careful alignment of SOFR and Eurodollar futures contracts is necessary for continuity in data analysis. While Eurodollar futures were based on expected interest rates over the three months following the settlement date, SOFR futures are based on interest rates over the three months preceding the settlement date. This difference necessitates adjustments when transitioning between the two contract types. For instance, the first-outstanding Eurodollar future aligns with the second-outstanding SOFR future. Such careful alignment ensures that the analysis of interest rate expectations remains consistent over time.

Appendix C Calculation of Asset Price Changes

When an event occurs at time t, we use data from a minutes prior to the event and b minutes after the event to assess price movements. However, trades can be sparse, and we also would like to avoid price changes driven by a single transaction. To address this, we take the average price in the 5-minute interval from $t-(5+a)$ to $t-a$ and in the 5-minute interval from $t+b$ to $t+(b+5)$ to smooth out price fluctuations.

Despite our efforts to account for sparsity, there are still cases where pre-event or post-event prices are missing. The following rules outline how to handle these situations.

First, we lack intraday data for certain assets on specific days, particularly in the early part of our sample. For these asset-date combinations, we will record missing values for asset price or yield changes.

Second, if trading data is available for an asset on the day of an event, for an event that starts at time t_1 and cannot find a trade from $t_1-(5+a)$ to t_1-a:

1. Search for a price between t_1-a and t_1. If a price is found, use the closest one to t_1-a.
2. If no price is found, extend the search to any time before $t_1-(5+a)$. If a price is available, use the latest one (the closest to $t_1-(5+a)$).
3. If no price is found in either of these searches, use the last or closing price of the previous day.

Third, if trading data is available for an asset on the day of an event, for an event that ends at time t_2 and cannot find a trade from t_2+b to $t_2+(b+5)$:

1. Search for a price between t_2 and $t_2 + b$. If a price is found, use the closest one to $t_2 + b$.

2. If no price is found and the post-event time t_2 is before 3:30 PM, record zero as the price change.

3. If no price is found and t_2 is after 3:30 PM, use the opening price from the next day.

Fourth, for SXF (Toronto Exchange S&P 60 stock index futures), no quotes data is available before 2008. Trades begin at 9:30 AM, while BoC rate announcements occur at 9:00 AM. Between January 2008 and September 2009, quotes data became available before 9:30 AM, but we still lack trades data for that period, and the available quotes are sparse. For these cases, we will record missing values for the change in the log of SXF prices for all FADs prior to October 2009.

Appendix D Placebo events and regressions

Appendix D.1 Sampling of placebo events

To put the effects of speeches into perspective, we follow Ehrmann, Gnan and Rieder (2023) and generate a placebo distribution of speeches to match (i) the distribution of actual speeches across time on the year-month level and (ii) the timing of speeches on each day. In particular, we use the following procedure to generate each placebo timestamp:

1. Extract the “year-month" component from the timestamps of all actual speeches. Using this, create an empirical distribution of "year-month" combinations and randomly draw a candidate placebo "year-month" combination.

2. Randomly select a calendar day and append it to the “year-month" combination to form a complete date in the “year-month-day" format.

3. Extract the “hour-minute" component from all actual speech timestamps and use the empirical distribution to randomly draw a “hour-minute" combination. Append this to the previously generated date to create a full placebo timestamp in the "year-month-day hour-minute" format. In total, we draw 4,000 placebo speech events.

Unlike the Fed and BoC speeches, other monetary policy communication announcements follow a fixed schedule. For example, FOMC press conferences always take place after FOMC policy rate announcements, which occur on Wednesdays at 14:15 before January 2013 and at 14:30 afterward. For these events, we apply our windows to financial market movements exactly seven days prior, using the same time of day as the actual events.

Appendix D.2 Market reaction to placebo events

For both central bank communication events and placebo events, we look at market reactions associated with event i at time t (i.e. Δy_i). Table D.1 presents the total and average absolute changes in interest rates and stock market returns, analogously to Table 1, except that it uses placebo events. We find that central bank communication events trigger unusually large market

moves throughout the term structure and stock price. For example, on average, the FOMC announcement moves the five-year GoC benchmark bond yield market by 2 bps, while the placebo FOMC event moves only 0.56 bps – just 28% of the impact observed during the actual event.

Similarly, Table D.2 presents the total and average absolute changes in the CADUSD foreign exchange markets, analogously to Table 3, except that it uses placebo events. We find that central bank communication events trigger unusually large market moves. For example, on average, the FOMC announcement moves the spot CADUSD by 19.66 bps, while the placebo FOMC event moves only 5.94 bps.

Appendix Table D.1: IMPORTANCE OF PLACEBO CENTRAL BANK EVENTS TO FIXED INCOME AND STOCK MARKETS

Event	Banker Acceptance Futures				GoC Benchmark Bond				Stock	N
	1Q	2Q	3Q	4Q	2yr	5yr	10yr	30yr	Futures	
(A) Sum of Absolute Changes (pp)										
FOMC Announc	0.73	1.33	1.35	1.24	0.34	0.36	0.53	0.55	24.85	220
BoC Announc	0.95	1.42	1.82	1.51	0.45	0.72	0.72	0.51	21.82	198
Fed Speeches	18.02	28.78	31.94	29.44	7.57	10.29	11.00	10.90	853.20	3222
BoC Speeches	13.77	26.34	29.99	30.73	9.90	12.83	15.09	13.87	869.45	3439
FOMC Press Conf	0.30	0.34	0.45	0.40	0.26	0.36	0.36	0.34	11.36	67
BoC Press Conf	0.58	0.78	0.85	0.78	0.22	0.42	0.34	0.35	26.94	96
FOMC Minutes	0.54	0.75	0.89	0.98	0.51	0.54	0.49	0.58	20.25	169
(B) Mean Absolute Change Per Event (bp)										
FOMC Announc	0.33	0.61	0.63	0.58	0.53	0.56	0.83	0.86	13.43	220
BoC Announc	0.48	0.72	0.93	0.79	0.71	1.15	1.14	0.84	19.31	198
Fed Speeches	0.60	0.97	1.08	1.02	0.74	1.00	1.06	1.07	26.48	3222
BoC Speeches	0.42	0.80	0.91	0.93	0.73	0.94	1.10	1.02	25.28	3439
FOMC Press Conf	0.45	0.50	0.68	0.59	0.56	0.77	0.78	0.74	16.96	67
BoC Press Conf	0.60	0.82	0.91	0.84	0.72	1.35	1.10	1.18	29.94	96
FOMC Minutes	0.32	0.44	0.53	0.58	0.84	0.90	0.82	0.98	12.50	169

Note: This table displays the cumulative absolute change and average change of Canadian Banker's Acceptance contracts, Government of Canada bond yields, and Toronto future stock returns around each of the placebo announcements. Sample periods are 1997–2023 for banker acceptance futures, 1999–2023 for stock futures, and 2002–2023 for GoC benchmark bonds. N is the greatest number of available observations for any of the assets. In total, we draw 4,000 placebo speech events.

Appendix Table D.2: IMPORTANCE OF PLACEBO CENTRAL BANK EVENTS TO FOREIGN EXCHANGE MARKET

Event	CADUSD Spot	CADUSD Futures/Forward		N
		1Q	3Q	
(A) Sum of Absolute Changes (pp)				
FOMC Rate Announcement	13.30	9.27	13.36	224
BoC Rate Announcement	18.71	15.10	18.65	200
Fed Speeches	466.01	284.82	442.90	3865
BoC Speeches	461.26	357.38	438.80	3862
FOMC Press Conference	5.26	4.54	4.87	69
BoC Press Conference	13.46	7.61	13.34	96
FOMC Minutes	8.99	5.97	8.92	177
(B) Mean Absolute Change Per Event (bp)				
FOMC Rate Announcement	5.94	6.39	6.02	224
BoC Rate Announcement	9.36	10.71	9.37	200
Fed Speeches	12.06	11.74	12.87	3865
BoC Speeches	11.94	11.78	12.27	3862
FOMC Press Conference	7.62	6.67	7.16	69
BoC Press Conference	14.02	11.19	13.90	96
FOMC Minutes	5.08	4.45	5.04	177

Note: This table presents the cumulative absolute changes and average absolute changes in the log price of CAD/USD spot rates, CAD/USD futures, and the 9-month outright CAD/USD forward exchange rates, measured around various types of placebo central bank communication events. Spot and three-quarter samples are from Jan 1997–Jul 2023. One-quarter sample is Oct 2006–Jul 2023 (earliest available date). N is the greatest number of available observations among the three assets.

Appendix D.3 Placebo regression results

To further assess the relative impact of central bank communication events, we run regressions that take placebo events as the baseline and flag actual central bank communication events with a dummy variable $D_{i,t}^{\text{actual}}$, as shown in equation (1).

$$|\Delta y_{a,i,t}| = \alpha + \beta_{a,i} D_{it}^{\text{actual}} + \epsilon_{a,i,t}$$

Table D.3 shows the estimates for $\beta_{a,i}$, with most of the $\beta_{a,i}$s being positive and statistically significantly different from zero, indicating that actual central bank communication events lead to significantly larger market reactions than placebo events.

In contrast, Table D.5 shows the estimates for β for the US fixed income market. Almost all βs are positive and statistically significantly different from zero for US events, indicating that actual Fed communication events lead to significantly larger market reactions than placebo events. Almost all βs are statistically insignificant, which aligns with intuition since Canadian monetary policy announcements typically have limited direct influence on US fixed income markets.

Appendix Table D.3: PLACEBO REGRESSION RESULTS FOR CANADIAN FIXED INCOME AND STOCK MARKETS

Event	Banker Acceptance Futures				GoC Benchmark Bond				Stock
	1Q	2Q	3Q	4Q	2yr	5yr	10yr	30yr	Futures
FOMC Announc	1.49***	1.74***	2.01***	1.81***	1.42***	1.64***	1.15***	0.65***	13.85***
	(0.26)	(0.23)	(0.24)	(0.21)	(0.19)	(0.21)	(0.23)	(0.20)	(3.13)
BoC Announc	3.74***	4.02***	4.13***	4.35***	3.35***	2.08***	0.95***	0.64***	6.49**
	(0.44)	(0.40)	(0.42)	(0.44)	(0.38)	(0.32)	(0.23)	(0.21)	(2.92)
FOMC Speeches	0.03	0.18	0.3**	0.27**	0.48***	0.61***	0.59***	0.23*	6.91**
	(0.09)	(0.12)	(0.14)	(0.13)	(0.13)	(0.14)	(0.16)	(0.12)	(3.03)
BoC Speeches	0.61***	1.07***	1.1***	1.02***	1.01***	0.78***	0.37***	0.39***	-1.09
	(0.14)	(0.19)	(0.20)	(0.19)	(0.17)	(0.14)	(0.13)	(0.15)	(3.25)
FOMC Press Conf	1.12**	1.45***	1.64***	2.1***	1.57***	1.5***	1.66***	1.02***	17.03***
	(0.56)	(0.37)	(0.41)	(0.43)	(0.36)	(0.38)	(0.35)	(0.27)	(4.17)
BoC Press Conf	0.56***	1.18***	1.55***	1.63***	1.19***	0.69**	0.58**	0.01	2.08
	(0.21)	(0.27)	(0.31)	(0.34)	(0.30)	(0.35)	(0.28)	(0.38)	(5.34)
FOMC Minutes	0.1	0.35***	0.42***	0.37***	-0.09	0.01	0.21	-0.2	2.58*
	(0.06)	(0.10)	(0.11)	(0.11)	(0.40)	(0.18)	(0.14)	(0.26)	(1.51)

Note: This table displays the regression βs of monetary policy events on Canadian fixed income yields and stock index prices. The regression specification is (1). Sample: Jan 1997–Jul 2023. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Appendix Table D.4: PLACEBO REGRESSION RESULTS FOR FOREIGN EXCHANGE MARKET

Event	CADUSD Spot	CADUSD Futures/Forward	
		1Q	3Q
FOMC Announcement	13.73***	18.61***	13.2***
	(1.47)	(2.24)	(1.53)
BoC Announcement	23.5***	27.76***	23.04***
	(2.14)	(2.87)	(2.3)
Fed Speeches	1.79*	2	1.44
	(0.94)	(1.26)	(0.99)
BoC Speeches	3.95***	3.67**	4.41***
	(1.47)	(1.74)	(1.69)
FOMC Press Conference	17.06***	18.67***	17.58***
	(2.5)	(2.67)	(2.67)
BoC Press Conference	6.89***	11.59***	6.92***
	(2.35)	(3.17)	(2.43)
FOMC Minutes	4.69***	6.32***	4.57***
	(0.82)	(1.07)	(0.86)

Note: This table displays the regression βs of monetary policy events on Canadian foreign exchange rates. The regression specification is (1). Sample for spot and 3Q is Jan 1997–Jul 2023. Sample for 1Q is Jun 2006–Jul 2023.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Appendix Table D.5: PLACEBO REGRESSION RESULTS FOR US FIXED INCOME MARKETS

	ED1	ED2	ED3	ED4	10-year
FOMC Announcement	2.74***	3.1***	3.5***	3.74***	1.62***
	(0.37)	(0.3)	(0.32)	(0.33)	(0.18)
BoC Announcement	0.01	0.03	0.09	0.12	0.09
	(0.1)	(0.12)	(0.13)	(0.14)	(0.09)
Fed Speeches	0.32*	0.33**	0.52***	0.5***	0.17*
	(0.17)	(0.15)	(0.18)	(0.19)	(0.09)
BoC Speeches	0.03	0.02	0.02	0.02	0.1
	(0.13)	(0.14)	(0.14)	(0.16)	(0.16)
FOMC Press Conference	0.77	1.19*	1.2*	1.76***	1.47***
	(0.67)	(0.63)	(0.68)	(0.65)	(0.21)
BoC Press Conference	0.06	0.37*	0.5**	0.26	0.11
	(0.16)	(0.19)	(0.22)	(0.23)	(0.12)
FOMC Minutes	0.59***	0.78***	1.04***	1.12***	0.54***
	(0.11)	(0.12)	(0.15)	(0.16)	(0.08)

Note: This table displays the regression βs of monetary policy events on US fixed income yields. The regression specification is (1). Sample: Jan 1997–Jul 2023.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Appendix E Gaussian affine term structure models

Appendix E.1 Basic framework

The aim of this section is to provide a brief overview of the ATSM and introduce concepts and notation used in Section 3.3. Specifically, consider an $K \times 1$ vector of variables F_t whose dynamics are characterized by a Gaussian vector autoregression:

$$F_{t+1} = c + \rho F_t + \Sigma u_{t+1} \tag{E.1}$$

with $u_t \sim$ i.i.d. $N(0, I_K)$. This specification implies that

$$F_{t+1}|F_t, F_{t-1}, \ldots, F_1 \sim N(\mu_t, \Sigma\Sigma')$$

for

$$\mu_t = c + \rho F_t.$$

Let r_t denote the risk-free one-period interest rate. If the vector F_t includes all the variables that could matter to investors, then the price of a pure discount asset at date t should be a function $P_t(F_t)$ of the current state vector. Moreover, if investors were risk neutral, the price they would be willing to pay would satisfy

$$P_t(F_t) = \exp(-r_t) E_t \left[P_{t+1}(F_{t+1})\right] = \exp(-r_t) \int_{\mathbb{R}^M} P_{t+1}(F_{t+1}) \phi(F_{t+1}; \mu_t, \Sigma\Sigma') dF_{t+1}$$

for $\phi(y; \mu, \Omega)$ the M-dimensional $N(\mu, \Omega)$ density evaluated at the point y:

$$\phi(y; \mu, \Omega) = \frac{1}{(2\pi)^{M/2} |\Omega|^{1/2}} \exp\left[-\frac{(y-\mu)'\Omega^{-1}(y-\mu)}{2}\right].$$

More generally, with risk-averse investors we would replace the above equation with

$$P_t(F_t) = E_t\left[P_{t+1}(F_{t+1}) M_{t+1,t}\right] = \int_{\mathbb{R}^M} P_{t+1}(F_{t+1}) \left[M_{t+1,t} \phi(F_{t+1}; \mu_t, \Sigma\Sigma')\right] dF_{t+1} \tag{E.2}$$

for $M_{t+1,t}$ the pricing kernel. In many macro models, the pricing kernel would be

$$M_{t+1,t} = \beta \frac{U'(C_{t+1})}{U'(C_t)(1+\pi_{t+1})}$$

for β the personal discount rate, $U'(C)$ the marginal utility of consumption, and π_{t+1} the inflation rate between t and $t+1$.

Affine term structure models are derived from the particular kernel

$$M_{t+1,t} = \exp\left[-r_t - (1/2)\lambda_t'\lambda_t - \lambda_t' u_{t+1}\right]$$

for λ_t an $M \times 1$ vector that characterizes investor attitudes toward risk, with $\lambda_t = 0$ in the case

of risk neutrality. Elementary multiplication of (4) by (6) reveals that for this case

$$M_{t+1,t}\phi(F_{t+1};\mu_t,\Sigma\Sigma') = \exp(-r_t)\phi(F_{t+1};\mu_t^Q,\Sigma\Sigma')$$

for

$$\mu_t^Q = \mu_t - \Sigma\lambda_t.$$

Substituting into and comparing with, we see that for this specification of the pricing kernel, risk-averse investors value any asset the same as risk-neutral investors would if the latter thought that the conditional mean of F_{t+1} was μ_t^Q rather than μ_t. A positive value for the first element of λ_t, for example, implies that an asset that delivers the quantity $F_{1,t+1}$ dollars in period $t+1$ would have a value at time t that is less than the value that would be assigned by a risk-neutral investor, and the size of this difference is bigger when the $(1,1)$ element of Σ is bigger. An asset yielding $F_{1,t+1}$ dollars has a market value that is reduced by $\Sigma_{11}\lambda_t$ relative to a risk-neutral valuation, through the covariance between factors i and 1. The term $\lambda_{1,t}$ might then be described as the market price of factor 1 risk.

The risk prices λ_t measure the additional expected return required per unit of risk in each of the shock. Following Duffee (2002), we assume λ_t being an affine function of the factors,

$$\lambda_t = \Sigma^{-1}(\lambda_0 + \lambda_1 F_t), \tag{E.3}$$

The risk premium equals the prices of risk times the quantities of risk (the covariances). In a Gaussian model, the covariances are constant, and the only source of time-variation in term premia are changes in the market prices of risk.

Under the above assumptions, the risk-neutral dynamics are given by

$$F_{t+1} = c^{\mathbb{Q}} + \rho^{\mathbb{Q}} F_t + \Sigma u_{t+1}^{\mathbb{Q}}, \tag{E.4}$$

where $u_{t+1}^{\mathbb{Q}} = u_{t+1} + \lambda_t$, $u_t^{\mathbb{Q}} \sim N(0, I_K)$, $E^{\mathbb{Q}}(u_r^{\mathbb{Q}} u_s^{\mathbb{Q}'}) = 0$ for $r \neq s$, and the parameters describing the physical and risk-neutral dynamics are related in the following way:

$$\begin{aligned} c^{\mathbb{Q}} &= c - \lambda_0, \\ \rho^{\mathbb{Q}} &= \rho - \lambda_1. \end{aligned} \tag{E.5}$$

The VAR process in Equation (E.1) generates a '$\mathbb{P}$-measure' and the implied dynamics are referred to as the '$\mathbb{P}$-dynamics'.

The short rate is assumed to be related to the K factors through affine mapping:

$$r_t = \delta_0 + \delta_1' F_t, \tag{E.6}$$

Then, as demonstrated in Appendix A of Ang and Piazzesi (2003) , under the above assumptions the yield on a risk-free n-period pure-discount bond can be calculated as follows. Let p_t^n represents the price of an n-period zero coupon bond. Starting with $p_t^{(0)} = 1$, Equation (E.2) allows bond prices to be computed recursively by

$$p_t^n = \mathbb{E}_t(M_{t+1} p_{t+1}^{n-1}). \tag{E.7}$$

The state dynamics of F_t (Equation (E.1)) together with the dynamics of the short rate r_t (Equation (E.6)) and the Radon–Nikodym derivative form the affine class of term structure models because bond prices are exponentially affine functions of the state variables. More precisely, bond prices are given by

$$p_t^n = \exp(A_n + B_n' F_t), \tag{E.8}$$

where the coefficients A_n and B_n follow the difference equations:

$$\begin{aligned} A_{n+1} &= A_n + B_n'(c - \Sigma\lambda_0) + \frac{1}{2} B_n' \Sigma\Sigma' B_n - \delta_0 \\ &= A_n + B_n' c^{\mathbb{Q}} + \frac{1}{2} B_n' \Sigma\Sigma' B_n - \delta_0, \end{aligned} \tag{E.9}$$

$$B_{n+1}' = B_n'(\rho - \Sigma\lambda_1) - \delta_1' = B_n' \rho^{\mathbb{Q}} - \delta_1', \tag{E.10}$$

with $A_1 = -\delta_0$ and $B_1 = -\delta_1$.

The continuously compounded yield y_t^n on an n-period zero coupon bond is given by

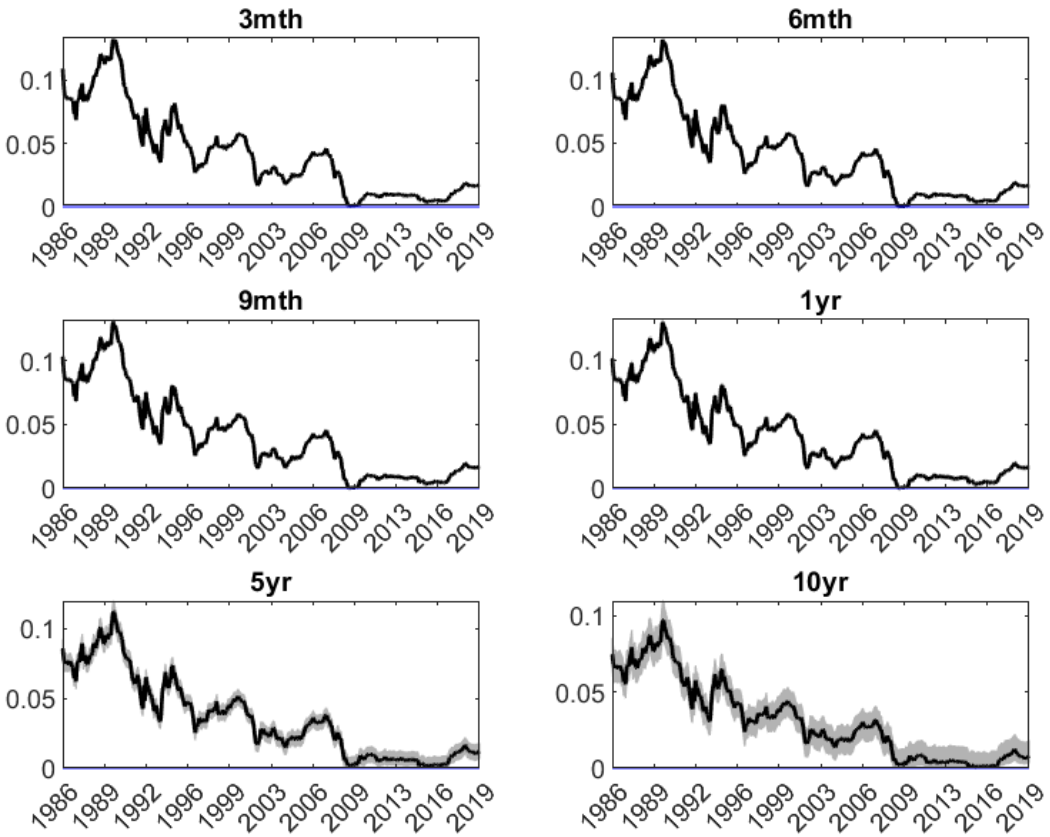
$$\begin{aligned} y_t^n &= -\frac{1}{n} \log p_t^n \\ &= A_n + B_n' F_t, \end{aligned} \tag{E.11}$$

where $A_n = -A_n/n$ and $B_n = -B_n/n$. Note that yields are affine functions of the state F_t, so that Equation (E.11) can be interpreted as being the observation equation of a state space system. The arbitrage-free loadings A_n and B_n are non-linear, recursive functions of the model parameters δ_0, δ_1, λ_0, λ_1, c, ρ, and Σ.

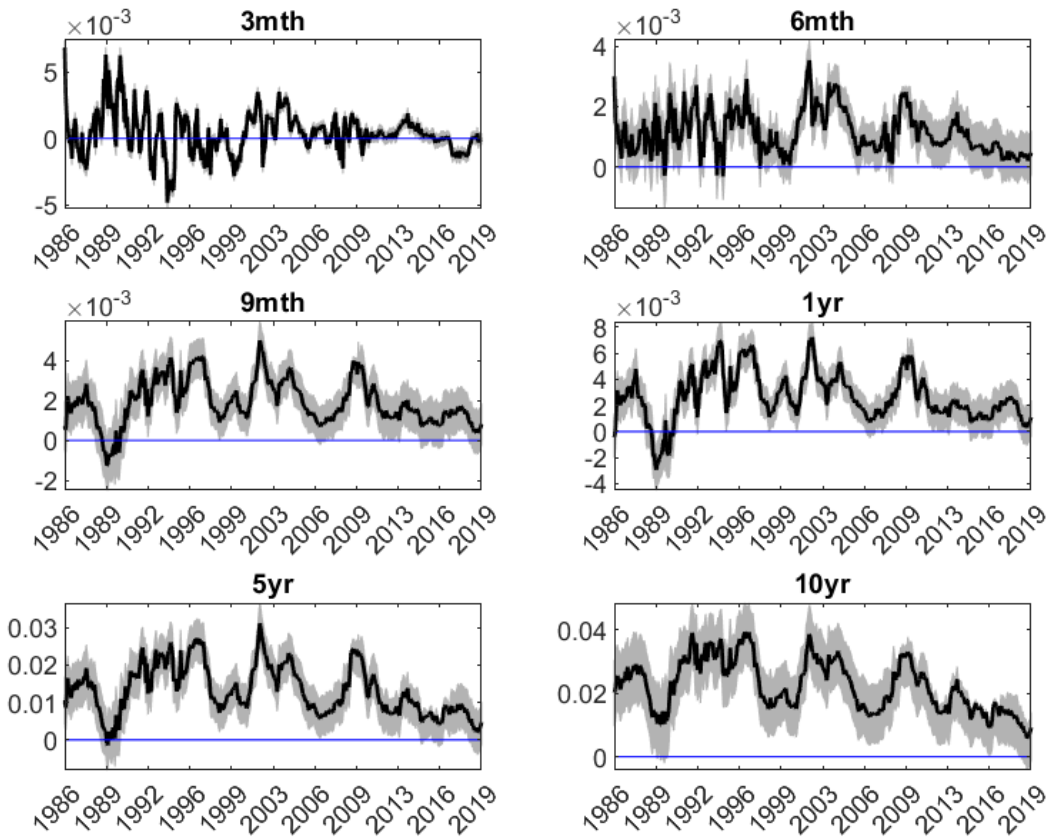
Appendix E.2 Data and Estimation Results

We estimate the dynamic term structure model using monthly data for Canadian zero-coupon yields across 13 maturities, ranging from 3, 6, and 9 months to 1 through 10 years. Yields for maturities are sourced from the Bank of Canada website. The sample runs from January 1987 to December 2019. The monthly expectation and term premium over various maturities can be found in Figures E.1 and E.2.

Appendix Figure E.1: YIELD CURVE ESTIMATION - EXPECTATION

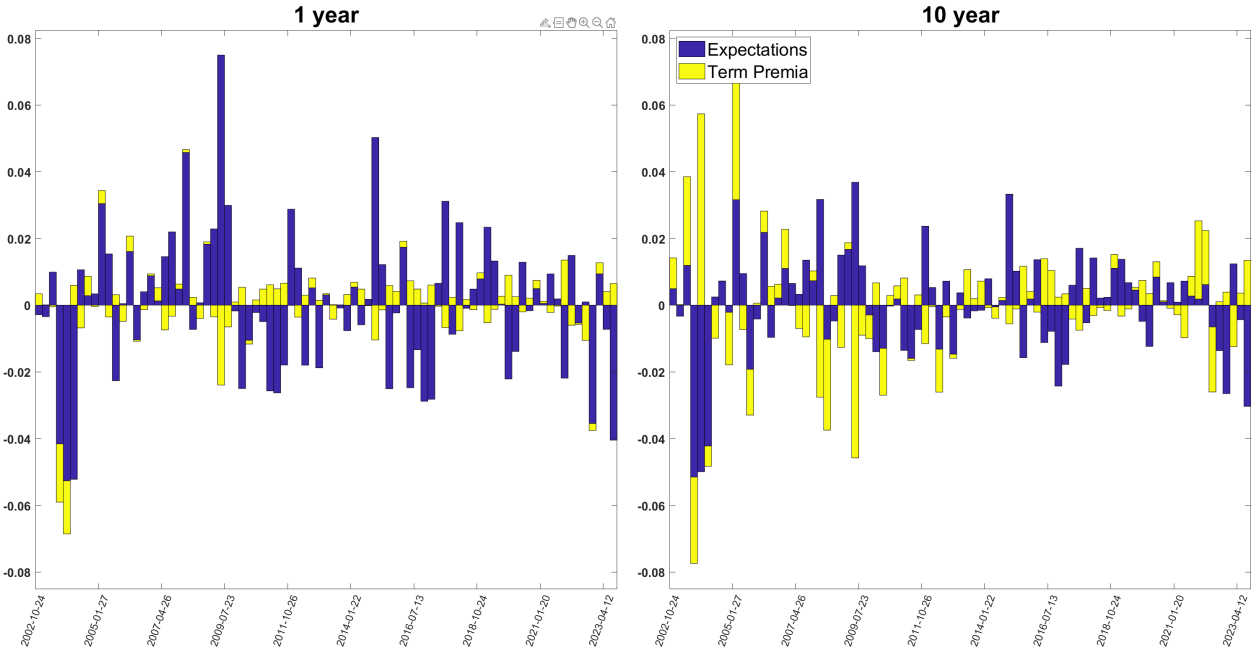


Appendix Figure E.2: YIELD CURVE ESTIMATION - TERM PREMIUM



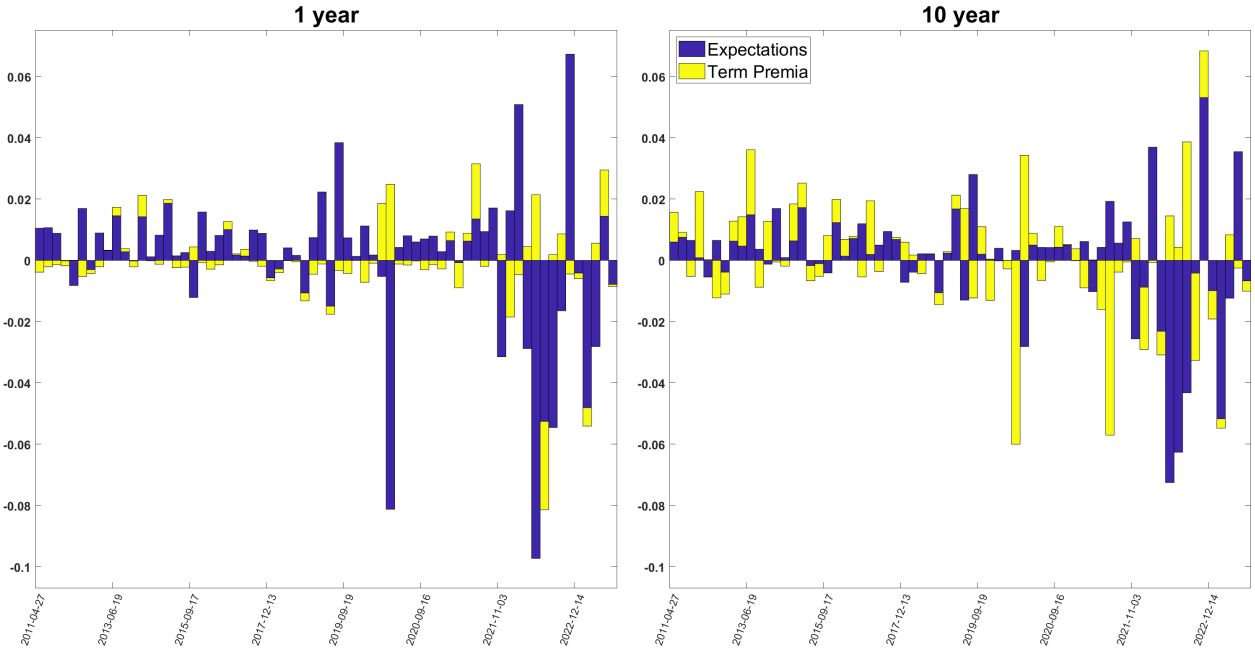
Appendix F Additional results for expectation and term premium decomposition

Appendix Figure F.1: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND BOC PRESS CONFERENCE

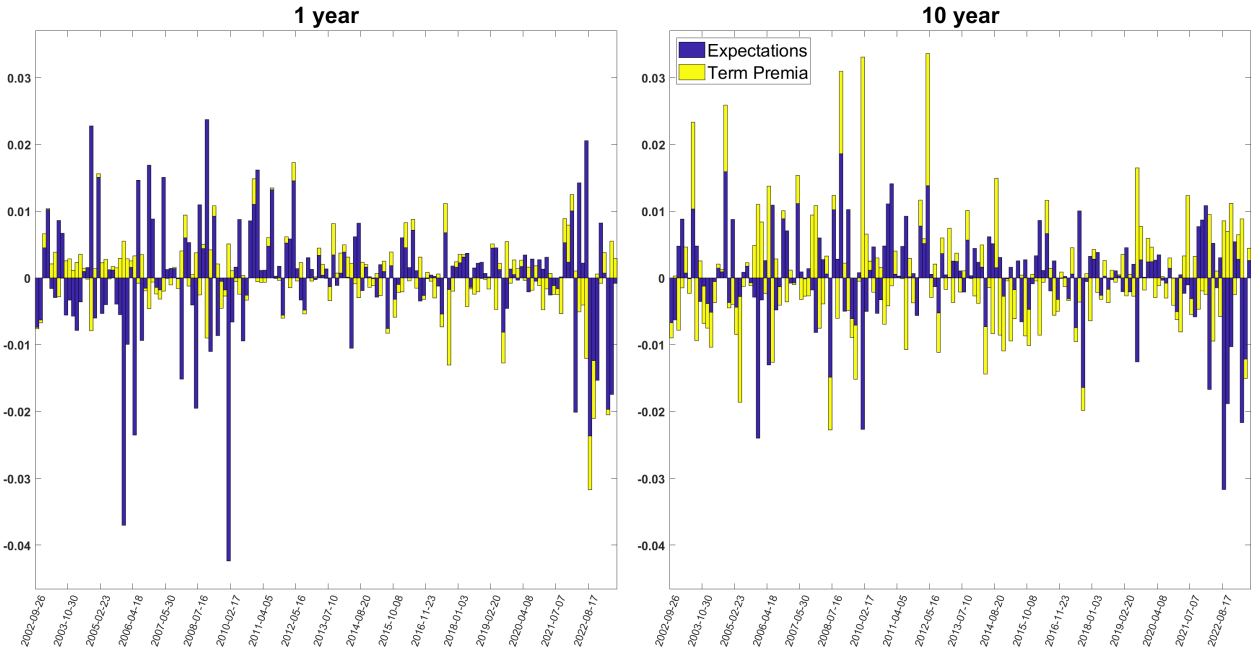


Appendix F.1 Additional results for CIP regressions: 2008-2023

Appendix Figure F.2: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND FOMC PRESS CONFERENCE



Appendix Figure F.3: DECOMPOSITION OF HIGH-FREQUENCY CHANGES IN YIELDS AROUND FOMC MINUTES RELEASE



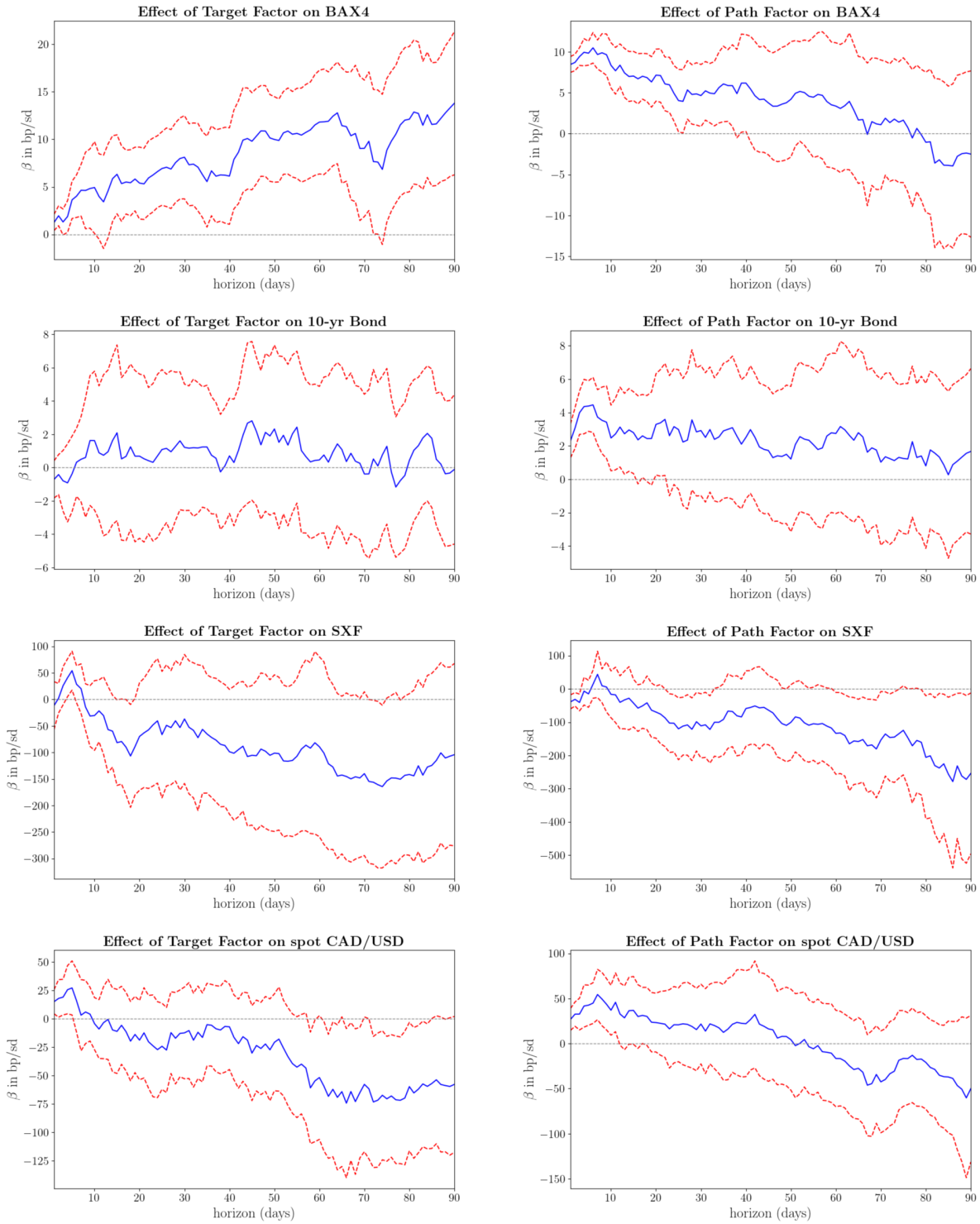
Appendix Table F.1: CIP REGRESSION RESULTS (2008-2023)

Statistics	BoC Announc	FOMC Announc	Speeches CA	Speeches US	Press Conf CA	Press Conf US	Minutes
Panel (A) three-month							
α							
point estimate	-0.004	-0.010	0.008	0.007	-0.007	0.020	0.005
t-stat	-0.623	-1.309	0.842	0.607	-0.701	1.387	1.128
p-value	0.534	0.193	0.402	0.545	0.486	0.170	0.262
β							
point estimate	0.054	0.157	0.182	0.112	-0.527	-0.349	0.276
t-stat	-8.248	-4.417	-1.671	-5.257	-3.538	-11	-2.732
p-value	0.000	0.000	0.097	0.000	0.001	0.000	0.007
R-squared	0.002	0.008	0.002	0.001	0.011	0.012	0.012
N	126	124	115	118	61	66	119
Panel (B) nine-month							
α							
point estimate	0.008	0.002	0.001	-0.002	0.005	0.002	0.003
t-stat	0.894	0.292	0.158	-0.517	0.877	0.517	1.615
p-value	0.373	0.771	0.874	0.607	0.384	0.607	0.109
β							
point estimate	1.372	0.161	1.378	0.590	0.652	0.384	0.650
t-stat	1.290	-2.492	1.257	-1.705	-0.937	-2.168	-2.152
p-value	0.200	0.014	0.212	0.091	0.353	0.034	0.034
R-squared	0.532	0.010	0.573	0.099	0.103	0.091	0.242
N	107	117	100	103	57	64	101
Panel (C) ten-year							
α							
point estimate	0.004	0.003	0.002	0.001	0.000	0.002	0.001
t-stat	1.350	1.098	0.677	0.262	0.082	0.544	0.980
p-value	0.180	0.275	0.500	0.794	0.935	0.589	0.329
β							
point estimate	1.229	0.748	0.697	0.313	0.863	0.130	0.299
t-stat	1.256	-1.034	-1.542	-11	-0.689	-5.828	-4.278
p-value	0.212	0.303	0.126	0.000	0.494	0.000	0.000
R-squared	0.486	0.130	0.143	0.114	0.293	0.010	0.037
N	125	126	124	137	61	67	120

Note: This table presents the CIP regression results over the sample from Jan 2008–Jul 2023. We provide the point estimate for α_n and β_n, accompanied by the respective t-statistics and p-values derived from testing α_n equal to 0 and β_n equal to 1. All samples are from Jan 2008–Jul 2023.

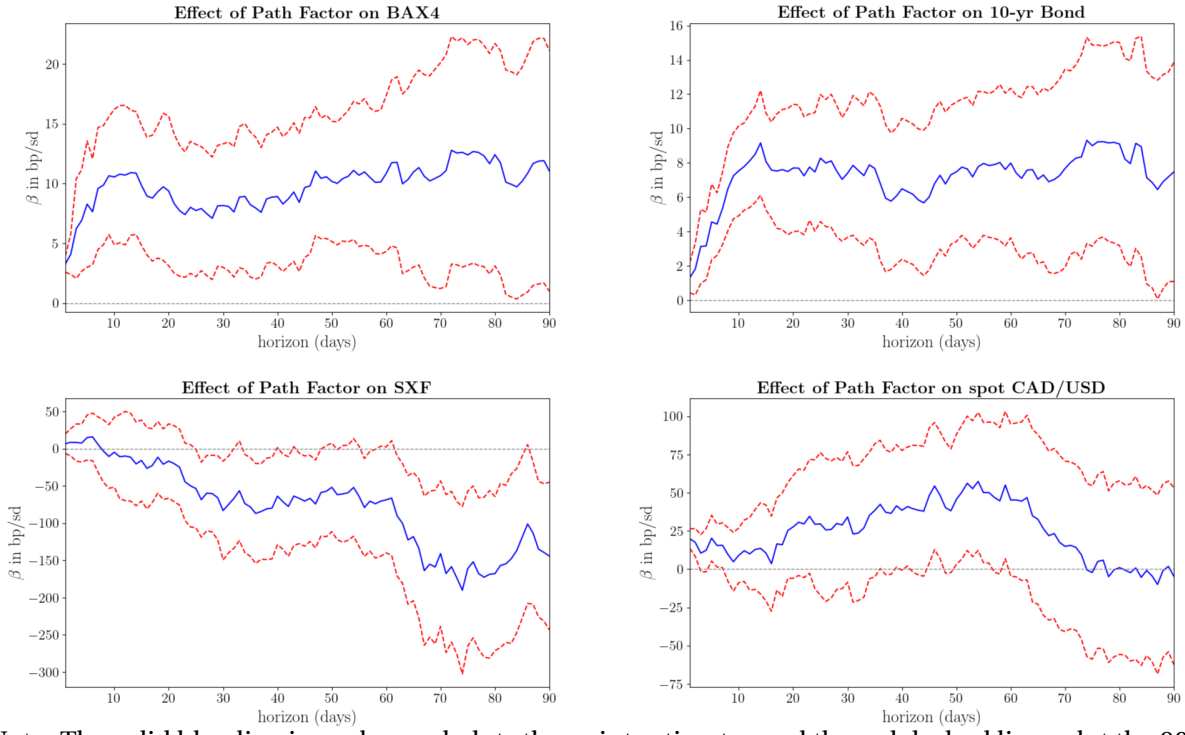
Appendix G Persistent responses of Canadian Financial Markets to Fed and Bank of Canada communication: 2008–2023

Appendix Figure G.1: PERSISTENT EFFECTS OF TARGET AND PATH FACTORS FROM BOC ANNOUNCEMENT: 2008–2023



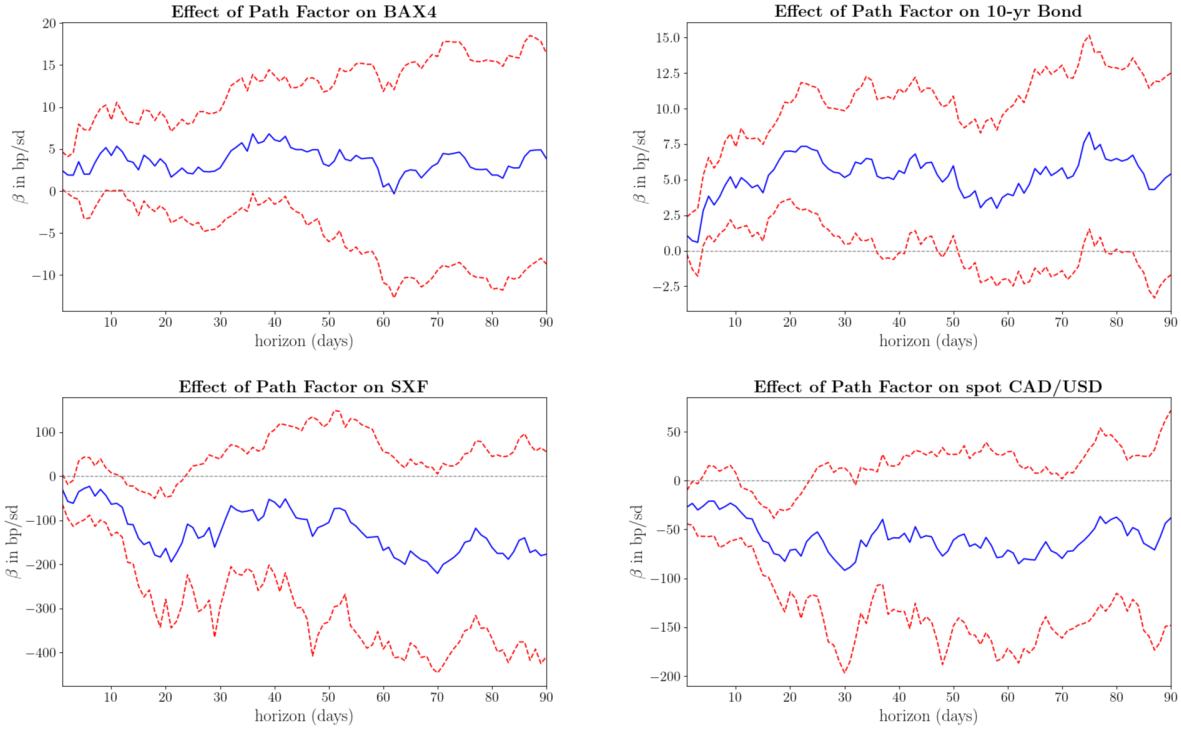
Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.

Appendix Figure G.2: PERSISTENT EFFECTS OF PATH FACTOR FROM BOC SPEECHES: 2008–2023

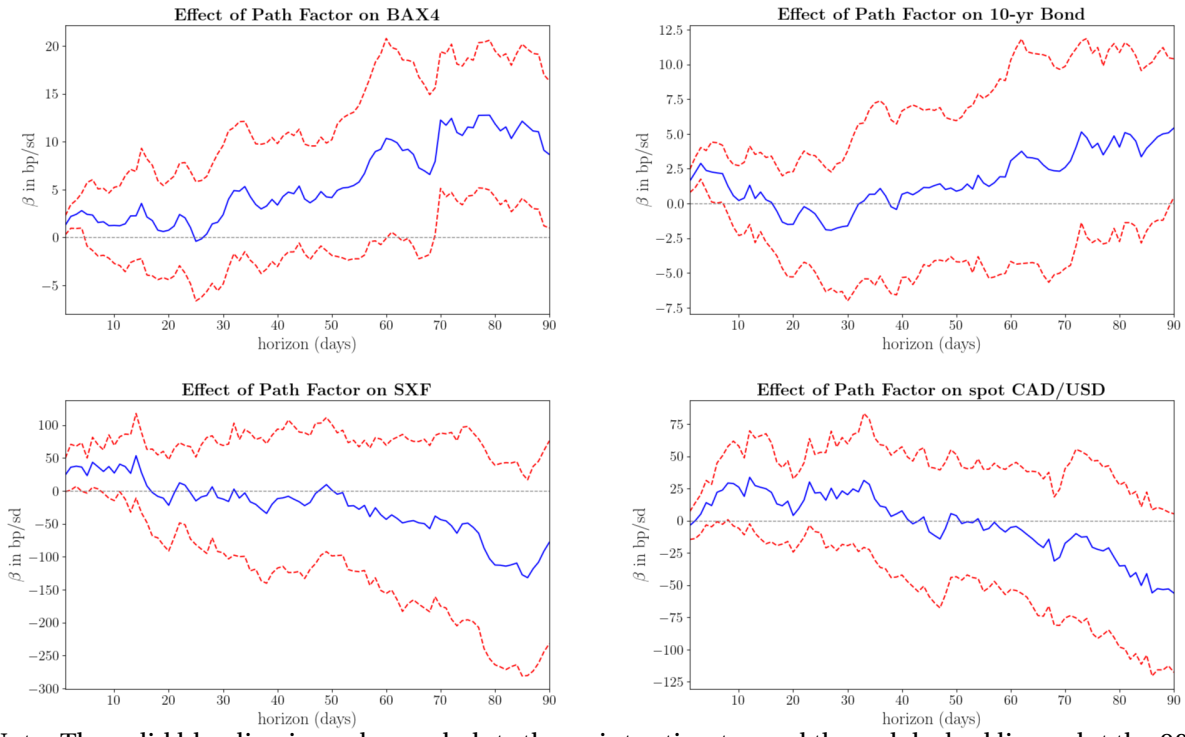


Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.

Appendix Figure G.3: PERSISTENT EFFECTS OF PATH FACTOR FROM FOMC ANNOUNCEMENT: 2008–2023



Appendix Figure G.4: PERSISTENT EFFECTS OF PATH FACTOR FROM FED SPEECHES: 2008–2023



Note: The solid blue line in each panel plots the point estimates and the red dashed lines plot the 90% confidence interval using robust standard errors.