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Exploring the drivers of the real term premium in Canada

by Zabi Tarshi and Gitanjali Kumar Garriott

Financial Markets Department
Bank of Canada
ztarshi@bankofcanada.ca

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Introduction

Changes in the term premium can reflect uncertainty about inflation, growth and monetary policy. Understanding the drivers of the term premium is important when central banks make decisions about monetary policy.

The term premium on longer-term securities increases when:

- investors are more risk averse
- the perceived risk of holding these securities is high

Investors who may have to resell long-term nominal securities before their maturity dates face uncertainty about the actual holding period return. Because of this uncertainty around interest rates, investors typically demand a risk premium for buying a long-term security instead of a short-term security. This premium compensates the investor for any unexpected losses due to changes in the market price when they resell the security.

Specifically, the nominal term premium can be broken down into two underlying components:

- **an inflation risk premium (IRP)**: this is the excess return that investors get from taking on the risk to buy the nominal security instead of a real security—that is, what they receive from being exposed to inflation risk
- **the real term premium (RTP**): this is the extra return that investors demand to hold a long-term real return bond instead of investing in a series of short-term real return securities

In this paper, we derive the IRP and RTP sequentially from the nominal term premium in Canada. We regress the nominal term premium on a set of inflation risk factors to obtain an estimate for the IRP. The residual of this regression is the RTP.[1]

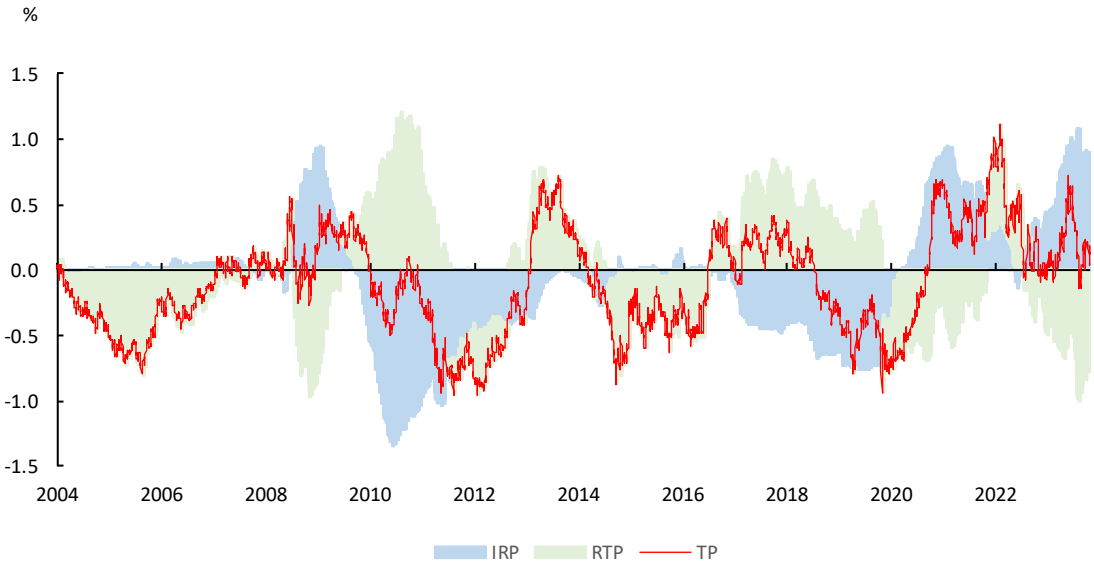
Chart 1 breaks down the cyclical part of the term premium into the two components' cumulative changes since 2004.[2] The two components broadly evolve as expected:

- The IRP declined after the global financial crisis (GFC) in 2008–09 when the macroeconomic environment was weak., It rose in 2021 after the start of the COVID-19 pandemic as inflation began to rise above 2%.
- The RTP climbed sharply during the GFC, which is consistent with prior studies that find that the term premium rises during recessions (Piazzesi and Swanson 2008).

[1] See Feunou and Tarshi (2024) for the technical details of this decomposition.

[2] The nominal term premium has both a cyclical and a trend component. The trend component is isolated, as described in Feunou and Tarshi (2024).

Chart 1: Decomposition of the nominal term premium



Note: IRP is inflation risk premium, RTP is real term premium, TP is term premium.

Sources: Bloomberg Finance L.P. and Bank of Canada calculations Last observation: March 8, 2024

A better understanding of the drivers of the RTP can show how much of the yield moves can be explained by uncertainty in the economy. It also reveals investors' risk appetite for holding long-term real return bonds.[3]

Changes in the RTP are influenced by:

- changes in the perceived riskiness of holding long-term real bonds
- changes in demand and supply factors for specific securities

In this paper, we focus on the first set of factors and leave a discussion of the second set of factors for future work.

We find that the estimated model captures the RTP dynamics leading up to the GFC and between 2012 and 2018 better than it does for other periods. We also find that concerns about the recession contributed to a higher RTP estimate in the pre-pandemic period. However, these variables are less able to explain changes after the pandemic, which suggests other factors are at play in driving the RTP.

Theoretical framework

The RTP is viewed primarily as reflecting growth risks, monetary policy uncertainty and other factors that affect the term premium, such as liquidity risk premium, sovereign risk premium, geopolitical risk, effects of flight to quality and search for yield. In this exercise, we use a price of risk approach and aim to capture mainly growth and monetary policy uncertainty factors.

[3] See Feunou and Tarshi (2024), who examine the IRP and its drivers.

We denote by X_t the set of factors that are related to the perceived riskiness for long-term bond investors. We use a two-year rolling-window regression framework to evaluate the link between daily changes in X_t and daily changes in RTP_t:

$$\Delta RTP_t = \beta'_{lt}\Delta X_t + \beta'_{it}X_t\Delta X_t + \varepsilon_t, \quad (1)$$

where $\Delta X_t$is the vector of daily demeaned changes in growth risk factors and $X_t\Delta X_t$ is the vector of daily demeaned interaction between the change in risk factors and the level of the risk factors. We also include an interaction term $(X_t\Delta X_t)$ to account for nonlinearities, which allows the price of risk to also depend on the level of the risk factor. Investors could be more sensitive to the additional change in risk when the level of risk is higher than when risks are lower. That is, $\beta'_t = \beta'_{lt} + \beta'_{it}\ X_t{}'$ can be interpreted as the time-varying investor risk aversion or the price of risk $(X_t\Delta X_t)$.[4]

In our selection of risk factors, we assume that RTP captures the real interest rate risk. Factors that are likely to increase the future short-term real interest rate may not be desired by investors holding long-maturity real bonds and would therefore require a high premium. Alternatively, factors that are likely to decrease the future short-term real interest rate may be desired by investors holding long-maturity real bonds and would therefore require a lower premium.

Specifically, we consider the following risk factors in the regression:

Future GDP growth

We use higher-order moments of 12-month-ahead growth in gross domestic product (GDP)—that is, volatility, skewness and kurtosis. We obtain these from Azizova, Feunou and Kyeong (2023), whose model forecasts GDP growth based on macroeconomic and financial data:

- When GDP growth is more **volatile**, the path of future real rates becomes more uncertain and investors demand higher compensation.
- When **kurtosis** is high, tail outcomes for future GDP growth are more likely and investors require greater compensation. Given the asymmetry in the distribution of GDP growth, left tail outcomes are likely to have a larger impact.[5]
- When GDP growth has a more negative **skew**, this implies a lower chance of robust economic growth, leading to a lower real rate. This increases bond returns, which means investors demand less compensation to invest in these bonds.

Change in the probability of a recession

Here, we define a recession as negative year-over-year growth in GDP over 12 months, which we also obtain from the forecasts in Azizova, Feunou and Kyeong (2023). An increase in the probability of a recession can decrease the term premium. This is because of the anticipation that the central bank will lower the policy rate when facing negative demand shocks, which raises bond prices.

[4] Given the rolling-window nature of the regression, the estimated beta coefficients may not always be significant. When computing fitted values for the RPT, we include only betas that are significant.

[5] Negative news tends to have greater impact on agents than positive news does. See, for example, Gambetti, Maffei-Faccioli and Zoi (2023).

Stock market and bond market volatility

These are proxied by the VIX and MOVE indexes, respectively.[6] Previous research has found that a positive shock to the VIX lowers the term premium because investors shift away from riskier assets (Kumar et al. 2023). The MOVE is a proxy for monetary policy uncertainty. A higher MOVE index is expected to increase the RTP.

Empirical findings

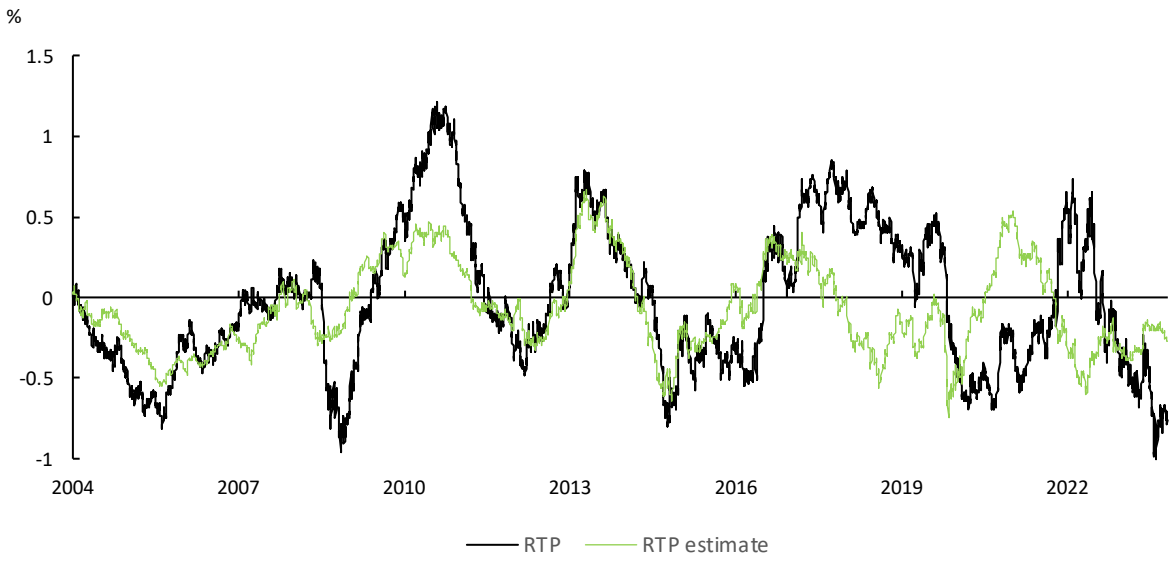
Chart 2 shows the fit of the model against the RTP derived from Feunou and Tarshi (2024).

The regression effectively captures the dynamics in the RTP in some periods, while in other periods we see divergence between the fitted and actual values.

Specifically, the estimated model matches the run-up in RTP before the GFC and also matches most of the fluctuations between 2012 and 2017. This suggests that changes to the perceived riskiness of long-term real return bonds can explain the cyclical fluctuations in the RTP during some episodes.

However, during other periods, this risk–return trade-off does not fully capture the RTP dynamics. In these cases, other factors may be dominating the variation. This could be attributed to variables not included in the model: for example, central bank quantitative easing or flight to safety, which reflect changes to the relative demand and supply of bonds.

Chart 2: Fitted value of the real term premium regression



Note: RTP is real term premium.

Sources: Bloomberg Finance L.P., Feunou and Tarshi (2024) and Bank of Canada

Last observation: March 8, 2024

[6] VIX is the Chicago Board Options Exchange Volatility Index, which tracks stock market uncertainty. MOVE is the Merrill Lynch Option Volatility Estimate Index, which tracks volatility in the U.S. Treasury bond market.

Chart 3 shows the main drivers of the RTP estimate from 2004 to 2020, separated into two sub-periods.[7] We find that recession concerns and GDP skewness were dominant factors in these two sub-periods.

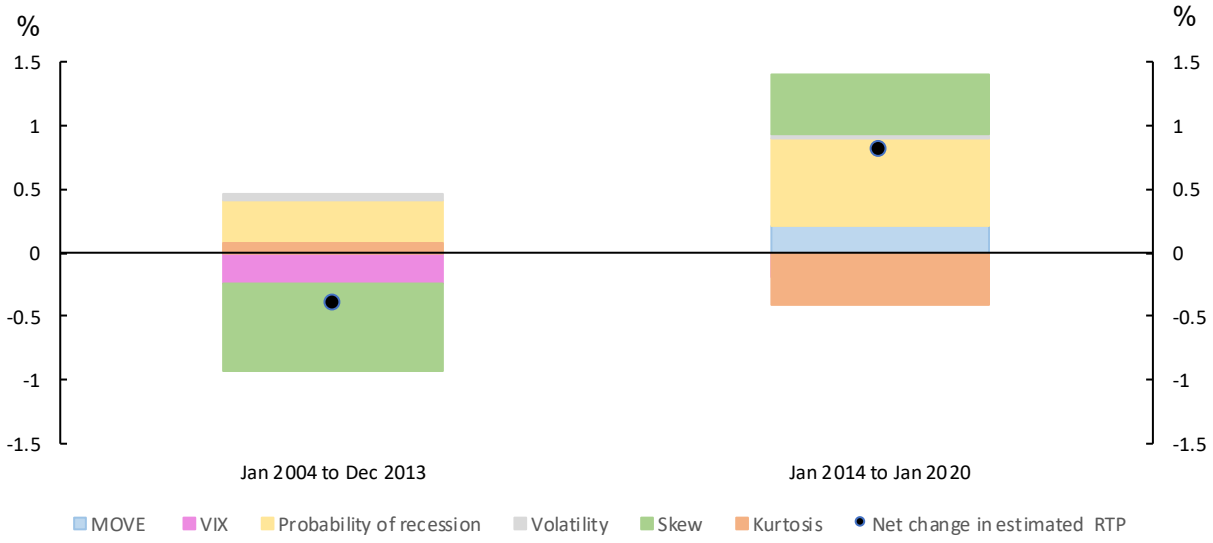
January 2004 to December 2013

The decline in the RTP estimate in this sub-period (which includes the GFC) is driven by GDP skew and the VIX.[8] This reflects the environment of slower growth faced by many advanced economies after the GFC. This environment led to lower real rates, which meant that investors demanded less compensation to invest in long-term bonds.

January 2014 to January 2020

This sub-period includes the 2014–16 collapse in oil prices, which was accompanied by policy rate cuts in Canada. The RTP estimate in this sub-period is driven by GDP skew. As trade and manufacturing picked up and commodity exporters gradually recovered from low energy prices, global growth prospects strengthened as early as 2017. For Canada, this recovery also implied a more positive skew to GDP growth, which led to higher real interest rate expectations. This decreased the bond returns, which meant that investors demanded more compensation to invest in these bonds.

Chart 3: Contributors to changes in the estimated real term premium



Note: MOVE is the Merrill Lynch Option Volatility Estimate Index, VIX is the Chicago Board Options Exchange Volatility Index, RTP is real term premium.

Sources: Bloomberg Finance L.P. and Bank of Canada calculations

Last observation: March 8, 2024

[7] We do not discuss key drivers from 2022 onward because of the poor fit of the model. Part of the decline in the RTP estimate could be attributed to an increase in inflation risk factors around 2022–23, when inflation risks became more prominent, potentially reducing the explainability of the RTP. However, Feunou and Tarshi (2024) show that the explanatory power of inflation risk factors does not particularly increase but remains steady.

[8] In our current setting, the risk factors are not orthogonal. This makes it challenging to interpret the contribution of risk factors in terms of price and quantity of risk.

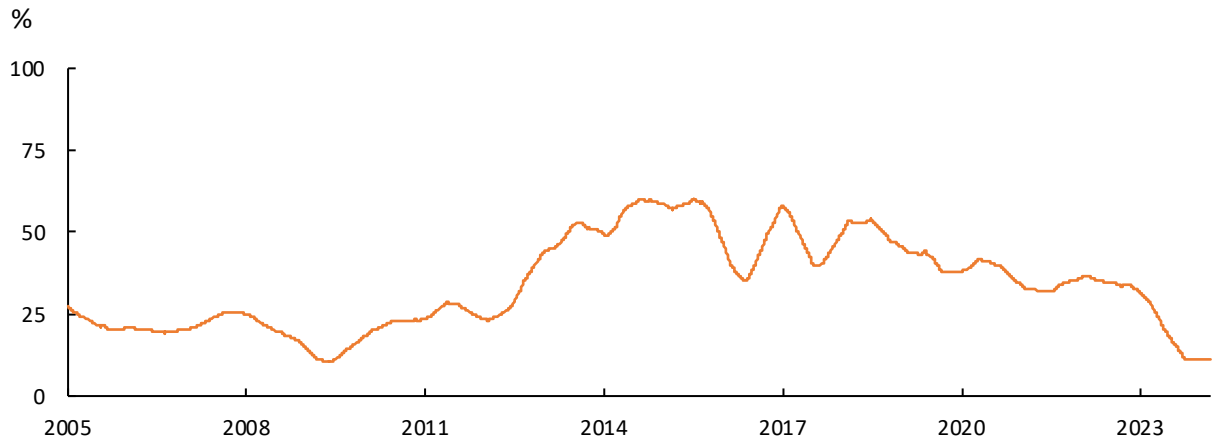
Chart 4 shows that our model partially explains the daily movement in the RTP, with average *R*-squared value of around 33% throughout the sample period.

While the average *R*-squared value is around 50% from 2011 to 2020, the explanatory power of the model has declined in the recent past. This suggests that:

- the growth and uncertainty variables can only partially explain the daily changes in the RTP
- the rolling-window relationship may not accurately capture time-varying pricing of these risks

Chart 4: Variation in the real term premium explained by growth-related risk factors

One-year rolling window



Sources: Bloomberg Finance L..P. and Bank of Canada calculations

Last observation: March 8, 2024

Conclusion

Using a price of risk approach, we find that macrofinancial risk factors can explain some of the variation in the daily changes in real term premium. But we also find that since the COVID-19 pandemic, other factors might be playing a bigger role. These factors include the relative demand and supply of bonds, which was impacted by the Bank of Canada's quantitative easing program. Assessing the impact of this program on bond yields and the real term premium is a project for future work.

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