



BANK OF CANADA
BANQUE DU CANADA

Bank of Canada Monthly Research Update

May 2020

This monthly newsletter features the latest research publications by Bank of Canada economists. The report includes papers appearing in external publications and staff working papers published on the Bank of Canada's website.

PUBLISHED PAPERS

In-Press

Zhao, Guihai, “Ambiguity, Nominal Bond Yields, and Real Bond Yields”, American Economic Review: Insights, Vol 2(2): 177-192, June 2020

Forthcoming

Chernis, Tony & Cheung, Calista & Velasco, Gabriella, “A three-frequency dynamic factor model for nowcasting Canadian provincial GDP growth”, International Journal of Forecasting

Allen, Jason & Hortaçsu, Ali & Kastl, Jakub, “Crisis Management in Canada: Analyzing Default Risk and Liquidity Demand during Financial Stress”, American Economic Journal: Microeconomics

Chang, Bo Young & Orosi, Greg, “A Simple Method for Extracting the Probability of Default from American Put Option Prices”, Journal of Futures Markets

Ho, Anson T. Y. & Huynh, Kim P. & Jacho-Chávez, David T. & Rojas-Baez, Diego, “Data Science in Stata 16: Frames, Lasso, and Python Integration”, Journal of Statistical Software

STAFF WORKING PAPERS

Kartashova, Katya & Zhou, Xiaoqing, “How Do Mortgage Rate Resets Affect Consumer Spending and Debt Repayment? Evidence from Canadian Consumers”, Bank of Canada Staff Working Paper 2020-18

STAFF DISCUSSION PAPERS

Ens, Erik & Johnston, Craig, “Scenario Analysis and the Economic and Financial Risks from Climate Change”, Bank of Canada Staff Discussion Paper 2020-3

ABSTRACTS

Ambiguity, Nominal Bond Yields, and Real Bond Yields

This paper presents an equilibrium bond-pricing model that jointly explains the upward-sloping nominal and real yield curves and the violation of the expectations hypothesis. Instead of relying on the inflation risk premium, the ambiguity-averse agent faces different amounts of Knightian uncertainty in the long run versus the short run; hence, the model-implied nominal and real short rate expectations are upward sloping under the agent's worst-case equilibrium beliefs. The expectations hypothesis roughly holds under investors' worst-case beliefs. The difference between the worst-case scenario and the true distribution makes realized excess returns on long-term bonds predictable.

A three-frequency dynamic factor model for nowcasting Canadian provincial GDP growth

This paper estimates a three-frequency dynamic factor model for nowcasting the Canadian provincial gross domestic product (GDP). The Canadian provincial GDP at market prices is released by Statistics Canada annually with a significant lag (11 months). This necessitates a mixed-frequency approach that can process timely monthly data, the quarterly national accounts, and the annual target variable. The model is estimated on a wide set of provincial, national and international data. In a pseudo real-time exercise, we find that the model outperforms simple benchmarks and is competitive with more sophisticated mixed-frequency approaches (MIDAS models). We also find that variables from the Labour Force Survey are important predictors of real activity. This paper expands previous work that has documented the importance of foreign variables for nowcasting Canadian GDP. This paper finds that including national and foreign predictors is useful for Ontario, while worsening the nowcast performance for smaller provinces.

Crisis Management in Canada: Analyzing Default Risk and Liquidity Demand during Financial Stress

This paper shows that strategies in, and reliance on the payments system as well as special liquidity supplying tools provided by the central bank are important indicators of distress of individual banks. We conclude that central banks can benefit from using high-frequency data on liquidity demand to obtain a better picture of the

financial health of individual participants of the financial system. For the particular case of Canada, using unique features of the payments system and information from the liquidity facilities we find that the willingness-to-pay for liquidity during the financial crisis stayed at low levels throughout the Canadian financial system and that there was no increase in counterparty risk. This suggests that the central bank's overall policy response might have been less pronounced if they had used the methods employed in this paper to analyze the crisis than the actual response.

A Simple Method for Extracting the Probability of Default from American Put Option Prices

In this paper, we present a novel method to extract the risk-neutral probability of default of a firm from American put option prices. Building on the idea of a default corridor proposed in Carr and Wu (2011), we derive a parsimonious closed-form formula for American put option prices from which the probability of default can be inferred. The proposed method is easy to implement and helps overcome the main limitation of the method used in Carr and Wu (2011), which relies on the price of one deep-out-of-the-money put option. Our empirical results are based on seven large U.S. firms for the period 2002 to 2010. These results show that, in some cases, the option-implied probability of default can provide a more accurate estimate of default probability, compared to the estimates implied from credit default swap spreads.

Data Science in Stata 16: Frames, Lasso, and Python Integration

Stata is one of the most widely used software for data analysis, statistics, and model fitting by economists, public policy researchers, epidemiologists, among others. Stata's recent release of version 16 in June 2019 includes an up-to-date methodological library and a user-friendly version of various cutting edge techniques. In the newest release, Stata has implemented several changes and additions that include:

- Lasso
- Multiple data sets in memory
- Meta-analysis
- Choice models
- Python integration
- Bayes-multiple chains
- Panel-data ERMs

- Sample-size analysis for CIs
- Panel-data mixed logit
- Nonlinear DSGE models
- Numerical integration

This review covers the most salient innovations in Stata 16. It is the first release that brings along an implementation of machine-learning tools. The three innovations we consider in this review are: (1) Multiple data sets in Memory, (2) Lasso for causal inference, and (3) Python integration.

How Do Mortgage Rate Resets Affect Consumer Spending and Debt Repayment? Evidence from Canadian Consumers

We study the causal effect of mortgage rate changes on consumer spending, debt repayment, and defaults during an expansionary and a contractionary monetary policy episode in Canada. Our identification takes advantage of the fact that the interest rates of short-term fixed-rate mortgages (the dominant product in Canada's mortgage market) have to be reset according to the prevailing market interest rates at predetermined time intervals. Our empirical strategy exploits this exogenous variation in the timing of mortgage rate resets. We find asymmetric responses of consumer durable spending, deleveraging, and defaults. These results can be rationalized by the cash-flow effect in conjunction with changes in consumers' expectations about future interest rates. Our findings help us to understand the responses of the household sector to changes in the interest rate, especially in countries where variable-rate, adjustable-rate, and short-term fixed-rate mortgages are prevalent.

Scenario Analysis and the Economic and Financial Risks from Climate Change

Central banks are increasingly focused on the risks from climate change for the economy and financial system. Two sets of risks are of particular concern: physical risks from more frequent and severe weather events, and transition risks from the move toward a lower-carbon intensive economy. This paper adapts climate-economy models that have been applied in other contexts for use in climate-related scenario analysis. We consider illustrative scenarios for the global economy that could generate economic and financial system risks by varying assumptions on key variables such as climate policy in plausible ways. The results show significant economic implications from climate change and the transition to a low-carbon economy. The timing and magnitude of global GDP and sectoral impacts, among

other outcomes, vary considerably under the mix of scenarios. These risks touch on the interests of a broad range of stakeholders across the private and public sectors. In addition to central banks and governments, these risks could affect financial institutions, resource-intensive industries and other private sector firms. Further improvements in scenario analysis, as well as wider-spread use across the public and private sectors, could lead to a better understanding of the risks and opportunities of climate change.

UPCOMING EVENTS

*** All onsite conferences and events are suspended until further notice.**

Jean-Charles Rochet (University of Geneva, Swiss Finance Institute)
Organizer: Toni Ahnert (FSD)
Date: 11 June 2020 (Virtual)