

Bank of Canada Monthly Research Update

June 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

Bolt, Wilko & Van Oordt, Maarten R.C., “[On the Value of Virtual Currencies](#)”, *Journal of Money, Credit and Banking*, Vol 52(4): 835-862, June 2020

Forthcoming

Brooks, Skylar, “[What finance wants: Explaining change in private regulatory preferences toward sovereign debt restructuring](#)”, *Review of International Political Economy*

Matveev, Dmitry, “[Time-Consistent Management of a Liquidity Trap with Government Debt](#)”, *Journal of Money, Credit and Banking*

Gu, Xing & Mamon, Rogemar & Duprey, Thibaut & Xiong, Heng, “[Online estimation for a predictive analytics platform with a financial stability analysis application](#)”, *European Journal of Control*

Ho, Anson T. Y., “[Interconnectedness through the Lens of Consumer Credit Markets](#)”, *Advances in Econometrics: The Econometrics of Networks*

Bhandari, Anmol & Birinci, Serdar & McGrattan, Ellen & See, Kurt, “[What Do Survey Data Tell Us About US Businesses?](#)”, *American Economic Review: Insights*

STAFF WORKING PAPERS

Leiva-Leon, Danilo & Uzeda, Luis, “[Endogenous Time Variation in Vector Autoregressions](#)”, *Bank of Canada Staff Working Paper 2020-16*

Guo, Xing, “[Identifying Aggregate Shocks with Micro-level Heterogeneity: Financial Shocks and Investment Fluctuation](#)”, *Bank of Canada Staff Working Paper 2020-17*

Feunou, Bruno & Lopez Aliouchkin, Ricardo & Tedongap, Roméo & Xu, Lai, “[The Term Structures of Loss and Gain Uncertainty](#)”, *Bank of Canada Staff Working Paper 2020-19*

Garriott, Corey & Riordan, Ryan, “[Trading on Long-term Information](#)”, *Bank of Canada Staff Working Paper 2020-20*

Demone, Christophe & Di Matteo, Olivia & Collignon, Barbara, “[Classical Decomposition of Markowitz Portfolio Selection](#)”, *Bank of Canada Staff Working Paper 2020-21*

Allen, Jason & Li, Shaoteng, “[Dynamic Competition in Negotiated Price Markets](#)”, Bank of Canada Staff Working Paper 2020-22

Ahnert, Toni & Machado, Caio & Pereira, Ana Elisa, “[Trading for Bailouts](#)”, Bank of Canada Staff Working Paper 2020-23

Kosse, Anneke & Lu, Zhentong & Xerri, Gabriel, “[An Economic Perspective on Payments Migration](#)”, Bank of Canada Staff Working Paper 2020-24

Friedrich, Christian & Guérin, Pierre & Leiva-Leon, Danilo, “[Monetary Policy Independence and the Strength of the Global Financial Cycle](#)”, Bank of Canada Staff Working Paper 2020-25

Witmer, Jonathan, “[Monetary Policy Implementation and Payment System Modernization](#)”, Bank of Canada Staff Working Paper 2020-26

STAFF DISCUSSION PAPERS

Armeliuss, Hanna & Claussen, Carl Andreas & Hendry, Scott, “[Is Central Bank Currency Fundamental to the Monetary System?](#)”, Bank of Canada Staff Discussion Paper 2020-2

Duprey, Thibaut, “[Canadian Financial Stress and Macroeconomic Conditions](#)”, Bank of Canada Staff Discussion Paper 2020-4

Welte, Angelika & Molnar, Jozsef, “[The Market for Acquiring Card Payments from Small and Medium-Sized Canadian Merchants](#)”, Bank of Canada Staff Discussion Paper 2020-5

ABSTRACTS

On the Value of Virtual Currencies

Our economic framework suggests that the exchange rate of virtual currency is determined by three components. First, the current value of transactions in virtual currency which absorb part of the exchange rate risk. Second, the decisions and expectations of forward-looking investors to buy virtual currency (thereby effectively regulating its supply). Third, the elements that jointly drive future consumer adoption and merchant acceptance of virtual currency. The model predicts that, as virtual currency becomes more established, the exchange rate will become less sensitive to the impact of shocks to speculators' beliefs. This undermines the notion that excessive exchange rate volatility will prohibit widespread use of virtual currency.

What finance wants: Explaining change in private regulatory preferences toward sovereign debt restructuring

It is widely assumed that when private financial actors seek to influence the regulation of global finance, their preference is for fewer or weaker rules. But is this preference tied to fixed material interests, or is it more malleable? Can it change over time? If so, why might it? I address these questions by examining a recent shift in private creditor preferences toward the regulation of sovereign debt restructuring. I argue that changed material circumstances created demand for regulatory change among creditors but did not determine the nature of their preferred solution. Instead, it was shifts in collectively-held ideas—the specific content of which was informed by important historical and contextual factors—that led private creditors to embrace stronger debt restructuring rules, despite being historically opposed to such rules. In making this argument, the article contributes to a fuller understanding of private market actors in global financial politics, challenging the assumption that these actors necessarily prefer weaker rules, and highlighting the more contingent nature of their regulatory preferences. It also contributes to wider debates about preference formation and change, highlighting important complementarities between distinct theoretical traditions, which together provide a much richer explanation of the case at hand.

Time-Consistent Management of a Liquidity Trap with Government Debt

This paper studies optimal discretionary monetary and fiscal policy when the lower bound on nominal interest rates is occasionally binding in a model with nominal rigidities and long-term government debt. At the lower bound it is optimal for the government to temporarily reduce debt. This decline stimulates output, which is inefficiently low during liquidity traps, by lowering expected real interest rates following the lift-off of the nominal rate from the lower bound. Away from the lower bound, the long-run level of government debt increases with the risk of reaching the lower bound. The accumulation of debt pushes up inflation expectations so as to offset the opposite effect due to the lower bound risk.

Online estimation for a predictive analytics platform with a financial stability analysis application

An online parameter estimation via filtering recursions is constructed to support a data-analytics scheme in the predictive domain. Multivariate financial market indices or signals revealed in real time are used in our numerical implementation. This work contributes to the analysis and forecasting of financial crises in an environment that evolves dynamically. In particular, we capture the regime-switching characteristics of the Financial Stress Index (FSI) and Industrial Production Index (IPI), designed to detect periods of financial crisis. We integrate two different stochastic models for FSI and IPI deemed to mirror the systemic financial stress levels in the financial and business cycles, respectively. The joint dynamics of the FSI and IPI, exhibit stochasticity, mean reversion, seasonality, and occasional jumps are identified in the most efficient way. All parameters are modulated by a discrete-time hidden Markov chain that switches between economic regimes reflecting various interacting economic forces. Through change of reference probability technique, adaptive multivariate filters are derived which in turn provides online optimal parameter estimates. Historical Canadian economic-based FSI and IPI are examined and an early-warning signal extraction method is put forward to generate alerts at the early stage of some crisis events. Our modelling approach captures the empirical characteristics of FSI and IPI as well as provides auspiciously early warnings for episodes of systemic financial crisis.

Interconnectedness through the Lens of Consumer Credit Markets

Financial systemic risk is often assessed by the interconnectedness of financial institutes in terms of cross ownership, overlapping investment portfolios, interbank credit exposures, etc. Less is known about the interconnectedness between financial institutes (FI) through the lens of consumer credits. Using detailed consumer credit data in Canada, this paper constructs a novel banking network to measure FIs' interconnectedness in the consumer credit markets. Results show that FIs on average are more connected to each other over the sample period, with the interconnectedness measure increases by 19% from 2013 Q4 to 2019 Q4. FIs with more diversified portfolios are more connected in the network. Among various types of FIs, secondary FIs have the notable increase in interconnectedness. Domestic Systemically Important Banks (DSIBs) and secondary FIs offering a broad range of loan products are more connected to large FIs, while those specialized in single loan types are more connected to their industry peers. FI connectedness is also significantly related to their participation in the mortgage markets.

What Do Survey Data Tell Us About US Businesses?

This paper examines the reliability of survey data on business incomes, valuations, and rates of return, which are key inputs for studies of wealth inequality and entrepreneurial choice. We compare survey responses of business owners with available data from administrative tax records, brokered private business sales, and publicly traded company filings and document problems due to nonrepresentative samples and measurement errors across all surveys, subsamples, and years. We find that the discrepancies are economically relevant for the statistics of interest. We investigate reasons for these discrepancies and propose corrections for future survey designs.

Endogenous Time Variation in Vector Autoregressions

We introduce a new class of time-varying parameter vector autoregressions (TVP-VARs) where the identified structural innovations are allowed to influence — contemporaneously and with a lag — the dynamics of the intercept and autoregressive coefficients in these models. An estimation algorithm and a parametrization conducive to model comparison are also provided. We apply our framework to the US economy. Scenario analysis suggests that the effects of monetary policy on economic activity are larger and more

persistent in the proposed models than in an otherwise standard TVP-VAR. Our results also indicate that costpush shocks play an important role in understanding historical changes in inflation persistence.

Identifying Aggregate Shocks with Micro-level Heterogeneity: Financial Shocks and Investment Fluctuation

This paper identifies the aggregate financial shocks and quantifies their effects on business investment based on an estimated DSGE model with firm-level heterogeneity. On average, financial shocks contribute only 1.1% of the variation in U.S. public firms' aggregate investment. The negligible aggregate relevance of financial shocks mainly results from the interaction between firm-level heterogeneity and general equilibrium effects. Following a contractionary financial shock, financially constrained firms are directly forced to cut investment, which dampens the aggregate investment demand and lowers the capital good price. The lower capital good price motivates the financially unconstrained firms to invest more, which largely cancels out the financial shock's direct effect in aggregation. If the firm-level heterogeneity is removed, the implied relevance of financial shocks to aggregate investment will be 50 times larger. This sharp difference indicates that representative firm models could overstate the relevance of financial shocks in driving the business cycle fluctuation and highlights the importance of micro-level heterogeneity in identifying the aggregate shocks.

The Term Structures of Loss and Gain Uncertainty

We document that the term structures of risk-neutral expected loss and gain uncertainty on S&P 500 returns are upward sloping on average. These shapes mainly reflect the higher premium required by investors to hedge downside risk and the belief that potential gains will increase in the long run. The term structures exhibit substantial time-series variation with large negative slopes during crisis periods. Through the lens of Andersen et al.'s (2015) framework, we evaluate the ability of existing reduced-form option pricing models to replicate these term structures. We stress that three ingredients are particularly important: (i) the inclusion of jumps, (ii) disentangling the price of negative jump risk from its positive analog in the stochastic discount factor specification, and (iii) specifying three latent factors.

Trading on Long-term Information

Predatory trading discourages informed investors from gathering information and trading on it. However, using 11 years of equity trading data, we do not find evidence that informed investors are being discouraged. They have roughly constant volumes and profits through the sample. They are sophisticated, trading patiently over weeks and timing their trading to achieve negative price impacts, leaving price efficiency unchanged. We identify shorter-term traders and, in contrast to theory, find that they supply liquidity by trading in the opposite direction of the informed. Inefficient prices may be the result of informed investors' sophisticated trading and not of predatory short-term trading.

Classical Decomposition of Markowitz Portfolio Selection

In this study, we enhance Markowitz portfolio selection with graph theory for the analysis of two portfolios composed of either EU or US assets. Using a threshold-based decomposition of their respective covariance matrices, we perturb the level of risk in each portfolio and build the corresponding sets of graphs. We show that the “superimposition” of all graphs in a set allows for the (re)construction of the efficient frontiers. We also identify a relationship between the Sharpe ratio (SR) of a given portfolio and the topology of the corresponding network of assets. More specifically, we suggest $SR = f(\text{topology}) \approx f(\text{ECC}/\text{BC})$, where ECC is the eccentricity and BC is the betweenness centrality averaged over all nodes in the network. At each threshold, the structural analysis of the correlated networks provides unique insights into the relationships between assets, agencies, risks, returns and cash flows. We observe that the best threshold or best graph representation corresponds to the portfolio with the highest Sharpe ratio. We also show that simulated annealing performs better than a gradient-based solver.

Dynamic Competition in Negotiated Price Markets

This paper develops a framework for investigating dynamic competition in markets where price is negotiated between an individual customer and multiple firms repeatedly. Using contract-level data for the Canadian mortgage market, we provide evidence of an “invest-then-harvest” pricing pattern: lenders offer relatively low interest rates to attract new borrowers and poach rivals' existing customers, and then at renewal charge interest rates which can be higher than what may be available through other lenders in the marketplace. We build a dynamic model of price negotiation with

search and switching frictions to capture key market features. We estimate the model and use it to investigate (i) the effects of dynamic competition on borrowers' and banks' payoffs, (ii) the implications of dynamic versus static settings for merger-studies, and (iii) the impacts from recent Canadian macroprudential policies.

Trading for Bailouts

Government interventions such as bailouts are often implemented in times of high uncertainty. Policymakers may therefore rely on information from financial markets to guide their decisions. We propose a model in which a policymaker learns from market activity and where market participants have high stakes in the intervention. We study how the strategic behavior of informed traders affects market informativeness, the probability and efficiency of bailouts, and stock prices. We apply the model to study the liquidity support of distressed banks and derive implications for market informativeness and policy design. Commitment to a minimum liquidity support can increase market informativeness and welfare.

An Economic Perspective on Payments Migration

Canada is in the midst of developing three new core payment systems: Lynx, Settlement Optimization Engine (SOE) and Real-Time Rail (RTR). Lynx and SOE will replace the current Large Value Transfer System (LVTS) and Automated Clearing Settlement System (ACSS), whereas RTR will be a new capability. This paper examines the expected migration of ACSS and LVTS payments into RTR, SOE and Lynx. To that end we define a methodology for comparing the current and future payment instruments that end-users will be faced with in the new payments landscape. Similarly, we develop a method to assess the current and future payment systems from the perspective of banks. Based on this we estimate that a substantial portion of the current value of ACSS and LVTS payments might find its way to RTR due to changing end-user behaviour. Our analysis also suggests that banks might migrate a considerable amount of LVTS transactions to either SOE or RTR. The findings provide a good starting point for future research on the implications of the new payments infrastructure.

Monetary Policy Independence and the Strength of the Global Financial Cycle

We propose a new strength measure of the global financial cycle by estimating a regime switching factor model on cross-border equity

flows for 61 countries. We then assess how the strength of the global financial cycle affects monetary policy independence, which is defined as the response of central banks' policy interest rates to exogenous changes in inflation. We show that central banks tighten their policy rates in response to an unanticipated increase in the inflation gap during times when global financial cycle strength is low. During times of high financial cycle strength, however, the responses of the same central banks to the same unanticipated changes in the inflation gap appear muted. Finally, by assessing the impact of different policy tools on countries' sensitivities to the global financial cycle, we show that using capital controls, macroprudential policies, and the presence of a flexible exchange rate regime can increase monetary policy independence.

Monetary Policy Implementation and Payment System Modernization

24/7 payment settlement may impact the demand for central bank reserves and thus could have an effect on monetary policy implementation. Using the standard workhorse model of monetary policy implementation (Poole, 1968), we show that 24/7 payment settlement induces a precautionary demand for central bank balances. Absent any changes or response by the central bank, this will put upward pressure on the overnight interest rate in a standard corridor system of monetary policy implementation. A floor system is much less sensitive to this change, as long as excess balances are large enough.

Is Central Bank Currency Fundamental to the Monetary System?

In this paper, we discuss whether the ability of individuals to convert commercial bank money (i.e., bank deposits) into central bank money is fundamentally important for the monetary system. This is a significant question since the use of cash—the only form of central bank money that the public currently has access to—is declining rapidly in many countries. The question is highly relevant to the discussion around whether central banks need to issue a retail central bank digital currency (CBDC). We conclude that depositors' need for control could be a reason why cash or a CBDC is essential, even in countries with strong measures safeguarding commercial bank money.

Canadian Financial Stress and Macroeconomic Conditions

I construct a new composite measure of systemic financial market stress for Canada. Compared with existing measures, it better captures the 1990 housing market correction and more accurately reflects the absence of diversification opportunities during systemic events. The index can be used for monitoring. For instance, it reached a peak during the COVID-19 pandemic second only to the 2008 global financial crisis. The index can also be used to introduce non-linear macrofinancial dynamics in empirical macroeconomic models of the Canadian economy. Macroeconomic conditions are shown to deteriorate significantly when the Canadian financial stress index is above its 90th percentile.

The Market for Acquiring Card Payments from Small and Medium-Sized Canadian Merchants

This note uses industry data and a unique dataset of small and medium-sized merchants to provide insights into the acquirer-merchant market in Canada. Three main findings are presented. First, smaller merchants pay their acquirer more for every dollar of card payment than larger merchants. Second, this finding is mainly explained by high fixed costs. Third, the acquiring market in Canada is concentrated and has remained fairly stable since 2010.

UPCOMING EVENTS

*** All onsite conferences and events are suspended until further notice. All events listed below will take place virtually.**

Sebastian Schmidt (European Central Bank)
Organizer: CEA/INT EFR Speaker Series
Date: 16 July 2020

Todd Schoellman (Federal Reserve Bank of Minneapolis)
Organizer: CEA/INT EFR Speaker Series, Youngmin Park (CEA)
Date: 21 August 2020

Dirk Krueger (Department of Economics, University of Pennsylvania)
Organizer: CEA/INT EFR Speaker Series, Katya Kartashova (CEA)
Date: 28 August 2020

Karen Kopecky (Federal Reserve Bank of Atlanta)
Organizer: CEA/INT EFR Speaker Series, Youngmin Park (CEA)
Date: 4 September 2020

Arlene Wong (Department of Economics, Princeton University)
Organizer: CEA/INT EFR Speaker Series, Julien Champagne (CEA)
Date: 11 September 2020

Johannes Wieland (Department of Economics, University of California
San Diego)
Organizer: CEA/INT EFR Speaker Series, Julien Champagne (CEA)
Date: 25 September 2020