

Bank of Canada Monthly Research Update

June 2019

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

Ahnert, Toni & Anand, Kartik & Gai, Prasanna & Chapman, James, “[Asset Encumbrance, Bank Funding, and Fragility](#)”, *The Review of Financial Studies*, Vol 32(6): 2422–2455, June 2019

Bao, Te; Hennequin, Myrna; Hommes, Cars and Massaro, Domenico, “[Coordination on bubbles in large group asset pricing experiments](#)”, *Journal of Economic Dynamics and Control* (May 2019)

Chiu, Jonathan & Koepp, Thorsten, “[Incentive compatibility on the Blockchain](#)”, *Social Design Essays in Memory of Leonid Hurwicz*: 323-335, 2019

Hommes, Cars & Massaro, Domenico & Weber, Matthias, “[Monetary policy under behavioral expectations: Theory and experiment](#)”, *European Economic Review*, Vol 118: 193-212, September 2019

Forthcoming

Chiu, Jonathan & Monnet, Cyril, “[Relationships in the Interbank Market](#)”, *Review of Economic Dynamics* (RED)

Damar, Evren & Gropp, Reint & Mordel, Adi, “[Banks' funding stress, lending supply and consumption expenditure](#)”, *Journal of Money, Credit and Banking*

Hommes, Cars, “[Behavioral and experimental macroeconomics and policy analysis: a complex systems approach](#)”, *Journal of Economic Literature*

STAFF WORKING PAPERS

Kryvtsov, Oleksiy & Petersen, Luba, “[Central Bank Communication That Works: Lessons from Lab Experiments](#)”, Bank of Canada Staff Working Paper 2019-21

Ichihashi, Shota, “[Online Privacy and Information Disclosure by Consumers](#)”, Bank of Canada Staff Working Paper 2019-22

Raykov, Radoslav, “[Systemic Risk and Collateral Adequacy](#)”, Bank of Canada Staff Working Paper 2019-23

ABSTRACTS

Asset Encumbrance, Bank Funding, and Fragility

We model asset encumbrance by banks subject to rollover risk and study the consequences for fragility, funding costs, and prudential regulation. A bank's privately optimal encumbrance choice balances the benefit of expanding profitable, yet illiquid, investment funded by cheap long-term senior secured debt, against the cost of greater fragility from runs on unsecured debt. We derive testable implications about encumbrance ratios. The introduction of deposit insurance or wholesale funding guarantees induces excessive encumbrance and fragility. Limits on asset encumbrance or Pigovian taxes eliminate such risk-shifting incentives. Our results shed light on prudential policies currently being pursued in several jurisdictions.

Coordination on bubbles in large group asset pricing experiments

We present a large-group experiment in which participants predict the price of an asset, whose realization depends on the aggregation of individual forecasts. The markets consist of 21 to 32 participants, a group size larger than in most experiments. Multiple large price bubbles occur in six out of seven markets. The bubbles emerge even faster than in smaller markets. Individual forecast errors do not cancel out at the aggregate level, but participants coordinate on a trend-following prediction strategy that gives rise to large bubbles. The observed price patterns can be captured by a behavioral heuristics switching model with heterogeneous expectations.

Incentive compatibility on the Blockchain

A blockchain is a digital ledger that keeps track of a record of ownership without the need for a designated party to update and enforce changes to the record. The updating of the ledger is done directly by the users of the blockchain and is traditionally governed by a proof-of-work (PoW) protocol. We formalize this protocol as a Cournot game where users compete to update the blockchain for a reward. Cheating occurs in the form of "double spending" when users try to tamper with ownership records in order to defraud their counterparties. Ruling out incentives to cheat can be summarized in the form of a "no double-spending constraint." These constraints put restrictions on the design of a blockchain and, thus, play a role akin to incentive compatibility constraints in classic mechanism design.

Monetary policy under behavioral expectations: Theory and experiment

Expectations play a crucial role in modern macroeconomic models. We consider a New Keynesian framework under a behavioral model of expectation formation and under rational expectations. Contrary to the rational model, the behavioral model predicts that inflation volatility can be lowered if the central bank reacts to the output gap in addition to inflation. We test the opposing theoretical predictions in a learning-to-forecast experiment. In line with the behavioral model, the results support the claim that output stabilization can lead to less volatile inflation.

Relationships in the Interbank Market

The market for central bank reserves is mainly over-the-counter and exhibits a core-periphery network structure. This paper develops a model of relationship lending in the unsecured interbank market. In equilibrium, a tiered lending network arises endogenously as banks choose to build relationships to insure against liquidity shocks and to economize on the cost to trade in the interbank market. Relationships matter for banks' bidding strategies at the central bank auction and introduce a relationship premium that can significantly distort the observed overnight rate. For example, it can explain some anomalies in the level of interest rates—namely, that banks sometimes trade above (below) the central bank's lending (deposit) rate. The model also helps to explain how monetary policy affects the network structure of the interbank market and its functioning, and how the market responds dynamically to an exit from the floor system. We also use the model to discuss the potential effects of bilateral exposure limits on relationship lending.

Banks' funding stress, lending supply and consumption expenditure

The paper employs a unique identification strategy that links survey data on household consumption expenditure to bank-level data in order to estimate the effects of bank financial distress on consumer credit and consumption expenditures. Specifically, we show that households whose banks were more exposed to funding shocks report significantly lower levels of non-mortgage liabilities compared to a matched sample of households. The reduced access to credit, however, does not result in lower levels of consumption. Instead, we show that households compensate by drawing down liquid assets. Only households without the ability to draw on liquid assets reduce

consumption. The results are consistent with consumption smoothing in the face of a temporary adverse lending supply shock. The results contrast with recent evidence on the real effects of finance on firms' investment, where even temporary adverse credit supply shocks are associated with significant real effects.

Behavioral and experimental macroeconomics and policy analysis: a complex systems approach

This survey discusses behavioral and experimental macroeconomics emphasizing a complex systems perspective. The economy consists of boundedly rational heterogeneous agents who do not fully understand their complex environment and use simple decision heuristics. Central to our survey is the question under which conditions a complex macro-system of interacting agents may or may not coordinate on the rational equilibrium outcome. A general finding is that under positive expectations feedback (strategic complementarity) --where optimistic (pessimistic) expectations can cause a boom (bust)-- coordination failures are quite common. The economy is then rather unstable and persistent aggregate fluctuations arise strongly amplified by coordination on trend-following behavior leading to (almost-)self-fulfilling equilibria. Heterogeneous expectations and heuristics switching models match this observed micro and macro behavior surprisingly well. We also discuss policy implications of this coordination failure on the perfectly rational aggregate outcome and how policy can help to manage the self-organization process of a complex economic system.

Central Bank Communication That Works: Lessons from Lab Experiments

We use controlled laboratory experiments to test the causal effects of central bank communication on economic expectations and to distinguish the underlying mechanisms of those effects. In an experiment where subjects learn to forecast economic variables, we find that central bank communication has a stabilizing effect on individual and aggregate outcomes and that the size of the effect varies with the type of communication. Announcing past interest rate changes has the largest effect, reducing individual price and expenditure forecast volatility by one- and two-thirds, respectively; cutting half of inflation volatility; and improving price-level stability. Forward-looking announcements in the form of projections and forward guidance of upcoming rate decisions have less effect on individual forecasts, especially if they do not clarify the timing of future

policy changes. Our evidence does not link the effects of communication to forecasters' ability to predict future nominal interest rates. Rather, communication is effective via simple and relatable backward-looking announcements that exert strong influence on less-accurate forecasters. We conclude that increasing the accessibility of central bank information to the general public is a promising direction for improving central bank communication.

Online Privacy and Information Disclosure by Consumers

I study the welfare and price implications of consumer privacy. A consumer discloses information to a multi-product seller, which learns about the consumer's preferences, sets prices, and makes product recommendations. While the consumer benefits from accurate product recommendations, the seller may use the information to price discriminate. I show that the seller prefers to commit to not using consumer information for pricing to encourage information disclosure. However, this commitment hurts the consumer, who could be better off by pre-committing to withhold some information. In contrast to single-product models, total surplus may be lower if the seller can base prices on information.

Systemic Risk and Collateral Adequacy

Many derivatives markets use collateral requirements calculated with industry-standard but dated methods that are not designed with systemic risk in mind. This paper explores whether the conservative nature of conventional collateral requirements outweighs their lack of consideration of systemic risk.

To investigate this issue, we calculate a new systemic risk metric: the expected systemic market shortfall. We analyze the composition of systemic risk across firms both before and after applying conventional collateral requirements.

Our results show that the conservative nature of conventional collateral levels does buffer systemic risk adequately and results in only small risk spillovers above collateral. These spillovers do not meaningfully add to banks' pre-existing systemic risk. We verify the robustness of this result by exploring alternative systemic risk measures, allowing for an implausibly large margin of error. Even under the most extreme scenario, the maximum market-wide shortfall in excess of collateral barely reaches 1 per cent of banks' market capitalization. This maximum shortfall therefore does not exceed the effect of a 1 per cent decline in stock price.

UPCOMING EVENTS

Bernabe Lopez-Martin (Central Bank of Chile)

Organizer: Christopher Hajzler (INT)

Date: 2 July 2019

Saskia ter Ellen (Norges Bank)

Organizer: Yuko Imura (INT)

Date: 16 July 2019

Falko Fecht (Frankfurt School of Finance and Management)

Organizer: Sofia Priazhkina (FSD)

Date: 28 August 2019

Charles Martineau (University of Toronto, Rotman School of
Management)

Organizer: Rodrigo Sekkel (FMD)

Date: 5 September 2019

Marc Giannoni (Federal Reserve Bank of Dallas)

Organizer: José Dorich (CEA)

Date: 6 September 2019

Ben Lester (Federal Reserve Bank of Philadelphia)

Organizer: Jean-Sébastien Fontaine (FMD)

Date: 12 September 2019

David Berger (Northwestern University, Department of Economics)

Organizer: Anthony Landry (CEA)

Date: 12 September 2019

Lucian (Luke) Taylor (University of Pennsylvania, Wharton Business
School)

Organizer: Jon Witmer (FMD)

Date: 26 September 2019

Giorgio Primiceri (Northwestern University, Department of
Economics)

Organizer: Joel Wagner (CEA)

Date: 27 September 2019

Domenico Giannone (Federal Reserve Bank of New York)

Organizer: Rodrigo Sekkel (FMD)

Date: 2 October 2019

Michael Koetter (Halle Institute for Economic Research)

Organizer: Radoslav Raykov (FSD)

Date: 3 October 2019

Patrick Augustin (McGill University, Desautels Faculty of
Management)

Organizer: Corey Garriott (FMD)

Date: 10 October 2019

Ufuk Akcigit (University of Chicago, Department of Economics)

Organizer: Ben Tomlin (CEA)

Date: 11 October 2019

James Cloyne (University of California Davis, Department of
Economics)

Organizer: Nuno Marques da Paixao (FSD)

Date: 15 October 2019

Robert Marquez (University of California Davis, Graduate School of
Management)

Organizer: Thibaut Duprey (FSD)

Date: 24 October 2019

Virgiliu Midrigan (New York University, Department of Economics)

Organizer: Katsiaryna Kartashova (CEA)

Date: 25 October 2019

Haelim Anderson (Federal Deposit Insurance Corporation)

Organizer: Jason Allen (FMD)

Date: 31 October 2019

Morten Ravn (University College London, Department of Economics)

Organizer: Martin Küncl (CEA)

Date: 15 November 2019

Catherine Tucker (Massachusetts Institute of Technology, Sloan
School of Management)

Organizer: Shota Ichihashi (CEA)

Date: 19 November 2019