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Bank of Canada Monthly Research Update

December 2018

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

Chu, Ba & Huynh, Kim P. & Jacho-Chavez, David T. & Kryvtsov, Oleksiy, "On the evolution of the United Kingdom price distributions", Annals of Applied Statistics, Volume 12(4), 2018, p. 2618-2646

Crucini, Mario J. & Landry, Anthony "Accounting for Real Exchange Rates Using Micro-Data", Journal of International Money and Finance, Volume 91, March 2019, p. 86-100

Huynh, Kim P. & Paligorova, Teodora & Petrunia, Robert, "Debt financing in private and public firms", Annals of Finance, Volume 14(4), November 2018, p. 465-487

Pichette, Lise & Robitaille, Marie-Noëlle & Salameh, Mohanad & St-Amant, Pierre, "Dismiss the output gaps? To use with caution given their limitations", Economic Modelling, Volume 76, January 2019, p. 199-215

Raykov, Radoslav, "Reducing margin procyclicality at central counterparties", Journal of Financial Market Infrastructures, Volume 7(2), December 2018, p. 43-59

Velásquez-Giraldo, Mateo & Canavire-Bacarreza, Gustavo & Huynh, Kim P. & Jacho-Chavez, David T. "Flexible Estimation of Demand Systems: A Copula Approach", Journal of Applied Econometrics, Volume 33(7), November 2018, p. 1109-1116

Forthcoming

Alexander, Patrick & Keay, Ian, "Responding to the First Era of Globalization: Canadian Trade Policy, 1870–1913", Journal of Economic History

Boutros, Michael & Witmer, Jonathan, "Monetary Policy Implementation in a Negative Rate Environment", Journal of Money, Credit and Banking

Benedict, Craig & Crucini, Mario J. & Landry, Anthony, "On What States do Prices Depend? Answers from Ecuador", Journal of Money, Credit and Banking

Cerezetti, Fernando & Lopez, Jorge Cruz & Manning, Mark & Murphy, David, "Who Pays? CCP Resource Provision in the Post-Pittsburgh World", Journal of Financial Market Infrastructures

Henry, Christopher S. & Huynh, Kim P. "Bitcoin Awareness and Usage in Canada: An update", Journal of Investing

Chen, Heng & Huynh, Kim P. & Shy, Oz, "Cash versus card: Payment discontinuities and the burden of holding coins", Journal of Banking and Finance

STAFF WORKING PAPERS

Cateau, Gino & Shukayev, Malik, "Limited Commitment, Endogenous Credibility and the Challenges of Price-level Targeting", Bank of Canada Staff Working Paper 2018-61

Xie, Erhao "Inference in Games Without Nash Equilibrium: An Application to Restaurants' Competition in Opening Hours", Bank of Canada Staff Working Paper 2018-60

Gao, Xiaodan & Xu, Shaofeng, "The Role of Corporate Saving over the Business Cycle: Shock Absorber or Amplifier?", Bank of Canada Staff Working Paper 2018-59

Kahn, Charles M. & Rivadeneyra, Francisco & Wong, Tsz-Nga, "Should the Central Bank Issue E-money?", Bank of Canada Staff Working Paper 2018-58

STAFF DISCUSSION PAPERS

Carter, Thomas J. & Mendes, Rhys R. & Schembri, Lawrence, "Credibility, Flexibility and Renewal: The Evolution of Inflation Targeting in Canada", Bank of Canada Staff Discussion Paper 2018-18

Henry, Christopher & Huynh, Kim & Welte, Angelika, "2017 Methods-of-Payment Survey Report", Bank of Canada Staff Discussion Paper 2018-17

Webley, Taylor "Fundamental Drivers of Existing Home Sales in Canada", Bank of Canada Staff Discussion Paper 2018-16

Garriott, Corey & Lefebvre, Sophie & Nolin, Guillaume & Rivadeneyra, Francisco & Walton, Adrian, "Alternative Futures for Government of Canada Debt Management", Bank of Canada Staff Discussion Paper 2018-15

ABSTRACTS

On the evolution of the United Kingdom price distributions

We propose a functional principal components method that accounts for stratified random sample weighting and time dependence in the observations to understand the evolution of distributions of monthly micro-level consumer prices for the United Kingdom (UK). We apply the method to publicly available monthly data on individual-good prices collected in retail stores by the UK Office for National Statistics for the construction of the UK Consumer Price Index from March 1996 to September 2015. In addition, we conduct Monte Carlo simulations to demonstrate the effectiveness of our methodology. Our method allows us to visualize the dynamics of the price distribution and uncovers interesting patterns during the sample period. Further, we demonstrate the efficacy of our methodology with an out-of-sample forecasting algorithm that exploits the time dependence of distributions. Our out-of-sample forecast compares favorably with the random walk forecast.

Accounting for Real Exchange Rates Using Micro-Data

The classical dichotomy predicts that all of the time-series variance in the aggregate real exchange rate is accounted for by non-traded goods in the consumer price index (CPI) basket because traded goods obey the Law of One Price. In stark contrast, Engel (1999) claimed the opposite: that traded goods accounted for all of the variance. Using micro-data and recognizing that final good prices include both the cost of the goods themselves and local, non-traded inputs into retail such as labor and retail space, our work re-establishes the conceptual value of the classical dichotomy. We also carefully show the role of aggregation, consumption expenditure weighting and assignment of covariance terms in the differences between our findings and those of Engel.

Debt financing in private and public firms

Using administrative confidential data on the universe of Canadian corporate firms, we compare debt financing choices of private and public firms. Private firms have higher leverage ratios, which are entirely driven by private firms’ stronger reliance on short-term debt. Further, private firms rely more of leverage during economic expansions, while public firms rely on equity financing. Specifically, private firms manage to increase their long-term debt during expansions, while short-term debt is used during downturns. Our findings have implications for a better understanding of the role of asymmetric information in private firms’ capital structure decisions.

Dismiss the output gaps? To use with caution given their limitations

The link between inflation and the output gap is central to the conduct of monetary policy. In this paper, we use a new real-time database for Canada to study various output gap measures. We analyze output gap revisions and assess the usefulness of these gaps in forecasting total CPI inflation and three newly developed measures of core CPI inflation: CPI-median, CPI-trim and CPI-common. We also consider labour input gaps, projected output gaps, and simple combinations of output gaps. We find that, when forecasting CPI-common and CPI-trim, some gaps appear to provide information that reduces forecast errors when compared with models that use only lags of inflation. However, forecast improvements are rarely statistically significant. In addition, we find little evidence of the usefulness of output gaps in forecasting inflation measured by total CPI and CPI-median. These results call for cautiousness when central banks use output gaps to forecast inflation as their usefulness is limited.

Reducing margin procyclicality at central counterparties

Many jurisdictions identify margin procyclicality at central counterparties (CCPs) as a potential threat to financial stability. This paper studies the effect of less procyclical margin models on cleared volumes and risk taking in a stylized CCP. It finds that less procyclical margins do not unambiguously improve financial stability, and that the net effect depends on market characteristics (volatility) and CCP member characteristics (risk aversion). A combination of high volatility plus insufficient risk aversion can lead to additional risk taking, creating exposures to the individual participant that cannot be predictably controlled or managed. In turn, this can lead to erosion of confidence in the CCP and motivation for members to flatten out positions or exit. However, as long as the system is outside this special case, which should be avoidable with proper bank regulation, a moderate amount of margin smoothing can actually stimulate trading, helping restore market confidence.

Flexible Estimation of Demand Systems: A Copula Approach

In this paper we study the own-price elasticity for gasoline in demand systems involving three expenditure categories in the transportation sector in Canada: gasoline, local transportation, and intercity transportation for Canadian households from 1997 to 2009. In particular, we conduct a replication of Chang and Serletis, (The demand for gasoline: Evidence from household survey data, Journal of Applied Econometrics, 2014, 29, 291–343) hereafter CS, who—using TSP version 5.1—estimated Deaton and Muellbauer, 's Almost Ideal Demand System (AIDS) (American Economic Review, 1980, 70, 312–326), Banks et al., 's Quadratic AIDS (Review of Economics and Statistics, 1997, 79, 527–539), and Barnett, 's Minflex Laurent (ML) (Journal of Business and Economic Statistics, 1983, 1, 7–23) models to demand systems consisting of these three goods, analyzing and enforcing theoretical economic regularity—that is, the compliance of estimates with positivity, monotonicity, and curvature. Using the R statistical language instead, we found that our estimates are similar to those of CS using data for single-member households and married couples without children, but differ for households with one child. (All replicated estimation tables in CS, as well as our full implementation, are available as supplementary material in the online version of this paper.) However, using a more flexible copula model, a total of 168 possible specifications for each type of household and their resulting gasoline own-price elasticities are also estimated. We find that allowing for skewness in the marginal distributions of local transportation budget shares greatly improves the Bayesian information criterion (BIC) of our models.

Responding to the First Era of Globalization: Canadian Trade Policy, 1870–1913

In this paper we document Canada's trade policy response to late-nineteenth- and earlytwentieth-century globalization. We link newly digitized annual product-specific data on the value of Canadian imports and duties paid from 1870–1913 to establishment-specific production and location information drawn from the manuscripts of the 1871 industrial census. Our findings reveal a highly selective move towards protectionism following the adoption of the National Policy in 1879. Changes in the Canadian tariff schedule narrowly targeted final consumption goods that had close substitutes produced by relatively large, politically influential domestic manufacturers.

Monetary Policy Implementation in a Negative Rate Environment

To analyze monetary policy implementation in a negative rate environment, we add the option to exchange central bank reserves for cash to the standard workhorse model of monetary policy implementation (Poole, 1968). Importantly, we show that monetary policy can be constrained when the target overnight rate is below the yield on cash. At this point, the overnight rate equals the yield on cash instead of the target rate. Modifications to the implementation framework, such as a reserve requirement that varies with cash withdrawals, can help restore the implementation of monetary policy such that the overnight rate equals the target rate.

On What States Do Prices Depend? Answers From Ecuador

In this paper, we argue that differences in the cost structures across sectors play an important role in firms' decisions to adjust their prices. We develop a menu-cost model of pricing in which retail firms intermediate trade between producers and consumers. An important facet of our analysis is that the labor-cost share of retail production differs across goods and services in the consumption basket. For example, the price of gasoline at the retail pump is predicted to adjust more frequently and by more than the price of a haircut because of the high volatility in wholesale gasoline prices relative to the wages of unskilled labor, even when both retailers face a common menu cost. This modeling approach allows us to account for some of the cross-sectional differences observed in the frequency of price adjustments across goods. We apply this model to Ecuador to take advantage of inflation variations and the rich panel of monthly retail prices.

Who Pays? CCP Resource Provision in the Post-Pittsburgh World

At the Pittsburgh Summit in 2009, G20 countries announced their commitment to clear all standardized over-the-counter (OTC) derivatives through central counterparties (CCPs). Since then, CCPs have become increasingly important and there has been an extensive program of regulatory enhancements to both them and OTC derivatives markets. However, as OTC clearing has grown, tensions have emerged among market participants over CCPs' traditional model of resource provision through loss mutualization. We argue that most of these tensions can be explained by a misalignment between the policy goal of enhancing financial stability and the delivery of that goal by mandating clearing through CCPs as they are currently organized. Specifically, the traditional model for resource provision makes most CCPs suitable for managing club goods, whereas financial stability is a public good. The key differences between these two types of goods, driven by the wedge between those who pay for them and those who derive the benefits, create the observed tensions. Thus, we propose a framework to analyze the functional elements of a CCP and examine whether an alternative clearing model might be more effective in supporting financial stability. We conclude that some tensions could perhaps be mitigated by unbundling the functions of a CCP and selecting the ownership and funding structure that best suits their individual characteristics. Functions that are critical for the provision of financial stability might imply some form of public sector involvement, whereas other services might lend themselves to a for-profit or traditional club model.

Bitcoin Awareness and Usage in Canada: An update

To help monitor the adoption and use of Bitcoin, the Bank of Canada conducted a survey in late 2016 and then again in late 2017. The second survey took place during an interesting time, since Bitcoin prices were increasing and reached an all-time high on December 17, 2017. The level of awareness of Bitcoin rose from 64 per cent in the 2016 Bitcoin Omnibus Survey (BTCOS) to 85 per cent in the 2017 BTCOS, while ownership rose from 2.9 to 5.0 per cent. The main reason survey participants cited for owning Bitcoin changed from transactional purposes in 2016 to investment purposes in 2017. In addition, only about half of Bitcoin owners were regularly using Bitcoin to buy goods or services or to send money to other people. This provides empirical support for the notion that most of the fluctuations in the Bitcoin price are due to speculation. However, self-reported holdings of Bitcoin among users did not change remarkably during the period between surveys.

Cash versus card: Payment discontinuities and the burden of holding coins

This paper provides new insights on consumers payment choice by comparing cost of paying with cash to paying with cards. Our novel method accounts for how much change is received in the form of banknotes and metal coins, assuming that the weight and size of coins are inconvenient to carry. We use the regression discontinuity design approach to estimate the model using the 2013 Bank of Canada Method-of-Payments Survey and find a significant number of cash users who switch to paying with debit or credit cards at transaction values marginally above $5 and $10. We attribute this finding to the burden of receiving coins as change associated with the currency denomination structure. Our proposed methodology is general and can be applied to other countries and institutional details.

Limited Commitment, Endogenous Credibility and the Challenges of Price-level Targeting

This paper studies the cost of limited commitment when a central bank has the discretion to adjust policy whenever the costs of honoring its past commitments become high. Specifically, we consider a central bank that seeks to implement optimal policy in a New Keynesian model by committing to a price-level target path. However, the central bank retains the flexibility to reset the target path if the cost of adhering to it exceeds a social tolerance threshold. We find that endowing the central bank with such discretion undermines the credibility of the price-level target and weakens its effectiveness to stabilize the economy through expectations. The endogenous nature of credibility also brings novel results relative to models with exogenous timing of target resets. A much higher degree of credibility is needed to realize the stabilization benefits of commitment. Multiple equilibria also emerge, including a low credibility equilibrium with frequent target resets and high volatility.

Inference in Games Without Nash Equilibrium: An Application to Restaurants' Competition in Opening Hours

This paper relaxes the Bayesian Nash equilibrium (BNE) assumption commonly imposed in empirical discrete choice games with incomplete information. Instead of assuming that players have unbiased/correct expectations, my model treats a player's belief about the behavior of other players as an unrestricted unknown function. I study the joint identification of belief and payoff functions. I show that in games where one player has more actions than the other player, the payoff function is partially identified with neither equilibrium restrictions nor the usual exclusion restrictions. Furthermore, if the cardinality of players' action sets varies across games, then the payoff and belief functions are point identified up to scale normalizations and the restriction of equilibrium beliefs is testable. For games where action sets are constant across players and observations, I obtain very similar identification results without imposing restrictions on beliefs, as long as the payoff function satisfies a condition of multiplicative separability. I apply this model and its identification results to study the store hours competition between McDonald's and Kentucky Fried Chicken (KFC) in China. The null hypothesis that KFC has unbiased beliefs is rejected. Failing to account for KFC's biased beliefs generates an attenuation bias on estimated strategic effects. Finally, the estimation results of the payoff functions indicate that the decision about store hours is a type of vertical differentiation. By operating through the night, a firm not only attracts night-time consumers but also can steal competitors' daytime customers. This result has implications on the optimal regulation of stores' opening hours.

The Role of Corporate Saving over the Business Cycle: Shock Absorber or Amplifier?

We document countercyclical corporate saving behavior with the degree of countercyclicality varying nonmonotonically with firm size. We then develop a dynamic stochastic general equilibrium model with heterogeneous firms to explain the pattern and study its implications for business cycles. In the presence of financial frictions and fixed operating costs, a persistent negative productivity shock signals low future income and prompts firms to hold more cash in order to preserve financial flexibility and maintain normal operations. This countercyclicality exhibits a hump-shaped relation to firm size. Compared with medium-sized firms, small firms have a higher marginal product of capital and thus better investment opportunities, which compete for resources with cash, while large firms have more pledgeable assets and demand less cash. We find that, on average, firms accumulate cash by cutting investment and employment in recessions, which reduces aggregate output and increases economic fluctuations. Corporate saving, therefore, amplifies aggregate shocks.

Should the Central Bank Issue E-money?

Should a central bank take over the provision of e-money, a circulable electronic liability? We discuss how e-money technology changes the tradeoff between public and private provision, and the tradeoff between e-money and a central bank's existing liabilities like bank notes and reserves. The tradeoffs depend on i) the technological setup of the e-money system (as a token or an account; centralized or decentralized); ii) the potential improvement in the implementation and transmission of monetary policy; iii) the risks to safety and privacy from cyber attacks; and iv) the uncertain impact on banks' efficiency and financial stability. The most compelling argument for central banks to issue e-money is to address competition problems in the banking sector.

Credibility, Flexibility and Renewal: The Evolution of Inflation Targeting in Canada

In 1991, Canada became the second country to adopt an inflation target as a central pillar of its monetary policy framework. The regime has proven much more successful than initially expected, both in achieving price stability and in stabilizing the real economy against a wide range of shocks. We identify and discuss three factors that have contributed to this performance:

(i) the simple, readily understood and consistently applied specification of the inflation target, which, since adoption, has taken the form of a point target inside a symmetric control range;
(ii) the establishment of the target in an agreement between the central bank and government, in which inflation control was recognized as a joint duty of both parties, implying key supporting roles for fiscal and macroprudential policy; and
(iii) the agreement's regular and thorough review-and-renewal process, which has led to continual improvement based on accumulated experience and advances in the academic literature.

Together, these factors have helped anchor inflation expectations around a credible target. This anchoring has in turn made it easier for monetary policy to stay on target, setting a powerful virtuous cycle into motion. An additional benefit is that well-anchored inflation expectations leave monetary policy with greater flexibility to consider its impacts on output and employment variability, as well as financial stability. Nonetheless, certain features of the current economic landscape—including low equilibrium real interest rates and high debt burdens in key sectors—now present monetary policy in Canada and other jurisdictions with significant challenges. We discuss these issues and argue that they require inflation-targeting central banks to give careful thought to the steps that can be taken to refine and strengthen their policy frameworks, widen their toolkits and best ensure complementarity with other macrofinancial policies.

2017 Methods-of-Payment Survey Report

As the sole issuer of bank notes, the Bank of Canada conducts Methods-of-Payment (MOP) surveys to obtain a detailed and representative snapshot of Canadian payment choices, with a focus on cash usage. The 2017 MOP Survey is the third iteration. This paper finds that the overall cash volume and value shares are 33 per cent and 15 per cent, respectively. These results highlight the ongoing decrease of cash usage in terms of volume and value compared with 2009 (54 per cent and 23 per cent, respectively) and 2013 (44 per cent and 23 per cent, respectively). Consumers still rate cash as an easy-to-use, low-cost, secure and widely accepted payment method, and it is commonly used among respondents who are aged 55 and above, have an income of less than $45,000, have only a high school education, or have a low rate of financial literacy.

The paper also provides comprehensive details on Canadians' adoption and use of payment innovations such as contactless credit and debit cards, as well as mobile and online payments.

Fundamental Drivers of Existing Home Sales in Canada

Existing home sales' share of Canada's economic pie has been rising in recent years, and variation around this trend has resulted in outsized contributions to changes in real gross domestic product (GDP). In this context, we use a cointegration framework to estimate the level of resale activity across the Canadian provinces that is supported by fundamentals—namely, full-time employment, housing affordability and migration flows—to help look through the volatility. The results suggest that, over longer horizons, resales activity and these fundamentals share a stable relationship, although deviations are sometimes persistent. We also find a robust and positive relationship between house price growth and deviations of existing home sales from fundamentals. While predicting quarterly changes in resales remains very difficult, provincial models improve upon national and naïve benchmarks and provide a useful framework for identifying risks to GDP growth that stem directly from the resale market.

Alternative Futures for Government of Canada Debt Management

This paper presents four blue-sky ideas for lowering the cost of the Government of Canada's debt without increasing the debt's risk profile. We argue that each idea would improve the secondary-market liquidity of government debt, thereby increasing the demand for government bonds and thus lowering their cost at issuance. The first two ideas would improve liquidity by enhancing the active management of the government's debt through market operations used to support the liquidity of outstanding bonds. The second two ideas would simplify the set of securities issued by the government, concentrating issuance in a smaller set of bonds that would each be more highly traded. We discuss the ideas and give an account of the political, legal and operational impediments.

UPCOMING EVENTS

Christopher Rauh (University of Montreal), 23 March 2019
Organizer: Gabriella Galassi (CEA)

Simon Gilchrist (NYU), 5 April 2019
Organizer: Anthony Landry (CEA)

Alexander Bick (Arizona State University), 1 May 2019
Organizer: Natalia Kyui (CEA)

Michael Kiley (Federal Reserve Board), 10 May 2019
Organizer: Laurent Martin (CEA)

Linda Tesar (University of Michigan), 21 June 2019
Organizer: Daniela Hauser (CEA)

David Berger (Northwestern), 13 September 2019
Organizer: Anthony Landry (CEA)

Giorgio Primiceri (Northwestern), 27 September 2019
Organizer: Joel Wagner (CEA)

Catherine Tucker (MIT), 19 November 2019
Organizer: Shota Ichihashi (CEA)