



BANK OF CANADA  
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# Bank of Canada Monthly Research Update

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February 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

### Forthcoming

Grundl, Serafin & Zhu, Yu, "Identification and Estimation of Risk Aversion in First-Price Auctions with Unobserved Heterogeneity", *Journal of Econometrics*

Wagner, Joel, "What does a relative price of investment wedge reveal about the role of investment-specific technology?", *B.E. Journal of Macroeconomics*

## STAFF WORKING PAPERS

Ichihashi, Shota, "Limiting Sender's Information in Bayesian Persuasion", *Bank of Canada Staff Working Paper 2019-10*

Hommel, Cars & Lustenhouwer, Joep, "Inflation Targeting and Liquidity Traps Under Endogenous Credibility", *Bank of Canada Staff Working Paper 2019-9*

Schroth, Josef, "Macroprudential Policy with Capital Buffers", *Bank of Canada Staff Working Paper 2019-8*

Park, Youngmin, "Inequality in Parental Transfers, Borrowing Constraints and Optimal Higher Education Subsidies", *Bank of Canada Staff Working Paper 2019-7*

## STAFF DISCUSSION PAPERS

Chapman, James & Wilkins, Carolyn A., "Crypto 'Money': Perspective of a Couple of Canadian Central Bankers", *Bank of Canada Staff Discussion Paper 2019-1*

## ABSTRACTS

### *Identification and Estimation of Risk Aversion in First-Price Auctions with Unobserved Heterogeneity*

This paper shows point identification in first-price auction models with risk aversion and unobserved auction heterogeneity by exploiting multiple bids from each auction and variation in the number of

bidders. The required exclusion restriction is shown to be consistent with a large class of entry models. If the exclusion restriction is violated, but weaker restrictions hold instead, the same identification strategy still yields valid bounds for the primitives. We propose a sieve maximum likelihood estimator. A series of Monte Carlo experiments illustrate that the estimator performs well in finite samples and that ignoring unobserved auction heterogeneity can lead to a significant bias in risk-aversion estimates. In an application to U.S. Forest Service timber auctions we find that the bidders are risk neutral, but we would reject risk neutrality without accounting for unobserved auction heterogeneity.

### *What does a relative price of investment wedge reveal about the role of investment-specific technology?*

In order to identify investment-specific technology (IST), most DSGE models assume a perfect inverse relationship between IST and the relative price of investment (RPI). This paper explores this relationship and provides evidence that the RPI also responds to changes in market power, which I find constitutes a third of volatility in the RPI. To corroborate this conclusion, two competing models are produced; the first is a two-sector model with a wedge separating the identification of IST with the inverse of the RPI. The RPI wedge is then estimated using Bayesian estimation techniques. A second, richer two-sector model is produced, where firms can vary markups depending on the number of competitors. This paper finds that changes in relative markups are highly correlated with the RPI wedge and help explain the sudden increase in the RPI following the Great Recession in the United States. In addition, with endogenous price markups, non-IST shocks can explain over a third of the volatility observed in the RPI, with marginal efficiency of investment contributing approximately 30 percent of the volatility in the RPI.

### *Limiting Sender's Information in Bayesian Persuasion*

This paper studies how the outcome of Bayesian persuasion depends on a sender's information. I study a game in which, prior to the sender's information disclosure, the designer can restrict the most informative signal that the sender can generate. In the binary action case, I consider arbitrary preferences of the designer and characterize all equilibrium outcomes. As a corollary, I solve a problem of how to maximize a receiver's payoffs by restricting the sender's information: Whenever the designer can increase the receiver's payoffs by restricting the sender's information, the receiver-

optimal way coincides with an equilibrium of the game in which the receiver persuades the sender.

### *Inflation Targeting and Liquidity Traps Under Endogenous Credibility*

Policy implications are derived for an inflation-targeting central bank, whose credibility is endogenous and depends on its past ability to achieve its targets. This is done in a New Keynesian framework with heterogeneous and boundedly rational expectations. We find that the region of allowed policy parameters is strictly larger than under rational expectations. However, when the zero lower bound on the nominal interest rate is accounted for, self-fulfilling deflationary spirals can occur, depending on the credibility of the central bank. Deflationary spirals can be prevented with a high inflation target and aggressive monetary easing.

### *Macroprudential Policy with Capital Buffers*

This paper studies optimal bank capital requirements in a model of endogenous bank funding conditions. I find that requirements should be higher during good times such that a macroprudential “buffer” is provided. However, whether banks can use buffers to maintain lending during a financial crisis depends on the capital requirement during the subsequent recovery. The reason is that a high requirement during the recovery lowers bank shareholder value during the crisis and thus creates funding-market pressure to use buffers for deleveraging rather than for maintaining lending. Therefore, buffers are useful if banks are not required to rebuild them quickly.

### *Inequality in Parental Transfers, Borrowing Constraints and Optimal Higher Education Subsidies*

This paper studies optimal education subsidies when parental transfers are unequally distributed across students and cannot be publicly observed. After documenting substantial inequality in parental transfers among US college students with similar family resources, I examine its implications for how the education subsidy should vary with schooling level and family resources to minimize inefficiencies generated by borrowing constraints. Unobservable heterogeneity in parental transfers creates a force to heavily subsidize low schooling levels chosen by borrowing constrained students with low parental transfers. This force is stronger for rich families, but it is weakened if heterogeneity in returns to schooling also leads to different schooling

choices. These mechanisms are quantified using a calibrated model. Quantitative analysis suggests a reform that reallocates public spending toward the first two years of college. The reform also reduces the gap in subsidy amounts by parental income during early years of college.

### *Crypto 'Money': Perspective of a Couple of Canadian Central Bankers*

The market for cryptoassets has exploded in size in the 10 years since bitcoin was launched. The technology underlying cryptoassets, blockchain, has also been held up as a technology that promises to transform entire industries. In this paper we examine what is new about cryptoassets and their technology and how they may affect core central bank functions. We do this by outlining what we think are the three most important research and policy questions for central bankers around cryptoassets and cryptocurrencies specifically. First, what is fundamentally new about the technology that underpins cryptocurrencies and other cryptoassets? Second, how do cryptocurrencies affect a central bank's role in the economy? Third, given the two challenges of a rise of cryptoassets and a decline in the use of cash, should digital payments be left entirely to the private sector or should central banks issue their own digital currencies? We discuss these three policy questions and highlight what aspects of them are most important to central bankers. Finally, we raise several new questions to help guide researchers in studying cryptoassets and their underlying technology.

## UPCOMING EVENTS

Joseph Steinberg (University of Toronto), 1 March 2019  
Organizer: Oleksiy Kryvtsov (INT)

Kristian Behrens (Université du Québec à Montréal), 8 March 2019  
Organizer: Alexander Chernoff (INT)

Marco Bonomo (Insper), 15 March 2019  
Organizer: Oleksiy Kryvtsov (INT)

Christopher Rauh (University of Montreal), 29 March 2019  
Organizer: Gabriela Galassi (CEA)

Darrell Duffie (Stanford), 2 April 2019  
Organizer: Jean-Sébastien Fontaine (FMD)

Simon Gilchrist (New York University), 5 April 2019  
Organizer: Anthony Landry (CEA)

Mathieu Parenti (Université Libre de Bruxelles), 9 April 2019  
Organizer: Alexander Chernoff (INT)

B. Ravikumar (Federal Reserve Bank of St. Louis), 12 April 2019  
Organizer: Lin Shao (INT)

Daniel Andrei (McGill Desautels), 18 April 2019  
Organizer: Guihai Zhao (FMD)

Stela Rubinova (World Trade Organization), 23 April 2019  
Organizer: Alexander Chernoff (INT)

David M. Arseneau (Federal Reserve Board), 25 April 2019  
Organizer: Corey Garriott & Jason Allen (FMD)

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

Yueran Ma (Chicago Booth), 2 May 2019  
Organizer: Guihai Zhao (FMD)

Michael Waugh (New York University), 3 May 2019  
Organizer: Walter Steingress (INT)

Toni M. Whited (University of Michigan), 9 May 2019  
Organizer: Jason Allen (FMD)

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

Olivier Coibion (University of Texas at Austin), 16 May 2019  
Organizer: Lerby (Murat) Ergun (FMD)

Gregory R. Duffee (John Hopkins University), 23 May 2019  
Organizer: Jean-Sébastien Fontaine (FMD)

Oleksandr Talavera (Swansea University), 31 May 2019  
Organizer: Oleksiy Kryvtsov (INT)

Cedric Tille (The Graduate Institute Geneva), 7 June 2019  
Organizer: Gurnain Pasricha (INT)

Adriana Z. Robertson (University of Toronto), 13 June 2019  
Organizer: Corey Garriott & Jason Allen (FMD)

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

Domenico Giannone (Federal Reserve Bank of New York), 27 June 2019  
Organizer: Rodrigo Sekkel (FMD)

Ben Lester (Federal Reserve Bank of Philadelphia), 12 September 2019  
Organizer: Jean-Sébastien Fontaine (FMD)

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

Lucian (Luke) Taylor (Wharton), 26 September 2019  
Organizer: Jon Witmer (FMD)

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

Patrick Augustin (McGill Desautels), 3 October 2019  
Organizer: Corey Garriott (FMD)

Catherine Tucker (Massachusetts Institute of Technology), 19  
November 2019  
Organizer: Shota Ichihashi (CEA)