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# Bank of Canada
# Monthly Research Update

October 2022

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

Jonathan Chiu & Charles M. Kahn & Thorsten V. Koeppl, "Grasping decentralized finance through the lens of economic theory", Canadian Journal of Economics, Vol 55(4): 1702-1728, November 2022

Jonathan Chiu & Thorsten V. Koeppl, "The economics of cryptocurrencies: Bitcoin and beyond", Canadian Journal of Economics, Vol 55(4): 1762-1798, November 2022

Serdar Kabaca & Renske Maas & Kostas Mavromatis & Romanos Priftis, "Optimal quantitative easing in a monetary union", European Economic Review, Vol 152, February 2023

## Forthcoming

Neville Arjani & Fuchun Li & Zhentong Lu, "Quantifying the economic benefits of payments modernization: the case of the large-value payment system", Journal of Financial Market Infrastructures

Zhentong Lu & Xiaoxia Shi & Jing Tao, "Semi-nonparametric estimation of random coefficient logit model for aggregate demand", Journal of Econometrics

# STAFF WORKING PAPERS

Jonathan Chiu & Charles M. Kahn & Thorsten Koeppl, "Grasping De(centralized) Fi(nance) Through the Lens of Economic Theory", Bank of Canada Staff Working Paper 2022-43

Daniela Balutel & Walter Engert & Christopher Henry & Kim Huynh & Marcel Voia, "Private Digital Cryptoassets as Investment? Bitcoin Ownership and Use in Canada, 2016-2021", Bank of Canada Staff Working Paper 2022-44

# ABSTRACTS

## *Grasping decentralized finance through the lens of economic theory*

In this viewpoint article, we provide an analysis of the value proposition of decentralized finance (DeFi) and its limitations using a simple stylized model of collateralized lending. DeFi uses a decentralized ledger to run smart contracts that automatically enforce the terms of a lending contract and safeguard the collateral. DeFi can lower the costs associated with intermediated lending and improve financial inclusion. Limitations are the volatility of crypto collateral and stablecoins used for settlement, the possible incompleteness of smart contracts and the lack of a reliable oracle. A proper infrastructure reducing such limitations could improve the value of DeFi.

## *The economics of cryptocurrencies: Bitcoin and beyond*

How well can a cryptocurrency serve as a means of payment? Cryptocurrencies need to overcome double-spending by costly mining and by delaying settlement. We formalize this insight through an incentive constraint that rules out double-spending and pins down the welfare costs of a cryptocurrency. We find that it is optimal to use seignorage rather than transaction fees to finance costly mining. In supplementary material, we study an extension with endogenous transaction fees and show quantitatively that the prime cost of Bitcoin arises from mining, but can be reduced substantially by optimally designing the reward system.

## *Optimal quantitative easing in a monetary union*

This paper explores the optimal allocation of government bond purchases within a monetary union, using a two-region DSGE model, where regions are asymmetric with respect to portfolio characteristics: the extent of substitutability between assets of different maturity and origin, asset home bias, and levels of government debt. An optimal QE policy under commitment does not only reflect different region sizes, but is also a function of these portfolio characteristics. By calibrating the model to the euro area, we show that optimal QE favors purchases from the smaller region (Periphery instead of Core), given that the former faces stronger portfolio frictions.

## *Quantifying the economic benefits of payments modernization: the case of the large-value payment system*

In this paper, we develop a discrete choice framework to quantify the economic benefits of payments modernization in Canada. Focusing on Canada's large-value transfer system (LVTS), we first estimate participants' preferences for liquidity cost, payment safety and the network effect by exploiting intraday variations in the relative choice probabilities of the two substitutable sub-systems in the LVTS (i.e., Tranches 1 and 2). Then, with the estimated model, we conduct counterfactual simulations to calculate the changes in participants' welfare when the LVTS is replaced by a real-time gross settlement system (RTGS), like Lynx (as an important part of the payments modernization initiative). The results show that, first, compared to the old system, Lynx has higher liquidity costs but is more secure, while the former is considered a more important factor by system participants. Second, when over 90% of current LVTS payments migrate to Lynx, there is an overall welfare gain; however, it maybe difficult to achieve such a high migration ratio in the new market equilibrium. Third, accounting for equilibrium adjustment, about a 75% service level improvement is needed to generate overall net economic benefits to participants. Among other things, adopting a liquidity savings mechanism and reducing risks in the new system could help achieve this improvement. Finally, the welfare changes are quite heterogeneous, especially between large and small participants.

### *Semi-nonparametric estimation of random coefficient logit model for aggregate demand*

In this paper, we propose a two-step semi-nonparametric estimator for the widely used random coefficients logit demand model. The approach applies to the same setup as Berry, Levinsohn, and Pakes (1995, BLP)-type of models with many products, but has the advantage of not requiring computing demand inversion. In particular, the first step of our approach estimates the fixed coefficients via a computationally very easy linear sieve generalized method of moments (GMM). The second step uncovers the distribution of the random coefficient via a sieve minimum distance or GMM procedure. We show identification and derive the asymptotic properties of the estimator in a large market environment. Monte Carlo simulations and empirical illustrations support the theoretical results and demonstrate the usefulness of our estimator in practice.

### *Grasping De(centralized) Fi(nance) Through the Lens of Economic Theory*

In this article, we use a simple stylized model of collateralized lending to analyze the value proposition and limitations of decentralized finance (DeFi). DeFi uses a decentralized ledger to run smart contracts that automatically enforce the terms of a lending contract and safeguard the collateral. DeFi can lower the costs associated with intermediated lending and improve financial inclusion. Limitations are the volatility of the crypto collateral and stablecoins used for settlement, the possible incompleteness of smart contracts and the lack of a reliable oracle. A proper infrastructure reducing such limitations could improve the value of DeFi.

### *Private Digital Cryptoassets as Investment? Bitcoin Ownership and Use in Canada, 2016-2021*

This report studies the dynamics of Bitcoin awareness and ownership from 2016 to 2021, using the Bank of Canada's Bitcoin Omnibus Surveys (BTCOS). In 2021, Canadians' awareness of Bitcoin remained stable at about 90%, while ownership increased to 13% from the 5% observed in 2018-2020. Canadian Bitcoin owners in 2021 were more likely to be male, aged 18 to 34 years old, with a university degree or high income. They largely see Bitcoin as an investment. A new question added to the 2021 BTCOS helps us understand the influx of investors to the Bitcoin market. Responses to this question show that roughly half of current Bitcoin owners invested during the COVID-19 pandemic (2020-2021). These recent owners differ in several ways from long-term owners. Finally, we document the broader economic context of the increase in Bitcoin ownership: widespread increases in savings and wealth by Canadian households during the pandemic, coupled with financial technology (fintech) companies providing accessible and user-friendly platforms for buying Bitcoin.

## UPCOMING EVENTS

Matteo Benetton (UC Berkeley)
Organizer: BAP Hybrid Speaker
Date: 1 November 2022

Bank of Canada Annual Economic Conference
Date: 3-4 November 2022

Lu Liu (University of Pennsylvania)
Organizer: FMD/FSD EFR Seminar Series
Date: 10 November 2022

Diversity and Inclusion in Economics, Finance and Central Banking Conference
Date: 14-15 November 2022

Karel Mertens (Federal Reserve Bank of Dallas)
Organizer: CEA/INT EFR Seminar Series
Date: 18 November 2022

Evan Dudley (Queen's University)
Organizer: FMD/FSD EFR Seminar Series
Date: 22 November 2022

Fatih Guvenen (Minnesota)
Organizer: CEA/INT EFR Seminar Series
Date: 2 December 2022

Thomas M. Eisenbach (Federal Reserve Bank of New York)
Organizer: FMD/FSD EFR Seminar Series
Date: 6 December 2022

Todd Keister (Rutgers University)
Organizer: BAP Hybrid Speaker
Date: 9 December 2022

Ken Kikkawa (University of British Columbia, Sauder)
Organizer: CEA/INT EFR Seminar Series
Date: 9 December 2022