

Research Update

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A Survey of Fintech Research and Policy Discussion

The intersection of finance and technology, known as fintech, has resulted in the dramatic growth of innovations and has changed the entire financial landscape. While fintech has a critical role to play in democratizing credit access to the unbanked and thin-file consumers around the globe, those consumers who are currently well served also turn to fintech for faster services and greater transparency. Fintech, particularly the blockchain, has the potential to be disruptive to financial systems and intermediation. Our aim in this paper is to provide a comprehensive fintech literature survey with relevant research studies and policy discussion around the various aspects of fintech. The topics include marketplace and peer-to-peer lending, credit scoring, alternative data, distributed ledger technologies, blockchain, smart contracts, cryptocurrencies and initial coin offerings, central bank digital currency, robo-advising, quantitative investment and trading strategies, cybersecurity, identity theft, cloud computing, use of big data and artificial intelligence and machine learning, identity and fraud detection, anti-money laundering, Know Your Customers, natural language processing, regtech, insuretech, sandboxes, and fintech regulations.

WP 20-21. Franklin Allen, Imperial College London; Xian Gu, Central University of Finance and Economics and the University of Pennsylvania; Julapa Jagtiani, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

Forecasting Consumption Spending Using Credit Bureau Data

This paper considers whether the inclusion of information contained in consumer credit reports might improve the predictive accuracy of forecasting models for consumption spending. To investigate the usefulness of aggregate consumer credit information in forecasting consumption spending, this paper sets up a baseline forecasting model. Based on this model, a simulated real-time, out-of-sample exercise is conducted to forecast one-quarter-ahead consumption spending. The exercise is run again after the addition of credit bureau variables to the model. Finally, a comparison is made to test whether the model using credit bureau data produces lower or higher root-mean-squared-forecast errors than the baseline model. Key features of the analysis include the use of real-time data, out-of-sample forecast tests, a strong parsimonious benchmark model, and data that span more than two business cycles. Our analysis reveals evidence that some credit bureau variables may be useful in improving forecasts of consumption spending in certain subperiods and for some categories of consumption spending, especially for services. Also, the use of credit bureau variables sometimes makes the forecasts significantly worse by adding noise into the forecasting models.

WP 20-22. Dean Croushore, University of Richmond and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Stephanie Wilshusen, Federal Reserve Bank of Philadelphia Consumer Finance Institute.

The Cyclicity of Labor Force Participation Flows: The Role of Labor Supply Elasticities and Wage Rigidity

Using a representative-household search and matching model with endogenous labor force participation, we study the cyclicity of labor market transition rates between employment, unemployment, and nonparticipation. When interpreted through the lens of the model, the behavior of transition rates implies that the participation margin is strongly countercyclical: The household's incentive to send more workers to the labor force falls in expansions. We identify two key channels through which the model delivers this result: (i) the procyclical values of nonmarket activities and (ii) wage rigidity. The smaller the value of the extensive-margin labor supply elasticity is, the stronger the first channel is. Wage rigidity helps because it mitigates increases in the return to market work during expansions. Our estimated model replicates remarkably well the behavior of transition rates between the three labor market states and thus the stocks, once these two features are in place.

Supersedes Working Paper 19-03.

WP 20-23. Isabel Cairó, Board of Governors of the Federal Reserve System; Shigeru Fujita, Federal Reserve Bank of Philadelphia Research Department; Camilo Morales-Jiménez, Board of Governors of the Federal Reserve System.

Rational Inattention via Ignorance Equivalence

We present a novel approach to finite rational inattention (RI) models based on the ignorance equivalent, a fictitious action with state-dependent payoffs that effectively summarizes the optimal learning and conditional choices. The ignorance equivalent allows us to recast the RI problem as a standard expected utility maximization over an augmented choice set called the learning-proof menu, yielding new insights regarding the behavioral implications of RI, in particular as new actions are added to the menu. Our geometric approach is also well suited to numerical methods, outperforming existing techniques in terms of both speed and accuracy, and offering robust predictions on the most frequently implemented actions.

WP 20-24. Roc Armenter, Federal Reserve Bank of Philadelphia Research Department; Michèle Müller-Ippen, University of Notre Dame; Zachary R. Stangebye, University of Notre Dame.

Identification Through Sparsity in Factor Models

Factor models are generally subject to a rotational indeterminacy, meaning that individual factors are only identified up to a rotation. In the presence of local factors, which only affect a subset of the outcomes, we show that the implied sparsity of the loading matrix can be used to solve this rotational indeterminacy. We further prove that a rotation criterion based on the ℓ_1 -norm of the loading matrix can be used to achieve identification even under approximate sparsity in the loading matrix. This enables us to consistently estimate individual factors, and to interpret them as structural objects. Monte Carlo simulations suggest that our criterion performs better than widely used heuristics, and we find strong evidence for the presence of local factors in financial and macroeconomic datasets.

WP 20-25. Simon Freyaldenhoven, Federal Reserve Bank of Philadelphia Research Department.

Real-Time Forecasting with a (Standard) Mixed-Frequency VAR During a Pandemic

In this paper we resuscitate the mixed-frequency vector autoregression (MF-VAR) developed in Schorfheide and Song (2015) to generate real-time macroeconomic forecasts for the U.S. during the COVID-19 pandemic. The model combines 11 time series observed at two frequencies: quarterly and monthly. We deliberately do not modify the model specification in view of the recession induced by the COVID-19 outbreak. We find that forecasts based on a precrisis estimate of the VAR using data up until the end of 2019 appear to be more stable and reasonable than forecasts based on a sequence of recursive estimates that include the most recent observations. Overall, the MF-VAR outlook is quite pessimistic. The estimated MF-VAR implies that level variables are highly persistent, which means that the COVID-19 shock generates a long-lasting reduction in real activity. Regularly updated forecasts are available at www.donghosong.com/.

WP 20-26. Frank Schorfheide, University of Pennsylvania, CEPR, NBER, PIER, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department; Dongho Song, Johns Hopkins University Carey Business School.

Labor Supply Within the Firm

There is substantial variation in working time even within employer-employee matches, and yet estimates of the Frisch elasticity of labor supply can be near zero. This paper proposes a tractable theory of earnings and working time to interpret these observations. Production complementarities attenuate the response of working time to idiosyncratic, or worker-specific, shocks, but firmwide shocks are mediated by preference parameters. The model can be identified using firm-worker matched data, revealing a Frisch elasticity of around 0.5. A quasi-experimental approach that mimics the design of earlier studies by exploiting only idiosyncratic variation would find an elasticity less than half this.

WP 20-27. Michele Battisti, University of Glasgow; Ryan Michaels, Federal Reserve Bank of Philadelphia Research Department; Choonsung Park, Korea Institute of Finance.

Vacancy Chains

Replacement hiring—recruitment that seeks to replace positions vacated by workers who quit—plays a central role in establishment dynamics. We document this phenomenon using rich microdata on U.S. establishments, which frequently report no net change in their employment, often for years at a time, despite facing substantial gross turnover in the form of quits. We propose a model in which replacement hiring is driven by the presence of a putty-clay friction in the production structure of establishments. Replacement hiring induces a novel positive feedback channel through which an initial rise in vacancy posting induces still more vacancy posting to replace employees who are poached. This vacancy chain in turn induces volatile responses of vacancies, and thereby unemployment, to cyclical shocks.

WP 20-28. Michael W.L. Elsby, University of Edinburgh; Ryan Michaels, Federal Reserve Bank of Philadelphia Research Department; David Ratner, Board of Governors of the Federal Reserve System.

The Firm Size and Leverage Relationship and Its Implications for Entry and Business Concentration

Larger firms (by sales or employment) have higher leverage. This pattern is explained using a model in which firms produce multiple varieties and borrow with the option to default against their future cash flow. A variety can die with a constant probability, implying that bigger firms (those with more varieties) have a lower coefficient of variation of sales and higher leverage. A lower risk-free rate benefits bigger firms more as they are able to lever more and existing firms buy more of the new varieties arriving into the economy. This leads to lower startup rates and greater concentration of sales.

Supersedes Working Paper 19-18.

WP 20-29. Satyajit Chatterjee, Federal Reserve Bank of Philadelphia Research Department; Burcu Eyigungor, Federal Reserve Bank of Philadelphia Research Department.

Bank Stress Test Results and Their Impact on Consumer Credit Markets

Using Federal Reserve (Fed) confidential stress test data, we exploit the gap between the Fed and bank capital projections as an exogenous shock to banks and analyze how this shock is transmitted to consumer credit markets. First, we document that banks in the 90th percentile of the capital gap reduce their new supply of risky credit by 13 percent compared with those in the 10th percentile and cut their overall credit card risk exposure on an annual basis. Next, we show that these banks find alternative ways to remain competitive and attract customers by lowering interest rates and offering more rewards and promotions to select groups of borrowers. Finally, we show that consumers at banks with a gap increase their credit card spending and debt payoff and at the same time experience fewer delinquencies. We also show that our results are generalizable to other lending products, such as mortgages and home equity. Overall, our results demonstrate a positive feedback loop among credit supply, credit usage, and credit performance due to the stress tests.

WP 20-30. Sumit Agarwal, National University of Singapore; Xudong An, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Larry Cordell, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Raluca A. Roman, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

Probability Forecast Combination via Entropy Regularized Wasserstein Distance

We propose probability and density forecast combination methods that are defined using the entropy regularized Wasserstein distance. First, we provide a theoretical characterization of the combined density forecast based on the regularized Wasserstein distance under the Gaussian assumption. Second, we show how this type of regularization can improve the predictive power of the resulting combined density. Third, we provide a method for choosing the tuning parameter that governs the strength of regularization. Lastly, we apply our proposed method to the U.S. inflation rate density forecasting, and illustrate how the entropy regularization can improve the quality of predictive density relative to its unregularized counterpart.

WP 20-31 Revised. Ryan Cumings-Menon, U.S. Census Bureau; Minchul Shin, Federal Reserve Bank of Philadelphia Research Department.

The Credit Card Act and Consumer Debt Structure

We investigate whether the Credit Card Accountability, Responsibility, and Disclosure (CARD) Act of 2009 influenced the debt structure of consumers. By debt structure, we mean the proportion of total available credit from credit cards for each consumer. The act enhances disclosures of contractual and related information and restricts card issuers' ability to raise interest rates or charge late or over-limit fees, primarily affecting nonprime borrowers. Using the credit history via the Federal Reserve Bank of New York/Equifax Consumer Credit Panel during 2006–2016, we find that the average ratio of credit limit on cards to total consumer debt declined for nonprime borrowers in comparison to prime borrowers after the introduction of the CARD Act. The decline did not occur before the bill was first introduced in Congress; it took place afterward and continued through the end of our sample period. The results suggest that the CARD Act likely had an adverse effect on nonprime borrowers.

WP 20-32. Yiwei Dou, New York University; Julapa Jagtiani, Federal Reserve Bank of Philadelphia; Joshua Ronen, New York University; Raman Quinn Maingi, New York University.

Financial Consequences of Identity Theft

We examine how a negative shock from identity theft affects consumer credit market behavior. We show that the immediate effects of fraud on credit files are typically negative, small, and transitory. After those immediate effects fade, identity theft victims experience persistent increases in credit scores and declines in reported delinquencies, with a significant proportion of affected consumers transitioning from subprime-to-prime credit scores. Those consumers take advantage of their improved creditworthiness to obtain additional credit, including auto loans and mortgages. Despite having larger balances, these individuals default on their loans less than prior to identity theft.

Supersedes Working Paper 19-02.

WP 20-33. Nathan Blascak, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Julia Cheney, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Robert Hunt, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Vyacheslav Mikhed, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Dubravka Ritter, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Michael Vogan, Ally Bank.

A World Without Borders Revisited: The Impact of Online Sales Tax Collection on Shopping and Search

I study the effect of closing the online sales tax loophole on online spending and search. Using online shopping data, sales taxes, and Amazon's staggered sales tax collection, I estimate that household price elasticity is -1.9 , implying a 13 percent decline in Amazon's revenues upon sales tax collection. After Amazon collects sales taxes, households increase their spending on Amazon's taxed competitors, but not its untaxed competitors. I find no evidence that households change their browsing or shift their spending offline. Collecting sales taxes online will help governments recapture lost taxes and increase online competition, but will not shift customers back offline.

WP 20-34. Mallick Hossain, Federal Reserve Bank of Philadelphia.