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FROM THE LAB

IN THIS ISSUE

9th Advances in Macro-Finance Tepper-LAEF
conference held September 2018

Over the Counter Markets and Securities 3rd Workshop
conference held October 2018

IN THE NEXT ISSUE

Financing Macroeconomics
conference held November 2018

Trade in Dynamic Stochastic General Equilibrium Models
conference held November 2018

FROM THE LAB



03 Director's Message

Finn Kydland

9th Advances in Macro-Finance Tepper-LAEF Conference

04 Conference Participants

Presentation Summaries

Note: speakers are highlighted in author listings

05 Too Much Skin-in-the-Game? The Effect of Mortgage Market Concentration on Credit and House Prices

Deeksha Gupta

Discussant: Daniel Greenwald

05 Information versus Investment

Stephen J. Terry, Toni M. Whited, and Anastasia A. Zakolyukina

Discussant: Max Croce

06 Long-Term Finance and Investment with Frictional Asset Markets

Julian Kozlowski

Discussant: Konstantin Milbradt

07 Finance in a Time of Disruptive Growth

Nicolae Garleanu and Stavros Panageas

Discussant: Gian Luca Clementi

08 An Information-based Theory of Financial Intermediation

Zachary Bethune, Bruno Sultanum, and Nicholas Trachter

Discussant: Michael Choi

08 A Walrasian Theory of Sovereign Debt Auctions with Asymmetric Information

Harold Cole, Daniel Neuhann, and Guillermo Ordóñez

Discussant: Philip Bond

09 Selection, Leverage, and Default in the Mortgage Market

Arpit Gupta and Christopher Hansman

Discussant: Felipe Severino

10 Employer Credit Checks: Poverty Traps versus Matching Efficiency

Dean Corbae and Andrew Glover

Discussant: Igor Livshits

10 Foreign Investment of U.S. Multinationals: the Effect of Tax Policy and Agency Conflicts

James F. Albertus, Brent Glover, and Oliver Levine

Discussant: Francois Gourio

11 Household Debt Revaluation and the Real Economy: Evidence from a Foreign Currency Debt Crisis

Emil Verner and Gyozo Gyongyosi

Discussant: Stefan Lewellen



Over the Counter Markets and Securities 3rd Workshop

14 Conference Participants

Presentation Summaries

Note: speakers are highlighted in author listings

15 Bottleneck Links, Essential Intermediaries, and Competing Paths of Diffusion in Networks

Mihai Manea

Discussant: Johan Walden

16 Endogenous Specialization and Dealer Networks

Batchimeg Sambalaibat and Artem Neklyudov

17 Unbundling Macroeconomics via Heterogeneous Agents and Input-Output Networks

David Baqaee and Emmanuel Farhi

Discussant: Erik Loualiche

18 Insider Networks

Selman Erol and Michael Lee

Discussant: Bernard Herskovic

19 Dynamic Trading: Price Inertia and Front-Running

Yuliy Sannikov and Andy Skrzypacz

Discussant: Dmitry Livdan

20 Frictional Intermediation in Over-the-Counter Markets

Julien Hugonnier, Benjamin Lester, and Pierre-Olivier Weill

Discussant: Yao Zeng

21 On the Instability of Banks and other Financial Intermediaries

Chao Gu, Cyril Monnet, Ed Nosal and Randall Wright

Discussant: Alberto Teguia

22 Floating Rate Money: The Store-of-Value Premium in Treasury Floating Rate Notes

Matthias Fleckenstein and Francis Longstaff

Discussant: Burton Hollifield

22 Agency in Tangibles

Colin Ward

Discussant: Benjamin Hébert

23 Pledgeability and Asset Prices: Evidence from Chinese Corporate Bond Markets

Hui Chen, Zhou Chen, Zhiguo He, Jinyu Liu and

Rengming Xie

Discussant: Dmitry Orlov



Director's Message

Finn Kydland

One could say that the two conferences summarized in this issue justify the word "Finance" in the name of LAEF (as if such a justification were needed). Both conferences were designed to bring together the leading scholars in the field. One was the 9th annual conference on Advances in Macro-Finance, held alternately over the years in Pittsburgh and in Santa Barbara. The academic organizers were Tetiana Davydiuk, Assistant Professor, and Ariel Zetlin-Jones, Associate Professor, both from the Tepper School of Business at Carnegie Mellon University. When the initiative was taken to the first of these nine annual conferences, primarily by Lars-Alexander Kuehn, CMU, and Nicolas Petrosky-Nadeau, then at CMU but since moved to the San Francisco Fed, many would agree that this conference represented a timely innovation. These days, however, macro-finance-themed conferences have become more common, although I'd be inclined to suggest that our own version represents the "gold standard" in terms of the (growing) quality of the research papers from which the program is selected, and the extent of the interaction that takes place during the conferences.

The second finance oriented conference summarized is the third annual OTC Markets and Securities Conference. The academic organizer of those conferences has always been Batchimeg Sambalaibat, Assistant Professor of Finance at Indiana University. The two conferences summarized here were clearly related in many ways, as one can see from the potential topics suggested in the respective invitations to submit papers. Both made clear that theoretical as well as empirical papers were encouraged. In the case of the macro-finance conference, suggested topic areas were: Impact of financial and investment frictions; labor markets; credit risk and corporate financing; models of risk premia; determinants of income and wealth inequality; household finance; and taxation. In the case of the OTC conference: The design of markets and securities; networks and relationships; information design and disclosure; the industrial organization of financial intermediaries; search theory; financial contracting; and the intersection of these topics with macroeconomics, asset pricing, and corporate finance. In any case, if finance is your area of interest, this is your issue!





Advances in Macro-Finance Tepper-LAEF

September 28–29, 2018

Jim Albertus – Carnegie Mellon
Javier Birchenall – UC Santa Barbara
Philip Bond – University of Washington
Michael Choi – UC Irvine
Gian Luca Clementi – NYU
Harold Cole – University of Pennsylvania
Dean Corbae – UW-Madison
Max Croce – UNC – Chapel Hill
Thomas Cooley – NYU
Tetiana Davydiuk – Carnegie Mellon
Francois Gourio – FRB Chicago
Daniel Greenwald – MIT
Arpit Gupta – NYU
Deeksha Gupta – Carnegie Mellon

Christopher Hansman – Imperial College
Julian Kozlowski – FRB St. Louis
Finn Kydland – UC Santa Barbara
Stefan Lewellen – Penn State and London Business School
Igor Livshits – FRB Philadelphia
Konstantin Milbradt – Northwestern
Stavros Panageas – UC Los Angeles
Peter Rupert – UC Santa Barbara
Felipe Severino - Dartmouth
Stephen J. Terry – Boston University
Nicolas Trachter – FRB Richmond
Emil Verner – MIT
Ariel Zetlin-Jones – Carnegie Mellon

Too Much Skin-in-the-Game? The Effect of Mortgage Market Concentration on Credit and House Prices

Deeksha Gupta



The author develops and calibrates a model where concentration in the mortgage market by government-sponsored

enterprises (GSE) can explain some features of the housing crisis. In the model, the key mechanism involves banks extending credit to risky borrowers in order to boost house prices. The calibrated model explains about half of the boom and bust in house prices and over 90% of lending to sub-prime borrowers during 1991-2009. The paper also shows that more concentrated credit markets coincide with larger and riskier credit booms and busts. Thus, the paper contributes to the macro-prudential policy discussion in the crisis's aftermath.

The author considers an overlapping generation's economy with poorly endowed households that ask for loans, and banks who lend them. Households live for two periods deriving utility from housing when young and from a general consumption good when they are old. A fixed proportion of households receives their endowment when young and the remaining receive it when old. The latter households ask

for loans to satisfy their housing needs. Borrowers can be high or low quality, the latter having a lower expected endowment than the former. Once a generation is born, the expected endowment is common knowledge, which removes any adverse selection from information asymmetries.

The author assumes segmented mortgage markets, so households only borrow from their local bank. Banks do not compete on interest rates but interact strategically on their effects on the housing market in a way similar to Cournot competition. They issue a marginal loan facing a trade-off between the price impact on current mortgages and future loans profitability. In particular, their lending affects house prices, which influences default. The model allows large lenders to internalize this effect.

The author calibrated the model to the 1991-2009 US housing market. The calibrated model matches four stylized facts about the secondary mortgage market and housing prices during the boom. First, there was a simultaneous increase of credit growth, house prices and the debt-to-income ratio. Second, the boom that preceded the recent housing crisis had an unprecedented increase in risky lending. Third, it matches the timing of the boom of risky lending, which started in the early 2000s,

after house prices had been increasing for almost a decade. Finally, lenders in highly concentrated areas continued risky lending after a bad shock hits the economy for a short period.

The audience pointed out that GSEs might have political motivations and have a dual mandate. Thus, it is hard to explain increases in prices without government intervention. They also questioned what happens with risk-averse instead of risk-neutral banks. They showed that income is exogenous in the model, so the debt-to-income ratio only changes by the amount banks borrow, but not from endogenous income shocks. They also mentioned that the assumption that banks are symmetric in the model is very restrictive relative to standard Cournot models. The author mentioned that there is not granular data to identify individual shares. The audience also asked what happens to the results when the model directly incorporates Cournot competition in the mortgage market.

The discussant explained that the paper seems intuitive and have a potentially powerful mechanism, which possibly mattered more in the bust than during the boom. He also suggested solving for the socially optimal allocations and to consider a model with limited liability by lenders, so the risk trade-off is less intense.

Information versus Investment

Stephen J. Terry, Toni M. Whited and Anastasia A. Zakolyukina



The authors study the real effects of information frictions that prevent releasing of information about firm performance.

Firm managers are asked to carry out two tasks by shareholders: making R&D investment choices and disclosing information about firm performance. However, firm managers do not perform these tasks as shareholders expect because of conflicting managerial compensation

incentives. Long-term incentives to make the firm grow by investment coincide with shareholder incentives and are compensated by stocks. Short-term incentives to manipulate information to boost the stock price are not aligned with shareholder incentives and are compensated by

options. To overcome the difficulty in measuring information frictions, the authors examine earnings misreporting since managers distort information either through misreporting firm performance or through distorted investment choices or both.

The authors assume that the firm's revenue, net of variable inputs, is the product of endogenous quality and exogenous productivity in their model. One of the manager's choice variables is R&D investment, which makes quality grow. Intrinsic earnings are given by output minus R&D cost. Also, there are two extra components of earnings which make observed earning different from intrinsic earnings: an exogenous accounting shock and a net distortion in the book value of the firm chosen by the manager. If the manager chooses a positive amount of bias by misreporting, she can be penalized if the misreporting is discovered.

Optimal policies show that if both productivity and accounting shocks are unfavorable, the manager chooses a high level of R&D investment

and negative bias. In contrast, as productivity shocks are getting more favorable, the manager chooses zero manipulation, since it is too costly. Faced with a positive accounting and favorable productivity shock, the manager chooses upward bias and lower R&D investment, since they increase the current stock prices and result in a positive option payoff. The model also shows path dependence. A manager with higher past earnings performance is more likely to earn nothing from her options. As a result, the manager chooses higher investment to increase stock compensation today and downward reporting bias to increase the expected value of newly compensated options.

Using data from Compustat, Equilar, and Audit Analytics, the authors calculate trade-offs between real investment choices and bias in reporting in several counterfactual cases. In the baseline model, managers report bias equal to two percent of sales. With infinite information manipulation cost,

managers manipulate earnings through adjustments to R&D investment only. Then, the investment volatility increases by ten percent, and firm value decreases by half a percent relative to the baseline model. Without options compensation, value-maximizing managers do not manipulate earnings and R&D investment becomes much more stable. The authors also find that an increase in the volatility of investment of half a percentage point decreases bias by one percentage point.

Several audience members asked whether a manager who misreports firm performance has financial disadvantage only upon discovery. One was curious why the authors assume a single type of manager and how multiple types of managers can improve the model. Another audience member asked whether there is a quick way to map the inefficiency in the cross-section. Finally, some members asked why the authors use investment volatility as the best measure of concern.

Long-Term Finance and Investment with Frictional Asset Markets

Julian Kozlowski



In economies with less developed financial systems, such as in emerging economies, borrowing is done through shorter maturities. This

inspires questions of how the level of development of a given financial system influences the average maturity of debt and the relative yields of different maturities. Motivated by these questions, Julian Kozlowski presents a framework that illustrates the relationship between financial system development and bond maturities and yields. The result is a liquidity-based

mechanism for generating an upward sloping yield curve.

In the model, a production sector finances investment using bonds with the same maturity that are sold to investors. They can then sell these bonds in a secondary market to the investors, who face liquidity shocks that make it costly for them to hold bonds, so they want to sell. However, they face search frictions in the secondary market, resulting in the possibility they cannot sell the bonds and are subjected to a holding cost. The expected value of the holding cost an investor faces given they cannot sell and are liquidity constrained increases with the maturity of the bond, and in equilibrium,

raises the yields of bonds with longer maturities, resulting in an upward sloping yield curve and borrowing and investing at shorter maturities.

Using data on corporate bonds in the US and Argentina, Julian estimates the effect of bond maturity length on liquidity spreads to give a quantitative measure of the relationship predicted by the model. This exercise provides evidence of a stronger positive impact of maturity on liquidity spreads in a developing country, Argentina, than in a developed country, the United States. They use these estimates to calibrate the model to show how improving financial development in Argentina, or making bonds more liquid, would

change bond yields and the average maturity of bonds and investment in the country.

During the discussion, several comments were focused on the relationship between the payoff of investments in the production sector and the maturity of their bond issuance. In particular, an assumption in the model that productivity of a

bond issuer increases with the maturity of their project and that the bond maturity matches the project maturity. They debated this assumption, as it has implications for the impact of bond illiquidity on welfare. There was a short discussion about the assumption that investment is externally financed and how this impacts the quantitative implications of the model when

comparing Argentina and the US. One commenter suggested the possibility of using the model to look at the impact of time-varying liquidity on borrowing and investment. On the whole, this paper provides a novel way for the level of financial development to influence bond markets and investment choices, and a method for testing this new channel in data.

Finance in a Time of Disruptive Growth



Nicolae Garleanu and Stavros Panageas

There are two trends related to the distribution of recent growth in the United States that motivated this paper.

First, there has been a rapid rise in the quantity of alternative assets, things like venture capital and private equity, relative to total assets in the US economy or GDP; accompanied by a decline in real interest rates. Second, the wealth generated by new or disruptive firms is going to new, or self-made billionaires, as opposed to individuals that were previously wealthy. The authors, Nicolae Garleanu and Stavros Panageas, seek to explain these concurring trends with a model of disruptive growth.

In the model, they split new households into two groups: workers and entrepreneurs. Entrepreneurs are stochastically allocated a growing

number of profitable projects such that a small proportion of entrepreneurs receive a large proportion of these projects (disruptive technologies), and so the entrepreneurs who receive the profitable projects become wealthy. The result is that the economy grows overall, but that this growth is unequally distributed. Entrepreneurs can trade securities with both other entrepreneurs and old generation investors to share the risk imposed by the stochastic allocation of projects. However, there are frictions that result in this risk being shared imperfectly. The risk-sharing structure and the stochastic process for distributing profitable projects allows the authors to explain the rise in alternative investments along with the unequal distribution of new wealth generated by introducing new or disruptive technologies.

During the discussion, there were some questions about the motivating

facts and how they correspond to the model predictions. For example, the model explains declining real interest rates via disruptive growth; however, their notion of disruptive growth seems like a more recent phenomenon while the decline in real interest rates seems to be a longer-term trend. A portion of the discussion focused on how predictions from the theory correspond to other trends seen in data, like a decline in the number of IPOs. In terms of the model, the reduced form way in which imperfect risk-sharing is imposed was a minor point of contention, with some suggesting the possibility of endogenizing this mechanism. Overall, the authors present a nice description of several empirical facts about the distribution of recent growth in the United States, and a novel way of generating these results in an economic model of disruptive growth.

An Information-based Theory of Financial Intermediation

Zachary Bethune, Bruno Sultanum, and **Nicholas Trachter**



There is a large amount of evidence that suggests that many markets for financial assets that trade over-the-counter (OTC) exhibit a

core-periphery structure, where some market participants actively engage in trade and populate the core, while others trade less often and populate the periphery. Hence, there is a revival in building models with endogenous intermediation in which some investors optimally populate the core and thus become intermediaries. In this paper, the authors ask whether heterogeneity in the information investors possess about the trade motives of their counter-parties can generate the observed market structure and then test, empirically, some key predictions of the model.

The authors construct a model with three important features. First, they allow for asset maturity and new issuance, and thus need not rely

on investors' utility flows from asset holdings changing through time to get a steady state with trade. Second, the authors assume the utility flow of each investor is private information, which will imply that an optimal trade mechanism destroys some efficient trades. Third, the authors assume investors are heterogeneous in screening ability, a technology that allows them to observe their counterparties in trade with some probability.

The author's show that a steady state equilibrium exists, and that heterogeneity in screening ability drives the structure of trade in the market through determining trading speed. Those with a high screening ability act as intermediaries while those endowed with low screening ability populate the periphery.

The authors test the predictions of the theory, using transaction-level data on the OTC market for credit default swaps (CDS). The data feature allows the authors to consider a 13-F filing as exogenous variation in the information the market possesses about the institution's motives to trade CDS.

They find that a 13-F filing increases an investor's probability of trade with the periphery in the week following a filing, but find either a zero or smaller increase in the trade's probability with the core. The results are robust controlling for different fixed effects, across types of CDS, and across types of institutions. The authors also show that a 13-F increases trade probabilities only up to two weeks after a filing, but the effect vanishes in weeks three and beyond. While these predictions follow from the theory of financial intermediation under private information, they do not follow from theories that build on complete information.

The discussant, Michael Choi, suggested that the theory is well-motivated, the model is tractable, and the empirical results are convincing. One participant asked whether CDS trade information is on 13-F filings. The author noted that albeit the answer is no, the filing correlates with the institution's hedging motives, which is important for the theoretical prediction.

A Walrasian Theory of Sovereign Debt Auctions with Asymmetric Information

Harold Cole, Daniel Neumann, and Guillermo Ordonez



Governments finance their fiscal needs by selling bonds in sovereign debt auctions. In these auctions, governments sell many bonds at

one time to many investors. Investors can submit multiple bids and are often free to buy as many units of the bonds as they can afford. Given the set of submitted bids, there is a series

of rules that determine the prices of newly issued sovereign bonds and the corresponding revenues for the government.

Understanding the evolution of primary market sovereign bond prices has proven to be challenging. It has been difficult to attribute the price movements from shocks to a particular set of "fundamentals." Deciphering the right mapping from shocks to prices complicates the fact that shocks will typically differ in the mechanism by which they affect bond prices.

The authors argue that changes in investor information may be an important driver of the observed premium on sovereign debt. To make this point, the authors depart from the standard presumption that fundamentals are always in the information set of investors and explore how prices are determined if investors have to obtain information at a cost about non-public fundamentals. This introduces the possibility that investors are asymmetric in their information sets, and that bond prices

reflect this asymmetry.

To circumvent some challenges standard auction models face in determining equilibrium prices, the authors propose a novel auction model with three key characteristics: first, the good being auctioned is perfectly divisible; second, the number of bidders is large; third, there is both common uncertainty about the good quality and about the mass of investors who take part in the auction. Given these three characteristics, the price-quantity strategic aspect of standard auction

theory become less relevant, and a price-taking, or Walrasian, analysis emerges as a good approximation. With price-taking, instead of studying strategic bidding and information processing, the authors can focus on "rational expectations equilibrium" where realistic auction rules clear the "market". The approximation allows for an analysis of the role of information in equilibrium price determination and the role of auction rules in determining the volume and asymmetry of information endogenously gained by investors.

When the degree of asymmetric information among investors is exogenous, the authors uncover a level-volatility trade-off. Specifically, while uniform-price auctions generate a higher sensitivity to demand shocks, the discriminatory-price auction generates a higher debt burden.

The discussant, Professor Philip Bond used a bare-bones version of the model to convey its main idea. He also suggested that they could simplify some part of the model if they introduce a secondary market.

Selection, Leverage, and Default in the Mortgage Market

Arpit Gupta and Christopher Hansman



There is a consensus that household and mortgage leverage are important for macroeconomic financial stability.

Particularly given the 2008 financial crisis, policymakers need to know how to best regulate mortgage leverage. However, the relevant trade-offs in deciding an optimal policy are unclear. The authors identify adverse selection as a complicated factor for a policy to incorporate. This is because borrowers with high leverage are more likely to default both because leverage has a causal impact on default and that riskier borrowers select into higher leverage. This paper studies the empirical relevance of adverse selection in regulating mortgage leverage.

First, the paper exploits a natural

experiment to disentangle the adverse selection effect from the causal effect. The key is to use option adjustable rate mortgages, where one is based on LIBOR and another on treasuries. To identify the causal effect, they compare two identical loans where one person owes more than the other because of the adjustable portion. To identify the adverse selection effect, they compare two different loans where the adjustable portion results in both owing the same amounts. Decomposing the leverage impact on defaults, they find that 60-70% is due to the causal effect while 30-40% is because of adverse selection. Second, the authors calibrate a model of adverse selection and evaluate a loan to value cap policy. They compare the policy predictions by an informed regulator who accounts for adverse selection and a naïve regulator who does not. The naïve regulator overestimates the reduction

in defaults, a reduction in interest rates, and policy effectiveness and underestimates the reduction in loan size and welfare loss.

Several suggestions arose from discussion. The first set involved robustness of results. The discussant wondered how sensitive the results are to parameters and would be interested to see a range of estimates. The discussant also questioned the role of certain model assumptions and how results would differ if they relaxed assumptions. The second set involved the estimation methodology. Showing they do not correlate the instrument with other outcomes would strengthen the validity of the identifying assumption. Using a limited value maximum likelihood estimator could help address the weak instrument issue. Another minor suggestion was to use a combined loan to value ratio (CLTV) as a more comprehensive measure of leverage compared to a loan to value ratio (LTV).

Employer Credit Checks: Poverty Traps versus Matching Efficiency

Dean Corbae and Andrew Glover



Human resources employees check credit reports when hiring. Low to medium income workers claim bad credit has cost them a job. This raises a

poverty trap concern. Workers with bad credit may face longer unemployment, making it harder to pay off credit and prolonging unemployment even further. A proposed policy to address the poverty trap concern is to ban credit checks. In this paper, the authors show that the effects of the credit check ban are measurable. Through a model approach, they calculate the aggregate and distributional welfare consequences of banning credit checks.

The authors develop a job search model with a short-term credit market and workers with heterogeneous patience levels. The model captures the idea that the credit market can infer private information about workers' residual labor productivity. Since patient workers care more about

future credit, they will be less likely to default. Patient workers will also invest more in costly human capital because they place a higher emphasis on its future payoff. As a result, there is a positive correlation between residual labor productivity and credit quality. When employers can screen employees by credit quality, they will infer higher labor productivity from better credit and hire employees with good credit. Because employees with bad credit experience longer unemployment spells, it is even harder for them to improve credit, which feeds back into unemployment duration.

The authors then calibrate model parameters to assess the magnitude of the poverty trap and the credit check ban. They find that it takes 1 week longer for the bottom 10% of workers to find a job and 2 weeks longer for the bottom 1%. In the distribution, they find that the credit check ban helps unemployed impatient workers the most, yet hurts patient workers. Turning to magnitudes, the model implies that the ban has small detrimental consequences for the patient workers and large beneficial

consequences for the unemployed impatient workers.

In discussion, a main question involved how effective informational hiring restrictions are. The concern was that when regulation restricts employers' informational set, employers may switch to correlated signals with potentially adverse social consequences. The discussant made an analogy to how banning criminal checks backfired through inducing racial profiling. A secondary comment in discussion involved a few ways to improve the model. First, the model includes little punishment for default, which leads to the conclusion that banning credit checks lowers repayment incentives. This may not be the case with additional default punishment. Second, the model features default checks which could change to more accurately resemble credit quality checks instead. Third, the model could benefit from introducing other costly signals of residual labor productivity, one example would be education.

Foreign Investment of U.S. Multinationals: the Effect of Tax Policy and Agency Conflicts

James F. Albertus, Brent Glover, and Oliver Levine



The authors investigate the impact of the 2017 Tax Cut and Job Act (TCJA) on foreign investment and cash holdings of U.S.

multinationals. Before the TCJA reform, the U.S. has a worldwide tax system so the firms are subject to U.S. tax on foreign income if they repatriate

foreign earnings instead of holding them as cash or reinvesting in capital. The reform changed the tax policy into a territorial tax system which does not impose a U.S. tax liability for foreign earnings. The research question is how the TCJA affects a U.S. firm's incentives to invest overseas.

The authors build a static model to derive comparative statics and a dynamic partial equilibrium model to quantify the effect of the policy change on the foreign operations

of multinational firms. There are two countervailing tax effects under the worldwide tax system. The direct tax channel is that U.S. levies a tax on foreign income if they bring it home which reduces the incentives to invest overseas. The opportunity cost of the capital channel is that the worldwide system lowers the opportunity cost of reinvesting because holding cash overseas or repatriating the income to home is costlier. This channel leads optimal investment to increase in the

tax rate. Albertus explained that the cost of the capital channel always dominates. Therefore, the shift to a territorial tax system after the TCJA reform reduces foreign investment by almost 10%. The territorial system shuts down the opportunity cost of capital channel, hence the optimal investment declines in the tax rate.

The model also incorporates agency conflicts between managers and shareholders in the choice of investment, cash holdings and repatriation. The manager holds a constant fraction of equity in the firm, gets profits through bonus pay and can divert resources for personal benefit. The simulations of the model show that after TCJA reform the decline in the capital stock is larger for a firm with a perfectly aligned manager (no agency conflicts). However, the impact of agency conflicts is low for an average firm. Bonus compensation, meaning a

higher agency cost, encourages higher investment.

The overaccumulation of cash overseas can explain the expectations of the firms that a tax reform or a tax holiday would occur at a future date. To incorporate this anticipation effect, in the full dynamic model the reform happens with a constant probability such that the future foreign income is not subject to any repatriation tax indefinitely. As the likelihood of the reform is lower, the opportunity cost channel is weaker which reduces the pre-reform investment.

A participant asked what happens if the authors consider all investment instead of only foreign investment if there are international constraints. Albertus answered that those are outside of the model. Another question is whether the tax rate is a statutory tax rate. The presenter answered that the tax rate in the calibration is the effective tax rate.

The discussant, Francois Gourio from FRB Chicago, argued that two assumptions are unnecessary in the model: expectations and agency costs. The assumption in the model is that firms know the reform will happen but they don't know when. However, the TCJA passage and form is uncertain until the end. A better assumption would be having expectations about a tax holiday since it happened in 2004. The second assumption is that agency costs are effected by the tax changes. However, Gourio argued that this does not seem important for the results. Agency costs might be lower for cash held abroad because it is harder to spend.

Albertus replied that agency conflicts do not seem important for an average firm. However, for firms with low equity/high bonus CEOs, agency conflicts lead to significant overinvestment.

Household Debt Revaluation and the Real Economy: Evidence from a Foreign Currency Debt Crisis

Emil Verner and Gyozo Gyongyosi



This paper asks how a sudden increase in household debt affects a country's real economy during a crisis. To establish causality, the

authors exploit spatial variation in exposure to household foreign currency debt, using the unexpected and sharp depreciation of the Hungarian Forint in 2008 as a natural experiment.

The authors argue that studying this setting has two advantages: First, the magnitude of the depreciation was tremendous, as prior to 2008, 69% of Hungarian household debt was denominated in foreign currency. Second, perhaps the depreciation

was sharp and unexpected. It was not caused by distress in household credit markets, and it was especially strong as investors were concerned the Hungarian government's large external financial needs.

With the goal of assessing the contracyclic household debt-deflation channel, the authors use detailed micro-data to study how individuals and local labor markets are differently exposed to foreign currency debt. They point out that the ideal experiment to study their question would be to randomly assign household debt levels. With this in mind, their strategy is to exploit the variation in household debt exposure that comes from differences of local banking markets and the timing of borrowing. As an identifying assumption, they use

parallel trends of regions that were exposed to the foreign currency debt at different levels.

The paper provides three main results: First, the authors document that a shock to local household debt increases household default rates and persistently decreases local consumption, both for durable and non-durable goods. Second, they find that an increase in household debt causes a significantly worse local recession. Local unemployment increases and wages decline in regions with greater exposure to foreign currency debt. Third, they document negative local spillovers. Households with only domestic but no foreign currency debt are more likely to default if exposed to foreign currency debt. Foreign currency debt predicts a decline in house prices.

Following the talk, the discussant pointed out that while the paper rules out multiple alternative explanations for how household debt shocks affect the real economy, there are still a couple of open questions, such as whether currency was the only difference across foreign banks. The discussant asked whether these debt shocks affect consumers who can no longer borrow to finance consumption. The discussant suggested that additional placebo

tests might be useful to shut down some potential alternative explanations. In addition, he questioned the external validity of the paper, arguing that the results depend on a lot of specific frictions, such as strict repayment terms, a restrictive monetary policy, and that there was no Hungarian government bailout despite massive government debt.

The discussant concluded by highlighting the potential importance and novelty of the paper. In particular,

he emphasized that we have limited evidence on how household debt and currency shocks affect the real economy, and that the paper at hand contributes importantly by trying to identify these effects. He pointed out that the authors document a novel type of spillover across households and found a creative way of using micro-level data to answer an important macro question.





Over the Counter Markets and Securities 3rd Workshop

October 12–13, 2018

David Baqaee – UC Los Angeles
Hui Chen – MIT Sloan
Selman Erol – Carnegie Mellon University
Benjamin Hebert – Stanford University
Bernard Herskovic – UCLA Anderson
Burton Hollifield – Carnegie Mellon University
Amir Kermani – UC Berkeley
Finn Kydland – UC Santa Barbara
Dmitry Livdan – UC Berkeley
Francis Longstaff – UCLA Anderson
Erik Loualiche – University of Minnesota
Mihai Manea – Stony Brook

Dmitry Orlov – University of Rochester
Peter Rupert – UC Santa Barbara
Batchimeg Sambalaibat – Indiana University
Yuliy Sannikov – Stanford University
Alberto Teguia – UBC Sauder
Johan Walden – UC Berkeley
Colin Ward – University of Minnesota
Pierre-Olivier Weill – UC Los Angeles
Randall Wright – University of Wisconsin
Madison
Yao Zeng – University of Washington, Seattle

Bottleneck Links, Essential Intermediaries, and Competing Paths of Diffusion in Networks

Mihai Manea



Information is an easily reproducible and non-rival good that travels in network economies. For instance, friends share digital goods in social networks, such as news and event invitations. Personal contacts help with gaining professional expertise. Technological innovation spreads via partnerships among firms. Manea explores the pricing of information when trade between agents is constrained by a network.

In these network economies, prices and allocations depend on two opposite forces that sellers experience. First, sellers might capture part of the profits gained by intermediaries who acquire the original asset and resell copies, i.e., the so called indirect appropriability effect. The second force is competition among sellers of the original good and buyers who might become resellers, which reduces prices in secondary markets.

In the model, the economy primitives include a finite set of players (nodes) and an undirected network that connects them. Initial sellers are endowed with an identical information good that is indivisible, freely replicable, and non-depreciating. In the first period,

these players replicate and sell the good to their network. Buyers acquire and consume the good, and become sellers in the next period.

The current set of sellers and their connections describe the current state of the economy. In each state, a random subset of seller-buyer connections bargains. Nash bargaining determines if they trade, and how they split the surplus, i.e., how much the buyer pays for the good to the seller.

The solution is a Markovian cooperative equilibrium that specifies a trade surplus distribution in each state for every buyer-seller link. The main result is a unique bargaining solution that elucidates the interplay between intermediation and competition in a general network. The solution reveals a natural classification of links into bottleneck links, which provide essential intermediation and facilitate indirect appropriability, and redundant links, which create competition that hurts sellers. As these labels suggest, removing a bottleneck link from the network disconnects some buyers from sellers and disrupts the diffusion of the good, while removing a redundant link does not affect the diffusion. The author then studies the ramifications of the result for more structured networks. For instance, in cycle networks, where the good can reach a buyer via multiple disjoint paths, competition makes

information have a zero price. In less linked networks, sellers are better off as long as the network remains connected. Sellers are better off in connected economies than in autarky, but prefer less linked economies to fully connected ones.

The discussant suggested extending the framework with impatient agents and analyzing its effects on the sellers' surplus and competition. The audience asked about the convenience of Nash bargaining in this context since it depends on the bargaining power of sellers and buyers, which the paper does not explicitly model in its current version. Given the possibility of no trade in some connections, the discussant suggested modeling the fragility of links after a history of no trade, i.e., with a lower probability of future matching. Further, there are two straightforward extensions not yet explored in this framework. First, what happens to prices and allocations when the analysis incorporates endogenous restrictions to information sharing such as patents or privacy policies? Second, how do the results extend to situations with information synergies, i.e., where pieces of the information being sold are part of a bigger message that is more valuable than the pieces?

Endogenous Specialization and Dealer Networks

Batchimeg Sambalaibat and Artem Neklyudov



The network structure of OTC markets comprises a set of highly interconnected dealers forming the core, and many more

dealers that sparsely connect forming the periphery around this core. This structure is persistent over time. In particular, the relative importance of dealers in the network and who they trade with are highly persistent. Current network models of OTC markets operate under the assumption that this structure is exogenous. The main goal of the paper is to explain how dealer heterogeneity arises. The authors aim to answer how dealers' size and position in the network remain persistent.

The authors close the gap between search and network literatures by building a search-based model of network formation. They show that dealer specialization in a dynamic directed search model can generate the observed network structure, and the stylized facts concerning persistence. Their model builds on Duffie, Gârleanu and Pedersen (2005) and, in particular, on Vayanos and Wang (2007). The authors add dealers and interdealer trades to the environment presented in those papers. Dealers are ex-ante identical,

but clients have heterogeneous liquidity needs. Some clients buy and hold an asset whereas others buy knowing they will resell it quickly. Dealers intermediate directly between clients, but also connect with other dealers to provide liquidity to their clients. The authors assume a fully connected dealer network where the transaction volumes between pairs of dealers are endogenous.

Their model produces both symmetric and asymmetric equilibria. The symmetric equilibrium features a circular network where dealers have identical network centrality implying that client heterogeneity alone does not ensure a unique equilibrium in which the core-periphery network is featured. The asymmetric equilibrium gets such a network structure because of specialization of dealers in clients' liquidity needs. Clients face a trade-off between a dealer's ask-price and its liquidity service in this equilibrium. Some dealers charge a high ask-price but in return offer better liquidity if the client has to return the bond. Others charge a lower price but offer worse liquidity. Thus, clients with different liquidity needs sort into different dealers.

The asymmetric equilibrium also captures the observed network persistence not featured in the existing models of OTC markets. The authors capture this persistence by relaxing two standard assumptions

made in the existing search models. First agents' private valuations of an asset change randomly. Second, agents trade through random search and matching. The authors model clients and dealers separately and limit valuation changes within clients. Hence dealers' identities and their equilibrium roles remain stable. The stability of dealer identities then allows the authors to explicitly model network links between dealers. As a result, dealers trade with each other repeatedly.

A member in the audience asked how the modeling decision for getting a core-periphery network structure as an equilibrium outcome compares to two other potential approaches: one being ex-ante homogeneous dealers selecting into the core-periphery structure and another one being otherwise ex-ante homogeneous dealers selecting the speed of search, something akin to Farboodi et al. (2018). Sambalaibat responded that there are various policy questions that an endogenous network model would allow her to answer such as how the network dealers will be affected by one dealer going bankrupt. Specifically, would the clients end up choosing other dealers? How would the whole network respond to such a shock? She concluded that the proposed approaches could not let her investigate these questions.

Unbundling Macroeconomics via Heterogeneous Agents and Input-Output Networks

David Baqaee and Emmanuel Farhi



The paper unbundles the standard representative agent and aggregate production functions commonly

used in macroeconomic modeling to assess the general equilibrium effects of shocks. The presenter Baqaee shows that the propagation and aggregation of shocks differ in models with Heterogeneous Agents and Input-Output networks (HA-IO). The framework in the paper is very general such that they can extend it to varying environments with different production functions, consumption functions and distortions such as economies with wedges and markups.

They show that in standard macroeconomic models with representative agents and balanced-growth consistent preferences in an efficient equilibrium, the shock propagation is symmetric which is a consequence of the first welfare theorem. However, this symmetry result no longer holds when one extends the model environment to heterogeneous consumers, non-homothetic preferences, elastic factor supplies with non-balanced growth preferences and distortions in the economy. Through the production networks, the transmission of shocks on prices and quantities are asymmetric because of the existence of local general equilibrium effects. This point is important in interpreting

reduced form coefficients of many instrumental variable studies since the common presumption that general equilibrium effects are small if the shock hits a small part of the economy, is not correct when the network effects are present.

As for the aggregation results, the paper shows that the industry-level aggregates are endogenous when the economy is inefficient and the simple averaging of productivities and markups do not uncover them. The decomposition of aggregates into individual parts is not possible since aggregates might behave separately from its industry components because of the linkages with the outside of the economy. As an intuitive example, they show that TFP accounting now differs from the usual Solow residual definition. Real GDP growth can be decomposed into changes in inputs, changes in technology and changes in allocative efficiency. In efficient economies, the third part disappears. However, when the economy is inefficient for e.g. wedges and markups, the reallocation component is important for both aggregate TFP accounting and also for industry-level aggregates. In the disaggregated accounting, the industry-level productivities and also markups are endogenous and are subject to the fallacy of decomposition such that even if all producer markups in the industry increase, the industry level markup might decrease because of the reallocation effects across producers in the industry.

One participant asked about the homotheticity of goods assumption in baseline model and why it is important for the analysis. Baqaee answered that without homotheticity, it is difficult to think about the price index which is not observable and not measurable.

The discussant Erik Loualiche defines the model as 'the model of everything' to emphasize the richness of the structure. He mentions that the framework is very useful to understand the link between micro and macro elasticities. One of the important results in the paper is the breaking of symmetry since there is no support for this in the data. He asks further how can we make sense of micro estimates in macroeconomics? There is a lot of work that use micro-level data to estimate the impact of a shock to the economy. It is important to know to be able to answer how the rise in housing prices caused the financial crisis, for example. However, he criticizes the paper as it creates 'I know that I know nothing' paradox. So we know that the estimates are contaminated but we don't know whether it is upwards or downwards. So in terms of policy, the results are not helpful.

Baqae answers that you can try to use the formulas in the paper to identify the elasticities, the formulas tell you exactly how many assumptions you have to make. An extension for this paper will do an application using industry level productivity data using e.g. an exchange rate shock to identify the elasticities.

Insider Networks

Selman Erol and Michael Lee



The motivation of the paper is from two cases of insider trading; one in 1928 and the other in 2008 in which the beneficiaries made large

profits. The significance is that the acts were seemingly legal and the information channel was too complex to detect.

Participants asked what makes up insider trading and whether one has to pay for the information to be prosecutable upon trading. Erol responded that if one understands that she is holding information that she should not and she trades on it, then she is liable too. However, the regulators are very ambiguous about the definition of insider trading and they will implement this in the model. In principle, what makes up an insider trading is the violation of fiduciary duty. One participant commented that good or bad information could be handled asymmetrically. Erol responded that for an extension of the paper, they will incorporate various kinds of information that can be considered as illegal into a formal model to talk about the boundaries of insider trading, however in this model there is only one piece of information which is unambiguously illegal and the aim of the regulator is to prove this activity.

The presenter continued with the formal model for the formation and transmission of insider transmission networks similar to the aforementioned cases. In the model,

agents create complex networks to transmit insider information that avoids prosecution by regulators. The regulators respond by setting ambiguous regulatory environments and greater regulatory sophistication. This gives rise to a core-periphery structure in the network formation in which intermediaries, who specialize in information transmission, are placed at the core.

The model comprises three periods. In the first period, an information network is formed efficiently. In the second period, the sender, i.e. insider, chooses a path to transmit information to the receiver. A shorter path is more profitable, yet is subject to a higher risk of being caught. In the last period, the regulator chooses its enforcement strategy, in particular its search intensity. The regulator observes the identities of the sender and the receiver, but not the network nor the information transmission path. The regulator must correctly identify the path to prove the crime and avoid the associated social cost. This structure leads to a cat-and-mouse game between the regulator and the agents. In equilibrium the optimal strategy of the regulator is a mixed strategy that creates the regulatory ambiguity as an endogenous object of the model. Agents expect the regulatory ambiguity and take it into account in the network formation stage. Given the regulator's strategy, the agents form flexible networks with multiple path lengths that are slightly longer than the regulator's potential search intensities. In equilibrium, the agents in the network also adopt a mixed strategy in the path length. The

equilibrium core-periphery network comprises a set of agents at the core that take charge in transferring insider information with flexible interconnections and of peripheries that have only one link to the core and no connection to each other. The equilibrium network structure is cost efficient since some core members with zero measure create various information paths to a continuum of periphery members of potential senders and receivers.

The discussant, Bernard Herskovic pointed out that the model is very elegant and has a nice application. However, the assumption that the network formation stage is restricted to pure strategies is not without loss of generality. The authors can consider random sub-networks with a probability distribution over edges and the sender-receiver pair is randomly picked, that is, a mixed strategy over multiple static networks. The discussant commented that there is tension between regulator searching a finite length of a communication path although there is a mass of agents and a continuum of links. So, he asks what happens if the regulator chooses where to start the search, for example from the core as all information paths go through the core agents. The presenter responded that it doesn't matter where you start the search, what matters is the number of links you are searching. There can be a lot of possible paths but the regulator realizes only one of them since the regulator is randomizing, hence starting from core is not more or less costly than starting from any other starting point.

Dynamic Trading: Price Inertia and Front-Running

Yuliy Sannikov and Andy Skrzypacz



A market with heterogeneous investors presents many puzzles. What determines the speed of trading? What is the link between

microstructure and the time series properties of prices, such as momentum and excess volatility? What is the price impact of large traders, and how many does it matter for optimal execution of transactions?

The authors attempt to build a game theoretical framework to analyze these phenomena. Specifically, they model a market in which the price of a risky asset is Brownian motion. Players have private information about their personal desire to buy or sell at any price, and they trade, optimizing between the price at which they trade and the costs of delayed execution.

The authors aim to derive the properties of the market that individuals face from the interaction of individual behaviors. They show that they can derive these market properties in a game theoretic framework and they link the price impact of traders and time series properties of prices to the composition of the market.

We can broadly classify the price

properties they derive as "on-equilibrium" and "off-equilibrium". One important on-equilibrium property they derive is momentum, which depends on the relative competitiveness of current buyers and sellers. Off equilibrium, they show that traders have "instantaneous" and "permanent" price impacts, i.e. price depends on the trading rate and the total amount bought or sold. In addition, depending on market composition, there may also be a "transient" price impact, i.e. the temporary impact on the price of the total amount sold.

The authors introduce asymmetry among players into the class of models in which rational traders have private information about their desire to buy or sell. Players differ in their risk capacity parameter that determines their impatience to trade. An important implication of this heterogeneity is that when trading is not anonymous, not only trading speed but also price impacts depend on player size. Large players will trade slowly, as for any quantity they want to sell they have lower holding costs than small players. Hence, trades of large players are more "toxic": they generate price momentum detrimental to anyone on the other side of the trades. While these observations hold regardless

of whether the source of trades is observable, observability implies that the trades of large players have larger instantaneous price impacts, i.e. the same quantity generates a bigger change in price.

Since they explicitly model preferences of all market participants, the model can be a laboratory for studying welfare. They find that with transparency, market power is bad for individual welfare. Market power implies slower trades, but it also leads to a higher price impact in a transparent market.

One audience member asked where the functional form of the cost of trading is coming from. The author replied that it is micro-founded using a CARA utility function. Another audience member asked whether the best outcomes of each agent are independent. The author noted that we could correlate them and it is the imperfect information that prevents the agents from getting their best outcomes.

The discussant mentioned that the paper micro-founds what we observe in the data, that the price impact of trading is not linear. He acknowledged that the paper helps to understand transparency in the market and the price impact in a transparent market depends on the traders.

Frictional Intermediation in Over-the-Counter Markets

Julien Hugonnier, Benjamin Lester, and **Pierre-Olivier Weill**



Recent empirical studies have uncovered detailed stylized facts about the intermediation process in over-the-counter (OTC) markets.

Notably, assets reallocated from one customer to another through a sequence or chain of dealers, and there is a lot of heterogeneity among the dealers along many dimensions. These observations pose a clear challenge to benchmark search-theoretic models of OTC markets, in which dealers are homogenous and the inter-dealer market is frictionless.

In this paper the authors develop a search-theoretic framework capable of confronting these facts, and yet tractable enough to provide clear insights into the underlying economic forces, and into the aggregate implications for prices, allocation, and efficiency. The first key innovation is to model the dealer sector as a decentralized market, where dealers periodically meet other dealers who may be willing and able to trade. The second key innovation is to allow for an arbitrary, continuous distribution

of dealers' flow valuations. Taken together, these assumptions generate intermediation chains of stochastic lengths and imply that, as in the data, dealers will differ regarding their typical position within a chain, the frequency and direction with which they trade, and their contribution to trading volume.

The authors can establish key properties of equilibrium trading patterns, which allows for a parsimonious characterization of the equilibrium distributions. As a result, the model remains fully tractable, which offers three distinct advantages. First, the authors can reduce the characterization of equilibrium to a fixed-point problem over a two-dimensional endogenous variable. Second, they explicitly derive and analyze several model-implied statistics that have direct counterparts in the empirical literature that studies the intermediation process in OTC markets. These derivations include the average time-to-trade for customers and dealers, etc. Using these derivations, the authors argue that the model is quantitatively consistent with several stylized facts. Third, exploiting the closed-form solutions, the authors calibrate the

model in a simple, transparent fashion. Their calibration exactly matches key targets in the data, including turnover and the average liquidity yield spread. The calibration also reveals the relative importance of the arrival rates of preferences shocks, trading opportunities between customers and dealers, and trading opportunities within the dealer sector. Using the calibrated model to perform welfare analysis, they show that the search market achieves about 98% of the total, frictionless, gains from trade. Of these gains from trade, customers appropriate about 90 percent, and dealers about 10 percent.

One audience member asked whether the question this paper intends to answer is best addressed in the directed search framework. The author replied that the current framework is better at incorporating differences in time to sell. One audience member asked why there is specialization in buying and selling in the model. The author replied that the direction of trading and the left-over agents that do not trade drive the feature. The discussant mentioned a potential extension which incorporates noisy trading into the current framework.

On the Instability of Banks and other Financial Intermediaries

Chao Gu, Cyril Monnet, Ed Nosal and **Randall Wright**



There is a venerable view that banks, or financial intermediaries, are inherently unstable and excessively volatile. Many

have advocated for government intervention including Keynes (1936), Kindleberger (1978), Minsky (1992) and Williams (2015). Even Friedman (1960) who defended unfettered markets in virtually all contexts, supported bank regulation in his program for monetary stability. In this paper, the authors seek to answer whether financial intermediaries are inherently unstable.

Since there is no generally accepted all-purpose model to study this question, given that the myriad of functions performed by financial institutions are difficult to capture in a single setup, the authors consider four different specifications. These are constructed using building blocks taken from off-the-shelf models, combined and applied in novel ways. The purpose is to determine whether these models of institutions are prone to multiple equilibria or volatile dynamics, including cyclic, chaotic or stochastic outcomes that entail fluctuations even if fundamentals are constant.

The first formulation extends Diamond and Dybvig's (1983) model of liquidity insurance (or maturity transformation) to an infinite horizon. The second features fixed costs of exploiting investment opportunities, similar to Diamond (1984) and Huang (2017). The third, an adaptation of Nosal et al. (2017), puts intermediaries like those in Rubinstein and Wolinsky (1987)

into an OTC asset market similar to Duffie et al. (2005). The fourth has bank liabilities serving as payment instruments, similar to currency in Lagos and Wright (2005) or Berentsen et al. (2007). The authors find that in each case financial intermediation can engender instability: An economy with these institutions is more likely to have multiple equilibria or volatile dynamics than the same economy without them. Typically, there is a unique and stable equilibrium without intermediation, but multiple or volatile equilibria with it due to complementarities that arise between agents in the models.

To save time, Professor Wright focused his presentation only on the assumptions and results of the third formulation that features asset market intermediation. In this model, the authors adapt Nosal et al. (2017) with a few changes in the environment, such as switching from continuous to discrete time. There are three risk-neutral types of agents in a dynamic environment: Buyers, sellers and middlemen. Buyers and sellers live one period, after which "clones" replace them. Middlemen are infinitely lived and modeled as in Rubinstein and Wolinsky (1987), they buy goods from producers and hold inventories until they randomly sell to customers. A key assumption, however, is that they trade assets and not goods, which matters for the result of multiple equilibria because holding assets might be optimal for intermediaries. Agents meet bilaterally and entry of sellers, buyers and middlemen is endogenous.

Several clarifying questions on the assumptions were asked during the presentation. For example, a participant asked whether results and

dynamics were driven exclusively by the entry of sellers. Professor Wright answered that it is critical for the result; however, there are at least two other dynamics that also contribute. First, the distribution of inventories results in standard transition dynamics like in the growth model. Second, the belief that the value of inventories might increase over time results in a "speculative" dynamic. The notion and definition of instability was also discussed. A participant questioned why instability is defined as the presence of multiple outcomes. Professor Wright mentioned that this is one definition, but there are definitely others. This one comes, for example, from the possibility of switches between liquid and illiquid states given that equilibria might not be stable, without changes in parameters that could cause catastrophic conditions.

The session concluded with comments by Professor Alberto Teguia, who suggested a discussion on quantifying the instability and identifying the set of parameters for which this excess volatility is a problem. Calibration exercises could be useful. He raised the question of what is the optimal solution for this increased volatility because of intermediaries: market interventions such as smart contracts or Government intervention such as taxes? Professor Wright had previously discussed that welfare is ambiguous in this model even when focusing solely in the steady state. As regulation gets rid of this excess volatility, it might truncate the upside or welfare improvements that might result from the presence of financial intermediaries. However, more work is needed in this point.

Floating Rate Money: The Store-of-Value Premium in Treasury Floating Rate Notes

Matthias Fleckenstein and Francis Longstaff



To better understand market valuations of important stores of value during flights-to-security, recent literature has shown that

markets place a significant premium on the liquidity and safety of near money assets. Recent literature suggests that this premium differs across types of Treasury securities, with more liquid securities trading at higher prices than comparable illiquid securities. Interestingly, floating rate notes (FRNs) have much less price volatility than Treasury bills or notes, suggesting that FRNs could have a price stability premium over other government backed securities. To compare securities with similar cash flows, Fleckenstein and Longstaff use interest rate swap markets to transfer a FRN with random cash flow into a synthetic security with fixed cash flow. The authors provide evidence that FRNs trade on average at a premium of 5.92 and 9.82 basis

points respectively over a comparable portfolio of Treasury bills and notes.

After identifying the FRN premium over Treasury bills and notes, the authors provide evidence that the relative price stability of FRNs accounts for the premium rather than other factors. First, the authors suggest that since the U.S. government backs both FRNs and Treasury bills and notes, rollover risk cannot drive the premium. Second, the authors point out the similarity in liquidity between FRNs and Treasury bills and notes during the sample period, suggesting that liquidity cannot drive the premium. Third, the premium of on-the-run securities over off-the-run securities cannot explain the authors' findings because the swapped FRNs and Treasury notes are both on-the-run when compared, and the finding of a positive premium is inconsistent with the on-the-run premium. Fourth, the authors show that the premium is not driven by the near-money liquidity premium in Treasury bill yields by regressing changes in the premia on changes in the Treasury-bill spread, finding no correlation.

The paper was well received by the

audience, but they had several minor concerns regarding the research. First, several audience members suggested that the authors could provide more support that only the price stability of FRNs drives the premium. In particular, the audience recommended that the authors consider whether forward-looking basis swaps can explain the premium of FRNs over Treasury bills and notes. Second, the discussant, Burton Hollifield, suggested that the authors consider why only the government offers FRNs and why the government has not fully saturated the market by issuing more FRNs. Hollifield pointed out that consideration of the incentives generated by the premium could be a fruitful area for further research on this topic.

In summary, Fleckenstein and Longstaff compare FRNs to Treasury bills and notes, finding premia of 5.92 and 9.82 basis points, respectively. The authors provide compelling evidence that the price stability of FRNs relative to Treasury bills and notes drives the premium, and the discussion identified several areas for future research on this topic.

Agency in Tangibles

Colin Ward



Recent years have seen economies and firms alike increasingly focus their investment on intangible assets. These assets, however,

have several features which can make economic modeling difficult. In particular, investments in intangible assets can only be measured indirectly,

and the development of intangible assets is often enacted by specialists whose incentives may not align with those of the firm. Thus, the author argues, firms with more intangible assets may face increased agency frictions. To examine this possibility, this paper builds a dynamic firm model which incorporates both physical investment and intangible development. Key to this model is that the agency friction is directly embedded in the firm's intangibility.

The model is populated by investors (or principals) and specialists (or agents). The investors control investment into physical capital and seek to maximize the value of the firm, while specialists control the development of intangible capital and seek to maximize their own utility function. Intangible capital is not directly observable to the investor who must instead rely on observable metrics such as cash flow to infer what is happening with intangible capital.

Thus, contracts between the principal and agent rely on the realization of cash flows to incentivize the development of intangible capital.

In line with the author's initial argument, the model solution does, in fact, predict that as a firm becomes more intangible, the agency frictions will increase. This has important implications for the investment decisions of firms. In particular, the author finds that because increased intangibility leads to the firm's value being more dependent on aligning the agent's incentives with the firm's, the incentive constraint tightens

and investment in physical capital becomes relatively lower. Interestingly, this occurs although the average Q of these firms is rising.

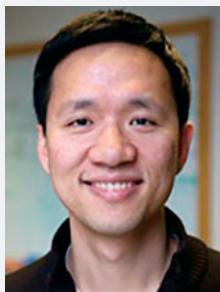
Besides building their model, the author tests some of its predictions using firm-level data from 1975 until 2015. By creating portfolios from the firm data and sorting them by intangibility, the author finds that, consistent with the model, more intangible firms have higher average Q's and relatively flat rates of investment in physical capital. They replicate this finding in a separate firm level specification, providing

additional evidence for the validity of the model. Both the model and the empirical analysis offer a potential mechanism behind the relative decline in what one may have expected investment to be in recent years.

Conference participants questioned why the agency friction isn't also present, or at least noticeable, for low levels of intangibility, and why the growth in the agency friction displays nonlinearity. In addition, participants wondered whether the model could distinguish between different types of human capital as they may respond differently to the agency frictions.

Pledgeability and Asset Prices: Evidence from Chinese Corporate Bond Markets

Hui Chen, Zhou Chen, Zhiguo He, Jinyu Liu, and Rengming Xie



The value of an asset can depend on many things other than the expected cash flows from holding the asset. Key among these is

the relative liquidity, one aspect of which is its pledgeability. Assets which are pledgeable are more valuable than those which are not as we can use them as a source of collateral. How much more valuable these assets are, however, has yet to be fully explored. This is because of the inherent difficulty in measurement, as the asset pledgeability is endogenous to asset fundamentals. In their paper, the authors seek to exploit features of Chinese corporate bond markets to estimate the empirical value of asset pledgeability.

The empirical strategy relies on the fact that within the Chinese bond markets there are two segmented markets: the interbank market and the centralized exchange market. Crucially, these two markets have different rules for repos. Namely,

in the interbank market transaction terms are determined bilaterally, while in the exchange market the exchange unilaterally determines the eligibility of collateral. Thus, the pledgeability of an asset, and consequently its price, can be different between the two markets. The authors use this to calculate the exchange premium, which under certain assumptions, identifies the premium from pledgeability and other liquidity factors. The authors then take advantage of an exogenous policy shock which disallowed the pledgeability of certain assets, allowing them to further tease out the pledgeability premium from the exchange premium using a difference-in-differences approach.

The authors, using the policy shock as an instrument, find that a 100% increase in the haircut increases bond yields by 40 bps. This estimate, the authors argue, is likely downward biased because of adjustments in haircuts in the interbank market. Thus, as a robustness check, the authors perform an alternative instrumental variable specification using the price change in the spread of matched

AAA bonds on the exchange market instead. This specification, the authors argue, will probably overestimate the effect of the change in pledgeability. Using the alternate approach, the authors find an increase of 83 bps. The authors then use these estimates to calculate the implied shadow cost of capital, finding it is equal to 1.5% and 3.2% under the first and second specification, respectively.

Several of the conference participants had questions surrounding how the bonds are being rated, and about the relationship between the ratings and the Chinese government. For example, one participant asked about how the ratings should be interpreted if the firms being rated are partially state owned. Another participant was curious about the potential role of hedging across the segmented markets.



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