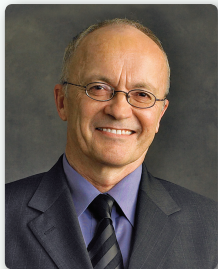


A Message from the Director

Finn Kydland



For the second time, building on the success of the first edition one year before, LAEF has held a conference in cooperation with the Tepper School of Business at Carnegie Mellon University in Pittsburgh. The conference, organized by **Lars Kuehn** and **Nicolas Petrosky-Nadeau**, both assistant professors at the Tepper School, once again brought together young researchers in macroeconomics and finance, pairing them with senior academics in opposite fields to discuss their work.

This year's conference saw timely and innovative work on the role of ambiguity aversion for business cycles. Increases in ambiguity, that is, a loss of confidence in probability assessments, act like an 'unrealized' news shock: They generate large recessions accompanied by ex post positive excess returns. The conference also presented work showing how informational opacity in credit markets can be an optimal response to accommodate increasingly worse collateral and sustain more credit. Over time, however, financial markets do become fragile, as small aggregate shocks to collateral values are more likely to generate a large systemic collapse in output and consumption. Furthermore, if, in this environment, a crisis triggers information production, it renders expansionary policies less effective in speeding up recoveries.

Several papers bridged the gap that sometimes exists between finance and macroeconomics. For instance, one paper studies option markets to gauge the likelihood and value of government bailout guarantees. Research was presented on optimal mortgage refinancing and its impact on consumption smoothing. Finally, as a last highlight, the organizers presented a new look at the equity premium puzzle through the lens of the dynamics of the labor market. The now standard approach to modeling equilibrium unemployment, the Diamond-Mortensen-Pissarides search framework, generates strong asymmetries over the business cycle in employment, production, and consumption, with occasional very deep recessions. This endogenous disaster risk produces realistically high equity premiums and stock-market volatility, as well as low interest rates and interest-rate volatility.

The third in the series of conferences organized jointly by LAEF and the Tepper School will take place in Santa Barbara on September 14 and 15, 2012.

Throughout 2011, LAEF continued an active visitor's program. These visitors stayed for anywhere from a few days to three weeks. In some cases, the purpose was to facilitate progress on joint research with UCSB researchers. In other cases, we simply viewed the proposed research so interesting that we were happy to provide a great work environment and other resources so that the research could make significant progress. Moreover, we as faculty and doctoral students at UCSB had the opportunity to learn about it at an early stage, through seminars and conversations.

A unique example was the visit of **Daron Acemoglu**, Massachusetts Institute of Technology, whose visit was supported by LAEF in co-operation with the UCSB College of Engineering. While on campus, Daron gave the 2011 Mohammed Dahleh Distinguished Lecture (see copy of announcement on page 2), as well as a seminar in the Department of Economics.

Other visitors were (with affiliation at the time of their visits) **Paul Klein**, University of Southampton, **Roman Sustek**, University of Nottingham, **Kjetil Storesletten**, Federal Reserve Bank of Minneapolis, **Carlos Zarazaga**, Federal Reserve Bank of Dallas, **Andre Kurmann**, Federal Reserve Board, and **Tom Cooley**, New York University. While all the others came only once, we were happy to welcome Tom several times during the year.

*March 2012 will prove to be a busy month for LAEF. We are hosting three conferences that month, the first of which - "Health and Mortality" - will be summarized in our next newsletter. The conference will be held in early March, organized by **Eric French**, **Gary Hansen** and **Víctor Ríos-Rull**.*

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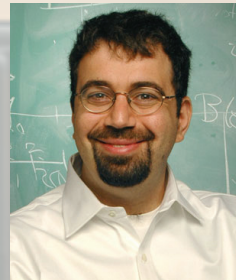
*Special thanks for their accurate and concise summaries of each of the presentations go to UCSB Economics graduate students **Rachel Moore**, **Julian Neira** and **Irishikesh Singhania**. Thanks also to UCSB Artworks, Instructional Development, for newsletter design and production.*

The 2011 Mohammed Dahleh Distinguished Lecture

Cascades in Networks and Aggregate Volatility

We study the cascade effects created by interconnections between sectors, firms or financial institutions. Focusing on a multi-sector economy linked through a supply network, we show how structural properties of the supply network determine aggregate volatility and the possibility of cascades in which low productivity or the failure of a set of suppliers propagates through the rest of the economy as their downstream sectors/firms also suffer and transmit further downstream.

Professor Daron Acemoglu



Department of Economics
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

April 11th, 4-5pm
1001 Engineering Science Building

K. Daron Acemoglu is Elizabeth and James Killian Professor of Economics in the Department of Economics at the Massachusetts Institute of Technology and a member of the Economic Growth program of the Canadian Institute of Advanced Research.

Advances in Macro-Finance II

SEPTEMBER 17-18, 2011

Conference Participants

Laurence Ales — *Carnegie Mellon University-Tepper*

Javier Bianchi — *New York University and University of Wisconsin, Madison*

Michele Boldrin — *Washington University, St. Louis*

David Chapman — *Boston College*

Hui Chen — *MIT-Sloan*

Michael Gallmeyer — *University of Virginia*

Brent Glover — *Carnegie Mellon University-Tepper*

Jonathan Glover — *Carnegie Mellon University-Tepper*

Barney Hartman-Glaser — *Duke University-Fuqua School of Business*

Cosmin Ilut — *Duke University-Fuqua School of Business*

Urban Jermann — *University of Pennsylvania-Wharton*

Xu Jiang — *Carnegie Mellon University-Tepper*

Marek Kapicka — *University of California, Santa Barbara*

Bryan Kelly — *University of Chicago-Booth*

Lars-Alexander Kuehn — *Carnegie Mellon University-Tepper*

Finn Kydland — *University of California, Santa Barbara*

Robert McDonald — *Northwestern University-Kellogg*

Rajnish Mehra — *Arizona State University-W.P. Carey School of Business*

Michael Michaux — *University of Southern California-Marshall*

Konstantin Milbradt — *MIT-Sloan*

Rachel Moore — *University of California, Santa Barbara*

Julian Neira — *University of California, Santa Barbara*

Martin Oehmke — *Columbia University*

Guillermo Ordoñez — *Yale University*

Nicolas Petrosky-Nadeau — *Carnegie Mellon University-Tepper*

Vincenzo Quadrini — *University of Southern California-Marshall*

Nicolai Roussanov — *University of Pennsylvania-Wharton*

Bryan Routledge — *Carnegie Mellon University-Tepper*

Lukas Schmid — *Duke University-Fuqua School of Business*

Hrishikesh Singhanian — *University of California, Santa Barbara*

Fallaw Sowell — *Carnegie Mellon University-Tepper*

Chester Spatt — *Carnegie Mellon University-Tepper*

Kjetil Storesletten — *Federal Reserve Bank of Minneapolis*

Chris Telmer — *Carnegie Mellon University-Tepper*

S. "Vish" Viswanathan — *Duke University-Fuqua School of Business*

Lu Zhang — *The Ohio State University*

Christian Zimmermann — *Federal Reserve Bank of St. Louis*

Summaries of each of the presentations follow.
Note: speakers are highlighted in author listings.

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Urban Jerman

Discussant: David Chapman

Ambiguous Business Cycles page 4

Cosmin Ilut and Martin Schneider

Discussant: Bryan Routledge

An Equilibrium Asset Pricing Model with Labor

Market Search page 4

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Discussant: Michele Boldrin

Too-Systemic-to-Fail: What Option Markets Imply about Sector-Wide Government page 5

Brian Kelly, Hanno Lustig and Stijn van Nieuwerbergh

Discussant: Robert McDonald

Overborrowing, Financial Crises and “Macro-prudential Policy” page 6

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Discussant: Lukas Schmid

Collateral Crises page 6

Gary Gorton and **Guillermo Ordoñez**

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Houses as ATMs? Mortgage Refinancing and Macroeconomic Uncertainty page 7

Hui Chen, Michael Michaux and Nikolai Roussanov

Discussant: Kjetil Storesletten

Maturity Rationing

by Konstantin Milbradt and Martin Oehmke

Discussant: Barney Hartman-Glaser

Milbradt and Oehmke generalize the Stiglitz-Weiss (1981) credit rationing literature with a model of heterogeneous project maturity to examine an environment where projects with long-term maturity are rationed. They ask how asymmetric information over project default probability affects the amount and type of investment undertaken by firms. They allow for an endogenous response to maturity rationing to consider how rationing could amplify the business cycle. The main message of the model is that frictions get worse over time. The authors generate this result by allowing for heterogeneity over two project characteristics: maturity and quality. There are two quality-types: “good” risk-free projects and “bad” projects which face a constant default probability. The riskiness of a bad project will increase with its maturity. Maturity is observed, but project quality is private information to the firm. All bad projects have a negative net present value, but firms will still seek financing, mimicking firms with good projects, resulting in a pooling price at every maturity level, with price

increasing in project maturity as the pool becomes riskier. If average quality is low enough, good, long maturity projects may not be affordable for firms. If good projects of long maturity are not financed, investors do not fund any long-maturity projects, leading to maturity rationing.

Dynamics are introduced by giving firms an option to draw a new project. This is costly; second choice projects have a higher probability of default than initial projects. This policy has two conflicting welfare effects. The ability to redraw offers an improvement because some firms with long-maturity projects that could not receive financing can now finance a project. It imposes a negative externality by distorting investment decisions. If a firm that was not being financed redraws and enters a pool with a riskier project, the interest rate must increase for that pool. If too many firms redraw and the interest rate becomes too high, safe projects may not be affordable to firms that would have financed in the environment without redrawing, and they may also redraw a project themselves. This implies that the maturity rationing boundary will decline. How far it declines depends on the decline in average pool quality. A small deterioration in average quality could lead to a large fall in funded maturities, a phenomenon called a “rationing spiral” by the authors. In this respect, the friction could amplify business cycle fluctuations.

Barney Hartman-Glaser discussed the paper. He first noted that adverse selection increasing with project maturity is an assumption of the model. A conference participant asked why information should be asymmetric. Perhaps neither party has much information about a project which matures thirty years in the future. Another participant asked if there was evidence that effects from asymmetric information increase with maturity. If there is learning, short-term projects would suffer more from adverse selection. Oehmke responded that he did not have any specific examples in mind, but that it seemed intuitive that there should be more uncertainty over projects that mature farther into the future. If there are no cash flows before maturity, the investor cannot learn about project quality. Hartman-Glaser speculated about a role for government intervention. Could rationing be shut down with a guarantee on long-term projects? He also commented on the interesting welfare implications. It is not clear if adding the ability to redraw a project has an overall positive or negative effect. It is a potential gain if the average quality of new projects is not too low. A conference participant wondered if the motivation is really the financial crisis. The paper seems to model a steady-state phenomenon. Oehmke concluded the discussion by admitting that so far the authors have only presented comparative statics, but have ambitions of simplifying the model to put it in a dynamic framework.

A Production-Based Model for the Term Structure

by Urban Jermann

Discussant: David Chapman

Production-based asset pricing models can match features of stock returns that consumption-based models have difficulty matching. An unanswered question is how production-based models fare at matching the term structure of interest rates. Jermann generalizes the production-based approach in Jermann (2010), and explicitly introduces inflation in order to price nominal bonds of different maturities. The author’s model is able to match the average yield curve up to five-year maturity almost perfectly, match the volatility of longer term yields, and generate

time-varying bond risk premiums close to those from Fama-Bliss regressions. A novel analytical finding is that the difference in depreciation rates between equipment and structures plays an important role for the sign and size of the term premium.

The model is a two-sector version of a q-theory of investment model. A representative firm makes capital investment decisions and faces stochastic productivity shocks. Shocks can take two possible realizations, so assuming the existence of two types of capital stocks makes it possible to recover state prices from the firm's production choices. In the empirical implementation, these capital stocks map into equipment and structures. Investment in capital includes a capital adjustment cost whose curvature plays an important role. For a given investment process, the curvature determines the volatility of percentage changes in the marginal adjustment cost, and thus Tobin's q . Inflation is then introduced as an exogenous two-state random process. With the assumption that investment decisions are not contingent on inflation, the price of a nominal bond is just the price of a real bond times the expected loss due to inflation. A conference participant questioned the reliance of the findings on Hayashi's equivalence between Tobin's marginal q and average q . Jermann clarified that Hayashi's result makes the computation simpler, but none of the results depend on it. The model is then calibrated to match the equity premium and the volatility of stock returns as well as the mean and volatility of short-term yields.

The discussant, David Chapman, pointed out that inflation in the predictability regressions is basically noise. While this is a reasonable starting point, it is inconsistent with an existing literature that documents violations of the Fisher neutrality assumption. Modeling inflation in a more involved way could allow the model to address the role of monetary policy rules or inflation expectations in imposing testable no-arbitrage restrictions on the dynamics of the nominal term structure. A second comment by Chapman noted that although replicating Fama-Bliss discount yields is also a reasonable starting point, it would be desirable to evaluate the fit of the model by looking at some other data used in the term structure literature. Two suggestions were to look at data on term structure by Campbell and Shiller or the weighted-forward rate excess return regressions of Cochrane and Piazzesi.

Chapman concluded with several questions: Why is it that production-based models seem to work so much better than general equilibrium consumption models? Is it that the data for investment is much better than the data for consumption? Is it that we cannot get the functional form for utility right? Is it that labor ruins everything? What are the directions in which a q-theory of investment model can be matched to a household sector? Jermann responded that this remains a mystery, and the success of the model is partly due to the fact that by focusing on production, it completely circumvents the equity premium puzzle.

References: Jermann, U. J., 2010. The Equity Premium Implied by Production. *Journal of Financial Economics* 98, 279-296.

Ambiguous Business Cycles

by *Cosmin Ilut and Martin Schneider*

Discussant: *Bryan Routledge*

Standard business cycle models assume that agents can assign probabilities to uncertain future events (expected utility), and that these probabilities do not differ from the true probabilities in a systematic manner (rational expectations). However, expected utility is inconsistent with the Ellsberg paradox. This paradox

shows that people are ambiguity-averse: they prefer risk (known probabilities) to ambiguity (unknown probabilities). Ambiguity-averse agents lack the confidence to assign probabilities to future events. Ilut and Schneider ask: How would ambiguity-averse agents respond to changes in aggregate uncertainty in a standard business cycle model?

The authors construct a tractable dynamic stochastic general equilibrium model in which agents have multiple beliefs over future outcomes. (Each belief corresponds to a probability distribution over possible future outcomes.) Agents in the model decide on future plans using the worst case belief from this set of multiple beliefs. In this framework, bad (good) news regarding the future reduces (increases) agents' confidence in their subjective assessment of the future outcomes by enlarging (shrinking) the set of multiple beliefs. Thus a confidence shock changes agents' subjective assessment of risk. The authors estimate a standard business cycle model with ambiguity about productivity shocks. They find that time-varying confidence can generate co-movement and account for over half of the fluctuations observed in output, consumption, investment, and labor hours. In addition, time-varying confidence can generate countercyclical asset premia: an empirical regularity that is hard to replicate in models with risk shocks.

Bryan Routledge, the paper's discussant, remarked that the ambiguity process estimated from U.S. data by the authors was fairly consistent with the Michigan Survey of Consumer Confidence. Routledge pointed out the difficulty in distinguishing between time-varying ambiguity and time-varying ambiguity aversion. This distinction is important in welfare calculations. With time-varying ambiguity, we can ask the following question: How would welfare be affected if we are able to eliminate ambiguity? On the other hand, time-varying ambiguity aversion cannot be eliminated because it is a preference characteristic. Ilut replied that the fit of the model with the Michigan Survey was reassuring. He also noted that the addition of time-varying ambiguity, while interesting, would result in a loss of model tractability.

A conference participant asked if ambiguity can be thought of as an omitted factor in standard models. Ilut replied that in this model only a confidence shock generates co-movement between variables. The counter-cyclicality of asset prices is very small in economies with risk shocks, but large in economies with ambiguity shocks. To follow up, the participant asked if the authors had tried to estimate a version of the model in which ambiguity shocks were associated with volatility shocks. Ilut replied that they had not done so because they would like to explore ambiguity shocks as an alternative to volatility shocks. Another conference participant wondered why labor supply was not negatively correlated with consumption and investment in the model. Ilut responded that in the Neo-Keynesian environment, price markup shocks prevent this negative correlation.

An Equilibrium Asset Pricing Model with Labor Market Search

by *Lars-Alexander Kuehn, Nicolas Petrosky-Nadeau and Lu Zhang*

Discussant: *Michele Boldrin*

In a frictionless production economy with aggregate productivity shocks, consumers smooth consumption by accumulating capital. The risk, and therefore the equity premium generated, is too small to explain asset prices. Kuehn, Petrosky-Nadeau and Zhang point out that two-thirds of disposable income is from wages, leading

them to consider an equilibrium asset pricing model with labor income dynamics as a possible solution to the equity premium puzzle. The model incorporates both the large movements in and out of employment, and the persistence of unemployment spells. Epstein-Zin preferences help generate a higher risk premium by aggregating the risk associated with future utility. The model generates a high equity premium and a low risk-free rate, coming very close to empirical observations. Also captured is the low volatility of the risk-free rate. The model overestimates the volatility of stock returns.

A household in the model consists of a continuum of workers, some of whom are employed. There is perfect consumption smoothing within the household. Households maximize expected utility by choosing consumption and how much to invest in risky and safe assets. A representative firm posts vacancies. The matching function depends on the number of unemployed workers and the number of vacancies. Once matched, a firm faces a constant probability of destruction. Productivity follows an autoregressive process of order one. The firm will post vacancies as long as it is profitable to do so, which depends on market tightness, marginal profits and the value of employment net of separation. Wages are determined by Nash bargaining. The return on stock will be a function of equity value, aggregate productivity, wage, and the cost of vacancies. The utility of an unemployed worker is meant to incorporate unemployment insurance, home production activity, and additional leisure time as in Hagedorn and Manovskii (2008). The government will collect lump-sum taxes to finance the unemployment insurance. Wages will depend on the worker's bargaining weight, market tightness, and the value from unemployment. The higher the worker's bargaining weight, the less wage is affected by the value of unemployment, and the higher the procyclicality of wage with aggregate output. Asset prices, aggregate employment, output, and consumption growth all respond to aggregate shocks. This connection, combined with Epstein-Zinn preferences, helps generate the high equity premium without driving up the risk-free rate. The calibrated model produces an average equity premium of 6.19% and risk-free rate of .92%, close to empirical observations of 6.33% and 0.86%, respectively.

Capital is taken out of production to emphasize the main mechanism of the model, but Michele Boldrin, the paper's discussant, pointed out that this makes the representative firm a little opaque. Agents buy risky shares of the firm's dividends, but these dividends are not determined by returns to capital. To explain equity premium, it seems necessary to have equity. Perhaps taking away capital is too much of a simplification. Boldrin suggested that who owns firm shares is also important. The fact that families in the model share dividend income increases the utility from unemployment and may dampen the model's main mechanism for generating equity premium. He also considered the value assigned to unemployment to be too high at 95% of the average marginal product of labor. Petrosky-Nadeau emphasized that the high value of unemployment is not just from unemployment insurance, but the utility from leisure.

A conference participant was not convinced, stating that it is hard to imagine a world where workers would rather be laid off than take a 10% wage cut. Another conference participant thought that an important life-cycle component was missing. It is usually the young who suffer more from unemployment, and the old hold stocks. Petrosky-Nadeau responded that older workers get paid closer to their marginal product, so they are not the ones getting laid off in the model.

Too-Systemic-To-Fail: What Option Markets Imply About Sector-Wide Government Guarantees

by Bryan Kelly, Hanno Lustig and Stijn van Nieuwerburgh

Discussant: Robert McDonald

How do we measure systemic risk? This question takes center stage in discussions regarding policy responses to the global financial crisis of 2007. In general, systemic risk is difficult to measure from market data because government intervention, implicit or explicit, distorts prices and allocations. Kelly, Lustig and van Nieuwerburgh build a structural model to measure systemic risk and the distortion created by the possibility of a government bailout. A structural perspective allows authors to disentangle the distortion due to the government intervention from the true underlying risks. The authors find that about 50% of the financial sector's equity value is due to the possibility of a bailout.

To begin with, Kelly, Lustig and van Nieuwerburgh document some empirical facts about the options market during the crisis. The authors use option prices to calculate the basket-index spread – the difference between the cost of insuring the basket of firms that make up the S&P 500 index individually, and the cost of insuring the S&P 500 index directly. It has been documented that correlations between firms increase during a financial crisis. If correlations increase, then the basket-index spread should shrink because options on the individual firm behave more like the option on the index. In line with this observation, the basket-index spread on call options shrunk during the crisis. However, the basket-index spread on put options widened during the crisis. Furthermore, news that increased the likelihood of bailout increased the put spread while news that decreased the likelihood of bailout had the opposite effect.

The model consists of agents with Epstein-Zin preferences. The model economy faces two types of rare disasters – a consumption disaster, and a financial disaster that affects financial sector dividend flows. Dividend loss in the financial disaster contains an idiosyncratic and a common sector-wide component. A government bailout is defined as a floor on the common sector-wide loss component. The authors find that a calibrated version of this state-of-the-art option pricing model can match the put and call spreads during the crisis only in the presence of the bailout. Furthermore, the presence of the bailout reduces the cost of capital for financial firms. The calibration suggests that about 50% of the financial sector's equity value is due to the presence of the bailout.

The paper's discussant, Robert McDonald, agreed with the authors' observation that government intervention during the crisis might have been important for stock returns and option prices. McDonald remarked that the paper's conclusion was too strong because security prices reflect expectations regarding infinite sample paths, but we only get to observe one realization of the sample path. McDonald urged the authors to compare their calculations to Arrow-Debreu state prices implied by traditional option price models. Furthermore, he asked what the resource constraint would look like in the presence of the bailout. Bryan Kelly responded that the mere presence of the bailout guarantee can affect market prices without altering the resource constraint. Moreover, the drop in consumption due to a disaster can be interpreted as resources dedicated to the bailout. A conference participant asked if the ban on short-selling that was imposed during the crisis could explain the basket-index spread. Kelly responded that it could not because the ban was in effect only for a short period of time and market makers were exempt from the ban.

Overborrowing, Financial Crises and 'Macro-prudential' Policy

by *Javier Bianchi and Enrique Mendoza*

Discussant: *Lukas Schmid*

Narratives of the global financial crisis of 2008 often point to excessive leverage, or "overborrowing," as one of its main causes. Discussion of how to prevent future financial crises includes calls for "macro-prudential" policies to moderate overborrowing. However, the concept of overborrowing tends to be vaguely defined or presented as a value judgment due to the fact that a credit boom ended in a bust. This result raises several questions: What exactly does overborrowing mean? Is it a significant macroeconomic problem? Are welfare effects large enough to justify policy action? What are the features of macro-prudential instruments?

To address these questions, Bianchi and Mendoza's starting point is to define overborrowing as the difference between what atomistic agents facing a collateral constraint borrow and the amount borrowed by a social planner who faces the same constraint but internalizes the effect of borrowing on prices. The authors construct a business cycle model where a binding collateral constraint triggers a financial crisis. The collateral constraint is modeled as an upper limit on total borrowing given by a constant fraction of the market value of current land holdings, an asset in fixed supply. A binding collateral constraint leads to "fire-sales" of land, causing a drop in the price of land and a further tightening of the collateral constraint. An innovative aspect of the model is that the collateral constraint limits not only household debt but also the amount of working capital used in production by firms. This implies that a credit crunch has both demand side effects – reducing agents' abilities to smooth consumption – and supply-side effects – reducing labor demand and output.

Agents in the authors' economy overborrow in the sense that in "good times" they do not internalize the concept that lower leverage reduces fire-sale effects in "bad times." The model is calibrated to United States (U.S.) data and simulated for 100,000 periods. The authors find that, compared to the social planner equilibrium, in the competitive equilibrium, the probability of financial crises increases by a factor of 3, asset prices fall 18 percentage points more during a typical crisis, the volatility of macro variables increases between 5 and 40 percent, excess returns increase by a factor of 5, and the price of risk increases by 50 percent. A state-contingent tax on debt (about 1 percent on average and positively correlated with leverage) and a tax on dividends (about -0.4 percent on average) recovers social planner allocations.

The discussion of the paper by Lukas Schmid centered around three comments. First, the model produces a higher volatility of consumption than output, opposite of what is observed in U.S. data, and more in line with moments of developing economies. Bianchi commented that investment was left out to simplify the computation and this is possibly the reason why U.S. moments are not matched. However, Bianchi added, the model is not meant to be a rich model of business cycles. Schmid's second concern was regarding the reliance of the model on the assumption of a small open economy. On this note, a conference participant added that low interest rates are closer to what central bankers have in mind when they think of overborrowing, so modeling them might be important. Bianchi explained that the effect of endogenizing interest rates is unclear. On one hand, it could dampen the boom-bust cycle because, during the boom, high interest rates decrease

the demand for credit. On the other hand, if the model is calibrated to match the domestic credit market, the level of debt in the economy is higher, which makes crises worse and more likely. Furthermore, Bianchi noted that there is evidence that the interest rate in the U.S. is significantly affected by external factors. The third comment by Schmid was on the source of shocks. The model relies on TFP shocks, but, if anything, TFP seems to have increased during the crisis. Schmid suggested that credit shocks might be a better source of fluctuations given that the emphasis is financial crises, and papers such as Jermann and Quadrini (2009) have shown that credit shocks track hours worked quite well during the crisis. Since the role of taxes that recover optimality is to undo the collateral constraint, the policy response might be different if the source of shocks considered is different. Bianchi noted that he and Mendoza have an extension with credit shocks à la Jermann-Quadrini and the results are very similar.

References: Jermann, U., and V. Quadrini (2009): "Macroeconomic effects of financial shocks," NBER working paper 15338.

Collateral Crises

by *Gary Gorton and Guillermo Ordoñez*

Discussant: *Vincenzo Quadrini*

Financial crises tend to happen near business cycle peaks. The recent financial crisis was preceded by declining transparency over the value of collateral-backed assets. Gorton and Ordoñez present a model which is consistent with these facts, predicting an endogenous decline in transparency during expansion, thus fueling a credit boom. The authors use the model to ask how effective policy can be when a negative shock hits, decreasing collateral value. They find that the effectiveness of policy depends on the amount of information created in response to the negative shock. If lenders decide to generate information, policy is less effective than the case where agents continue to borrow against collateral of unknown value, an "ignorance is bliss" scenario.

There are two types of risk-neutral agents in the model: young (households) and old (firms). The households have an endowment of the perishable numeraire good which can be consumed or used in production, but they do not have any production technology. The firms have the production technology and land, but do not have the numeraire, which is required for production. Land can be used for production, or on its own it may yield a positive amount of the numeraire. With a certain probability, the land is bad and will yield zero. To produce, the firms must borrow from the households using the land as collateral. Households and firms do not know the quality of the land, but firms can pay a fee to expose land quality to both parties. After production, the young (households) become old (firms) and buy the land. An unobservable idiosyncratic shock may change the quality of the land. Two potential regimes result: information-sensitive and information-insensitive. Under the former regime, the firms pay the fee to verify land quality. If the quality is good, the firm receives the optimal amount of numeraire good for production. Under the latter regime, the firm borrows without information production. If the optimal quantity of numeraire input requires information production, the firms can induce an information-insensitive regime by reducing borrowing and output. The model predicts an information-insensitive regime when the probability of having good collateral is either very high or very low, and an information-sensitive regime for intermediate probabilities.

The full optimal investment is obtained when the probability of good collateral is high enough that all firms get full investment without information production, or under the information-sensitive regime when a firm's collateral is confirmed to be of good quality.

The authors consider a negative aggregate shock which changes a fraction of good quality land into bad quality. Which land units change quality is not observed, and over time the ratio of good to bad land converges back to its original value. The impact of the shock depends on the current amount of information. If an economy has been in an information-insensitive regime for some time, little is known about true collateral type. The shock will have the most impact because all firms will be credit-constrained based on the new beliefs if information is not produced. If the shock causes a movement from the information-insensitive to information-sensitive regime, recovery can happen faster because the firms with good land can receive the optimal investment. The government could improve welfare with a positive aggregate shock if it could react quickly, and if there were no information production. The government could also tax households and give transfers to firms so that the otherwise credit-constrained firms could invest the optimal amount without triggering information production. The last potential policy prescription is preventative. The government could produce information during an expansion and credit boom, so that more is known about the collateral when the shock hits, making the recession less severe. However, this policy is not *ex ante* beneficial unless the government can predict the negative aggregate shock.

The paper's discussant, Vincenzo Quadrini, emphasized the difference between costly state verification and this model. Here, the true value of the asset is not observable to either party. The household approaches the firm, and the firm decides whether to verify the quality. Quadrini then gave an example of how the credit booms work in the model. At the start, some firms have good quality land and others have bad quality land, and this is known. Those with good land get the optimal funding, and those with bad land get zero funding. After the idiosyncratic shock hits, the land that was good before still has a high enough probability that it is good to serve as collateral for the full optimal loan amount. The land that was bad now has a small probability of being good. Those firms can take out small loans without information production. The second period experiences more loans, more production and more consumption. A negative aggregate shock could either knock all firms into the less-than-optimal loan range under an information insensitive regime, or spark information production, requiring firms to pay the verification fee. A conference participant wondered if land is the right asset to think about for an analysis of the recent financial crisis. Housing was created even when it was not needed and used as collateral. Land in the model is a fixed quantity. Ordoñez responded that the paper considers the mix of assets that already exist, not the creation of new assets.

Houses as ATMs? Mortgage Refinancing and Macroeconomic Uncertainty

by Hui Chen, Michael Michaux and Nikolai Roussanov
Discussant: Kjetil Storesletten

Fixed rate mortgages, the mainstay of the U.S. housing market, have an implicit prepayment option that can be exercised by

refinancing. Interest rate fluctuations alone, the primary financial motive to refinance, cannot explain all the aggregate refinancing activity observed in the data. Empirically, seventy percent of refinanced loans also involve a cash-out – taking out a loan with a larger balance than the previous one. The ability to cash-out is important for liquidity-constrained households who want to smooth their consumption in response to idiosyncratic or aggregate shocks. Chen, Michaux and Roussanov ask whether consumption smoothing can explain aggregate refinancing and cash-out behavior.

The authors present several stylized facts about aggregate refinancing activity and its relation to macroeconomic conditions. Aggregate refinancing activity co-moves negatively with mortgage rates and with year-on-year industrial production growth, and positively with the VIX index (a measure of implied aggregate volatility of the S&P 500). The authors find that, even after controlling for variation in interest rates and house prices, aggregate cash-outs increase during economic downturns. In spite of high interest rates, households tend to refinance at the end of economic expansions. Since cash-outs are highly correlated with refinancing, the time series behavior of cash-outs suggests that households borrow against their home equity to smooth their consumption during economic downturns.

The authors construct a model in which infinitely-lived households, with power utility, face uninsurable labor income risk, interest rate risk, house price risk, inflation risk, and real growth rate risk. Each household is endowed with a house (with an interest-only mortgage), borrowing constrained, and supplies labor inelastically. Households can repay, refinance, or default on the mortgage. The refinancing option allows households to borrow against their housing collateral. Households choose consumption, savings in a risk-free asset and housing, and mortgage adjustments so as to maximize their expected lifetime utility. The authors calibrate the model and simulate household behavior. They find that refinancing is consistent with consumption smoothing: it occurs primarily when households have low income realizations or a low level of liquid assets. Furthermore, the authors find that counter-cyclical labor income risk drives cyclical refinancing.

Kjetil Storesletten, the paper's discussant, noted that the dynamics of aggregate refinancing and cash-out in the model were remarkably consistent with empirical data. However, the model had very little default in comparison to the data. Storesletten was concerned that, compared to the data, refinancing costs in the model were too high. He suggested that underwater mortgages, access to unsecured credit, and dynamically inconsistent consumption-saving decisions might be additional reasons that might explain aggregate refinancing activity in the data. Storesletten urged the authors to use their model to calculate the value of mortgages and mortgage-backed securities, and to understand the effects of monetary policy on aggregate consumption. Roussanov agreed that refinancing costs in the model were large. He added that increasing the persistence of labor income shocks could reduce these costs. A conference participant asked if the authors had considered adding idiosyncratic house price shocks. Roussanov replied that adding such shocks to the model would be interesting.



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