# Introduction to Financial Economics

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**Abstract:** This introduces the symposium on financial economics.

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## 1. Introduction

Financial economics is a broad field covering corporate finance, asset pricing, and financial intermediation. The foundations of modern corporate finance date back to the celebrated papers of Modigliani and Miller [64][65] and the development of agency theory starting with Jensen and Meckling [48]. Asset pricing was revolutionized by the development of mean-variance analysis by Markowitz [60], the Capital Asset Pricing Model by Lintner [58] and Sharpe [71]. The theory of efficient markets by Samuelson [70], the option pricing model of Black and Scholes [17] and Merton [62] and role of asymmetric information in Grossman and Stiglitz [41] followed on. Financial intermediation theory lagged behind with the modern literature dating back to Bryant [20], Diamond and Dybvig [29] and Diamond [28].

The financial crisis that started in the summer of 2007 has emphasized the crucial role of finance in economics. This has led to a resurgence of interest in the field. This symposium contains a number of important recent theoretical contributions. Some were presented at the July 2011 European Summer Symposium in Economic Theory, held in Gerzensee, Switzerland at the Study Center of the Foundation of the Swiss National Bank. This meeting was to mark the twentieth anniversary of the series. Many of the papers in this JET Symposium were prompted by the crisis. This is true of the papers on banking crises that are discussed in Section 2 and those in Section 3 that cover the interaction of various institutional structures with the crisis. Section 4 discusses a number of novel approaches to asset pricing that extend the frontiers of the field significantly.

## 2. Banking Crises

Financial crises have occurred frequently both historically and in recent years as documented by Bordo et al. [18] and Reinhart and Rogoff [69]. However, the fact that prior to 2007 the last major banking crisis in the U.S. prior was during the Great Depression in the 1930's meant that the study of crises was a niche subject primarily studied by those interested in economic history or international economics.

There were traditionally two theories to explain the origins of banking crises. One line of argument maintains that they are undesirable events caused by random deposit withdrawals unrelated to changes in the real economy. In the influential work of Bryant [20] and Diamond and Dybvig [29] bank runs are sunspot phenomena as in Cass and Shell [22]. In these models, agents have uncertain needs for consumption in an environment in which long-term investments are costly to liquidate. If depositors believe that other depositors will withdraw then all agents find it rational to redeem their claims and a panic occurs. Another equilibrium exists where everybody believes no panic will occur and agents withdraw their funds according to their consumption needs. In this case, their demand can be met without costly liquidation of assets.

The second set of theories of banking crises is that they are a natural outgrowth of the business cycle. An economic downturn will reduce the value of bank assets, raising the possibility that banks are unable to meet their commitments. If depositors receive information about an impending downturn in the cycle, they will anticipate financial difficulties in the banking sector and try to withdraw their funds, as in Jacklin and Bhattacharya [46]. This attempt will precipitate the crisis. According to this interpretation, crises are not random events but a response of depositors to the arrival of sufficiently negative information on the unfolding economic circumstances. This view is consistent with the evidence in Gorton [36] that in the

U.S. in the late nineteenth and early twentieth centuries, a leading economic indicator based on the liabilities of failed businesses could accurately predict the occurrence of banking crises.

One strand of the business cycle explanation of crises emphasizes the role asymmetry of information plays in triggering banking crisis. In this view, a panic is a form of monitoring. Chari and Jagannathan [25] focus on a signal extraction problem where some depositors withdraw money for consumption purposes while others withdraw money because they know that the bank is about to fail. In this environment, depositors who cannot distinguish whether there are long lines to withdraw at banks because of consumption needs or because informed depositors are getting out early may also withdraw. Chari and Jagannathan show crises occur not only when the outlook is poor but also when liquidity needs are high despite no one receiving information on future returns.

Building on the empirical work of Gorton [36], Allen and Gale [7] develop a model that is consistent with the business cycle view of the origins of banking crises. They assume that depositors can observe a leading economic indicator that provides public information about future bank asset returns. If there are high returns then depositors are quite willing to keep their funds in the bank. However, if returns are sufficiently low, they will withdraw their money in anticipation of low returns and there is a crisis.

Calomiris and Kahn [21] show that the threat of bank liquidation disciplines the banker when he can fraudulently divert resources ex post. The first come-first served constraint provides an incentive for costly information acquisition by depositors. Calomiris and Kahn regard bank runs as always beneficial since they prevent fraud and allow the salvage of some of the bank value. Diamond and Rajan [30] develop a model in which banks have special skills to

ensure that loans are repaid. By issuing demand deposits with a first come-first served feature, banks can precommit to recoup their loans. This allows long-term projects to be funded and depositors to consume when they have liquidity needs. However, this arrangement leads to the possibility of a liquidity shortage in which banks curtail credit when there is a real shock.

Peck and Shell [68] consider a class of feasible deposit contracts that must satisfy a sequential service constraint but partial or full suspension of convertibility is allowed. They show that the optimal contract within this class allows for run equilibria with positive probability.

The first paper in the symposium, Martin, Skeie and von Thadden [61], develops an infinite horizon model of shadow bank runs. The non-banks engage in maturity transformation that involves borrowing short term to invest in long term assets. An important difference with standard banking models is that the long term assets can be traded in a market. The initial focus is on the threat of an institution specific run rather than a systemic problem. When faced with such a threat, the non-bank has a pecking order of methods to raise cash. First, it can use its free cash flow and investment as a buffer. Second, it can increase collateral to attract emergency lending. Finally, it can engage in market sales of assets. This menu of options leads to distinct liquidity, collateral and asset liquidation constraints.

The first main result is to show that net asset sales in the form of securitization weakens a borrower's balance sheet and makes the non-bank more fragile. The reason is that these sales reduce the assets available to raise cash in emergency situations through borrowing or asset liquidation. The second result concerns systemic risk. If there is a shock to asset values that is sufficiently strong then a run on all the non-banks is possible as a self-fulfilling expectation. The

more borrowers that are simultaneously in distress, the more difficult that raising funds in the asset market becomes because there is a limited number of buyers and hence limited cash in the market. The more that sell, the lower the price goes and this causes more to sell so there is a downward spiral. This is exacerbated if the system as a whole is exposed to a short term funding risk.

Akerlof and Romer [4] stresssed that in crises bank managers are interested in taking as much as possible from the bank for themselves. For example, when long term rates are comfortably above short term rates they may issue long term mortgages financed by short term liabilities. As long as interest rates stay the same, the bank will make large profits and the managers will receive large bonuses. The strategy is very risky though, in that if short term rates rise enough, the bank will fail. The strategy illustrates that risk taking can be the result of the attempt by managers to extract funds from the bank for themselves.

In the second paper in the symposium, Boyd and Hakenes [19] provide a formal model that builds on the ideas presented by Akerlof and Romer [4]. In their approach managers can simply divert bank assets for their personal benefit. Boyd and Hakenes also incorporate standard "risk shifting" opportunities where managers can choose the risk of a loan portfolio and this cannot be observed and controlled by depositors. The effect of three policy tools that can affect looting and risk shifting are investigated. These are policies to restrict a bank's investment choices, policies to make looting more costly for managers and finally, capital regulation. The authors focus on two variants of the model. In the first, the managers are also owners. In other words, all the equity is inside equity. This is arguably an appropriate assumption for small banks. In the second, the managers own part of the equity and outsiders provide the remainder. This assumption is appropriate for large banks, where managers often own equity but the

majority of shares are owned by outsiders. The difference in the results obtained in the two cases is significant.

When there is an owner-manager, both anti-looting penalties and capital requirements are shown to be effective at simultaneously deterring looting and risk shifting. However, the third policy of restricting risky activities may have the opposite effect from that intended. It can in fact induce more risk taking and even if it induces lower risk it increases the chance of looting. With inside and outside equity, the analysis is more complicated. A penalty on looting operates similarly to the owner-manager case in that it reduces looting and risk shifting. However, capital regulation can either increase or decrease the amount of looting depending on the ownership structure of the bank and the ability of managers to loot. The more outside equity there is and the more lucrative looting is, the more likely that looting will occur. As with owner-manager banks, policies to restrict risk taking can actually increase risk taking and looting. Anti-looting penalties are the only policy that has unambiguous effects with both ownership structures.

There is a considerable amount of evidence accumulating that low interest rates increase risk taking by banks both in terms of real estate and other loans. This is the so-called risk-taking channel of monetary policy. Maddaloni and Peydró [59] consider the impact of low interest rates and securitization on bank lending standards and risk taking using data from the Euro area and the U.S. They find evidence that low short term (policy) interest rates result in a softening of lending standards and increase in bank risk taking. This effect is magnified when supervision standards for bank capital are weak, interest rates are held low for an extended period, and the more securitization there is in an economy. Their results are in line with Taylor's [72] view that loose monetary policy is an important cause of the crisis.

Jiménez, Ongena, Peydró, and Saurina [49] consider the impact of short term interest rates on banks' risk taking. They use a unique data set from Spain on all loans since 1984 as well as all loan applications since 2002 up until the beginning of 2009 that can be matched with relevant bank and firm information. They find that loose monetary policy in terms of low short term interest rates leads banks to take greater risks when granting loans, particularly banks with lower capital. Low long term rates have much smaller effects. Ioannidou, Ongena and Peydró [45] study data from the credit register in Bolivia and find similar results.

The third paper in the symposium, Dell'Ariccia, Laeven and Marquez [27] is the first to develop a theoretical analysis of the effect of interest rates on bank risk taking and provide insight into why low rates lead to increased risk taking. They develop a one-period model of bank lending where firms need external financing to make productive investments. Banks grant loans to firms and monitor them, which helps improve firms' performance. The more monitoring effort a bank exerts, the greater is the probability that a firm's investment is successful. Given that monitoring is costly and banks have limited liability, banks are subject to a moral hazard problem in the choice of monitoring effort and need to be provided with incentives. One way of doing this is through the amount of equity capital a bank has. Capital forces banks to internalize the costs of their default, thus ameliorating the limited liability problem banks face due to their extensive reliance on deposit-based financing. A second instrument to improve banks' incentives is embodied in the interest rate on the loan. A marginal increase in the loan rate gives banks a greater incentive to monitor in order to receive the higher payoff if the project succeeds and the loan is repaid. Thus, capital and loan rates are alternative ways to improve banks' monitoring incentives, but entail different costs. Equity is assumed to be more expensive than deposits.

The focus of the analysis is on the change in bank risk taking caused by an exogenous fall in real interest rates. There are two main effects from this. The first is that it leads to a reduction in the interest rate on bank loans. This in turn reduces the gross return from monitoring and hence the incentive of banks to monitor. This effect thus tends to increase the riskiness of loans. The second effect is on offsetting one. A drop in the real interest rates reduces the cost of debt and this increases profits and provides an incentive to limit risk. The overall effect depends on the balance of these two effects.

The authors consider two cases. The first is where banks can adjust their capital structures to the optimal level as real interest rates change and the second is where capital structures are fixed. In the former case they show that for any downward sloping demand function, reductions in real interest rates lead to greater leverage and higher risk. In the latter case, the effect of the reduction in interest rates depends on whether bank capitalization is above or below a critical cutoff. Above this level, banks increase risk but below they reduce it. The cut off level depends on the degree of bank competition. This is a very interesting set of results that provides considerable insight into the empirical literature discussed above. The model provides potentially testable hypotheses concerning when reductions in risk can be expected. It is thus an important input into the policy debate on the desirability of low interest rates for an extended period.

The final paper on banking in the symposium, Allen, Carletti and Gale [6] is concerned with the role of printing money to prevent crises. Most theories of banking crises assume contracts are written in real terms but in practice financial contracts are almost always written in nominal terms. The possibility of nominal contracts potentially makes a significant difference because it means that the central bank can costlessly create liquidity to prevent a crisis.

Their analysis is based on a standard banking model. There are three dates and, at each date, there is a single good that can be used for consumption or investment. Assets are represented by constant returns to scale technologies that allow the consumers' initial endowment of the good to be transformed into consumption at the second and third dates. The short-term asset is a storage technology. The long-term asset requires an investment at the initial date and yields a random return at the final date. There is a large number of ex ante identical consumers, each of whom is endowed with one unit of the good at the initial date. At the second date, a random fraction of consumers discover they are early type and want to consume only at the second date while the remaining consumers are late type and want to consume only at the third date.

The first step in the analysis is to characterize the first best allocation as the solution to a planner's problem. The planner invests the consumers' endowments in a portfolio of short- and long-term assets and distributes the asset returns to the early and late consumers at the second and third dates. The portfolio is chosen before the realization of the aggregate state, which consists of the fraction of early consumers and the return on the risky asset. The consumption allocation is determined after the state is realized and is therefore state contingent.

Allen, Carletti and Gale then show how this first best equilibrium can be implemented in a banking system where there are three types of institutions, a central bank, commercial banks, and firms. Fiat money is issued by the central bank. Deposit contracts and loan contracts are denominated in terms of money and money is used in transactions so money is both a unit of account and a medium of exchange. The central bank's policy is passive: at each date it supplies the amount of money demanded by the commercial banks. The banks and firms are assumed to

be profit maximizing and in a competitive equilibrium they earn zero profit. Consumers maximize expected utility.

In contrast to the results in most of the banking literature, the combination of nominal contracts and a central bank policy of accommodating commercial banks' demand for money leads to first best efficiency. This result holds when there are aggregate liquidity and asset return shocks and also when there are idiosyncratic liquidity shocks. The reason that a competitive equilibrium implements the same state-contingent allocation as the planner's problem despite the debt-like nature of the deposit contract, is that deposit contracts are written in terms of money. Regardless of the liquidity and asset return shocks, banks are able to meet their commitments as long as the central bank supplies them with sufficient amounts of fiat money. The price level adjusts in response to aggregate shocks in order to clear markets and it is this price adjustment that allows state contingent consumption.

The one case where monetary accommodation is not sufficient to implement the first best is the case of idiosyncratic (bank-specific) asset return risk. If the banks' asset-specific returns are observable, efficiency can be restored by introducing a public or a private insurance scheme whereby banks can securitize the assets and effectively hold a diversified portfolio of asset-backed securities. However, such schemes are vulnerable to moral hazard if there is asymmetric information about asset returns. Insuring low returns gives banks an incentive to engage in asset substitution and to misrepresent the realized returns of the assets.

## 3. Institutional Structures and Crises

Before 2007, most of the literature focused on banks and the role of short term debt in causing crises. However, the crisis that started in 2007 has underlined that there are many other factors that can contribute to the severity of a crisis. One important factor is the institutional structure in which financial institutions and investors interact. Duffie [31] contains an interesting discussion of how institutional structures contributed to the crisis, what reforms have been implemented to prevent this going forward and what remains to be done. The papers from the symposium discussed in this section are concerned with the role of institutional structures in exacerbating crises.

In an important contribution, Hirshleifer [44] pointed out that the revelation of information can lead to a fall in social welfare because it destroys risk sharing possibilities. For example, if nobody knows the value of an asset then it can be sold near the average price. This allows people to share the risk associated with the asset. All owners receive the same irrespective of whether their asset has a high or low value. However, if the value is revealed before the asset is traded then the risk sharing role of the market will be destroyed. Each owner of the asset will receive its true value.

At the same time it is well known that information about values can be useful in ensuring the efficient allocation of resources. Investments need to be made in high return opportunities. This raises the general question of when government policy should be directed toward encouraging information flows and when it should be concerned with suppressing them. Examples of the former are the introduction of FAS 115 in 1994 and FAS 157 in 2007. These both encouraged the use of "mark-to-market" pricing in the financial sector to reveal asset values. On the other hand there are many examples where information is not revealed by

regulators or government agencies. For example, bank regulators do not report all the information they have available. Central banks acting as lenders of last resort go to great lengths to hide the identities of the banks they are lending to.

The fifth symposium paper, Andolfatto, Berenstein and Waller [8] considers a particular aspect of this question of when information revelation is optimal. They focus on incentives for revelation when private investors have the ability to expend resources to discover the information that is not revealed by the official sector. In this case reveling information may be undesirable but not revealing it may be even worse.

They consider a simple model with a Lucas fruit tree with a stochastic dividend. If the level of the dividend is suppressed then the owners can share the risk associated with the varying levels of payoff. However, if the information is revealed this risk sharing effect is destroyed and welfare is lowered. The main result of the paper is to show that disclosure is optimal when individuals have a strong incentive to discover the information themselves. This occurs when the variance of returns is high, the expected return on assets is low, or the cost of acquiring information is low. The reason for this result can be seen by considering the extreme case where the variance of returns is high so there is a large incentive to acquire the information. But when investors do this, they waste large amounts of resources acquiring information. It would be better from a social point of view to reveal the information and provide it for free. Insurance possibilities are destroyed in both cases but with revelation no costs of information gathering are expended.

The final part of the paper considers a number of ways in which the model can be used to interpret changes in information revelation that may have contributed to triggering the crisis. Gorton [37], [38] has suggested that the introduction of the ABX.HE index by the financial

information firm Markit, which allowed a credit default swap to be introduced, lead to the revelation of subprime market risk. When house prices started to fall, this revelation of information caused the market for securitized mortgages to collapse since investors were no longer willing to buy commercial paper that allowed these assets to be traded. Another example the authors give is the increased transparency about the value of banks' assets caused by the introduction of FAS 157 in 2007. Their model also suggests that increased macroeconomic risk could lead to more information acquisition that then is released through market revelation.

In the sixth symposium paper, Acharya and Bisin [1] study financial markets in which agents can default on their promised payments. There are two main contributions. They show a "counterparty risk externality" arising because an agent's position in a financial claim (e.g., a credit default swap contract) can affect the claim's payoff. For example, if a seller of the claim sells an overly large quantity, he will default in the states where he needs to pay and the claim will pay less than its promised payoff. Equivalently, if a buyer buys an overly large quantity, this means that the seller sells too much in equilibrium and the claim pays less than its full payoff. Because of this externality, competitive equilibrium is typically constrained inefficient.

The second contribution is to define a new notion of equilibrium that deals with the externality. The new definition requires that agents observe each other's position and can hence determine how a claim's payoff changes when others change their positions. Under the new definition, each agent maximizes his objective taking into account that the prices of the financial claims are not constant, as in the standard definition, but depend on his position. The new equilibrium is termed "centralized clearing" while the standard equilibrium, in which agents do not observe others' positions, is termed non-transparent. Centralized clearing is constrained Pareto optimal while the non-transparent equilibrium is not.

The results are developed first through a simple example and then through a general model of static competitive equilibrium. The paper also compares the performance of centralized equilibrium with other mechanisms that can address the counterparty-risk externality, such as collateral. It shows that the other mechanisms can yield efficient allocations in some cases but not in others.

In the seventh paper in the symposium, Oehmke [66] studies how strategic traders sell an asset over time. The asset is illiquid, in the sense that selling it impacts the price. The price impact is exogenous, and has a temporary and a permanent component. The main innovation relative to previous models of strategic traders facing an exogenous demand curve is that the traders are subject to a balance-sheet constraint. This constraint limits the total risk derived from the asset that traders can bear during the liquidation period. The setting is interpreted as the liquidation of illiquid collateral. That is, the sellers have lent cash to another trader and are holding an asset collateral in exchange. That trader has declared bankruptcy, and the lenders must seize and liquidate the collateral.

The main results of the paper concern the sellers' optimal liquidation policy and the resulting asset price dynamics. The first is that a monopoly seller has an incentive to sell slowly, to economize on the temporary price impact. This can, however, violate the balance sheet constraint since the constraint limits the total risk that the seller can bear during the liquidation period. When the constraint is violated, the seller sells quickly at the beginning of the liquidation period. This causes the price to overshoot, i.e., drop and then rise.

The second result is that when the asset is split among competing sellers, the balance sheet constraint is less severe because each seller holds a smaller piece of the asset. At the same time, each seller wants to sell before the others to obtain a better price. Overshooting is smaller

relative to the case of a single seller, but competition can reduce the value of the asset to each seller.

The paper uses the above results to derive implications for the financing structure of assets, i.e., whether an asset owner should seek financing from a single lender or from multiple lenders.

## 4. Novel Approaches to Asset Pricing

While a majority of the papers in the symposium have clearly been motivated by the crisis that started in 2007, the remaining papers have not been. They all provide new ways of thinking about asset pricing. The dimensions in which they do this are diverse ranging from new ways to think about how prices reveal information to the use of behavioral foundations to develop models consistent with puzzling empirical observations.

Standard asset pricing theories such as the Sharpe-Lintner capital asset pricing model, assumed that investors were symmetrically informed and had the same expectations about the risk and expected returns of stocks and bonds. In a pioneering contribution, Grossman and Stiglitz [41] developed a model where investors could acquire information at a cost and as a result of their trading asset prices partially revealed this information. This paper has led to a large literature that is covered well in Vives [75].

In an early paper Hellwig [43] pointed out a problem in the Grossman and Stiglitz approach, namely that when submitting their demands, traders would take into account the information content of the price but not the price impact of their trade. Admati [2] and Vives [74] showed that this problem disappears in an idealized limit continuum economy. However, there remained the question of how to model imperfectly competitive behavior in a reasonable

way. Kyle [54] developed an approach of this type where traders take account of the price impact of their trades and compete in demand schedules. He also characterized a convergence condition under which in a large market, strategic and competitive equilibria converge to each other.

In the eighth symposium paper, Kovalenkov and Vives [52] use the framework of Kyle [54] and identify the conditions under which the competitive rational expectations equilibria can be used as an approximation to the "true" strategic equilibrium in a standard financial market context. They consider what happens when Kyle's convergence condition where the number of informed traders and the amount of noise trading grow proportionately is satisfied and there is a well-defined limit economy. In this case the competitive rational expectations equilibrium of a large but finite market with risk averse traders provides a good approximation to the actual strategic equilibrium. The approximation is particularly good when the noise trading volume per informed trader is large relative to his risk bearing capacity. The reason is that in this case a competitive trader limits his trading activity for this reason. If the market is a minimum size then it is possible to take the shortcut of assuming the competitive behavior of the finite m=number of agents is good enough. However, this is not true if, for example, the informed traders are sufficiently close to being risk neutral.

The Kovalenkov and Vives model also provides some interesting insights into the Grossman and Stiglitz paradox of why if information is costly people are prepared to pay for it if markets are efficient and fully reflect that information. If there is a large entry cost into the market then the number of informed traders increases more slowly than the size of the market and no information is revealed in the limit. If the entry cost in a large limit market is zero then the number of informed traders increases faster than the market and in the limit the market is

fully revealing. Even if information is costly to acquire in a large limit market, prices become fully revealing but the incentives to acquire information are preserved.

Momentum is said to occur when excess stock returns exhibit unconditional positive serial correlation in the short to medium term. Reversals are when there is a switch to excess returns becoming negatively serially correlated in the long run. There is considerable empirical evidence of momentum followed by reversal effects in aggregate and in individual stock returns (see e.g. Jegadeesh and Titman [47], Chan et al. [24] for momentum and De Bondt and Thaler [26] for reversals).

At a theoretical level, it has been difficult to explain these patterns of stock returns using models based on rational behavior. Berk, Green and Naik [15] are able to explain momentum but not reversals. Lewellen and Shanken [56] and Fama and French [32], [33] provide models that are consistent with long run reversals but not momentum. Wang [76] and Cespa and Vives [23] suggest theories that can predict momentum or reversal but not both. The one paper that does provide a theory that is consistent with both is Vayanos and Woolley [73]. They develop a model of delegated portfolio management when there is asymmetric information. Gradual portfolio adjustment leads to momentum and then reversals.

In the ninth symposium paper, Albuquerque and Miao [5] develop a dynamic rational expectations model that provides a very interesting and plausible explanation for the two effects. They use a similar model to Wang [77], who was the first to develop a dynamic version of the Grossman and Stiglitz [41] model. As usual in these models, there is an informed and uninformed group. Informed investors have private information about the earnings of publicly traded firms and in private firms whose returns are assumed to be positively correlated with the publicly traded ones. The important additional assumption that Albuqueque and Miao make is

that the informed investors also have advance information about future shocks to earnings that are unrelated to current performance. The informed also have access to a publicly traded risk free asset. They must solve a complex forecasting problem given their private information. The uninformed investors can only invest in the publicly traded firms and risk free asset. They try to deduce the information of the informed from the price in the usual way.

The model is solved in a different way from Wang [77]. The authors choose a state vector containing persistent components of earnings of both the public and private firms as well as a finite sequence of future innovations to earnings.

The reason that the momentum and reversal effects occur can be seen by considering the effect of informed investors receiving good advance information. They bid up stock prices and informed investors act as trend chasers. Since private firms are positively correlated with publicly listed firms, the informed also buy these. The informed are thus bearing more aggregate risk and the expected risk premium increases generating short run momentum. The uninformed investors are on the other side of the market selling stocks and are thus acting as contrarians. When the time arrives for the high earnings predicted by the good advance information to be realized, excess returns fall generating long run reversals.

In the tenth paper in the symposium, Pasquariello [67] develops a rational expectations model similar to that in Grossman and Stiglitz [41], Kyle [53] and Vives [74] but instead of traders' behavior being consistent with standard expected utility theory, they behave according to Kahneman and Tversky's [50], [51] Prospect Theory. In this framework, economic agents assess gambles with a value function defined over gains and losses relative to a reference point instead of the absolute level of financial wealth or consumption. The function is concave over gains and so displays risk aversion in this region. For losses it is convex and so is risk seeking and is

steeper so there is loss aversion. Prospect Theory has been used to explain a number of asset pricing puzzles such as the magnitude of the equity premium, excess return volatility, momentum and the disposition effect, the value premium, or stock return predictability and its implications for liquidity and volatility (see, e.g., Benartzi and Thaler [14], Aït-Sahalia and Brandt [3], Barberis, Huang, and Santos [11], Barberis and Huang [9], Berkelaar, Kouwenberg, and Post [16], Gomes [35], Grinblatt and Han [40], Barberis, Huang, and Thaler [12], Kyle, Ou-Yang, and Xiong [55], Barberis and Huang [10], Barberis and Xiong [13], and Li and Yang [57]). However, this is the first application in the context of rational expectations models.

As in standard rational expectations models, there is a continuum of competitive price taking informed traders who receive a noisy signal of the asset payoff who submit demand schedules. There are also noise traders submitting market orders and risk neutral market makers. The results are compared with those in the standard literature where traders have exponential utility functions (see, e.g., Vives [75]). Pasquariello shows that Prospect Theory traders reduce the average price impact of noise trading but worsen price efficiency and lower aggregate trading volume. It is also shown that Prospect Theory traders makes equilibrium market quality state dependent whereas in the standard model this only depends on exogenous preference and preference and technology parameters.

The Prospect Theory model is also analyzed when informed traders' acquisition of private information about asset payoffs is costly. In this case it is shown that relative to the standard model, Prospect Theory traders diminish information production and amplifies its effects on market quality but attenuates its state dependence. This suggests that the extent to which Prospect Theory traders affect financial market quality is sensitive to the market's information environment.

The eleventh symposium paper, Gorton, He and Huang [40], studies how managerial incentives affect asset prices in a Lucas-tree setting. The economy consists of a manager and a representative competitive investor. Both agents can hold a risky asset, and the asset's payoff is higher when the manager exerts more effort. In turn, the manager exerts more effort when he holds a larger share of the asset. In equilibrium, the distribution of the asset between the investor and the manager, the asset's payoff, and the asset's price are jointly determined.

The dynamics shown in the paper can be summarized in the following main mechanism. Suppose that the asset yields high payoff in the current period. If the investor and the manager hold the asset and do not trade, their consumption will go up temporarily, resulting in a less smooth consumption profile. Trade enables the agent who is less willing to engage in inter-temporal substitution to buy the asset and transfer consumption to the next period. If the manager is less willing to substitute intertemporally, he will buy the asset. As a consequence, he will have a greater incentive to exert effort, and this will cause the asset's payoff in the next period to increase. If instead the investor is less willing to substitute intertemporally, the manager will sell the asset, and the asset's payoff in the next period will decrease. In summary, the combination of asset trading and managerial incentives can affect or dampen economic fluctuations depending on the agents' relative preference parameters. The paper is one of the first to examine how agency considerations of firms' managers interact with the prices of the assets issued by the firms, and what this implies for the dynamics of aggregate output.

In the final symposium paper, Favara and Song [34] study house price dynamics when agents have heterogeneous beliefs. House prices depend on aggregate income and on an aggregate preference shock. Agents observe their own income and preference shocks, which are noisy versions of their aggregate counterparts. They hold heterogeneous beliefs about future

asset prices because they receive different income shocks and hence make different inferences about aggregate income. Moreover, the price does not reveal aggregate income perfectly because of the aggregate preference shock, and agents do not know the latter perfectly because their own preference shock is a noisy version.

In addition to heterogeneous beliefs, there are short-sales constraints. As in the financial-market models of Miller [63] and Harrison and Kreps [42], the combination of heterogeneous beliefs and short-sales constraints causes house prices to be higher than under homogeneous beliefs. House prices are also more volatile because they reflect only the beliefs of the optimists.

The paper's main contributions are the following. First it extends the literature on heterogeneous beliefs and short-sales constraints to a housing market setting. One interesting aspect of this extension is that there is market segmentation, whereby optimists buy houses and pessimists rent. In the financial-market models, such segmentation takes the trivial form that pessimists stay out of the market. An additional difference relative to most of the previous literature is to derive heterogeneous beliefs not from different priors but from different signals within a type of rational expectations equilibrium setting.

Second the paper shows empirically that in US cities in which beliefs are more heterogeneous, house prices are higher and more volatile. These results support the model, and provide one explanation for the puzzlingly high heterogeneity of house price behavior across cities.

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