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**Article**

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## Program Report

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## Corporate Finance

Raghuram G. Rajan\*

The NBER's Program on Corporate Finance was founded in 1991, and has initiated some very promising avenues of research since then. Narrowly interpreted, corporate finance is the study of the investment and financing policies of corporations. Because firms are at the center of economic activity, and almost any topic of concern to economists — from microeconomic issues like incentives and risk sharing to macroeconomic issues such as currency crises — affects corporate financing and investment, it is however increasingly difficult to draw precise boundaries around the field.

The range of subjects that Corporate Finance Program members have addressed in their research reflects this broad scope. Rather than offering a broad brush survey of all the work currently being done, however, I thought it would be most useful to focus on what our researchers have contributed to the analysis of the ongoing financial crisis. Even here, I have had to be selective, given the large number of papers on this subject in the last two years. I should also note that even prior to the crisis, Corporate Finance Program members had done important work on such topics as credit booms, illiquidity, bank runs, and credit crunches. This work laid much of the foundation for the more recent analyses. In the interests of space, though, I will not survey that earlier work.

A number of papers offer an overview of the crisis (Brunnermeier, 14612; Diamond and Rajan, 14739; Gorton, 14398). There is some consensus on its proximate causes: 1) the U.S. financial sector financed low-income borrowers who wanted to buy houses, and it raised money for such lending through the issuance of exotic new financial instruments; 2) banks seemed very willing to take risks during this time, and a significant portion of these instruments found their way, directly or indirectly, into commercial and investment bank balance sheets; 3) these investments were largely

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financed with short-term debt. But what were the more fundamental reasons for these proximate causes?

## Why Low Income Borrowers?

Atif Mian and Amir Sufi (13936) offer persuasive evidence that it was an increase in the supply of finance to low-income borrowers — not an improvement in the credit quality of those borrowers — that drove lending, appreciation of house prices, and subsequent mortgage defaults. They argue that zip codes with high unmet demand for credit in the mid-1990s (typically dominated by low-income potential borrowers) experienced large increases in lending from 2001 to 2005. These increases occurred even though these zip codes experienced significantly negative relative income and employment growth over this time period, suggesting that improvements in demand did not drive lending. The increase in the supply of credit seemed to be associated with a sharp relative increase in the fraction of loans from these zip codes sold by originators for securitization. The increase in the supply of credit from 2001 to 2005 led to subsequent large increases in mortgage defaults from 2005 to 2007. Mian and Sufi conclude that originators selling mortgages were a main cause of the U.S. mortgage default crisis.

Why did supply increase? One possibility is that financial innovation — the process of securitization which spread risk — enabled the financial sector to lend to risky borrowers who previously were rationed. The reality, though, is that deep flaws in the process of securitization seem to have compromised quality. Efraim Benmelech and Jennifer Dlugosz (14878, 15045) offer some evidence on the extent to which low quality mortgage packages were transformed into highly rated securities. They suggest that “ratings shopping” by some issuers of mortgage backed securities (which refers to the process by which an issuer finds the rating agency that will offer the most favorable rating), as well as a fall in standards at some rating agencies, must have played a role in the deterioration in quality. Vasiliki Skreta and Laura Veldkamp (14761) argue that for complex products, where rating agencies could have produced a greater dispersion in ratings even if totally unbiased, the incentive for the issuer to shop for the highest rating may have been higher, and therefore the inherent bias in published ratings larger. It would be interesting

to see whether ratings shopping by issuers could come close to accounting for the size of the errors that were made.

Another possibility is raised by Charles Calomiris (15403) and Mian and Sufi (13936), all of whom argue that government pressure to expand housing to low-income segments, and government involvement through the Federal Housing Authority and mandates to Fannie Mae and Freddie Mac, may have caused the explosion in supply.

The effects of both flawed financial innovation and undue government pressure to lend may have been aggravated by household behavior. For instance, Mian and Sufi (15283) document the rise in home equity borrowing in areas that had substantial house price appreciation, with the borrowing seemingly going to finance additional consumption. Their estimates suggest an increase in home-equity borrowing of 2.8 percent of GDP every year from 2002 to 2006. Following the housing crash, home equity borrowing seems to account for at least 34 percent of the new defaults from 2006 to 2008. While all of these aggregate estimates are, by necessity, tentative, borrower repayment capacity may have deteriorated even after the initial mortgage origination because of the easy availability of credit.

### Were banks more willing to take risks?

The large quantities of mortgage backed securities that were originated should have been sold to institutions that could bear the risk. Somehow, they landed up on bank balance sheets, or in off-balance sheet vehicles like conduits, all financed with very short-term debt. Why did banks take all this risk?

One set of explanations has to do with incentive structures. Douglas W. Diamond and I (14739) argue that given the competition for talent, traders have to be paid generously based on performance. But, many of the compensation schemes paid for short-term risk-adjusted performance. This gave traders an incentive to take risks that were not recognized by the system, so that they could gener-

ate income that appeared to stem from their superior abilities, even though it was in fact only a market-risk premium. The classic case of such behavior is to write insurance on infrequent events, such as defaults, taking on what is termed “tail” risk. If traders are allowed to boost their bonuses by treating the entire insurance premium as income instead of setting aside a significant fraction as a reserve for an eventual payout, then they will have an excessive incentive to engage in this sort of trade. Indeed, traders who bought AAA mortgage backed securities were essentially getting the additional spread on these instruments relative to corporate AAA securities (the spread being the insurance premium) while ignoring the additional default risk entailed in these untested securities. Regulators also seemed to ignore these risks in setting capital requirements.

Tail risk taking may not have been unprofitable for bank shareholders *ex ante*, especially if there were implicit guarantees from the authorities to bail out the system when a crisis occurred. Andrei Shleifer and Robert W. Vishny (14943) propose an explanation of booms and busts in lending where bank managers’ interests are perfectly aligned with those of shareholders. The driving force in their model is investor sentiment — essentially a willingness by market investors to overpay for securitized debt in good times. Banks have to contribute some money of their own to securitizations so as to assure investors that they have “skin in the game.” In good times (high sentiment), banks will use up all of their available financing capacity in order to create financing packages that can be sold. They thereby maximize their profits from the cheap funding available from markets. In bad times (low sentiment), banks may have to liquidate some of their portfolio at low fire sale prices. But the losses incurred then are more than made up for by the profits obtained by stretching the balance sheet in good times.

Finally, Veronica Guerrieri and Peter Kondor (14898) propose a model in which manager career concerns drive booms and busts. Good managers know

the true state of the world next period — whether it will be the good state where risky projects will pay off in full so that risk taking makes sense or the bad state where they will default. Normal managers do not know the state — they only know probabilities. Normal managers would like to be seen by the market as good managers. When good times are likely and defaults are likely to be low, normal managers are likely to take on risky projects — reducing the overall risk premium for risky assets excessively. When bad times are likely and defaults are likely to be high, normal managers will take safe projects, increasing the overall risk premium for risky assets. Thus managerial career concerns could explain the changes in sentiment towards risky assets that Shleifer and Vishny allude to, and could explain the recent boom and bust.

The evidence on bank behavior is accumulating. Andrea Beltratti and Rene M. Stulz (15180) find that bank shares that had high stock market returns in 2006 fared very poorly in 2007–8. They also find that banks with more shareholder-friendly boards performed worse during the crisis. These findings are consistent with the notion that bank CEOs may have been maximizing shareholder value by taking on risk (or that the market did not realize the risk they were taking) — when the risk materialized, their share price tanked. Rudiger Fahlenbrach and Stulz (15212) find that CEOs like Richard Fuld of Lehman who had the highest equity holdings in their firms in 2006 performed the worst during the crisis. They suggest that monetary incentives seem not to have mattered in driving behavior in this crisis. The precise reason is unclear. Perhaps CEOs accumulated equity through risky behavior in the past, and did not realize that times had changed. Perhaps the probability of a tail event like the one that occurred in September 2008 was small enough that they ignored it. Or perhaps CEOs felt they had to take risk in order to shine or even survive in their jobs, an objective far more important than any expected monetary loss they might suffer.

## Financing with Short-Term Debt

Why were the banks financed with short-term debt? Diamond and Rajan (14739) argue that given the complexity of bank risk-taking, and the potential breakdown in internal control processes, investors would have demanded a very high premium for financing a bank long term. By contrast, they would have been far more willing to hold short-term claims on the bank, since that would give them the option to exit—or get a higher premium—if the bank appeared to be getting into trouble. So, investors would have demanded lower premiums for holding short-term secured debt in light of potential agency problems at banks.

Of course, short-term debt carries refinancing or liquidity risk (the risk that financial market conditions will not be so favorable when it comes time to refinance). Indeed, Heitor Almeida, Murillo Campello, Bruno Laranjeira, and Scott Weisbenner (14990) show that firms that had debt maturing during the crisis reduced investment by about one third the pre-crisis level relative to their peers, suggesting a substantial cost of illiquidity. Perhaps one reason that bank managers paid less attention to illiquidity was that it too was a tail risk.

Another reason, though, might be that banks discounted the cost of illiquidity because of implicit promises made by the Fed. Diamond and Rajan (15197) argue that if the Fed is perceived as being accommodative in the future, or if it is viewed as unwilling to allow system-wide stress, then banks have an incentive to move to more illiquid assets financed with short-term debt. Authorities may want to commit to a specific policy of interest rate intervention to restore appropriate incentives. For instance, to offset incentives for banks to make more illiquid loans, authorities may have to commit to raising rates when low, to counter the distortions created by lowering them when high.

Marcin Kacperczyk and Philipp Schnabl (15538) argue that in the 1980s and early 1990s, the off-balance sheet conduits set up by banks to hold commercial paper tended to invest in short-

term commercial paper while financing themselves with short-term issuances. It is only in the late 1990s and in this century that they moved to holding longer-term illiquid assets, thus incurring the liquidity mismatch. This suggests either that excessive risk taking, or great confidence in the Fed's willingness to pump in liquidity when needed, may have prompted the rise in asset-liability mismatches.

I have already described one rationale for the bank financing with very short-term debt: it reduced the risk that the lender would see his investment wasted by the bank. Another rationale is that short-term secured debt, because of its effective seniority in the normal course (overnight secured debt is effectively repaid every day before anyone else gets to assert their claim) is information-insensitive. So a large pool of uninformed investors (money market funds, pension funds, wealth funds) can hold these claims, unlike corporate debt or equity, because they are near riskless. The problem, of course, occurs when liquidity starts drying up in the markets. At such times, Gary Gorton and Andrew Metrick (15273) argue, investors will not lend against the full value of collateral—they will impose a “haircut” on the amount they are willing to lend against collateral, with the extent of the haircut signifying the extent to which there will be a price decline in the value of the collateral if it is sold conditional on default. A greater haircut obviously implies that the bank can raise less debt against its assets, which also means it either has to have more equity or sell assets. If it is hard to raise equity, then in an illiquid market there will be asset sales which further depress prices, raise haircuts, and so on.

## The Panic and Fire Sales

A number of papers address the panic itself. Zhiguo He and Wei Xiong (15482) start with a model in which creditors are willing to roll over their loans to a bank only when current fundamentals provide a margin of safety. In figuring out this margin, today's maturing creditors have to guess what kinds of margins tomor-

row's maturing creditors will demand. If today's maturing creditors anticipate that tomorrow's creditors will demand a high threshold of safety, today's creditors will demand an even higher threshold. This precipitates a dynamic rat race, such that if creditors anticipate a bad enough future scenario, lending could dry up today, even though fundamentals do not warrant it.

A related argument, but across creditor chains, underlies the work of Ricardo Caballero and Alp Simsek (14997, 15479). Essentially, the idea is that as asset prices fall, more banks are likely to become distressed. Banks now need to monitor not only their immediate borrowers, but also borrowers of their borrowers, and so on. As banks cut back on lending, more entities are forced to sell at fire sale prices, implying that still more banks become distressed, and increasing the complexity that each bank has to deal with. At some point, the environment could become so complex that all lending stops.

A number of papers thus argue that downward spirals in asset prices could occur, and they explain the various ways the spirals could become self-reinforcing. Arvind Krishnamurthy (15040) offers a nice overview of such models including his work with Caballero on models of Knightian uncertainty as applied to finance. Diamond and Rajan (14925) argue that if there is an “overhang” of impaired banks that may be forced to sell illiquid assets in the future, this can reduce the current price of illiquid assets sufficiently that the weak banks have no interest in selling them. Intuitively, if a bank today expects to fail in the future conditional on being forced to sell assets, then it has no interest in selling them today, even if that would assure it is solvent in all future states—the insurance it buys from current cash sales essentially is a direct transfer to the bank's creditors. At the same time, anticipating a potential future fire sale, cash rich buyers have high expected returns to holding cash, which also reduces their incentive to lock up money in term loans. Thus the prospect of future fire sales could impair current lending. The potential for a worse fire sale than necessary, as well as the associated decline



in credit origination, could make the crisis worse. That is one reason it may make sense to clean up the system and to deal with the “walking wounded” banks, even in the midst of the crisis.

Finally, Krishnamurthy (15542) offers a careful empirical overview of the kinds of problems that pervaded debt markets. He focuses on the provision of risk capital, the willingness to undertake “repo” financing without demanding huge haircuts, and the willingness to take on counterparty risk. He then shows how these problems can explain a variety of interesting anomalies during the panic, including seemingly large arbitrage opportunities in the markets. For instance, he explains why the 30-year swap rate being below the Treasury rate implies an almost certain money making opportunity, but only if the arbitrageur has the risk capital, can assure market participants of his own good standing (counterparty risk), and can absorb the haircuts in borrowing that are applied in such stressed times. Given that all of these attributes were in short supply during the crisis, the arbitrage persisted for a while, available only to the most solid market participants (who indeed made extraordinary profits over this interval).

## The Rescue Efforts

We now turn to the rescue efforts (or the bailouts, as some would, perhaps correctly, characterize them). Takeo Hoshi and Anil K Kashyap (14401) summarize the experience of the Japanese financial crisis and draw lessons about the design and the timing of bank rescue programs. They conclude that to effectively rebuild the balance sheet of banks, some mix of recapitalization and asset purchase is probably necessary—neither step alone is likely to be powerful enough to achieve this goal. They call attention to the importance of rigorous bank inspections prior to recapitalization to evaluate the size of the problem, and they observe that if the goal is to prevent further deterioration of asset values, troubled assets need to be restructured swiftly. They emphasize that macroeconomic recovery can help, and be

helped by, bank recovery.

Pietro Veronesi and Luigi Zingales (15458) calculate the costs and benefits of U.S. government intervention in September–October 2008. They conclude that on net the intervention increased the value of financial claims on the banks by about \$131 billion, at a cost to taxpayers of between \$25 and \$47 billion. They conclude that a bankruptcy would have destroyed about 22 percent of failing banks’ value (they do not compute what the loss to the economy would have been if the banks failed, only the cost to the claimants on the banks). Their calculations suggest that the rescue plan came at a cost to taxpayers, but benefited the economy overall.

## What did not cause the panic?

We have many theories of what caused the panic and the subsequent credit crunch, but also some theories of what did not. Christian Laux and Christian Leuz (15515) argue that it is unlikely that fair value accounting—roundly criticized by bankers—was responsible for the crisis. First of all, market values rather than accounting values enter many market contracts (such as how much collateral to demand). These would have been unaffected by fair value accounting. Second, not all changes in fair value enter the computation of bank’s regulatory capital. Indeed, the researchers argue that from about the third quarter of 2007, banks used cash-flow-based models to value mortgage related securities, and therefore it is a myth that marking-to-market pricing was widespread for mortgage related securities. Third, even where fair value was used, it appears that if anything, banks overvalued their assets, especially where they had discretion. More generally, in my view, to the extent that regulatory capital binds, it would seem that rather than making accounting less transparent, regulators should have the ability to weaken capital requirements if they so choose. Moreover, the real problem with accounting in the midst of a crisis is the wide discretion that banks have—which reduces the transparency of their balance

sheets—rather than the fact that they mark assets to unrepresentative prices.

## Other Issues

The crisis led to a “sudden stop” of international capital flows into a large number of emerging markets. Hui Tong and Shang-Jin Wei (15207) analyze whether the volume and composition of capital flows into a country affected the extent of the crunch faced by its manufacturing sector. They find that on average the decline in stock prices was more severe for firms that were more dependent on external finance to fund their working capital. Further, while the overall volume of the pre-crisis capital flow into a country was not related to the severity of the stock price decline for dependent firms, the composition of capital inflows mattered. Dependent firms in countries that got more non-FDI (Foreign Direct Investment) inflows pre-crisis were affected by the crunch, while the effect was reversed in countries that had more exposure to FDI inflows pre-crisis. This adds to the literature suggesting not all forms of foreign capital inflows are risky, and that FDI inflows might be preferable to portfolio inflows. Of course, because one does not quite know whether the countries that get FDI inflows are special in a particular way, the results are suggestive rather than conclusive.

Finally, an overarching issue is whether an overpaid financial sector, contributing little to overall economic welfare, got the rest of the economy into trouble. Certainly, this is behind many reform proposals. Thomas Phillipon and Ariell Reshef (14644) address this issue and find that before the 1929 stock market crash, and before the Crash of 2008, finance jobs were indeed highly paid relative to the rest of the economy. In part, they attribute this to the greater complexity of finance jobs, and to the greater skills they required during this period. They do relate the higher required skill levels to deregulation, which seemed to expand access to credit to more corporations (as measured by Initial Public Offerings) and the greater willingness of the financial

sector in taking credit risk. Finally, they conclude that people in the financial sector do seem to have been overpaid by between 30 and 50 percent over the most recent period, despite the more complex

work they did. The natural conclusion from all this is that as regulation clamps down on risk taking, finance salaries will come back to earth, but so will access to credit. Making finance boring will have

costs but, as this article suggests, regardless of the reforms that are carried out, research in corporate finance promises to be interesting for years to come!

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## Research Summaries

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# Home Production, Consumption, and Labor Supply

Mark Aguiar and Erik Hurst\*

The way that consumers allocate consumption expenditures over the life cycle, or across states of nature, is a fundamental concern in economics. However, as Reid,<sup>1</sup> Mincer,<sup>2</sup> and Becker<sup>3</sup> noted in seminal contributions, consumption can be viewed as the output of “home production,” which uses inputs purchased in the market as well as non-market time. This implies that the allocation of time and resources via market transactions cannot be understood fully without also understanding how time is allocated outside of the market. As the relative price of their time falls, individuals will substitute away from market expenditures and use more of their own time to produce consumption commodities. Since an individual’s opportunity cost of time has a direct bearing on her total cost of consumption, market expenditures may be a poor proxy for actual consumption.

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*\*Aguiar and Hurst are Research Associates in the NBER’s Program on Economics and Growth and professors of economics at the University of Rochester and the University of Chicago’s Graduate School of Business, respectively. Their profiles appear later in this issue.*

The opportunity cost of allocating more time to market work is having less time available for non-market activities. To understand shifts in labor market activity, which are reflected in market hours, it is important to know whether the alternative non-market activities are substitutes for or complements to time devoted to market activities. In a series of papers, we study the role of the allocation of non-market time in determining both the behavior of market expenditures over the life cycle and the changing patterns of market hours during the last four decades.

### Framework

We adopt Becker’s modeling framework, in which the consumption commodities that enter the utility function are produced with a combination of time and market goods. When time and market goods are good substitutes in production, then we consider the time spent as home production, but when the two are poor substitutes, we consider the time leisure. For example, “television watching” and “eating a meal” are

both consumption goods. Both combine individual time with market expenditures. However, television watching time and market goods (the television itself, a cable subscription, and so on) will likely be complements. It is relatively hard to economize on one’s television watching time by increasing market purchases. In the meal example, however, time (preparation, clean up, and so on) and goods (groceries, kitchen durables, and the like) are substitutes. The substitutability results from the fact that individuals have the option of purchasing food prepared by others. How market expenditures evolve over the life cycle, and how home production evolves over time, thus depend on whether time and expenditures are complements (as in the first example) or substitutes (as in the second).

This framework is useful for understanding why food expenditure falls at retirement, while non-durable entertainment expenditure increases at the same time. It also can shed light on why the increase in women’s labor force participation since the 1960s was associated with an increase in women’s leisure time.