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Reflections on Northern Rock: The Bank Run that Heralded the Global Financial Crisis

Hyun Song Shin

In September 2007, television viewers and newspaper readers around the world saw pictures of what looked like an old-fashioned bank run—that is, depositors waiting in line outside the branch offices of a United Kingdom bank called Northern Rock to withdraw their money. The previous U.K. bank run before Northern Rock was in 1866 at Overend Gurney, a London bank that overreached itself in the railway and docks boom of the 1860s. Bank runs were not uncommon in the United States up through the 1930s, but they have been rare since the start of deposit insurance backed by the Federal Deposit Insurance Corporation. In contrast, deposit insurance in the United Kingdom was a partial affair, funded by the banking industry itself and insuring only a part of the deposits—at the time of the run, U.K. bank deposits were fully insured only up to 2,000 pounds, and then only 90 percent of the deposits up to an upper limit of 35,000 pounds. When faced with a run, the incentive to withdraw one's deposits from a U.K. bank was therefore very strong. For economists, the run on Northern Rock at first seemed to offer a rare opportunity to study at close quarters all the elements involved in their theoretical models of bank runs: the futility of public statements of reassurance, the mutually reinforcing anxiety of depositors, as well as the power of the media in galvanizing and channeling that anxiety through the power of television images.

However, the storyline of the Northern Rock bank run does not fit the conventional narrative. On September 13, 2007, the BBC's evening television news broadcast first broke the news that Northern Rock had sought the Bank of England's support. The next morning, the Bank of England announced that it would provide emergency liquidity support. It was only after that announcement—that is, after the

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central bank had announced its intervention to support the bank—that retail depositors started queuing outside the branch offices.

In fact, the financial damage to the bank had been done well before the run by its retail depositors. Northern Rock was unusual among U.K. mortgage banks in its heavy reliance on nonretail funding. By summer 2007, only 23 percent of its liabilities were in the form of retail deposits. The rest of its funding came from a combination of short-term borrowing in the capital markets and securitized notes and other longer-term funding sources (as we discuss in more detail below). Of course, the global credit crisis first erupted in summer 2007; in particular, on August 9, 2007, the short-term funding market and interbank lending all but froze. The triggering event on that day was the news that the French bank BNP Paribas was closing three investment vehicles that invested in U.S. subprime mortgage assets using short-term borrowed money. But many investment vehicles and financial institutions that tapped short-term financing had already begun experiencing difficulties in renewing their short-term borrowing.

Although Northern Rock had virtually no subprime lending, it was nevertheless fishing from the same pool of short-term funding. The managers of Northern Rock informed its regulators at the Financial Services Authority (FSA) as early as August 13, 2007, of Northern Rock's funding problems. The Bank of England was informed on August 14. From that time and for a full month until the fateful announcement on September 14 that triggered the depositor run, the FSA and the Bank of England sought to resolve the crisis behind the scenes, perhaps by arranging a takeover by another U.K. bank. However, the unfolding credit crisis as well as the reluctance to commit public money to facilitate a takeover stifled these efforts. Having failed to find a buyer for Northern Rock, the public announcement by the Bank of England on September 14, 2007, was recognition that Northern Rock's predicament had reached the point where only central bank support could avoid bank failure.

The Northern Rock depositor run, although dramatic on television, was an event in the *aftermath* of the liquidity crisis at Northern Rock, rather than the event that triggered its liquidity crisis. In this sense, the Northern Rock episode was not an old-fashioned bank run of the sort we see in movies like *It's a Wonderful Life* or *Mary Poppins*. Indeed, the irony of the images of Northern Rock's retail customers standing in line to withdraw deposits is that retail deposit funding is perhaps the most stable form of funding available to a bank. Although retail deposits can be withdrawn on demand, bankers have been heard to joke that a depositor is more likely to get divorced than to switch banks.

Thus, the real question raised by the Northern Rock episode is not so much why retail depositors are so prone to loss of confidence that lead to bank runs, but instead why the plentiful short-term funding that Northern Rock enjoyed before August 2007 suddenly dried up. To turn the question around, the issue is why sophisticated lenders who operate in the capital markets chose suddenly to deny lending to a bank that had an apparently solid asset book and virtually no subprime lending. Northern Rock was in the business of prime mortgage lending to U.K. households. The asset quality of any mortgage bank is vulnerable to a sharp decline

in house prices and rising unemployment. However, 2007 was the Indian summer of the housing boom in the U.K., and there were no outward signs of seriously deteriorating loan quality. Thus, the sudden refusal of lenders to fund Northern Rock needs an explanation. The answers to the puzzle reveal much about the nature of banking in the age of securitization and capital markets.¹

In what follows, I will outline the Northern Rock episode, expose the relevant facts for scrutiny, and explain how the Northern Rock case differs from the textbook model of bank runs. I will argue that a better perspective on the crisis can be gained by looking at the pressures on the *creditors* to Northern Rock. When a financial crisis strikes, prudent risk management by lenders leads to a generalized retrenchment as they attempt to meet the crisis by shedding their risky exposures. Shedding risky exposures means that they lend less. However, from the point of view of a borrower such as Northern Rock, prudent cutting of exposures by the creditors is effectively a withdrawal of funding. The Northern Rock case raises a number of important policy issues, not least how banking regulation should be formulated in the age of securitization and complex capital markets.

Background

Northern Rock was a “building society”—that is, a mutually owned savings and mortgage bank—until its decision to go public and float its shares on the stock market in 1997. As with other building societies in the United Kingdom, Northern Rock traced its origin to the so-called cooperative movement of the nineteenth century. It arose out of the merger of the Northern Counties Permanent Building Society (established in 1850) and the Rock Building Society (established in 1865). Even its name, “Northern Rock” conjured associations of dour solidity, which seemed appropriate for a savings and mortgage bank.

As with other U.K. building societies, Northern Rock started life as a regionally based institution, serving its local clientele. Northern Rock was originally based in the northeast of England, around the city of Newcastle upon Tyne.

In spite of its modest origins, Northern Rock had larger ambitions. In the nine years from June 1998 (the first year after demutualization) to June 2007 (on the eve of its crisis), Northern Rock’s total assets grew from 17.4 billion pounds to 113.5 billion pounds (approximately \$200 billion). This growth in assets corresponds to a constant equivalent annual rate of 23.2 percent, a very rapid rate of growth. By the eve of its

¹ For a chronology of the early stages of the financial crisis of 2007–2008, the interested reader might begin with Bank of England (2008), Bank for International Settlements (2008, chap. 6), International Monetary Fund (2008), Dudley (2007, 2008), Brunnermeier (this issue), and Greenlaw, Hatzius, Kashyap, and Shin (2008). For an account of Northern Rock and the U.K. institutional background, useful starting points are Dimsdale (2008), Mayes and Wood (2008), and Milne and Wood (2008). See Yorulmazer (2008) for an empirical analysis of U.K. banks during the run on Northern Rock. For an accessible and on-point journalistic discussion, see also “Northern Rock: Lessons of the Fall,” *Economist*, October 18, 2007, at (http://www.economist.com/displaystory.cfm?story_id=9988865).

crisis, Northern Rock was the fifth-largest bank in the United Kingdom by mortgage assets. Northern Rock's successes as a bank made it emblematic of the revitalization of the northeast region following the decline of traditional industries, such as coal mining and shipbuilding. Northern Rock funded a highly visible charitable trust and became the main sponsor to the local football (soccer) team, Newcastle United. For all these reasons, Northern Rock commanded fierce loyalty in its regional base.

However, as Northern Rock expanded its mortgage assets, the size of its balance sheet far outstripped its traditional funding base of branch-based retail deposits. Even as total assets grew by a factor of 6.5 in this period, retail deposits only grew from 10.4 billion pounds to 24 billion pounds. Figure 1 charts the composition of Northern Rock's liabilities from June 1998 to June 2007. Retail funding had been 60 percent of the bank's liabilities in 1998, but had fallen to 23 percent of total liabilities on the eve of the crisis in June 2007 (and would fall much farther after the run). Even in the case of retail deposits, only a small proportion consisted of the traditional branch-based deposits. The bulk of the retail deposits at the time of its run were non-branch-based deposits such as postal and telephone accounts. Postal accounts require customers to send in their withdrawal or deposit requests by post (by mail), and customers are rewarded for their inconvenience with a slightly higher deposit interest rate. Telephone accounts work in a similar way, but via telephone. These nonbranch retail deposits enabled Northern Rock to expand their retail deposits beyond their narrow regional base, but these deposits proved most vulnerable to withdrawal in the aftermath of the run on Northern Rock.

The gap in funding between the amount lent out and the amount depositors put in was made up by securitized notes and other forms of nonretail funding, such as interbank deposits and "covered bonds." Given the importance of securitized notes for the Northern Rock story, we postpone a discussion of securitized notes until later. Covered bonds are long-term liabilities written against segregated mortgage assets. As such, they are illiquid and long-term in nature, and so were not directly implicated in the run. However, other short-run wholesale funding was more closely implicated in the run on Northern Rock.

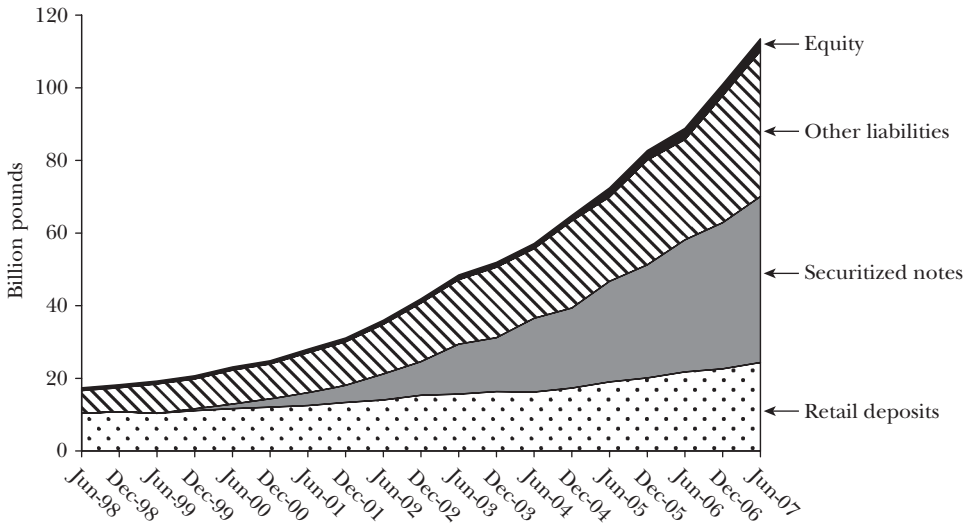
Before examining the components of Northern Rock's liabilities more closely, it is worthy of note that Northern Rock was not unique among U.K. banks in its growing use of nonretail funding. The Bank of England's *Financial Stability Report* (2008, figure 4) charts the trend in the use of nonretail funding among large U.K. banks since 2000. The median U.K. bank's nonretail funding started at 27.8 percent in December 2000 but had almost doubled to 47.8 percent by December 2007. Thus, what set Northern Rock apart from other U.K. banks was not that it used nonretail funding, but the extent to which it relied on such funding.

The Securitization Process

In many discussions of the Northern Rock episode, it has become the received wisdom that the heavy use of securitized notes made Northern Rock's business

Figure 1

Composition of Northern Rock’s Liabilities, June 1998–June 2007



Source: Northern Rock, annual and interim reports, 1998–2007.

model unusual, its balance sheet less traditional, and that securitization was somehow responsible in Northern Rock’s downfall (for example, see Mayes and Wood, 2008; Milne and Wood, 2008; and others). However, I will argue that the role of securitization is more subtle than this argument suggests.

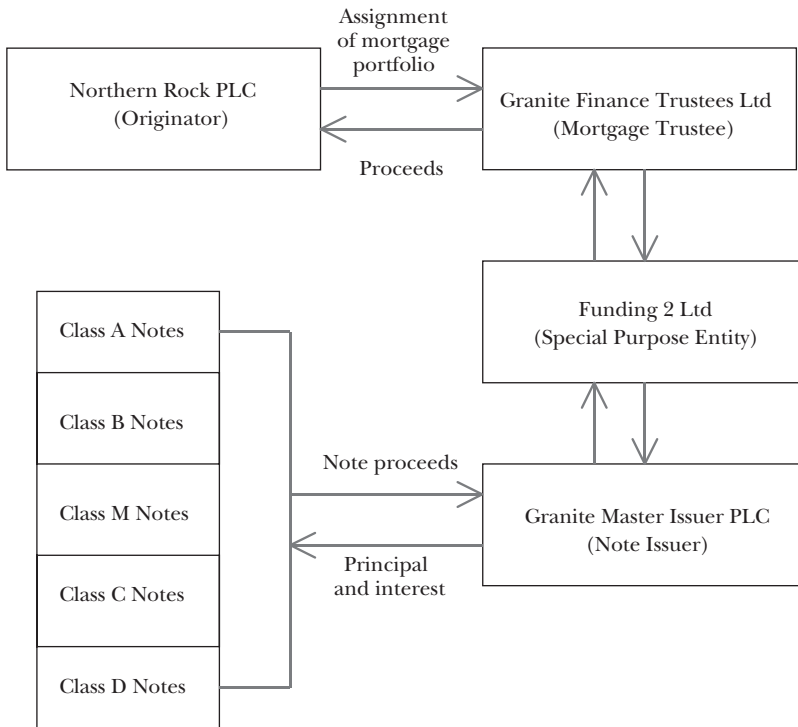
Northern Rock’s securitized notes were of medium to long-term maturity, with average maturity of over one year. The bank assigned portions of its mortgage assets to a trust—Granite Finance Trustees, which then entered into an agreement with special purpose entities called “Funding” and “Funding 2.” In turn, these special purpose entities entered into loan agreements with a separate note-issuing company, which issued the notes itself. Figure 2 is drawn from the offer documentation for a particular bond offering—the Granite Master Issuer series 2005-2.

The notes issued by Granite were floating rate “controlled amortization notes” that paid out according to set redemption dates spread over several years. The notes were ranked according to seniority, with Class A notes being more senior (paying 4 basis points above LIBOR, the benchmark London Interbank Offered Rate) and Class D notes being the most junior (paying 50 basis points above LIBOR).

Unlike the U.S. securitization process where the special purpose entities are considered separate from the bank that makes the loans (that is, as off-balance-sheet vehicles), the accounting rules that Northern Rock operated under meant that the special purpose entities were consolidated on Northern Rock’s main balance sheet. In this respect, the rapid growth of Northern Rock’s balance sheet reflects the accounting regime, along with the flow of new loans originated.

Figure 2

Structural Diagram of the Securitization Transaction for Northern Rock’s Granite Master Issuer Series 2005-2



Source: Supplement to Prospectus, May 23, 2005. At (<http://companyinfo.northernrock.co.uk/downloads/securitisation/prospectus%20&%20us%20supplement%2005-2.pdf>).

There is another contrast between Northern Rock and the U.S. and European banks caught up in the subprime crisis. The latter banks sponsored off-balance-sheet entities (such as “conduits” and “structured investment vehicles”) that held subprime mortgage assets funded with very short-term liabilities such as asset-backed commercial paper, which were at the heart of the subprime crisis. These short-term liabilities needed to be rolled over several times each year, which made banks highly vulnerable if credit markets became unwilling to fund new issues. In contrast, the notes issued by Granite had relatively longer maturities.² For example, Northern Rock had 31.1 billion pounds of securitized notes outstanding at the end of 2005. The total redemptions during 2006 of these notes were 7.12 billion pounds. So, only a small fraction (23 percent) were redeemed over the course of

² A full list of all of Northern Rock’s securitization vehicles and amounts outstanding can be compiled from annual reports, which are available at (<http://companyinfo.northernrock.co.uk/investorRelations/corporateReports.asp>).

the following year. Such a repayment pattern is in sharp contrast to banks or investment vehicles that relied on very short-term funding and therefore needed to roll over their liabilities several times during the year.

For this reason, the securitized notes issued by Northern Rock do not appear culpable for the run—at least not in a direct way. The Northern Rock case was therefore different from the outwardly similar downfalls for off-balance-sheet vehicles sponsored by other European banks such as BNP Paribas (mentioned earlier) or IKB, the German bank that suffered a liquidity crisis in August 2007, which were rooted in a need to roll over short-term securities. We return to this issue later in the paper.³

The Run on Northern Rock

A snapshot of the run on Northern Rock can be seen by comparing the composition of its liabilities before the run and after the run. The comparison is given in Figure 3, taken from the 2007 annual report of Northern Rock. The left-hand bar is the snapshot of the main components of Northern Rock's liabilities as of the end of June 2007—before the run—while the right-hand bar is the snapshot at the end of the year, after its run and after the liquidity support from the Bank of England.

The most glaring difference is the liability to the Bank of England after its liquidity support to Northern Rock, which stood at 28.5 billion pounds at the end of 2007. Covered bonds (which, remember, are illiquid long-term liabilities written against segregated mortgage assets) actually increased from 8.1 billion pounds in June 2007 to 8.9 billion in December 2007. Securitized notes fall only slightly from 45.7 billion to 43 billion pounds, which is consistent with the earlier theme that these notes played relatively little direct role in the Northern Rock run.

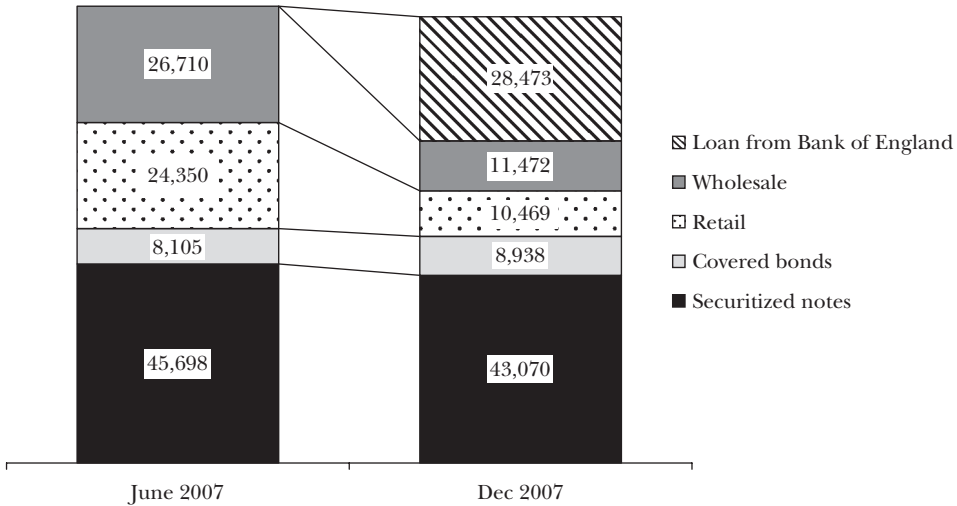
The largest falls are in the categories of retail deposits and for “wholesale liabilities.” “Wholesale funding”—nonretail funding that does not fall under either covered bonds or securitized notes—declines from 26.7 billion pounds in June to 11.5 billion pounds in December 2007. Although a detailed breakdown of the wholesale funding is not disclosed in the annual reports, they do contain some clues on the maturity and sourcing of this category of funding.

For example, the 2006 Northern Rock annual report (p. 41) states that wholesale funding consists of a “balanced mixture of short and medium term

³ In one instance, securitization did play a role in Northern Rock's downfall. This has to do with the Granite Master Issue 07-3. The notes were due to be issued in September 2007, but the crisis intervened before the notes could be sold. None of the notes were placed with investors, and the whole issue of notes—around 5 billion pounds face value—were taken back onto Northern Rock's balance sheet (as discussed in the Northern Rock 2007 annual report, p. 31). In this instance, the problem was that the planned sale of notes did not proceed, depriving Northern Rock of cash, rather than a problem with the rolling over of existing liabilities.

Figure 3

Composition of Northern Rock’s Liabilities Before and After the Run
(millions of pounds)



Source: Northern Rock annual report for 2007.

funding with increasing diversification of our global investor.” Medium-term funding refers to term funding of six months or longer, while short-term funding has a maturity less than six months. The 2006 annual report (p. 41) is worth quoting verbatim for an insight into the nature of this short-term funding:

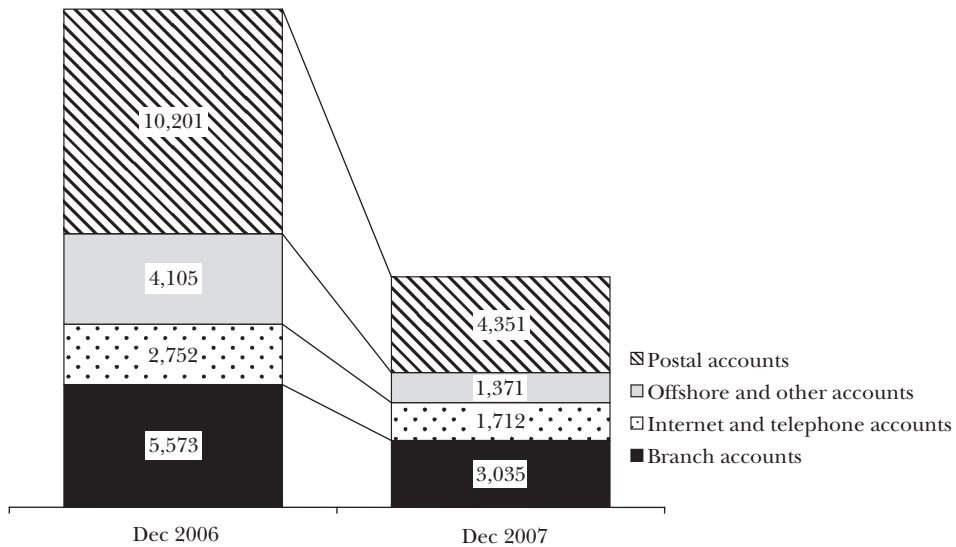
During the year, we raised £3.2 billion medium term wholesale funds from a variety of globally spread sources, with specific emphasis on the US, Europe, Asia and Australia. This included two transactions sold to domestic US investors totalling US\$3.5 billion. In January 2007, we raised a further US\$2.0 billion under our US MTN [medium term notes] programme. Key developments during 2006 included the establishment of an Australian debt programme, raising A\$1.2 billion from our inaugural issue. This transaction was the largest debut deal in that market for a single A rated financial institution targeted at both domestic Australian investors and the Far East.

In this way, Northern Rock’s short-term wholesale funding shared many similarities with the short-term funding raised by off-balance-sheet vehicles such as the “conduits” and “structured investment vehicles” used by many other banks and aimed at institutional investors. This type of funding was more short-term—less than one year, frequently much shorter—and thus more vulnerable to the liquidity crisis that hit the capital markets in August 2007. Indeed, the 2007 annual report (p. 31) states that, although Northern Rock managed to raise a net 2.5 billion pounds of wholesale funding in the first half of the year, the second half saw

Figure 4

Composition of Retail Deposits of Northern Rock Before and After Run

(million pounds)



Source: Northern Rock, annual report for 2007.

“substantial outflows of wholesale funds, as maturing loans and deposits were not renewed. This resulted in a full year net outflow of £11.7 billion.” Thus, the key to the initial “run” on Northern Rock was the nonrenewal of Northern Rock’s short- and medium-term paper. This was the run that led to the demise of Northern Rock—a run that happened out of sight of the television cameras.

Northern Rock also shows that retail deposits are not all created equal. Figure 4 charts the change in the composition of retail deposits of Northern Rock from December 2006 to December 2007. The total falls substantially, as one would expect in the aftermath of a depositor run, with total retail funding falling from 24.4 billion to 10.5 billion.⁴ However, the conventional branch-based customer deposits saw the smallest falls, falling from 5.6 billion to 3 billion pounds. In contrast, postal account deposits, offshore deposits and telephone and Internet deposits saw much more substantial falls. Although these retail deposits did run once the troubles at Northern Rock were publicized, the evidence suggests that the nonstandard retail deposits are the first to flee in a deposit run. Thus, the media coverage of the Northern Rock bank run, showing images of depositors queuing at the branch offices, was ironic. The branch deposits were actually the most stable of

⁴ These numbers come from the main text of the Northern Rock annual report for 2007. Figure 4 of this paper also comes from that report. Within the annual report, there is a small discrepancy between the 22.4 billion total given in the text and that implied by the figure.

all deposits, and branch deposits were far more stable than the wholesale funding raised in the capital markets from sophisticated financial institutions.

Reassessing the Run on Northern Rock

The Northern Rock bank run does not easily fit into the standard ways that economists think about bank runs. One difference is that the classic models of bank runs describe a pattern of coordination failure. For example, in Bryant (1980) and Diamond and Dybvig (1983), an individual depositor runs for fear that others will run, leaving no assets in place for those who do not run. However, in the first wave of the credit crunch that came in August 2007, the withdrawal of credit hit the whole market, not simply a subset of the institutions. If there was a run driven by a coordination failure, then it was a run from *all the institutions* that relied on short-term funding of this type. In this view, even though the global credit crunch had a disproportionate effect on Northern Rock, it was not aimed at Northern Rock in particular.

Another difference is that, in the coordination failure model of bank runs, the creditors are individual consumers who rationally choose whether to run or not based on their beliefs of what other depositors do. But the Northern Rock bank run was not enacted by individuals, but rather by sophisticated institutional investors. These investors often face constraints on their risk-taking either from risk management rules they follow for internal business reasons, or from regulatory rules. When measured risks are low, risk constraints on capital do not bind, and such investors will be willing to lend. However, when a crisis strikes, risk constraints bind and lenders cut back their exposures in response. But whatever the reason for the prudent cutting of exposures by the creditors to Northern Rock, their actions will look like a “run” from the point of view of Northern Rock itself. In this sense, the run on Northern Rock may be better seen as the tightening of constraints on the creditors of Northern Rock rather than as a coordination failure among them.

Of course, we should not draw too hard and fast a distinction between the coordination view of bank runs and the “leverage constraints” view of bank runs. Coordination (or lack thereof) will clearly exacerbate the severity of any run when a bank has many creditors. The point is rather that the run on Northern Rock needs to appeal to more than just coordination failure. In practice, this means that an explanation of the run on Northern Rock should make reference to *marketwide* factors and not only to the characteristics of Northern Rock and its creditors viewed in isolation. This is one more instance of the general maxim that in a modern market-based financial system, banking and capital market conditions should not be viewed in isolation.

Fluctuations in Leverage of the Financial System

Every textbook teaches that a traditional bank holds short-term liabilities, in the form of deposits, and uses them to finance longer-term, less-liquid assets, such as loans. However, it is less often recognized that the *financial system as a whole* works

in the same way, holding a mixture of long-term, illiquid assets financed by short-term liabilities. When a firm borrows money, it can buy more assets using this borrowed money together with its initial capital—its equity. The leverage of the firm is defined as a ratio of the total assets of the firm to its equity. Even for nonfinancial firms, their leverage is influenced by marketwide asset market conditions, as shown by Shleifer and Vishny (1992).

However, for leveraged financial firms (who borrow in order to lend) market conditions are pivotal in determining their leverage. Since equity is the buffer that protects creditors against loss, the degree of debt that a financial firm can take on depends on how volatile the asset values are. When financial conditions are benign and measured risks are low, creditors are willing to lend more per each dollar of equity held by the bank—that is, the creditors are willing to countenance higher leverage. However, when measured risks rise and financial market conditions turn hostile, then there is a sharp pullback in leverage, as creditors demand a higher equity cushion to shield them from losses.

In this way, fluctuations in the leverage of financial institutions keep step with fluctuations in measured risks and overall market conditions. A sharp increase in measured risks leads to a sharp pullback in leverage, which will create tensions somewhere in the system. Even if some institutions can adjust down their balance sheets flexibly in response to this scenario by reducing assets and paying down debt, there will be some pinch points in the system that will be exposed by the deleveraging. Arguably, this is what happened to Northern Rock.

While there is no agreed summary statistic on the extent of leverage in an economy or how leverage fluctuates, plenty of evidence suggests that such fluctuations are substantial. In a market-based financial system where credit is securitized and traded in financial markets, one gauge of overall leverage and funding conditions more generally is to look at the implicit maximum leverage possible in collateralized borrowing transactions such as repurchase agreements—known as “repos.”

In a repurchase agreement, the borrower sells a security today for a price below the current market price on the understanding that it will buy back the security in the future at a pre-agreed price. The difference between the current market price of the security and the price at which it is sold is called the “haircut” in the repo. The “haircut” fluctuates with funding conditions in the market, and these fluctuations largely determine the leverage of a financial institution. The reason is that the haircut determines the maximum permissible leverage achieved by the borrower. For example, if the haircut is 2 percent, the borrower can borrow \$98 for every \$100 worth of securities. Imagine that the borrower uses leverage to the maximum extent possible: that is, the borrower pledges the \$98 of securities for an amount equal to that amount, less 2 percent; and then pledges the additional funds raised as security for an additional round of loans, and so on. Since short-term profit is magnified by leverage, it is reasonable to assume that the borrower leverages up close to the maximum. The arithmetic of the borrowing multiplier is that if the haircut is 2 percent, then the maximum permissible leverage—ratio of

Table 1
Haircuts for Repos during March 2008

<i>Security</i>	<i>Typical haircuts</i>	<i>March 2008 haircuts</i>
Treasuries	< 0.5%	0.25% ~ 3%
Corporate bonds	5%	10%
AAA asset-backed securities	3%	15%
AAA residential mortgage-backed securities	2%	20%
AAA jumbo prime mortgages	5%	30%

Source: Bloomberg.

Note: In a repurchase agreement, the borrower sells a security today for a price below the current market price on the understanding that it will buy back the security in the future at a pre-agreed price. The difference between the current market price of the security and the price at which it is sold is called the “haircut” in the repo.

assets to equity—is 50 (the reciprocal of the haircut ratio). In other words, to hold \$100 worth of securities, the borrower must come up with \$2 of equity.

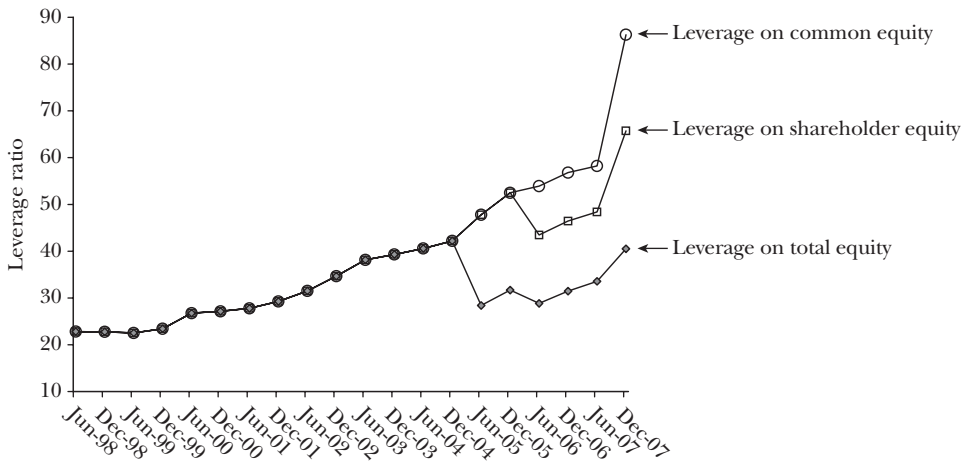
Suppose that a borrower leverages up to the maximum permitted level and has a highly leveraged balance sheet with a leverage of 50. If at this time a shock to the financial system raises the market haircut to 4 percent, then the permitted leverage halves to 25, from 50. In fact, times of financial stress are associated with sharply higher haircuts. Table 1 show the haircuts that were being applied during the peak of the market disruptions in March 2008 compared to the haircuts prevailing during normal times. For instance, a borrower holding AAA-rated residential mortgage-backed securities would have seen a ten-fold increase in haircuts, meaning that its leverage must fall from 50 to just 5.

Clearly, an increase in haircuts entails very substantial reductions in leverage, which creates hard choices. Imagine a borrower who sees the extent of its possible leverage fall by half. Either the borrower must raise new equity, so that its equity doubles from its previous level, or the borrower must sell half its assets, or some combination of both. Either raising new equity or cutting assets will entail painful adjustments. Raising new equity is notoriously difficult in distressed market conditions—but selling assets in a depressed market is not much better. For financial institutions that have assets which are very short-term and liquid—such as short-term collateralized lending—a common approach to this situation is to make the necessary adjustment by reducing lending (which in effect is reducing assets) and by repaying debt.

Of course, Northern Rock was a mortgage bank, not a securities firm that uses repo financing as its main borrowing method. However, the discussion of repos and how the haircuts fluctuate in response to market conditions can explain why leverage and credit conditions fluctuate substantially for the economy as a whole; the discussion now turns to why those factors had a particularly large effect on Northern Rock.

Figure 5

Northern Rock's Leverage, June 1998–December 2007



Source: Northern Rock, annual and interim reports, 1998–2007.

Note: The leverage ratio is the ratio of total assets to equity.

Vulnerability and Leverage at Northern Rock

Northern Rock was a very highly leveraged institution, which tended to make it especially vulnerable to a reduction in overall funding conditions for the financial system as a whole. To appreciate this point, it is important to draw some important distinctions regarding how leverage might be measured in practice. As stated already, leverage is defined in principle as the ratio of total assets to equity. But much turns on choosing the correct notion of equity.

Figure 5 plots the leverage of Northern Rock from June 1998 to December 2007, using three different measures of equity. Common equity is the purest form of equity—it is the stake held by the owners of the bank with voting power and hence who control the bank. “Shareholder equity” is defined as common equity plus preferred shares. Preferred shares do not have voting power but are senior to shares of the common equity holders in case the bank is liquidated, and they are paid a fixed dividend payment in perpetuity. In effect, preferred shares are like a perpetual bond. Finally, “total equity” is shareholder equity plus subordinated debt, a class of debt that is senior to the common and preferred equity, but which is junior to other types of debt taken on by the bank, including deposits.

In the early years of Northern Rock’s operation as a public limited company, no distinction existed between total equity, shareholder equity, and common equity. All equity was just common equity. However, beginning in 2005, the total equity series included for the first time 736.5 million pounds worth of subordinated debt as well as 299.3 million pounds worth of reserve notes (Northern Rock 2005 annual report, p. 51). Both of these items had been issued earlier (in 2001), but they were included in the equity series in the annual report for the first time in

2005. Treating these subordinated debt items as “equity” explains why the bottom line in the figure shows a drop in leverage in June 2005. However, when the subordinated debt items are excluded and equity is construed just as shareholder equity, Northern Rock’s leverage continued to increase in 2005. In 2006, Northern Rock issued 396.4 million pounds worth of “preference shares,” which it counted as shareholder equity (Northern Rock 2006 annual report, p. 59). This issuance of new preference shares accounts for the jump down in the leverage series with respect to shareholder equity in June 2006.

Subordinated debt can serve the useful purpose of being a buffer against loss for depositors and the senior creditors. For this reason, under the Basel international guidelines for bank regulation, subordinated debt is viewed as being part of bank capital (as “tier 2” capital). Preference shares can also act as a buffer against loss for depositors.

However, in the context of repo haircuts and how the overall leverage of the financial system is determined, a key idea is that the borrower should have a sufficient ownership stake in the assets that it controls so that the lender can be assured that the borrower does not engage in moral hazard or otherwise endanger the lender’s stake in the assets. The key is that the haircut is the equity stake held by the controlling party. Control is key, and only common equity can grant control. In Adrian and Shin (2008a), my coauthor and I provide a formal discussion of fluctuating leverage from this perspective.

In contrast, both subordinated debt and preferred shares are debt-like claims on the bank that do not grant control. The reason why the conventional regulatory rules treat these claims as being bank capital is that both are junior to deposits. Since the philosophy behind the Basel rules is that banks should hold buffers to protect depositors, even such debt-like claims are treated as “capital.”

However, when calculating the degree of leverage permitted by market conditions, the correct analogy is to think of the counterpart to the haircut in a repo contract. Equity (that is, capital) should be viewed as the stake held by the party that has control of the bank’s operation. In other words, for the purpose of calculating the market-permitted leverage, it is common equity that counts.

When leverage is interpreted strictly as the ratio of total assets to common equity, then Northern Rock’s leverage continued to climb throughout its history as a public company, rising from 22.8 in June 1998, just after its floatation, to 58.2 in June 2007, on the eve of its liquidity crisis. This level of leverage is very high, even by the standards of the U.S. investment banks at this time (around 25 to 30). Of course, Northern Rock’s leverage jumped even higher in December 2007 after its run, following the depletion of its common equity from losses suffered in the second half of 2007. Its leverage on common equity at the end of 2007 was 86.3.

When a bank is so highly leveraged, even a small increase in the implicit haircut on its borrowing will entail a withdrawal of funding from that bank. Thus, although most of the discussion above has focused on the constraints facing the leveraged creditors to Northern Rock, many of the points will apply also to nonleveraged creditors to Northern Rock—such as money market mutual funds, or

insurance companies. In a contracting problem with moral hazard, the minimum incentive-compatible stake in the assets that the borrower must hold will fluctuate widely as the underlying risk in the portfolio shifts (Adrian and Shin, 2008a).

When a borrower is as highly leveraged as Northern Rock, small fluctuations in its implied haircut can cause large shifts in available funding. In other words, if Northern Rock could borrow with a haircut of 2 percent, but then found itself needing to borrow at much higher haircut, the required reduction in leverage for Northern Rock would have been extreme. From the standpoint of Northern Rock, this reduction in the leverage permitted by the market manifested itself when many outside creditors declined to roll over existing short-term loans. In this sense, the “run” on Northern Rock was just a matter of when the next pullback in funding conditions would arrive. When the tide eventually turned, institutions with extreme leverage and balance sheet mismatches were left on the beach. Northern Rock was not the only one to find itself beached, but it lacked the liquidity support of a larger sponsor—apart from the Bank of England.

In effect, Northern Rock was faced with a giant margin call, where lenders demanded higher haircuts. The usual way to meet a margin call is to sell some assets to raise the cash. But the assets of Northern Rock were illiquid long-term mortgages, so that it could not meet those margin calls. The inability to meet this margin call led to Northern Rock’s demise.⁵

Economic Role of Short-Term Debt

The Northern Rock episode offers an opportunity to revisit some of the economic principles behind the use of short-term debt to finance long-term assets—which is of course essentially the classic model of how banks work. When the financial system as a whole finances long-term, illiquid assets by short-term liabilities, not every institution can be perfectly hedged in terms of its maturity profile. Northern Rock could be seen as such a “pinch point” in the financial system, where tensions would finally be manifested.

There are well-known arguments for the desirability of short-term debt in disciplining managers. For example, Calomiris and Kahn (1991) argue that demand deposits for banking arose naturally as way for the bank’s owners and managers to commit not to engage in actions that dissipate the value of the assets, under pain of triggering a depositor run. Diamond and Rajan (2001) have developed this argument further, and have argued that the coordination problem inherent in a depositor run serves as a collective commitment device on the part of the depositors not to renegotiate in the face of opportunistic actions by the

⁵ The possibility of distress and the key role played by leverage was discussed by Shleifer and Vishny (1997) and was taken up by Gromb and Vayanos (2002). Brunnermeier and Pedersen (forthcoming) have coined the term “margin spiral” to describe the increase in margin calls that amplifies distress in financial markets.

managers. When the bank has the right quantity of deposits outstanding, any attempt by the banker to extort a rent from depositors will be met by a run, which drives the banker's rents to zero. Foreseeing this, the banker will not attempt to extort rents. In a world of certainty, the bank maximizes the amount of credit it can offer by financing with a rigid and fragile all-deposit capital structure.

However, according to Calomiris and Kahn (1991) and Diamond and Rajan (2001), the relationship between the bank and the depositors reflects only the financial conditions of the bank itself. When the relationship between the bank and its depositors is viewed in isolation from the rest of the financial system, short-term debt has desirable incentive effects, and the fragility of the balance sheet has an economic rationale. However, one lesson from Northern Rock (subsequently to be repeated in the demise of Bear Stearns and Lehman Brothers) is that sometimes creditors are subject to external constraints, and may have to take actions that are the consequence of factors outside the immediate principal-agent relationship with the bank.

Take the following example (explored in Morris and Shin, 2008). Bank 1 has borrowed from Bank 2. Bank 2 has other assets (that is, loans it has made to other parties), as well as its loans to Bank 1. Suppose that Bank 2 suffers credit losses on these other loans, but that the creditworthiness of Bank 1 remains unchanged. The loss suffered by Bank 2 depletes its equity capital. In the face of such a shock, a prudent course of action by Bank 2 is to reduce its overall exposure, so that its asset book is trimmed to a size that can be carried comfortably with the smaller equity capital.

From the point of view of Bank 2, the imperative is to reduce its overall lending, including its lending to Bank 1. By reducing its lending, Bank 2 achieves its micro-prudential objective of reducing its risk exposure. However, from Bank 1's perspective, the reduction of lending by Bank 2 is a withdrawal of funding. If financial markets are deep and liquid, Bank 1 will find alternative sources of funding at roughly the same price—after all, nothing in Bank 1's risk characteristics has changed, so it should be able to borrow just as easily as it did before. But now imagine a situation where a combination of events arises: i) the reduction in Bank 2's lending is severe; ii) overall credit markets have seized up in such a way that no one has access to funding, including Bank 1; and iii) Bank 1's assets are so illiquid that they can only be sold at fire-sale prices. Under these circumstances, the prudent shedding of exposures from the point of view of Bank 2 will feel like a run from the point of view of Bank 1. Arguably, this type of run is one element of what happened to Northern Rock.

When evaluated from a system perspective, a maturity mismatch of short-term liabilities and long-term assets on the balance sheet of a financial institution is double-edged: From the point of view of incentive effects, a fragile balance sheet is desirable. However, spillover effects from outside the principal-agent relationship of banks and their depositors can generate countervailing inefficiencies. The demise of Northern Rock provides a lesson in the possible downside costs of maturity mismatch.

Implications for Financial Regulation

Traditionally, capital requirements have been the cornerstone of the regulation of banks. The rationale for capital requirements lies in maintaining the solvency of the regulated institution. By ensuring solvency, the interests of creditors—especially retail depositors—can be protected. Large-scale creditors who have the ability to monitor a bank can protect their interests through the enforcement of covenants and other checks on the actions of the bank’s managers. However, in the case of a traditional deposit-funded bank, the creditors are the small retail depositors, who face a coordination problem in achieving the monitoring and other checks that large creditors are able to put in place. The purpose of bank regulation has been seen as the protection of the interests of these small-scale depositors by putting into place through regulation those restrictions on the manager’s actions that would arise in relationships between a debtor and an active creditor who can take actions to safeguard his or her interests.

This traditional rationale for capital regulation leads naturally to the conclusion that the key determinant of the size of the regulatory capital buffer should be the riskiness of the bank’s assets. The Basel Committee on Banking Supervision brings together representatives of financial supervisors from 10 member countries to discuss best practices with regard to banking supervision. Although its recommendations have no legal force, they do carry considerable weight with banking authorities around the world. The original Basel capital accord of 1988 introduced coarse “risk buckets” into which assets could be classified. The more recent “Basel II rules,” which were implemented in most Basel Committee member countries in 2007 (with the United States following in 2008), have taken the idea much further by refining the gradations of the riskiness of the assets and thus fine-tuning the capital requirements to the risks of the assets held by the bank. However, the fall of Northern Rock was only a foretaste of the ensuing turmoil in the global financial system. The global financial crisis of 2007–08 poses a challenge to the traditional view of bank regulation. Northern Rock was only the first to fail among many other financial institutions that relied on access to a continuous stream of short-term liquidity to roll over expiring short-term debts. When that short-term liquidity did not materialize, it felt like a run from the point of view of these institutions. Bear Stearns and Lehman Brothers were two more high-profile failures of this type.

Two specific categories of policy proposals, which my coauthor and I discuss in further detail in Morris and Shin (2008), deserve closer attention. First, regulators might consider some type of liquidity regulation. The rationale is that a bank can survive a run if 1) it has sufficient liquid assets and cash or 2) it has sufficiently stable (that is, illiquid) liabilities such as long-term debt. This kind of a liquidity requirement may not be too onerous if the requirement is adhered to widely in the financial system. The idea is that when liquidity buffers are distributed throughout the financial system, the set of multiple buffers will act to reduce spillover—just as the absence of liquidity buffers has tended to amplify shocks that reverberate inside the system.

The second category of proposals would impose some limit on the raw leverage ratio, rather than risk-weighted assets. The argument for a raw leverage constraint is that it can act as a constraint “on the way up,” when banks are increasing their leverage on the back of permissive funding conditions. By preventing the build-up of leverage during good times, the leverage constraint dampens the effects of contracting leverage in bad times. The leverage constraint works both at the level of the debtor as well as that of the creditor. For example, in the earlier example of Bank 1 and Bank 2, from the point of view of Bank 1 (the debtor), a leverage constraint will prevent Bank 1 from building up excessive leverage, thereby making Bank 1 less susceptible to a cut-off of future short-term loans. From the point of view of Bank 2 (the creditor), the leverage constraint binds on the way up such that there is slack in the balance sheet capacity of Bank 2 when the tide eventually turns, so lending from Bank 2 to Bank 1 will suffer a smaller shock. Thus, for both lender and borrower, the leverage constraint binds during boom times so that the imperative to reduce leverage is less strong in the bust. Indeed, the bust may be averted altogether, as the initial boom is dampened. The most commonly encountered criticism against a raw leverage constraint is that it does not take the riskiness of the assets into account. However, a leverage constraint is not intended to replace Basel-style capital requirements, but rather to supplement them, on the grounds that a leverage constraint has desirable properties that cannot be replicated by risk-based capital ratios alone.

Both liquidity regulation and leverage caps have much in common with several recent proposals for the reform of financial regulation—as in Kashyap, Rajan, and Stein (2008)—that emphasize *de facto* cyclical variations in required capital, or insurance that would be taken out by banks. These complementary approaches address the general shortage of capital during a downturn as well as fluctuations in funding conditions and the possibility of sudden runs on the financial system.

The Northern Rock episode raises profound questions for economists and policymakers. Only a few years ago, Northern Rock was seeing a rapid growth of its assets, on the back of benign credit conditions, that had propelled it to being perhaps the most innovative and celebrated bank in the United Kingdom. However, the high implied leverage that Northern Rock had built up during the boom times was vulnerable to a reversal when the tide turned. Bank regulators should be mulling the potential role of liquidity requirements and leverage ratios as supplements for the conventional capital-based banking requirements. Economists should further deepen their understanding of the potential benefits and costs of financial intermediation that uses short-term liabilities to finance long-term assets.

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