Getting up to Speed on the Financial Crisis: A One-Weekend-Reader's Guide

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Abstract

All economists should be conversant with "what happened?" during the financial crisis of 2007-2009. We select and summarize 16 documents, including academic papers and reports from regulatory and international agencies. This reading list covers the key facts and mechanisms in the build-up of risk, the panics in short-term-debt markets, the policy reactions, and the real effects of the financial crisis.

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1. Introduction

The first financial crisis of the 21st century has not yet ended, but the wave of research on the crisis has already exceeded any single reader's capacity, with the pace of new work only making this task harder. Many professional economists now find themselves answering questions from their students, friends, and relatives on topics that did not seem at all central until a few years ago, and we are collectively scrambling to catch up.

This article is intended to serve as a starting point for economists who want to get up to speed on the literature of the crisis, without having to go into a cave and read for a whole year. To this end, the reading list is restricted to 16 documents, a list that an ambitious reader could cover in one weekend or at a more leisurely pace over a few weeks. Thus, this article is not a complete survey in any shape or form, and many interesting papers have been omitted. The coverage is from 2007 to 2009, and while the scope is global during this time period, it does not include any papers or discussion about the still ongoing Euro-currency and sovereign-debt crisis. The list is also confined to readings with significant empirical content, as we hope that this collection can at least answer the "what happened?" question about the crisis, even if the "why?" is not yet settled. In addition to a good number of papers from top journals, the final collection includes several reports from international agencies, a speech and a congressional testimony from Chairman Bernanke, and several as-yet-unpublished papers. We have tried hard to avoid repetition, and on several occasions chose one paper among several worthy contenders on the same topic. Thus, this is an unusual paper for the *Journal of Economic Literature* in that citations and the reference list include only the 16 documents covered in the review.

The proposed reading list and article are divided into eight sections. Following this introduction, Section 2 provides an overview and timeline of the crisis, with suggested readings that cover that same broad range. The three documents in that section can be thought of as an even briefer reading list, for people who only have an afternoon to spend on the project: 2010 testimony from Ben Bernanke in front of the Financial Inquiry Crisis Commission, and report chapters from the International Monetary Fund (2010) and Bank for International Settlements (2009) containing overviews of different aspects of the crisis.

Section 3 gives a historical perspective on financial crises, which we believe crucial for understanding the recent one. The two papers covered here, Reinhart and Rogoff (2011) and Schularick and Taylor (2012), are the products of Herculean data collection efforts on long historical time series about government and private debt. Both of these papers demonstrate the *strong association between accelerations in*

economy-wide leverage and subsequent banking crises. That finding deserves emphasis as the main empirical fact about historical predicates to financial crises.

Section 4 covers the build-up to the crisis. In retrospect, the experience of the 2000s looks ominously like the prelude to other large crises. Pozsar (2011) documents the important role played by "institutional cash pools", which grew rapidly in the decade before the crisis. These pools, with a scale unique to history, created a large demand for safe and liquid short-term debt, a demand met in part by securitization and other financial innovations. Bernanke (2005) foreshadowed some dynamics of the crisis when describing and naming the "global savings glut". The resulting growth in sovereign-wealth funds, a new institution of the 21st century, also added to the demand for short-term debt. By 2007, system-wide leverage had reached critical levels, but the historical aggregate-credit data necessary for "early-warning" models would not be built until after the damage was done. Coincident with the increase in leverage was a large run-up in housing prices. While historical cross-country data on housing prices is not as comprehensive as the data on credit aggregates, Reinhart and Rogoff (2008) find sharp increases in housing prices prior to the five largest financial crises of recent history, with the previous decade in the United States comparable (or worse) than those previous crises. Case and Shiller (2003), in a remarkably prescient paper, provide evidence that the United States was already experiencing a housing bubble well before the crisis began.

Section 5 discusses three papers about the two "panic" phases of the crisis – August 2007 and September-October 2008 – between which the crisis expanded from a relatively narrow slice of financial markets focused on subprime mortgages into a broad-based run on many types of short-term debt. The three papers in this section focus on three different components of short-term funding markets: Covitz, Liang, and Suarez (2011) on asset-backed commercial paper, McCabe (2010) on money-market mutual funds, and Gorton and Metrick (2012) on repurchase agreements and securitization. The combination of these three papers provides a narrative of contagion where each step drains the banking system of hundreds of billions of dollars and induces higher risk premia for banks to replace those funds.

Section 6 analyzes the various government responses, where opinion remains divided between views of government as savior or culprit. There are now many papers focusing on specific policy actions, but few comprehensive surveys. We chose Chapter III of the IMF's Financial Stability Report of October 2009, which includes a taxonomy and analyses of policy actions across 13 countries from 2007 to 2009. The report finds a few bright spots for policy, with actions to support the liquidity of short-term debt markets most effective during the pre-Lehman period of the crisis (before September 2008), and capital

injections into banks most effective in the post-Lehman period.

For some economists, the financial crisis only becomes interesting if it has effects for the real economy, a topic discussed in Section 7. To measure such effects, it is important to distinguish between shocks to credit supply (where a direct line can be drawn to the crisis) and to credit demand (which may have other causes). The papers in this section all attack this problem in creative ways and present persuasive evidence of the channel from financial shocks to real activity. Scharfstein and Ivashina (2010) analyze the syndicated loan market in the United States and find that decreases in lending were related to a banks' reliance on short-term funding and by indirect exposure to a Lehman bankruptcy shock. Puri, Rocholl, and Steffen (2012) exploit differential exposures of German banks to subprime securities and find that shocks to credit supply reduced the propensity to make consumer loans. Campello, Graham, and Harvey (2010) use detailed survey evidence to show that firms with credit constraints pulled back on investment.

Section 8 concludes the paper.

2. Overview and Timeline of the Crisis

The Financial Crisis of 2007-2009 began in early August with runs in several short-term markets formerly considered "safe". As Ben Bernanke (2010) put it: "Should the safety of their investments come into question, it is easier and safer to withdraw funds—'run on the bank'—than to invest time and resources to evaluate in detail whether their investment is, in fact, safe" (p. 3). Table 1 is an abbreviated timeline of the major events of the crisis. The crisis had been building for some time before August: During the first half of 2007 problems in the subprime market became increasingly visible and included the failure of several subprime originators. And even before that there was a credit boom, steeply rising home prices, and global imbalances in foreign trade.

In this section we will briefly provide an overview of the crisis, focused on three documents. The first is Ben Bernanke's testimony before the Financial Crisis Inquiry Commission, September 2, 2010. Bernanke provides a lucid overview of the crisis, the causes, the policy responses, and the ongoing issues. The second is Chapter II from the International Monetary Fund's (IMF) Financial Stability Report (2010), "Systemic Liquidity Risk: Improving the Resilience of Financial Institutions and Markets." Finally, the third is Chapter II of the Bank for International Settlements (BIS) 79th Annual Report, "The Global Financial Crisis." From just these three items, a clear picture of the crisis emerges.

Bernanke makes several important points in developing the idea that the crisis was a like an old-fashioned run. First, he distinguishes between triggers and vulnerabilities. Losses on subprime mortgages, or more accurately, the prospect of such losses, after house prices started to decline, were a trigger for the crisis. But, they cannot explain the crisis. As Bernanke puts it, ". . . judged in relation to the size of global financial markets, prospective subprime losses were clearly not large enough on their own to account for the magnitude of the crisis" (p. 2). Somehow the prospective losses had to be amplified to generate the crisis.

A second point that Bernanke makes is that the systemic vulnerabilities in large part were due to changes that had occurred in the financial sector of the economy. The financial crisis was a bank run, but in sectors of the money markets where financial institutions provided bank-like debt products to institutional investors. These financial institutions were mostly *shadow banks*. Bernanke (2010, p. 4):

> *Shadow banks* are financial entities other than regulated depository institutions (commercial banks, thrifts, and credit unions) that serve as intermediaries to channel savings into investment … Before the crisis, the shadow banking system had come to play a major role in global finance; with hindsight, we can see that shadow banking was also the source of key vulnerabilities. (p. 4; emphasis in original)

The main vulnerability was short-term debt, mostly repurchase agreements and commercial paper. These markets had grown enormously. Bernanke notes that "repo liabilities of U.S. broker dealers increased 2 ½ times in the four years before the crisis" (p. 5). And, the IMF also notes that "The repo market has represented the fastest growing component of the wholesale funding markets. . . " (p. 64). Not only were these markets large, but they were unregulated, as both Bernanke and the IMF point out.

A repo transaction is a collateralized deposit in a "bank," as follows. The depositor or lender puts money in the bank for a short-term, usually overnight. The bank promises to pay the overnight repo rate on the deposited money. To ensure the safety of the deposit, the bank provides collateral that the depositor takes possession of. Depositors are large institutional investors, money market funds, non-financial firms, states or municipalities, and other large investors. The size of their deposits is too big for an insured account at a bank, and hence the need for collateral to try to protect the deposit. If the bank fails, then the depositor can sell the collateral to recover the value of the deposit. If the deposit is $100

million and the collateral has a market value of $100 million, then there is said to be no "haircut" on the collateral. If the deposit is $90 million, and the collateral is $100 million, then there is said to be a 10 percent haircut. The IMF (2010, p. 71, 73) discusses some details about how the repo market works.

Though not a subject of academic research (prior to the crisis), the repo market is not a small, esoteric, market. IMF (2010) estimates total outstanding repo in U.S. markets at between 20 and 30 percent of U.S. GDP in each of the years from 2002 to 2007. Their estimates for the European Union are even higher, with a low of 30 percent and a peak just above 50 percent of E.U. GDP during the same time period. While these measurements are imprecise, it is clear that the repo market is sizeable in the advanced economies.

It was not only in the United States that there were problems of this sort. Disruptions in the U.S. short-term debt markets created a shortage of U.S. dollars in global markets. IMF (p. 61): "U.S. dollar funding was required especially by banks in Europe (e.g., Dutch, German, Swiss, and U.K. banks), but also by banks in Korea, to roll over short-term funding of longer-term U.S. dollar assets. The shortage in U.S. dollars also affected the foreign exchange swap market, with the U.S. dollar being used as the main swap currency for cross-currency funding."

The bankruptcy filing of Lehman Brothers in September 2008 (see the Timeline) enormously exacerbated the situation. The BIS summarizes what happened:

> The tipping point came on Monday 15 September, when Lehman Brothers Holdings Inc. filed for Chapter 11 bankruptcy protection: what many had hoped would be merely a year of manageable market turmoil then escalated into a full-fledged global crisis. Suddenly, with markets increasingly in disarray, a growing number of financial institutions were facing the risk of default. The resulting crisis of confidence quickly spread across markets and countries . . . (p. 23).

Most importantly, the failure of Lehman led to a run on money market mutual funds after one large fund "broke the buck" (see IMF, p. 65 ff; BIS, p. 25-26). The U.S. Treasury then announced a temporary guarantee of money market mutual funds. Confidence in the stability of the financial systems in the U.S. and Europe was lost. The resulting turmoil led to banks hoarding liquidity, and this will play an important role in transmitting the crisis to the real sector and internationally. In this way, the prospective losses in

the subprime market were amplified. Bernanke: "Ultimately, the disruptions to a range of financial markets and institutions proved far more damaging than the subprime losses themselves" (2010; p. 3).

Central banks engaged in unprecedented interventions and the U.S. Congress eventually passed the Troubled Asset Relief Program (TARP). On October 8, 2008 there was a coordinated reduction in policy rates by six major central banks; see BIS, p. 30. But, this was not the end. As the BIS explained:

> Although the global crisis of confidence had come to an end, policy action continued on an international scale as governments sought to support market functioning and to cushion the blow of rapid economic contraction. Even so, with many details unspecified, questions about the design, impact and consistency of these measures remained. As a result, financial markets were roiled by increasingly dire macroeconomic data releases and earnings reports, punctuated by short-lived period of optimism–often in response to the announcement of further government interventions. (p. 31).

Eventually, there were signs of stabilization, from mid-March 2009; see BIS, p. 34 ff. But, the real effects have persisted.

3. Historical Background

The recent crisis is often described as being the worst global crisis since the Great Depression, and the evidence supports this label. But the gap between crises of this magnitude means we must look towards long historical time series to gain perspective on patterns of global crises. We are fortunate that several teams embarked upon massive data-gathering projects prior to this crisis, so that some of their results are available now to give us that necessary perspective. In this section, we review two important contributions to this literature: Reinhart and Rogoff (2011) and Schularick and Taylor (2012). Both papers identify accelerations in debt as the key antecedent to banking crises, with Reinhart and Rogoff focusing on public and private debt and Schularick and Taylor on the structure of banking sector. Both sets of authors have developed important new data series to enable their analyses, and both provide a rich collection of historical details that make their papers worthy of close reading.

Reinhart and Rogoff define a banking crisis by the existence of one of two types of events: "(1) bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions; or (2) if there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar

outcomes for other financial institutions." Using this definition, the historical "incidence of banking crises is about the same for advanced economies as for emerging markets", and while this incidence has been lower since World War II, as of their writing only Portugal had been spared in that interval.

They find several interesting results. First, external debt increases sharply in advance of banking crises. Second, banking crises tend to lead sovereign-debt crises. In fact, not only does external debt rise sharply, but so does domestic government debt – a new data series built by the authors for their analysis. The second finding – that banking crises lead sovereign debt crises – is also supported by a VAR analysis. Although the direction of causality cannot be conclusively determined from such analyses, the consistent findings across many different countries and time periods suggests that banking crises play an important accelerator role in broader debt crises.

Schularick and Taylor (2012) provide another important historical perspective, analyzing the relationship of financial crises with overall credit growth in the economy. They begin by building a 140-year panel data set for 14 (currently) developed countries. The main novelty of their data set is the construction of credit and bank-asset series for each country, where aggregate credit is defined as the total amount of bank loans outstanding, and bank assets are defined as the sum of the balance-sheet assets for all banks. These "new" measures can then be compared to broad money aggregates (M2 or M3), which have long been available for most countries.

The basic time series of credit, assets, and broad money compared to GDP is shown in Figure 1, taken from their paper. Prior to the Great Depression, all three money and credit aggregates have a stable relationship with GDP. All three increase sharply just before the depression and then collapse in its aftermath. As pointed out by the authors, prior to 1950 the stability of these series would be consistent with the monetarist view, and would not suggest any need to analyze broader credit aggregates.

Things get more interesting in the post-WWII period, when both bank loans and bank assets begin to steadily increase relative to GDP, while the ratio of GDP to broad money remained stable. This striking change – unknown until their work – is described by the authors as heralding a "second financial era" where "credit itself then started to decouple from broad money and grew rapidly, via a combination of increased leverage and augmented funding via the nonmonetary liabilities of banks."

Their paper goes on to explore the impact of this change on the incidence and severity of financial crises. Their analysis adopts an "early-warning signal" approach that is standard in this literature, where macro variables are used to predict the onset of a crisis. While this early-warning approach has been

used extensively on emerging markets for the post-1970 period, only the data collection efforts of these authors allow for an extension to a longer time series while including credit aggregates as regressors. The results show that changes in credit supply (bank loans) are a strong predictor of financial crises, particularly when these changes are accelerating, an echo of the findings in Reinhart and Rogoff for external debt. Furthermore, broad money aggregates do not have the same predictive power, particularly in the post-WW II period. This finding motivates the title of their paper and their description of financial crises as "Credit Booms Gone Bust".

Reinhart and Rogoff (2011) and Schularick and Taylor (2012) provide a consistent picture of the run-up to a financial crisis: an acceleration of debt from both governments and financial intermediaries are the most important antecedents.

4. The Crisis Build-Up

On the build-up to the crisis, we review four documents, two that were written *before* the crisis, but are quite prescient.

The four are "Institutional Cash Pools and the Triffin Dilemma of the U.S. Banking System," by Zoltan Pozsar (2011); Ben Bernanke's 2005 Sandridge Lecture, "The Global Savings Glut and the U.S. Current Account Deficit;" "Is There a Bubble in the Housing Market," by Karl Case and Robert Shiller (2003); and Carmen Reinhart and Kenneth Rogoff's 2008 paper "Is the 2007 U.S. Sub-Prime Financial Crisis so Different? An International Historical Comparison."

As discussed in the previous section, crises are often preceded by credit booms. In the case of the U.S. in the recent crisis, the credit boom took the form of an increase the issuance of asset-backed securities, particularly mortgage-backed securities. This is related to the development and functioning of the shadow banking system. The growth in the shadow banking system was the outcome of several forces. The traditional banking model became less profitable in the face of competition from money market mutual funds and junk bonds. Securitization, the sale of loan pools to special purpose vehicles that finance the purchase of the loan pools via issuance of asset-backed securities in the capital markets, was an important response. Figure 2 shows the growth of U.S. private-label securitization issuance during 2000-2010:Q1. Although securitization began in the 1990s, the figure makes clear the explosive growth in the six or seven years before the crisis, a growth consistent with the notion of a credit boom. Over the period portrayed in the figure, the private-label securitization market grew from under $500 billion in issuance to over $2 trillion in issuance in 2006, the year before the crisis.

Securitization is off-balance sheet financing for banks and other financial intermediaries. But, if these intermediaries are not going to finance these loan pools on balance sheet, who is going to buy the asset-backed securities? Pozsar describes institutional cash pools: ". . . they are large (typically at least $1 billion in size) and centrally managed. The central management of cash pools refers to the aggregation (or pooling) of cash balances from all subsidiaries worldwide in the case of global corporations, or all funds (including mutual and hedge funds and separate accounts) in the case of asset managers. Furthermore, the investment decisions that pertain to pooled balances are performed by a single decision maker (typically a treasurer) and through a fund that is a *single* legal person, but one that manages the cash balances of *many* legal persons" (p. 5; emphasis in original). Pozsar documents a striking rise in the funds managed by these pools, from about $200 million in 1990 to nearly $4 trillion on the eve of the crisis.

The key point about the growth of institutional cash pools is that they have an associated demand for liquidity; in particular, they have a demand for insured deposit alternatives (Pozsar's terminology). The amounts of money that they wanted to allocated to "safe" asset classes far exceeded the amount that could be insured in a demand deposit account. The problem was that there were not enough safe assets, U.S. Treasuries, for the pools to hold. Pozsar estimates "that between 2003 and 2008, institutional cash pools' demand for insured deposit alternatives exceeded the outstanding amount of short-term government guaranteed instruments *not* held by foreign official investors by a cumulative of at least $1.5 trillion; the 'shadow' banking system rose to fill this gap" (p. 3; emphasis in original).

Foreign official investors hold large amounts of U.S. Treasuries. And this is where the effects of the current account imbalance may have played a role. Bernanke (2005): "If a country's saving exceeds its investment during a particular year, the difference represents excess saving that can be lent on international capital markets. By the same token, if a country's saving is less than the amount required to finance domestic investment, the country can close the gap by borrowing from abroad. In the United States, national saving is currently quite low and falls considerably short of U.S. capital investment. Of necessity, this shortfall is made up by foreign net borrowing- - -" (p. 3). There were large and persistent capital inflows from foreigners seeking U.S. assets as a store of value. It is not so clear why the foreigners want riskless assets, rather than, say, buy land and property in the U.S.

With large amounts of U.S. Treasuries held abroad, institutional cash pools had to find substitutes. The substitutes were of two forms. First, short-term bank debt-like products, such as repurchase agreements and asset-backed commercial paper provided collateral that substituted for government guarantees.

Second, there were indirect holdings of unsecured private money market instruments through money market mutual funds, where the funds' asset portfolio was short-term and globally diversified.

The joining together of the supply of asset-backed securities with the demand for private alternatives to insured deposits led to the shadow banking system, a genuine banking system providing products with a convenience yield, short-term debt of intermediaries, often based on privately-produced collateral.

Historically, for the private production of high quality asset-backed securities, mortgages have been the preferred collateral. The increase in the production of asset-backed securities appears to be a credit boom. In credit booms, households and firms are borrowing money. What are they doing with this money? One possibility is that they are buying houses. Credit booms seem to often coincide with house price increases. The causality is not clear. Is it that financial intermediaries lower their lending standards and fuel house price increases? Or, are house prices going up (for some other reason) and intermediaries are willing to lend against collateral that is then more valuable? This is an area for future research.

House prices were rising during the credit boom. Karl Case and Robert Shiller documented the house price increases in 2003. As the title of their article suggests, their main question concerns the nature of the house price increases: Is it a bubble? As they point out, ". . . the mere fact of rapid price increases is not in itself conclusive evidence of a bubble" (p. 300). They think of a bubble as "a situation in which excessive public expectations of future price increases cause prices to be temporarily elevated" (p. 299).

How do we determine if expectations of large future price increases can account for price increases today? Case and Shiller examine two kinds of evidence to suggest that "fundamentals" cannot account for the price increases. They first examine U.S. state data on home prices and fundamentals, such as income and employment, over 1985 to 2002, seventy-one quarters. Secondly, they directly elicit the views of home buyers based on a survey conducted in 2003 of people who bought homes in 2002 in four metropolitan areas: Los Angeles, San Francisco, Boston, and Milwaukee. The survey replicates a 1988 survey of the same metropolitan areas. For both analyses, Case and Schiller find evidence broadly consistent with a bubble. While there is clearly more research to be done on bubbles, keep in mind that this paper was published in 2003. From the vantage point of hindsight, after the financial crisis and the very significant decline in house prices, the Case-Shiller evidence is indeed very provocative.

House price run-ups prior to crises are common. This is shown by Reinhart and Rogoff (2008). Their research shows that there are important similarities across crises. They study eighteen bank-centered

financial crises from the post-War period, including a subset which they call "The Five Big Crises" of Spain (1977), Norway (1987), Finland (1991), Sweden (1991), and Japan (1992) (starting year in parenthesis). The Big Five crises occurred in developed economies, and were prolonged events with large declines in economic performance over extended periods.

Although they examine a number of different series, we focus on the run-up in housing prices. Figure 3 shows the relationship between real housing prices and banking crises. Date t is the first year of the financial crisis, and t-1, t-2, and so on, to t-4 indicates the previous four years, and t+1 etc. are the post-crisis years. The figure confirms that there was a run-up in housing prices in the U.S. that, in fact, exceeded the run up prior to the Big Five.

It is not only house prices, Reinhart and Rogoff further show striking similarities with respect to real rates of growth in equity price indices, current account balance-to-GDP ratios, real GDP growth per capita, and public debt growth and crises. It is hard to escape the conclusion that the financial crisis of 2007-2009 was not special, but follows a pattern of build-ups of fragility that is typical.

5. The Panics

This section discusses papers relating to the two main panic periods of the financial crisis: August 2007 and September-October 2008. We discuss three papers that each focus on a different component of the short-term debt market. Covitz, Liang, and Suarez (2011) analyze runs on the asset-backed commercial paper market that began in August 2007, which represented the first major event of the financial crisis. McCabe (2010) analyzes money market mutual funds (MMFs) and contrasts their behavior in August 2007 (when MMFs largely avoided runs) and in September 2008 (when they did experience runs). An important link between these two crises worked through the repo market, which weakened considerably in August 2007, limped along for a year, and then partially collapsed after the failure of Lehman. Gorton and Metrick (2012) analyze these dynamics and tie them to the changes in unsecured interbank-lending markets.

Commercial paper (CP) has been an important security for the financing of industrial firms for many decades. In the traditional CP market, highly rated firms can quickly issue debt with minimal transactions costs, and typically cover the risk that investors will suddenly disappear by obtaining a backup line of credit from a commercial bank. Demand for CP is high enough that financial intermediaries have increasingly made use of the market to finance long-term financial assets, in which case the debt is known as "asset-backed commercial paper", or just ABCP. When CP is used this way, financial

institutions can bundle mortgages, credit-card receivables, and other loans into off-balance-sheet vehicles. Like the related structure of securitization, such vehicles can be more transparent than full bank balance sheets, which can then enable lower funding costs. More cynically, such vehicles can be used to move assets off balance sheets in name only, allowing banks to save on regulatory capital. Whatever the reason, by July 2007 there was approximately $1.2 trillion of ABCP outstanding. With the majority of this paper held by MMFs, the ABCP market was deeply connected with more familiar parts of the financial system (Covitz, Liang, and Suarez, 2011).

Covitz, Liang, and Suarez describe the unraveling of this market in great detail, drawing the analogy between a "run" on an ABCP program and a traditional bank run. Conceptually, an ABCP program would suffer a "run" if lenders – equivalent to depositors in a bank – are unwilling to refinance CP when it comes due. Mechanically, the authors define a run as occurring in any week where a program does not issue any new paper despite having at least ten percent of its CP maturing. If a program is unable to issue new paper, then it must either rely on backup support from the program sponsor (typically a bank or group of banks), or it is forced to sell assets.

Figure 4, reproduced from their paper, shows the pattern of runs at ABCP programs during 2007. Here, the panic in August 2007 is clear. Beginning in the week of August 7, the frequency of runs increased dramatically, and the likelihood of exiting a run with later issuance fell in tandem. By the end of 2007, about 40 percent of programs were in a run and unable to finance themselves in their traditional short-term markets.

A nice feature of the ABCP data is that it allows for a cross-sectional analysis on the determinants of runs. Such analysis is rarely possible for bank runs, since the historical record does not allow for the same detail as is present in this modern data. This cross-sectional analysis yields a set of interesting findings, making this paper a unique contribution to the literature of bank runs, above and beyond its import for the study of the recent crisis. This analysis shows that programs were more likely to experience a run if they had high credit risk (from holdings of subprime-related securities) or high liquidity risk (from a missing or incomplete liquidity support from the plan sponsor). But, importantly, in the first few weeks of August, there was also a high level of run activity *unrelated* to program-specific measures. Taken together, the evidence indicates that vulnerability to runs is strongly related to fundamentals, but it takes some time for investors to figure things out. Even in this market, with relatively sophisticated investors, the first few weeks could fairly be characterized as a "panic".

Overall, the ABCP market fell by $350 billion in the second half of 2007. Most programs relied on backup support from their sponsors to cover this shortfall, with a significant impact on the balance sheets of those sponsors. Some programs made use of contractual options to extend the maturity of their paper, effectively reducing the returns for their lenders as compared to market rates. To understand the contagion of the financial crisis, it is necessary to trace these impacts through the system. McCabe (2010) is the next link in this chain, with a focus on MMFs, a major holder of ABCP and other securities directly related to the now-troubled housing sector.

We have earlier mentioned the key role played by the Reserve Primary Fund, a large MMF that "broke the buck" after the failure of Lehman in September 2008. Less well known are the struggles of MMFs in the August 2007 panic. As the main holders of ABCP, MMFs saw the values of their stakes decline when ABCP yields rose for outstanding paper. Furthermore, shrinking ABCP programs were forced to sell their underlying assets, placing further downward pressure on asset classes held by many MMFs. As a result of these dynamics, at least 43 MMFs required assistance from their sponsors in order to avoid breaking the buck. Essentially, these funds were "bailed out" by the banks or fund families that managed them. McCabe analyses the drivers of these bailouts and find that they were significantly more likely to occur when the funds held ABCP and when they had previously earned above average yields on their portfolio. While such sponsor assistance had occurred in earlier stress periods, the scale of intervention in 2007 was unprecedented.

The sponsor-based rescue of MMFs in 2007 prevented any runs by investors on those funds that year, but may have also solidified the expectation that MMFs would always be bailed out by their sponsors. Such expectations add to the belief that MMFs are super-safe money-like instruments that require no due diligence by investors. In that environment, investors can chase the highest-yielding funds without any perceived risk. Figure 5, taken from McCabe (2010), illustrates this dynamic.

Panel A of the figure shows the growth of MMFs from 1998 to 2010. Funds are broken into three categories – Tax-exempt, government-only, and prime – where the last category is the least restrictive on investments and also by far the largest. The total assets of MMFs were over $2 trillion before the ABCP crisis, after which assets actually rose significantly for both prime and government-only funds. The flight-to-safety in August 2007 benefitted both types of funds, as investors sought a safe haven from riskier asset classes. By September 2008, MMF assets had increased more than 50 percent since the ABCP panic.

The Lehman bankruptcy was a major shock to MMFs. The drop from parity of the Reserve Primary Fund led to a run on similar funds, with Figure 5 showing the sharp outflow from prime MMFs, with an almost one-for-one transfer into government-only funds. This transfer caused significant disruption in funding markets. Prime MMFs are a crucial supplier of funds to corporations and to financial intermediaries. When these investors moved to government-only MMFs, this liquidity supply was lost from private credit markets.

Panels B and C of Figure 5 show how Reserve Primary Fund, traditionally a conservative fund, began to take on more and more risk in the years before the crisis. Prior to 2001, the net yield to investors from the fund was always below average for prime funds. (McCabe finds no evidence that yield is related to investment skill in these funds; increases in yield seem driven entirely by increases in risk.) Beginning in 2001, however, relative yields began to creep upwards, and then increased sharply in 2007 and 2008. For MMFs, an increase in yields attracts new investors, and these new investors tend to be of the return-chasing type that are willing to rapidly leave if performance slips. The figure shows that Reserve Primary's assets and relative market share rose in tandem with its net yields.

As a holder of Lehman commercial paper, Reserve Primary was unable to maintain its value after the Lehman bankruptcy. McCabe's analysis shows that the subsequent runs on MMFs happened disproportionately at funds that, like Reserve Primary, had high relative yields, had recently attracted new performance-sensitive investors, and had riskier financial institutions (as measured by CDS spreads) as sponsors. The runs only stopped after government action to explicitly guarantee MMFs.

The papers by McCabe and by Covitz, Liang and Suarez are comprehensive analyses of the breakdowns in two major components of short-term debt markets, and the linking of ABCP and MMFs helps to show how contagion in these markets can spread. But there is still a missing piece, because the initial ABCP panic was driven by a weakness in subprime mortgages, whereas the eventual run on MMFs was triggered by the bankruptcy of Lehman. Indeed, the MMF market showed that it was capable of absorbing the ABCP losses – albeit at significant cost. So how did the real losses in mortgages eventually lead to the much more significant failure of Lehman Brothers and near collapse of the whole financial system? We argue in Gorton and Metrick (2012) that the repo markets played a key role in this contagion.

As discussed earlier, repo is the shadow-banking equivalent of a deposit market. Large institutional money pools, whose cash holdings far exceed insured deposit limits, can lend short-term to a financial

institution and receive collateral as protection. For every $100 of collateral, an institution can receive $(100-x) in loans, with $x representing the "haircut" and 1/x the allowable leverage. Precise estimates for the total size of the repo market are not available, and imprecise estimates can differ by a lot, but the order of magnitude is always in the trillions of dollars. The main piece of evidence in Gorton and Metrick is the rising "haircut index" on various types of repo collateral, as illustrated in Figure 6.

At the beginning of 2007, average haircuts were near zero on most types of collateral, allowing for very high leverage for holdings of these securities. Haircuts get their first shock at the time of the ABCP panic, and continue a steady rise throughout the next year. For every trillion dollars in the repo market for these non-government assets, each one percent increase in haircuts is equivalent to a $10 billion withdrawal of liquidity from the system, so a 25 percent rise from July 2007 to the eve of the Lehman failure represents a large drain. Following the Lehman failure, the index rose by an additional 20 percentage points, including 100 percent haircuts (= no trade at all) for some assets.

It is important to note that haircuts rose – and prices fell – for many assets that had no direct connection to subprime securities. This is the key step than can allow contagion from one asset class to the broader market that includes many other types of (seemingly unrelated) short-term debt. The main regressions in Gorton and Metrick (2012) show that the value of non-subprime assets moved closely with measures of distress in interbank funding markets, and *not* with an index of default risk on subprime securities.

How did the decline in subprime securities – a relatively small corner of the financial sector – eventually lead to the near collapse of global financial institutions many times the size? The papers discussed in this section trace one important vector of this contagion. First, the subprime failure had a direct effect on many ABCP programs, with runs that began in August 2007 eventually affecting 40 percent of that $1.2 trillion market. These runs and related price drops in other subprime-related securities caused unprecedented problems for MMFs, where at least 43 funds required support from their sponsors. After the initial panic of August 2007, interbank markets were slow to recover, with spreads between secured and unsecured funding remaining at high levels throughout the next year. This pressure also manifested itself in repo markets, where haircuts grew steadily throughout the year, adding to the funding pressure on financial intermediaries. When this pressure finally claimed Lehman Brothers as a victim, the stressed interbank markets nearly collapsed, and only recovered after significant government intervention. This intervention is discussed in the next section.

6. Policy Responses

Beginning in August 2007, governments of all advanced nations took a variety of actions to mitigate the financial crisis. Given the chaotic environment and the wide variety of interventions, it is unlikely we will ever have a complete evaluation of these policies. Given that the economics profession is still debating the efficacy of actions during the Great Depression, it would be a tall order to hope for clarity on our recent crisis. So our goal here is only to provide an overview of the types of policy actions undertaken, along with a brief review of the evidence on the short-term impact of these policies. In addition to the broad overview provided here, the timeline of the crisis shown in Table 1 includes some of the major policy actions taken in the United States.

IMF (2009) analyzes the effectiveness of policy responses in 13 developed economies. They divide the crisis into three periods: Period 1 ("Pre-Lehman"), from June 1, 2007 to September 15, 2008; Period 2 ("Global Crisis 1"), from September 15, 2008 to December 31, 2008; Period 3 ("Global Crisis 2"), from January 1, 2009 to June 30, 2009. In each of these three periods, they employ event-study methodology to measure the impact of five different kinds of policy actions, each of which was widely used across many countries in the sample. Table 2, reproduced from the IMF report, summarizes and classifies these actions.

With this classification as a guide, they identify 153 separate policy actions across their 13 countries. In the United States alone, they identify 49 actions, covering almost every subtype from Table 2 in each of the three crisis periods. There are many future PhD dissertations to be written on these interventions, and the work to date can only scratch the surface. Our only hope at this point is to get some guidance about short-term efficacy, and even there we will need to confine ourselves to a narrow set of outcome measures. The IMF report is an excellent start on this work, using event studies to evaluate the short-run impact of each type of policy (listed in Table 2), with results tabulated separately for each crisis subperiod.

To evaluate the efficacy of interest rate cuts, the IMF looked at the short-term reaction of both an "economic stress index" (ESI) and a "financial stress index" (FSI). The ESI is a composite of confidence measures (business and consumer), credit spreads, and stock prices of nonfinancial companies. The FSI is a composite of several measures of bank credit, spreads, and stock prices. Central banks in all regions cut interest rates in all three crisis periods, but the IMF finds no evidence of short-run impact of interest-

rate cuts on the ESI, and only limited evidence of a positive effect on the FSI. Of course, event studies will not identify any effects if these changes are anticipated – a major limitation when evaluating central bank actions. The story is better for liquidity support – the second category in Table 2 – where such actions often had a significant positive effect on interbank spreads and on the broader FSI measure during the first (pre-Lehman) period. In later periods, announcements of liquidity support did not have reliable effects, either because such announcements were anticipated or because concerns were more about solvency than liquidity.

To measure the short-term impacts of other financial sector policies – recapitalizations, liquidity guarantees, and asset purchases – the IMF looks to both the FSI and to an index of credit default swaps on domestic banks in the relevant country. Of these types of interventions, recapitalizations are found to be particularly effective, with significant improvements in an index of bank CDS spreads in almost all countries during the second and third crisis periods. (There were few recapitalizations in the first period.) These results are not as strong when the broader FSI is used as the outcome measure, which may be because the benefits of recapitalizations fall mostly to bondholders. Asset purchases and liability guarantees also show weaker results, with the exception of notable successes in the U.K.'s asset protection scheme (announced January 2009) and in the Swiss government's purchase of UBS assets.

Overall, the evidence suggests that liquidity support – in the forms described in Table 2 – was effective at calming interbank credit markets in the early stages of the crisis, but not after the fall of Lehman. In these later stages, capital injections were the most effective policy.

7. Real Effects of the Financial Crisis

The run on short-term debt created fear across the financial intermediary sector, especially after the failure of Lehman Brothers. The widespread loss of confidence, concerns about solvency and liquidity of counterparties, reached the real sector of the economy when intermediaries began to hoard cash and stop lending. The real effects of the financial crisis were global in nature. In this section we review three papers that document these phenomena. These papers are "Bank Lending during the Financial Crisis of 2008," by Ivashina and Scharfstein (2010); "Global Retail Lending in the Aftermath of the U.S. Financial Crisis: Distinguishing between Supply and Demand Effects," by Puri, Rocholl and Steffen (2012); and "The Real Effects of Financial Constraints: Evidence from a Financial Crisis," by Campello, Graham, and Harvey (2010.

Ivashina and Scharfstein study the supply of credit during the crisis in order to understand the real effects of the panic on the corporate sector. They look at syndicated loans, a market which has evolved over the last thirty years to become the main portal for large corporations to get loans. The market includes banks, but also a wide range of entities other than regulated commercial banks, such as investment banks, institutional investors, hedge funds, mutual funds, insurance companies and pension funds. Their first finding is that "syndicated lending started to fall in mid-2007, with the fall accelerating during the banking panic that began in September 2008. Lending volume in the fourth quarter of 2008 (2008:Q4) was 47% lower than it was in the prior quarter and 79% lower than at the peak of the credit boom (2007:Q2). Lending fell across all types of loans: investment grade and non-investment grade; term loans and credit lines; and those used for corporate restructuring as well as those used for general corporate purposes and working capital" (p. 320).

Syndicated lending fell, but commercial and industrial loans reported by the U.S. regulated banking sector rose by about $100 billion from September to mid-October 2008. But, Ivashina and Scharfstein show that this increase was not due to an increase in *new* loans. Instead it was corporate borrowers drawing down existing credit lines, that is, credit lines that had been negotiated prior to the crisis.

To show the effects of the crisis the authors first show that banks that were more vulnerable to a run, those that were to a greater extent financed by short-term debt other than insured deposits, cut their syndicated lending by more. They find that: "A bank with the median deposits-to-assets ratio reduced its monthly number of loan originations by 36% in the period August and December of 2008, relative to the prior year. However, a bank with a deposits-to-assets ratio one standard deviation above the mean reduced its loan by 49%, while a bank with deposits ratio one standard deviation above the mean reduced its loan originations lending by only 21%" (p. 320).

It is harder to demonstrate the effects of credit-line drawdowns on syndicated lending because there are no data measuring credit-line drawdowns. The authors consider the possibility that banks in syndicated credit lines where Lehman Brothers was part of the syndicate might experience larger credit-line drawdowns after the failure of Lehman. The idea is that commitments that would otherwise have been met by the other members of the syndicate would be more likely to be drawn on. They, in fact, find "that banks that co-syndicated a large fraction of their credit lines with Lehman reduced their lending more" (p. 320).

An important issue for these findings has to do with the fact that in a recession the demand for credit falls. To account for the above findings, the fall in demand must also explain why the more vulnerable banks reduced the lending more than the other banks. But, as the authors point out, this may be the case. They point to the example of investment banks, which have no demand deposit funding, lending more for corporate acquisitions. Since corporate acquisitions declined in the recession, perhaps this fall in demand accounts for the results, rather than the supply of loans. The authors find, however, that the results continue to hold for commercial banks and for loans that are not used for acquisitions. Their main conclusion then is that the decline in lending was in large part an effect of reduced bank loan supply.

The issue of the supply of credit is also the focus of Puri, Rocholl and Steffen (2012) who examine the effects of the U.S. financial crisis on lending to retail customers in Germany. They are also interested in whether there are detectable reductions in the supply of credit by banks, even when overall demand is going down. The setting they study is German savings banks, which operate in defined geographical areas and are mandated by law to serve only their local customers. In each geographical area there is a regional bank, a Landesbank, owned by the savings banks in that area. These German Landesbanken (the regional banks, each in a province) had exposures to U.S. subprime mortgages to varying degrees.

The authors exploit the fact that the Landesbanken suffer to different extents due to their exposures to U.S. subprime mortgages. Importantly, the savings banks had to guarantee or make equity injections into some of the stricken Landesbanken. The authors make use of this natural experiment in which some savings banks faced a shock because their Landesbanken had to be assisted. The authors' empirical strategy is to look at whether savings banks that are affected at the onset of the crisis (because their Landesbanken needed help) reduce their lending by more than the (relatively) unaffected savings banks. The data are especially rich, including the universe of all loan applications and the credit scores, and information about which applications were granted and which were turned down.

There was an overall decrease in demand for consumer loans, as measured by applications to both affected and unaffected savings banks. But, with respect to the supply of credit, "the average rejection rate of affected savings banks is significantly higher than of non-affected savings banks" (p. 3-4). The effect is stronger for mortgages, as compared to consumer loans. If a borrower had a prior relationship with the savings bank, the effect is mitigated, that is, those customers are less likely to have their applications rejected compared to new customers. Overall, their evidence is consistent with that of Ivashina and Scharfstein: banks reduced the supply of credit.

What effect did a reduced bank loan supply have on the real economy, on the activities of non-financial firms? This brings us to the study of Campello, Graham and Harvey (2010). To answer this question of effects on non-financial firms, these authors directly ask 1,050 chief financial officers in 39 countries in North America, Europe and Asia in December 2008 whether they were financially constrained during the crisis. Their survey asks about the cost and availability of credit, and about the effects on their decisions and actions, as well as many other questions. The survey asks whether a firm's operations are "not affected," "somewhat affected," or "very affected" by the turmoil in the credit markets. Firms that described themselves as "somewhat affected" or "very affected" were then further probed with questions concerning the nature of the effects, e.g., higher costs of external funds, limitations on credit. For U.S. firms, 244 indicated that they were unaffected by credit constraints, 210 indicated that they were somewhat affected, and 115 said they were very affected (In Europe, the numbers respectively were 92, 71, and 26; and in Asia, the numbers were 147, 112, and 24).

Figure 7, from Campello, Graham and Harvey (2010), gives a sense of the effects of credit constraints. The figure shows averages for each type of action for the constrained firms and the unconstrained firms ("constrained" is only "very affected," while "unconstrained" is the other two categories). While all firms cut back on expenditure and dividend payments and see their cash holdings and the number of employees decline, the constrained firms contract these policies much more, in a very noticeable (and statistically significant way). For example, unconstrained firms reduce the number of their employees by 2.7 percent on average, while constrained firms reduce the number of their employees by almost 11 percent.

What are the constraints that firms face? Eighty-one percent of the very affected firms reported that they experienced less access to credit; twenty percent cite problems with lines of credit. In other words, it seems that the reductions in credit that Ivashina and Scharfstein reported in their study of banks result in the constraints studied by Campello, Graham and Harvey.

The categorization of firms into "constrained" and "unconstrained" may confound a number of factors. The authors address this problem econometrically by matching constrained firms with an unconstrained "match" based on size, ownership form, credit rating, profitability, and so on, so that there is a sample of firms that only differs on the degree of access to credit. Tests based on this approach show the differential effect of financial constraints on corporate policies. Firms that are constrained show important differences even before the crisis, and increase very noticeably during the peak of the crisis.

The authors also delve into firms' liquidity management and investment decisions. For example, the Ivashina and Scharfstein result that there was a run on the banks, by firms drawing down on their credit lines "just in case," is confirmed. Thirteen percent of the constrained firms said that they would draw down on their credit lines now to have cash in the futures. And 17 percent drew down their credit lines as a precaution, compared to six percent of the unconstrained firms. With respect to investment during the crisis, 86 percent of constrained U.S. firms reported that they bypassed attractive investments, compared to 44 percent of unconstrained firms.

Overall, the evidence suggests that banks cut back on credit supply, although the demand for credit also fell. The resulting reduction in credit supply had significant impacts on credit-constrained firms.

8. Conclusion

The financial crisis of 2007-2009 was perhaps the most important economic event since the Great Depression. All professional economists need a working knowledge of the key details of this crisis. This paper summarizes these details using 16 papers, reports, and other documents. From these documents, a narrative emerges that is very similar to historical crises, while cloaked in institutional detail novel to this century.

One strong similarity to history comes in the acceleration of system-wide leverage just before the crisis, the strongest predictor of crises in the past two centuries. Furthermore, the recent crisis was preceded by rapid increases in housing prices, also a feature of all major crises since World War II. At this macro level, the pattern (but not the scale) of our crisis is very ordinary.

The crisis was exacerbated by panics in the banking system, where various types of short-term debt suddenly became subject to runs. This, also, was a typical part of historical crises. The novelty here was in the location of runs, which took place mostly in the newly evolving "shadow banking" system, including money-market mutual funds, commercial paper, securitized bonds, and repurchase agreements. This new source of systemic vulnerability came as a surprise to policymakers and economists, and some knowledge of its details is necessary for understanding the contagion that eventually spread to the real economy.

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Table 1: Financial Crisis Major Events Timeline

2007	
Jan. –July	Subprime mortgage underwriters Ownit Mortgage Solutions and New Century Financial Corp. file for bankruptcy. Massive downgrades of mortgage-backed securities by rating agencies. Kreditanstalt für Wiederaufbau (KfW), a German government-owned development bank, supports German bank IKB.
August	Problems in mortgage and credit markets spill over into interbank markets; haircuts on repo collateral rise; asset-backed commercial paper (ABCP) issuers have trouble rolling over their outstanding paper; large investment funds in France freeze redemptions.
August 17	Run on U.S. subprime originator Countrywide.
September 9	Run on U.K. bank Northern Rock
December 15	Citibank announces it will take its seven structured investment vehicles onto its balance sheet, $49 billion.
December	National Bureau of Economic Research subsequently declares December to be the business cycle peak.
2008	
March 11	Federal Reserve announces creation of the Term Securities Lending Facility to promote liquidity.
March 16	JPMorgan Chase agrees to buy Bear Stearns, with Federal Reserve Assistance, and Federal Reserve announces creation of the Primary Dealer Credit Facility.
June 4	Monoline insurers MBIA and AMBAC are downgraded by Moody's and S&P.
July 15	U.S. Securities and Exchange Commission issues an order banning naked short-selling of financial stocks.
September 7	Federal government takes over Fannie Mae and Freddie Mac.
September 15	Lehman Brothers files for bankruptcy.
September 16	The Reserve Primary Fund, a money market fund, "breaks the buck," causing a run on MMFs. Federal Reserve lends $85 billion to AIG to avoid bankruptcy.
September 19	U.S. Treasury announces temporary guarantee of MMFs, and Federal Reserve announces the Asset-Backed Commercial Paper Money Market Mutual Funds Liquidity Facility.
September 25	Washington Mutual, the largest savings and loan in the U.S. with $300 billion in assets, is seized by the authorities.
October	Financial crisis spreads to Europe.
October 3	U.S. Congress approves the Troubled Asset Relief Program (TARP), authorizing expenditures of $700 billion.
October 8	Central banks in US, England, China, Canada, Sweden, Switzerland, and the European Central Bank cut interest rates in a coordinated effort to aid world economy.
October 13	Major central banks announced unlimited provision of liquidity to U.S. dollar funds; European governments announce system-wide bank recapitalization plans.
October 14	U.S. Treasury invests $250 billion in nine major banks.
2009	
May	Results of the Supervisory Capital Assessment Program ("stress tests") announced.
June	National Bureau of Economic Research subsequently declares June to be the business cycle trough.
October	Unemployment rate peaks at 10.0 percent.

Table 2: Classification of Events

Central Bank – Monetary Policy and Liquidity Support

Interest rate change
Reduction of interest rates

Liquidity support
Reserve Requirements, longer funding terms, more auctions and/or higher credit lines

Government – Financial Sector Stabilization Measures

Recapitalization
Capital injection (common stock / preferred equity)
Capital injection (subordinated debt)

Liability guarantees[1]
Enhancement of depositor protection
Debt guarantee (all liabilities)
Debt guarantee (new liabilities)
Government lending to an individual institution

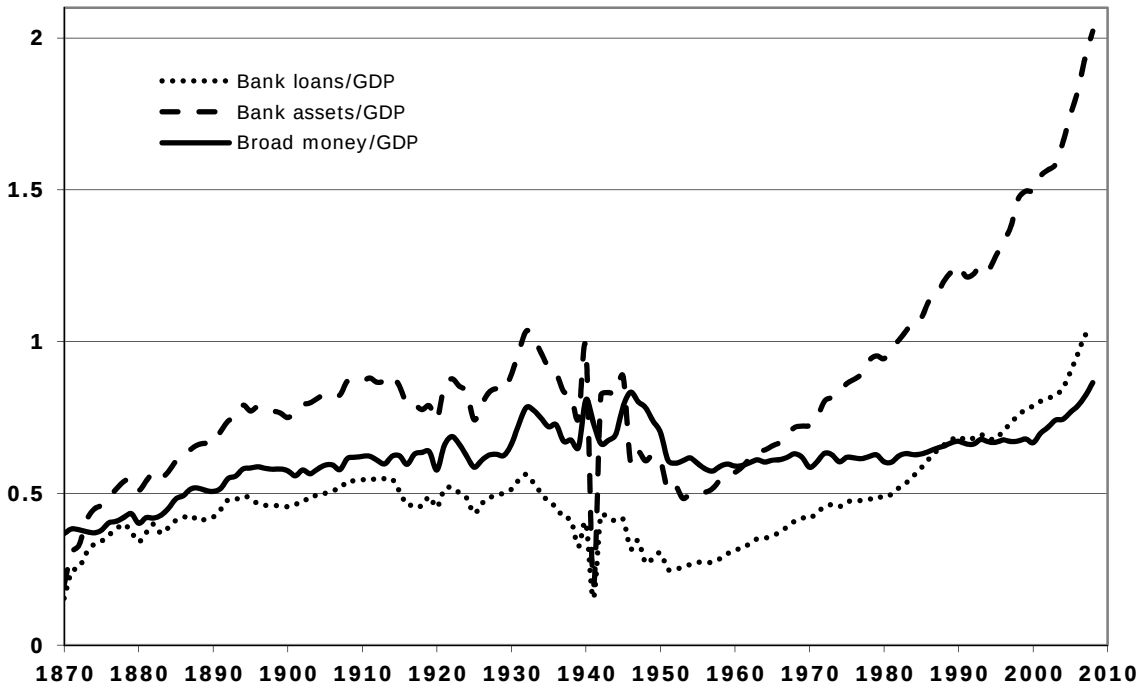
Asset purchases[2]
Asset purchases (individual assets, bank by bank)
Asset purchases (individual "bad bank")
Provisions of liquidity in context of bad asset purchases/removal
On-balance-sheet "ring-fencing" with toxic assets kept in the bank
Off-balance-sheet "ring-fencing" with toxic assets moved to a "bad bank"
Asset guarantees

Source: Table 3.1, IMF (2009)

[1]Includes the Federal Reserve's liquidity support to AIG for toxic asset removal to a special-purpose vehicle, coupled with government's loss sharing.

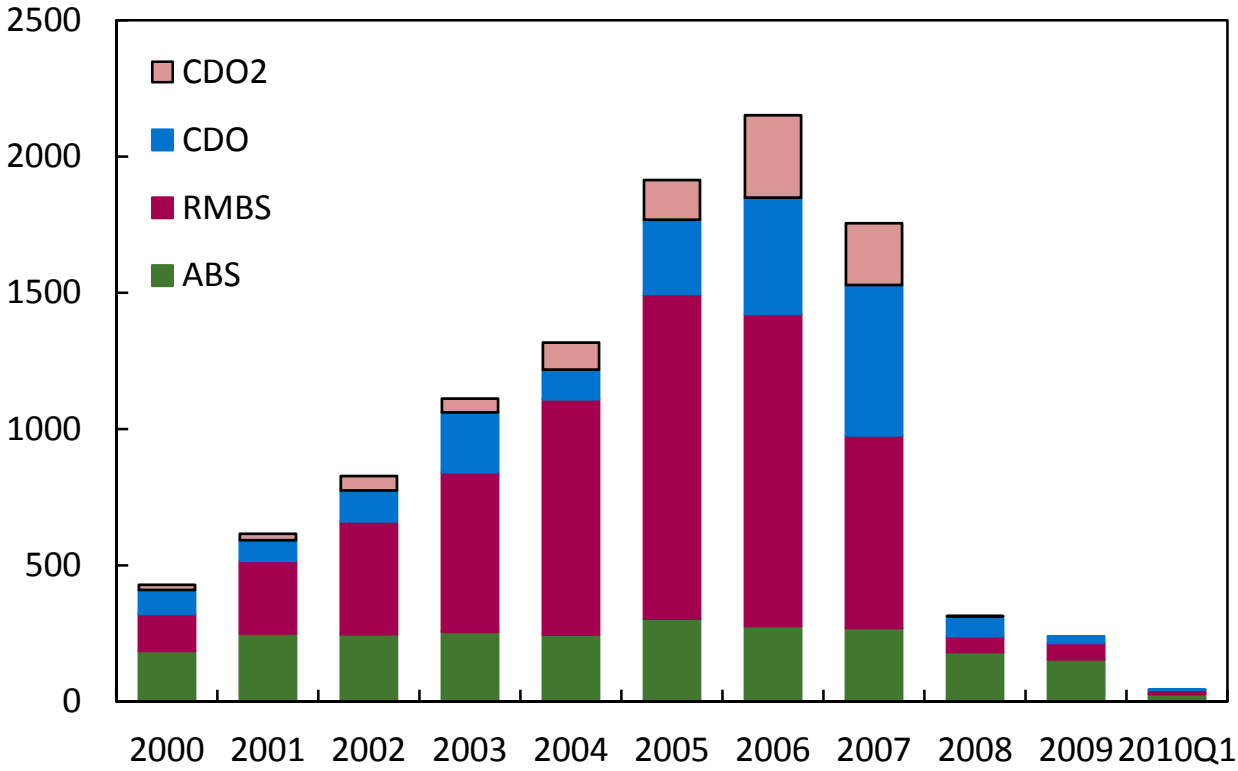
[2]Includes business loan guarantees as part of financial sector stabilization measures (e.g. the United Kingdom, Germany); for some countries, asset purchases were not conducted by the government, but (also) by the central bank (or a central-bank sponsored) agent such as the United States and Switzerland.

Figure 1: Money and Credit Aggregates Relative to GDP
(14-country averages by year)



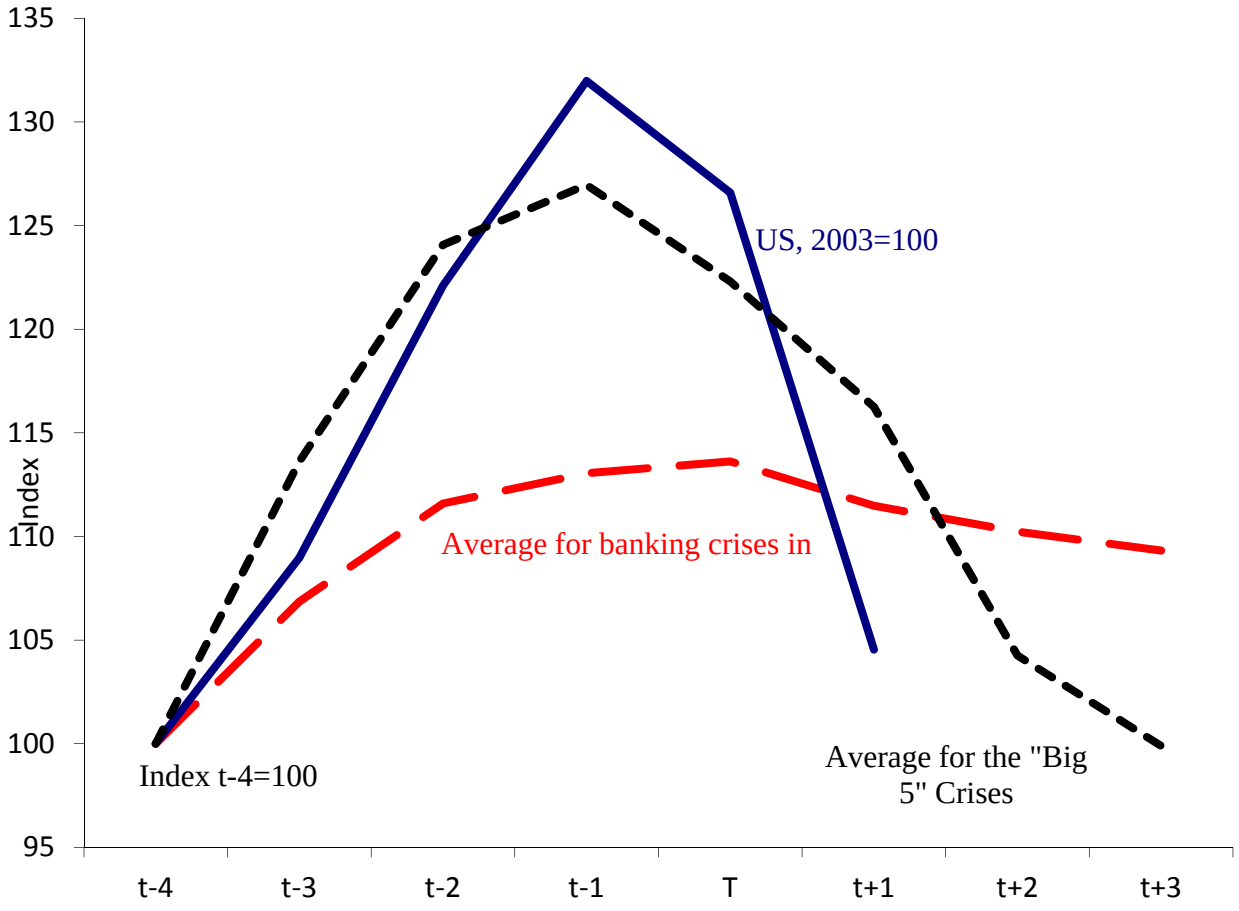
Source: Schularick and Taylor (2012).

Figure 2: U.S. Private-Label Term Securitization Issuance by Type
(In billions of U.S. dollars)



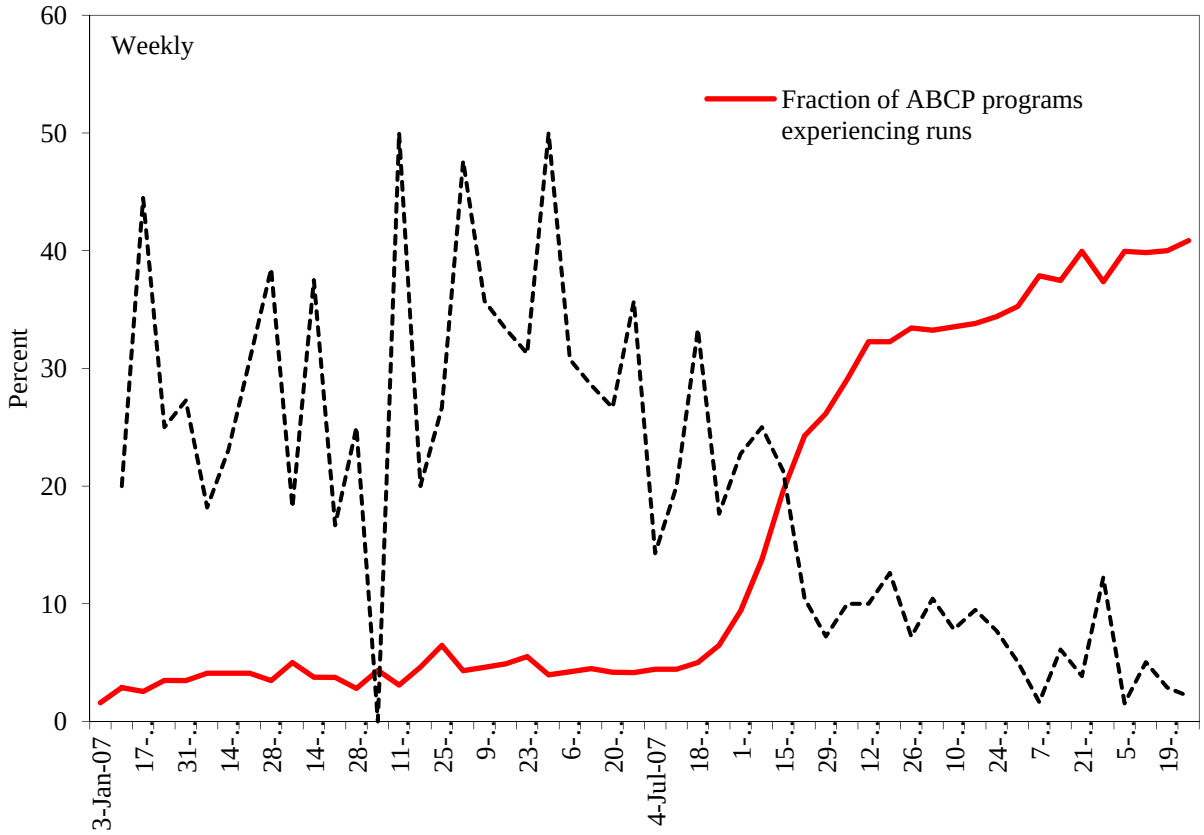
Sources: IMF (2010).

Figure 3: Real Housing Prices and Banking Crises



Source: Reinhart and Rogoff (2008).

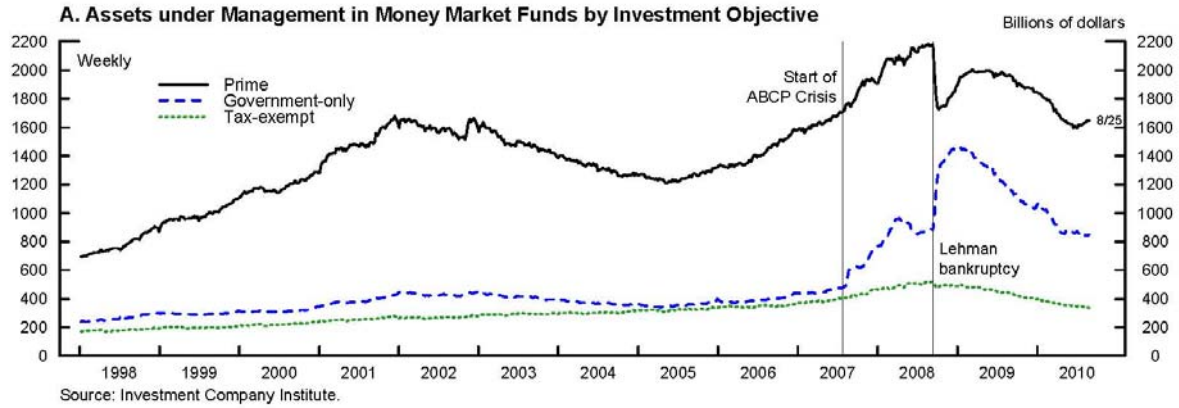
Figure 4: Runs on Asset-Backed Commercial Paper Programs

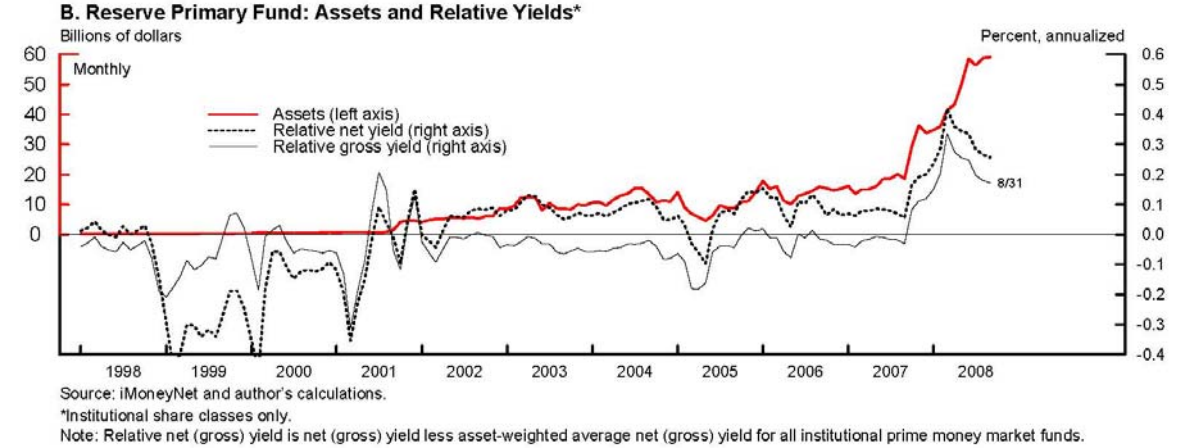


The solid line plots the percent of programs experiencing a run. We define that a program experiences a run in weeks when it does not issue paper but has at least 10% of paper maturing or when the program continues to not issue after experiencing a run in the previous week (see equation (1) in the text). The dotted line plots the unconditional probability of not experiencing a run in a given week after having experienced a run in the previous week (i.e., the hazard rate of leaving the run state). The figure is based on weekly data from DTCC on paper outstanding, maturities, and issuance for 339 ABCP programs in 2007.

Source: Covitz, Liang, and Suarez (2011).

Figure 5: Money Market Funds (McCabe (2010))





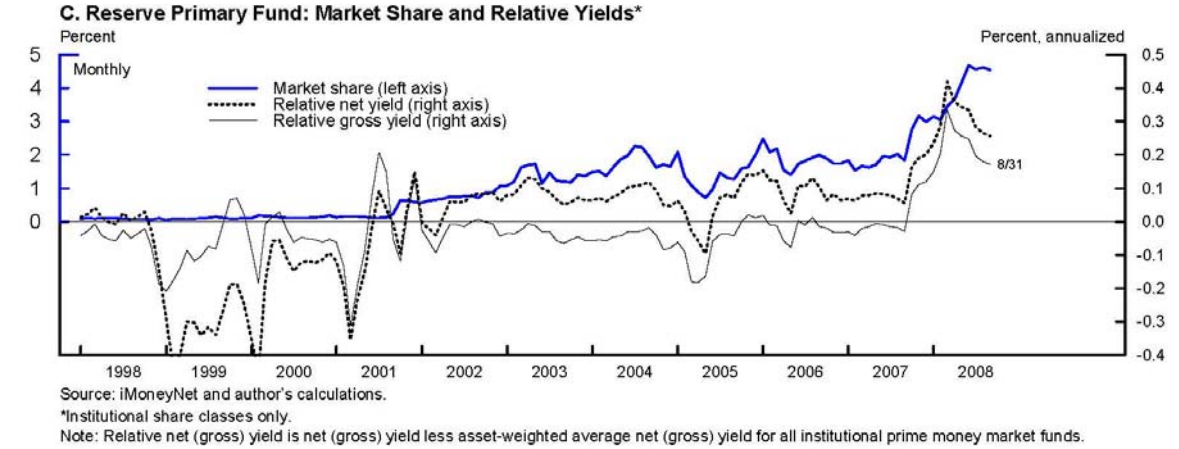
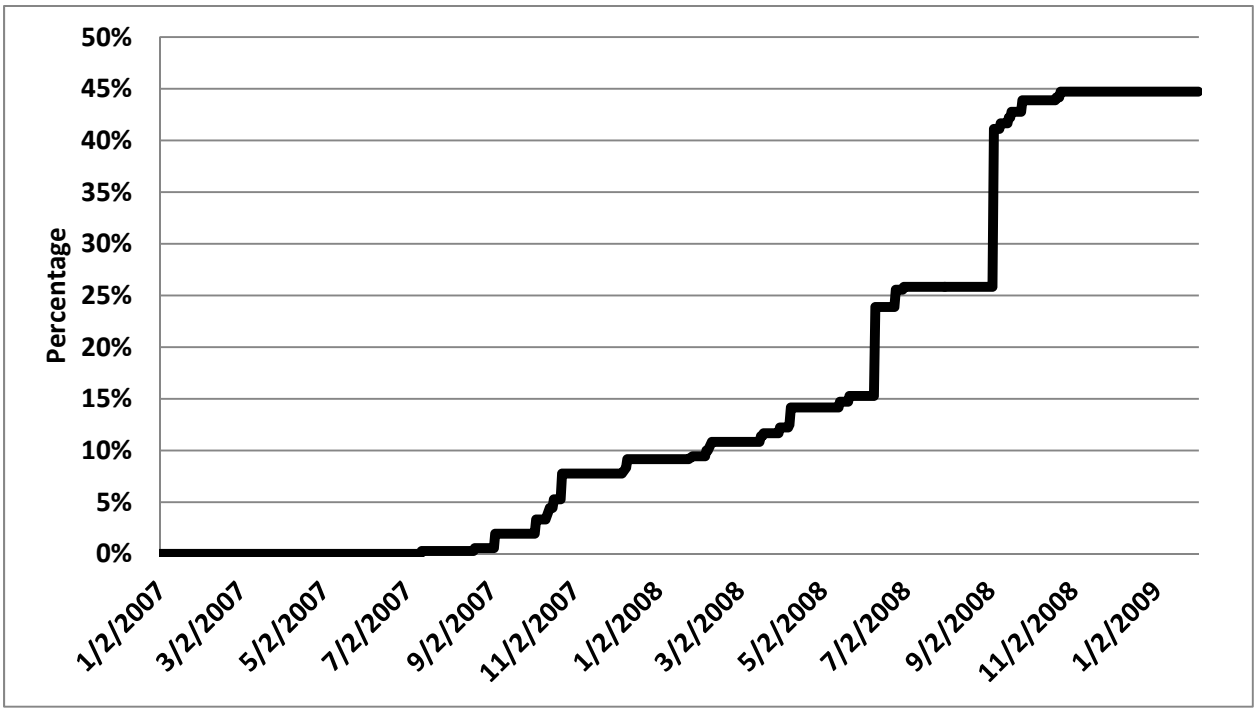
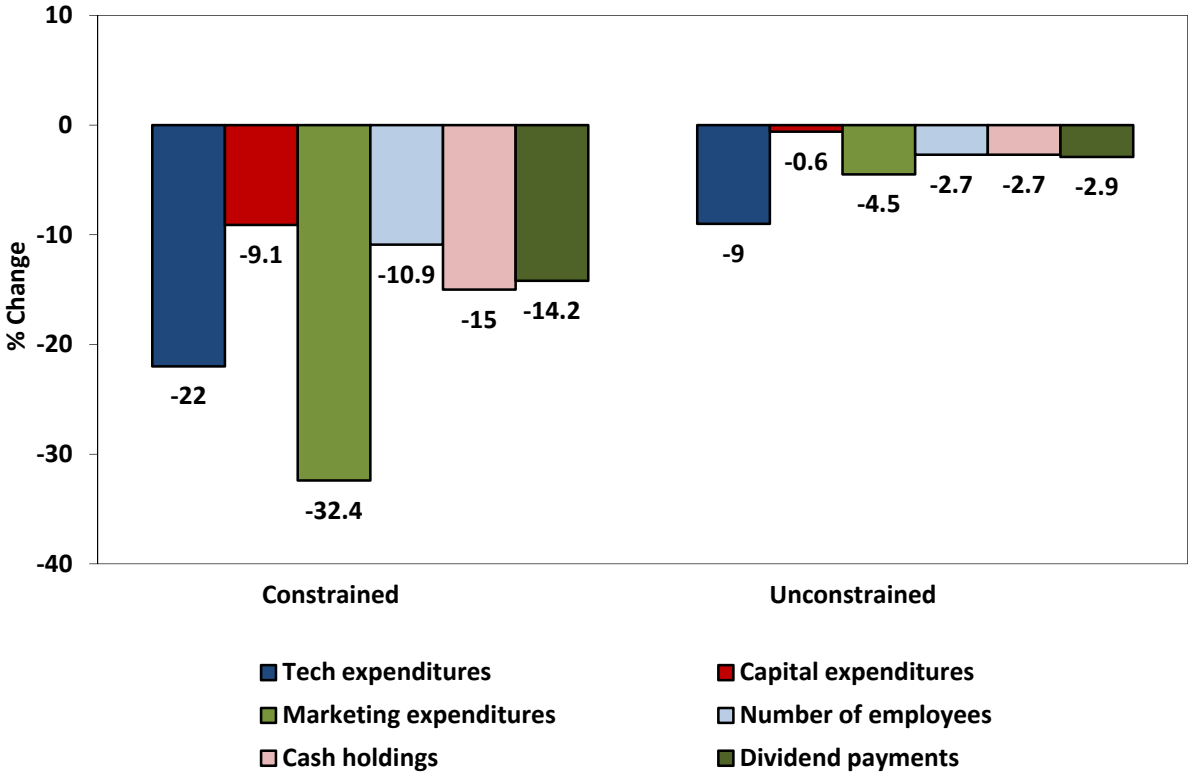


Figure 6: Average Haircuts (on nine asset classes; equally weighted)



Source: Gorton and Metrick (2012).

Figure 7: Plans of Constrained vs. Unconstrained Firms



Source: Campello, Graham and Harvey (2010).