

When Safe Proved Risky: Commercial Paper During the Financial Crisis of 2007-2009

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Abstract

Commercial paper is one of the largest money market instruments and has long been viewed as a safe haven for investors seeking low risk. However, during the financial crisis of 2007-2009, the commercial paper market experienced twice the modern-day equivalent of a bank run with investors unwilling to refinance maturing commercial paper. We analyze the supply of and demand for commercial paper and show that, in contrast to previous turbulent episodes, the crisis centered on commercial paper issued by, or guaranteed by, financial institutions. We describe the importance of Federal Reserve's interventions in restoring stability of the market. Finally, we propose three possible explanations for the sharp decline of the commercial paper market: substitution to alternative sources of financing by commercial paper issuers, adverse selection, and institutional constraints among money market funds.

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Commercial paper is a short-term debt instrument issued by large corporations. For issuers, commercial paper is a way of raising capital cheaply at short-term interest rates. For investors, commercial paper offers returns slightly higher than Treasury bills in exchange for taking on minimal credit risk. At the beginning of 2007, commercial paper was the largest U.S. short-term debt instrument with more than \$1.97 trillion outstanding. Most of the commercial paper was issued by the financial sector, which accounted for 92 percent of all commercial paper outstanding.

Commercial paper played a central role during the financial crisis of 2007-2009. Before the crisis, market participants used to regard commercial paper as a safe asset due to its short maturity and high credit rating. Two events changed this perception. The first event began to unfold on July 31, 2007, when two Bear Stearns' hedge funds that had invested in subprime mortgages filed for bankruptcy. In the following week, other investors also announced losses on subprime mortgages. On August 7, 2007, BNP Paribas suspended withdrawals from its three investment funds because of its inability to assess the value of the mortgages and other investment held by the funds. Given that similar assets served as collateral for a specific category of commercial paper—asset-backed commercial paper—many investors became reluctant to purchase asset-backed commercial paper. The total value of asset-backed commercial paper outstanding fell by 37 percent, from \$1.18 trillion in August 2007 to \$745 billion in August 2008. Other categories of commercial paper remained stable during this period.

The second event occurred on September 16, 2008, when the Reserve Primary Fund—a large money market fund with \$65 billion of assets under management—announced that it had suffered significant losses on its \$785 million holdings of Lehman

Brothers' commercial paper. Instead of each of its shares being worth \$1—a common rule in the money market industry—the Reserve Fund announced its shares were worth only 97 cents. In other words, the fund broke the buck—an occurrence that had happened only once before in the history of money market funds. This news triggered the modern-day equivalent of a bank run, leading to about \$172 billion worth of redemptions from the \$3.45 trillion worth money market fund sector. The run stopped on September 19, 2008—three days after it started—when the U.S. government announced that it would provide deposit insurance to investments in money market funds. Even though the announcement halted the run on money market funds, most funds nonetheless reduced their holdings of all types of commercial paper because they deemed them too risky. Within one month after the Reserve Fund's announcement, the total value of commercial paper outstanding fell by 15 percent, from \$1.76 trillion to \$1.43 trillion.

To stop the sudden decline in commercial paper, the Federal Reserve decided—for the first time in its history—to purchase commercial paper directly. The Federal Reserve started purchasing commercial paper on October 26, 2008 and its action promptly stabilized the market. By early January 2009, the Federal Reserve was the single largest purchaser of commercial paper and owned paper worth \$357 billion, or 22.4% of the market, through a variety of lending facilities. Throughout the year 2009, the Federal Reserve steadily reduced its holdings and in October 2009 it held \$40 billion of commercial paper accounting for 3.4% of the market.

In this paper, we analyze the commercial paper market during the financial crisis. First, we describe the institutional background of the commercial paper market. Second, we analyze the supply and demand sides of the market. Third, we examine the most

important developments during the crisis of 2007-2009. Last, we discuss three explanations of the decline in the commercial paper market: substitution to alternative sources of financing by commercial paper issuers, adverse selection, and institutional constraints among money market funds.

Basics of Commercial Paper

In the United States, commercial paper has been an important source of financing since the 19th century. According to the Securities Industry and Financial Markets Association, in early 2007, total U.S. short-term debt financing, also referred to as money market financing, accounted for approximately \$5 trillion. Commercial paper was the largest instrument in this market with more than \$1.97 trillion outstanding. In turn, the second-largest instrument was U.S. Treasury bill, which accounted for \$940 billion outstanding. Other important short-term debt instruments included time deposits, repurchase agreements, short-term notes, and bankers' acceptances.¹

Commercial paper is usually issued at a discount to a pre-determined face value, which means that investors acquire commercial paper at a price below the face value and receive the face value at maturity. The difference between the purchase price and the face value is the discount—that is, the interest received on commercial paper. In practice, the interest rate on commercial paper is a bit higher than the interest rate on

¹ The commercial paper market also exists in Europe, albeit the market is smaller. In January 2007, according to Euroclear—a consortium of the main European securities depositories—total value of commercial paper outstanding amounted to \$691 billion. In many ways, the commercial paper market in Europe is similar to that in the United States; the key difference, however, is that offerings are often denominated in currencies other than the U.S. dollar. Nevertheless, many large issuers are active in both markets and issue simultaneously in Europe and in the United States. For the sake of brevity, we focus on the commercial paper market in the United States though most of our analysis also applies to the commercial paper market in Europe.

Treasury bills of the same maturity and a bit lower than the interest rate on loans of the same maturity such as LIBOR (London Interbank Offered Rate), the benchmark interest rate paid on short-term lending among large banks (Stigum and Crescenzi, 2007).

Almost all commercial paper is rated by one or more nationally accredited rating agencies like Moody's, Standard & Poor's, or Fitch. Commercial paper sold in the market typically has the highest short-term rating as many market participants—either by choice or by regulation—restrict their purchases to high-quality papers.

Commercial paper is issued either via a dealer or directly by a corporation that needs to raise capital. In August 2006, about 80 percent of commercial paper was issued by dealers and the remaining 20 percent by corporations. Dealers charge fees of 5 to 12.5 basis points for issuing commercial paper; the fees vary according to the issuers' credit history, issuance size, and market conditions. Dealers typically advise issuers on pricing and purchase positions that do not sell in the market (Stigum and Crescenzi, 2007).

Most investors in commercial paper market purchase the paper at issuance and hold it until maturity. Hence, there is little trading of commercial paper in secondary markets. Instead, many investors continuously roll over maturing commercial paper, which means that they purchase newly issued commercial paper from the same issuer once their holdings of commercial paper mature. As a result, issuers usually refinance the repayment of maturing commercial paper with newly issued commercial paper. However, the need to roll over maturing commercial paper generates the risk that investors may not be willing to refinance maturing commercial paper. This risk is often called roll-over or liquidity risk. In this case, the issuer needs to find financing elsewhere to repay maturing commercial paper.

Supply Side of Commercial Paper

From the perspective of a commercial paper issuer, one benefit of commercial paper is that the issuer can avoid registration under the Securities Act of 1933, which is the set of rules that requires any firm issuing securities to provide a description of the company's properties and business, of the security itself, and of corporate management, along with financial statements. Registration is generally considered an expensive and lengthy process. The exemption from registration for commercial paper is usually based on Section 3(a)(3) of the 1933 Securities Act, which requires commercial paper issuers to satisfy three criteria. First, the maturity of commercial paper must not be more than 270 days. In practice, commercial paper typically has far shorter maturities—between 1 and 45 days—with an average maturity of about 30 days. Second, commercial paper must not be targeted towards the general public. Hence, issuers of commercial paper cater to institutional investors; usually offering large denominations of \$100,000 or more. Third, issuers of commercial paper must only use their proceeds from issuing commercial paper to finance current assets such as receivables or inventory. In practice, this requirement implies that firms need to demonstrate that they have sufficient scale of current transactions to justify the size of their commercial paper programs (Hahn, Cook, and Laroche, 1993).

As an alternative to Section 3(a)(3), issuers can also claim an exemption from registration under Section 4(2), which restricts the sale of commercial paper to accredited investors and, in exchange, allows issuers to use the proceeds to finance long-term assets. Issuers can also claim exemption under Section 3(a)(2), which requires commercial paper to be fully supported by a bank guarantee (Fitch, 2001).

Depending on the issuer, there are three categories of commercial paper: asset-backed, financial, and corporate commercial paper.² Due to historical reasons, the last two categories are sometimes simply referred to as commercial paper. To avoid confusion, we use the term commercial paper only when we refer to all three categories at once.

Over the last two decades, the commercial paper market has grown substantially. This growth was mostly spurred by the development of asset-backed commercial paper, which was first issued in the 1980s. The total value of the commercial paper market in 1990 was \$558 billion, of which 5.7 percent was asset-backed commercial paper, 59.9 percent was financial commercial paper, and 34.4 percent was corporate commercial paper. In January 2007, the total value of commercial paper accounted for \$1.97 trillion, of which 56.8 percent was asset-backed commercial paper, 34.4 percent was financial commercial paper, and 5.7 percent was corporate commercial paper.

Asset-backed Commercial Paper

Asset-backed commercial paper is issued by off-balance sheet conduits of a large financial institution, where off-balance sheet means that the assets and liabilities of the conduit are not included on the financial institution's balance sheet. However, the assets are under the control of the financial institution in the sense that the conduit is a shell company which is managed by the financial institution.

Conduits typically hold diversified portfolios of financial assets. In the 1980s and early 1990s, most conduits only invested in short-term and medium-term assets such as

² Corporate financial paper is also referred to as non-financial commercial paper.

trade receivables originated by their sponsoring financial institutions. During the late 1990s, some conduits started investing in long-term assets, including securitized assets such as mortgage-backed securities. By the early 2000s, most conduits invested in long-term assets, some of which were originated by the financial institutions' own customers and some of which were securitized assets originated by other financial institutions. As a result of this investment strategy, conduits developed a maturity mismatch between the long maturity of their assets and the short maturity of their asset-backed commercial paper. This maturity mismatch exposed conduits to roll-over risk, the risk that investors would stop refinancing the asset-backed commercial paper. The roll-over risk makes the conduit riskier for outside investors because the conduit may go bankrupt if all investors stop refinancing at the same time and the conduit cannot sell off its assets to repay investors.

To protect outside investors against roll-over risk, the financial institution which manages the conduit typically provides credit guarantees to outside investors. Under these credit guarantees, the financial institution promises to pay off maturing asset-backed commercial paper in case the conduit is unable to do so. From an investor's perspective, the combination of credit guarantees and conduit's assets substantially reduces the default risk of asset-backed commercial paper (Moody's Investors Service, 2003).

Using data from credit rating agencies, Acharya, Schnabl, and Suarez (2009) show that, in January 2007, 296 conduits were authorized to issue asset-backed commercial paper in the United States and Europe. The conduits were supported by a total of 126 sponsoring financial institutions. Most sponsoring financial institutions were

large commercial banks—based in the United States and Europe—many of which sponsored more than one conduit. In total, commercial banks accounted for \$903 billion—or 74.8 percent—of asset-backed commercial paper outstanding. For example, the largest financial institution sponsoring conduits in the United States was Citigroup with 16 conduits and \$92.6 billion of asset-backed commercial paper outstanding. The largest financial institution sponsoring conduits in Europe was the Dutch Bank ABN Amro with 9 conduits and \$68.6 billion of asset-backed commercial paper outstanding. Besides commercial banks, large sponsors of conduits also included structured investment groups (\$182 billion), mortgage lenders (\$72 billion), and other financial institutions (\$79 billion).

About 74.1 percent of outstanding commercial paper was issued by conduits with full credit guarantees. Acharya, Schnabl, and Suarez (2009) show that full credit guarantees are structured to avoid capital requirements required for assets held by banks directly. They argue that the avoidance of capital requirements was an important driver behind the growth of asset-backed commercial paper. An additional 18.4 percent of outstanding commercial paper was issued by conduits with extendible notes guarantees. Extendible notes guarantees are similar to full credit guarantees except that conduits can extend the commercial paper's maturity for a limited period of time. The remaining 7.5 percent was issued by structured investment vehicles, which are conduits that issue longer-term debt in addition to asset-backed commercial paper. Credit guarantees of structured investment vehicles typically cover asset-backed commercial paper, but not the longer-maturity debt.

Financial Commercial Paper

Financial commercial paper is issued by large financial institutions. In contrast to asset-backed commercial paper, financial commercial paper is issued by the institution directly and not via a conduit. Also, financial commercial paper is unsecured and the issuer does not pledge assets as collateral. Financial commercial paper is considered a low-risk asset because of its short maturity and the fact that its issuers are large institutions with strong balance sheets. If the balance sheet of an issuer deteriorates, investors usually become reluctant to roll over maturing commercial paper and the issuer has to exit the commercial paper market.

The main issuers of financial paper are foreign financial institutions, accounting for \$455 billion of commercial paper in early 2007. Many foreign issuers are U.S. subsidiaries of foreign banks, which are set up primarily to access the U.S. commercial paper market. The two main U.S. issuers of financial commercial paper are captive finance companies and bank-related finance companies. Captive finance companies are subsidiaries of automobile companies or manufacturing companies that issue commercial paper to secure financing for their parent companies (Fabozzi and Mann, 2005). In January 2007, total liabilities of captive finance companies accounted for \$1.87 trillion, of which \$165 billion was commercial paper. Some of the largest captive finance companies issuing financial commercial paper are those owned by General Motors, General Electric, and Toyota (Stigum and Crescenzi, 2007; Standard and Poor's, 2009).

Bank-related finance companies are funding subsidiaries of large bank holding companies. Many bank holding companies use such funding subsidiaries to issue commercial paper and pass the proceeds downstream into the bank. Bank holding

companies choose such a structure because banks themselves are usually not allowed to issue commercial paper. Some bank holding companies also issue commercial paper to finance non-bank activities. In January 2007, total liabilities of bank holding companies equaled \$757 billion, of which \$79 billion were in the form of commercial paper. Some of the largest bank holding companies issuing financial paper are Citibank and American Express (Saunders and Cornett, 2008; Standards and Poor's, 2009).

Corporate Commercial Paper

Corporate commercial paper is issued by non-financial businesses. In January 2007, total credit market debt of non-financial businesses was \$9.16 trillion of which \$145 billion was commercial paper, accounting for 1.6 percent of total liabilities. Like financial commercial paper, corporate commercial paper is unsecured and only large, creditworthy firms with strong balance sheets can issue commercial paper. Most issuers are in the largest size quintile of publicly traded corporations. For these firms, commercial paper is an important source of financing, representing about 30 percent of their current liabilities (Downing and Oliner, 2007). Among the main issuers of corporate financial paper are General Electric and Coca-Cola (Standards and Poor's, 2009).

Historically, commercial paper issuers used the proceeds from issuance to cover their short-term financing needs for working capital and inventory. Over time, many issuers started rolling over maturing commercial paper at regular frequencies, thus effectively financing a constant share of their activities via commercial paper. Kahl,

Shivdasani, and Wang (2009) estimate that, on average, commercial paper borrowing represents 36 percent of investment outlays among commercial paper issuers.

Demand Side of Commercial Paper

Money market funds and mutual funds are the main investors in commercial paper. In January 2007, money market funds and mutual funds owned commercial paper worth \$767 billion, or 31.4 percent of the market, according to the Federal Reserve Flow of Funds data. Other important investor classes were foreign investors (\$299 billion), state and local governments (\$205 billion), funding corporations (\$198 billion), and non-financial corporate businesses (\$109 billion). Individual households own little commercial paper directly, but they own commercial paper indirectly through their ownership of money market funds and mutual funds.

The dominant role of money market funds and mutual funds as commercial paper investors is relatively new. Money market funds emerged in the 1970s as an alternative to bank deposits that paid regulated interest rates below market-determined rates on commercial paper. Over time, money market funds grew in size and totaled \$2.4 trillion at the start of 2007 (Federal Reserve Flow of Funds data).

An important characteristic of money market funds is that, contrary to bank deposits, investments in money market funds were not traditionally insured by the government. Although money market funds seek to preserve the value of an investment at \$1.00 per share, it is possible that investors in money market funds can realize a loss on their investments. The main risks faced by money market funds include changes in interest rates and default on their investments (e.g., default on commercial paper).

To limit risks of money market fund investments, commercial paper holdings of money market funds are regulated under Rule 2a-7 of the Investment Company Act of 1940. Rule 2a-7 limits commercial paper holdings of money market funds to commercial paper that carries either the highest or second-highest rating for short-term debt from at least two of the nationally recognized credit rating agencies. Money market funds must not hold more than 5 percent of their assets in securities of any individual issuer with the highest rating and not more than 1 percent of their assets in securities of any individual issuer. Also, holdings of securities with the second-highest rating must not exceed 5 percent of the funds' assets. Notably, the rules requiring diversification reduce exposure to idiosyncratic risk but cannot reduce exposure to systematic risk which affects all commercial paper issuers at the same time.

Importantly, these regulations prevent money market funds from purchasing long-term assets such as mortgage-backed securities. However, the availability of asset-backed commercial paper provided money market funds with an opportunity to invest in such securities indirectly. In fact, some observers argue that the growth of the asset-backed commercial paper market was fuelled by demand from money market funds, which eventually spurred the rise in housing prices before the financial crisis. As a result, the asset-backed commercial paper market enabled transforming short-term assets into long-term assets—a function which is typically reserved for the financial institutions operating under strict bank regulations.

To analyze the importance of commercial paper for money market funds, we use data provided by iMoneyNet. These data are the most comprehensive source of money market funds' asset holdings and, among others, cover all taxable money market funds,

representing 84.5 percent of money market fund holdings. We focus on taxable money market funds because non-taxable money market funds hold primarily tax-exempt instruments issued by state and municipal governments.

As of January 2007, there were 473 taxable money market funds holding assets worth \$1.95 trillion. About one-third of the funds were Treasury funds, which hold almost exclusively government debt and government-backed agency debt. The other two-thirds were prime funds that also invest in non-government assets such as commercial paper. In January 2007, the largest asset class held by money market funds was commercial paper, accounting for \$634 billion or 32.5 percent of total asset holdings. The other asset classes included government debt and government-backed agency debt (\$585 billion), repurchase agreements (\$390 billion), bank obligations (\$297 billion), and other assets (\$45 billion).

Most large money market funds are geared towards institutional investors. A study by Moody's Investor Service (2007a) shows that in January 2007, the largest 15 institutional prime funds accounted for a total of \$459 billion worth of assets. Institutional prime funds hold a large number of different money market instruments and money market funds are therefore considered well diversified. Nevertheless, money market funds are highly exposed to risks in the financial industry as whole. Assets originated by the financial industry—measured as the total of financial commercial paper, structured securities, bank obligations, and repurchase agreements—accounted for 91.4 percent of money market fund assets.

Commercial Paper during the Financial Crisis

Commercial Paper and Financial Crisis in Historical Perspective

Although the commercial paper market is generally a stable source of financing, periodically there have been large and sudden declines in its size. The most prominent example is the Penn Central's failure (e.g., Calomiris, 1994; Calomiris, Himmelberg, and Wachtel, 1995). In June 1970, the transportation company, Penn Central, declared bankruptcy—the largest corporate bankruptcy up to that point—and as a result of its bankruptcy defaulted on its commercial paper. Once Penn Central defaulted, investors lost confidence in other non-financial commercial paper issuers and stopped refinancing maturing commercial paper. Within three weeks of Penn Central's bankruptcy, non-financial commercial paper outstanding dropped by more than 9%, from \$32 billion to \$29 billion. In response, the Federal Reserve responded by lending aggressively to banks through the discount window, which alleviated liquidity constraints and stabilized the market.

After, and largely as a result of, the Penn Central's failure non-financial issuers started purchasing insurance against market-wide liquidity disruptions in the form of backup loan commitments. Within a few years after the crisis, almost all non-financial issuers held backup loan commitments covering 100 percent of outstanding commercial paper. The loan commitments were issued by banks through which the Federal Reserve had administered their lending during the crisis. This arrangement improved the safety of the non-financial commercial paper market for two reasons. First, banks have access to the discount window; second, banks typically experience deposit inflows during periods of market-wide liquidity disruptions (Gatev and Strahan, 2006). However, the backup

loan commitments increase the riskiness of the financial sector as a whole because the risks of market-wide disruptions are effectively insured by the financial sector.

Similar episodes of declines in the size of commercial paper market have occurred since Penn Central. Typically in such cases, a single commercial paper issuer experiences a negative shock which reduces investors' confidence in other commercial paper issuers. The common element of such episodes is that they appear suddenly and lead to large, usually temporary contractions in the market size. For example, the failure of the energy company Enron in 2001 raised concerns about the quality of financial reporting and led to a sharp decline in outstanding corporate commercial paper. However, an important difference between all such episodes, relative to the financial crisis of 2007-2009, is that most of them concerned the non-financial commercial paper market rather than the financial or the asset-backed commercial paper market.

Collapse of the Asset-backed Commercial Paper Market

The decline in the asset-backed commercial paper market was triggered by the crisis in the subprime mortgage market. Although delinquencies on subprime mortgages had been rising through most of 2006, the financial crisis showed its first clear signs only in summer 2007. On July 31, 2007, two Bear Stearns's hedge funds that had invested in subprime mortgages filed for bankruptcy. A third Bear Stearns's hedge fund suspended investors' redemptions. In the following week, more news about delinquencies in subprime mortgages hit the market. On August 7, 2007, BNP Paribas halted withdrawals from its three investment funds and suspended calculation of their net asset values.

As a result of these announcements, investors in asset-backed commercial paper became concerned that the collateral backing asset-backed commercial paper might be of a lower quality than they initially thought. Consequently, many investors stopped refinancing maturing commercial paper and within two days the spread on overnight asset-backed commercial paper increased from a low 10 basis points to 150 basis points. Because of the credit guarantees, sponsoring financial institutions had to provide liquidity to pay off maturing asset-backed commercial paper. This obligation raised concerns about counter-party risk among banks and caused inter-bank lending rates to shoot upwards. The crisis in asset-backed commercial paper quickly spread across the financial sector and affected banks worldwide (Acharya and Schnabl, 2009).

As shown in Figure 1, from August 2007 to August 2008, the value of asset-backed commercial paper outstanding fell by 33.1 percent, from \$1.18 trillion to \$789 billion. These numbers likely understate the actual decline in demand for asset-backed commercial paper because credit guarantees often required sponsoring banks to directly purchase asset-backed commercial paper.

Even though asset-backed commercial paper outstanding decreased, issuance of asset-backed commercial paper increased in late August 2007. As shown in Figure 2, average daily issuance of asset-backed commercial paper increased from \$71 billion in early August 2007 to \$106 billion in early September 2007. At the same time, however, average maturity of asset-backed commercial paper decreased sufficiently to more than offset the increase in issuance, thus resulting in an overall decline in commercial paper market size. Figure 3 further shows that the spread between asset-backed commercial paper and the Federal funds interest rate spiked up shortly after the crisis started. While

in the year before the crisis the average spread equaled 3 basis points, in the year after the crisis its value rose to 46 basis points.

The decrease in outstanding asset-backed commercial paper, combined with the increase in its spread, suggests that the decline was likely caused by a drop in demand for, rather than supply of, asset-backed commercial paper. In line with this interpretation, several money market funds reported that they had reduced their holdings of asset-backed commercial paper to mitigate the risk of negative publicity, which could trigger withdrawals by investors (Moody's Investor Service, 2007b).

Covitz, Liang, and Suarez (2009) show that conduits with the weakest credit guarantees had the largest difficulties in rolling over their maturing asset-backed commercial paper. For example, from July to December 2007, total asset-backed commercial paper issued by structured investment vehicles fell from \$84 billion to \$15 billion. Acharya, Schnabl, and Suarez (2009) further demonstrate that credit guarantees covered almost all of the maturing asset-backed commercial paper and 97 percent of asset-backed commercial paper was repaid at maturity or shortly thereafter. Issuers defaulted only on 3 percent of asset-backed commercial paper outstanding. Hence, most of the investment losses due to the fall in asset prices effectively remained contained with the sponsoring financial institutions, not the investors in asset-backed commercial paper.

Figures 1, 2, and 3 also illustrate that the events of August 2007 had little impact on issuers of financial and corporate commercial paper. Those issuers continued rolling over commercial paper at customary rates. For example, the spread of financial commercial paper over the Federal funds rate remained at negative one basis point in the

year before and the year after the crisis. The amount of non-asset backed commercial paper outstanding remained stable at \$980 billion in the year after the crisis.

Lehman's Bankruptcy

The second major negative shock in the commercial paper market was the default of Lehman Brothers. In September 2008, many investors were surprised to learn that the Reserve Primary Fund—one of the largest money market funds with more than \$65 billion of assets under management—owned more than \$785 million of Lehman's commercial paper. In fact, the founder of the Reserve Primary Fund, who had been one of the pioneers of the money market industry, had publicly expressed the view that money market funds should not invest in commercial paper because it was too risky. In line with this view, until September 2005, the Reserve Primary Fund stated in its filings with the Securities and Exchange Commission that the fund did not invest in commercial paper. This commitment was abandoned in later filings and, from 2006 onwards, the Reserve Primary Fund began acquiring significant amounts of commercial paper to boost its performance (Stecklow and Gullappalli, 2008).

The revelation of the Reserve Fund's exposure to Lehman's bankruptcy triggered an immediate run on the fund. On September 16, 2008, the Reserve Primary Fund was forced to pay out \$10.8 billion in redemptions and faced about \$28 billion of further withdrawal requests. The run quickly spread to other money market funds with commercial paper holdings. Our analysis based on iMoneyNet data shows that, within a week, institutional investors reduced their investments in money market funds by more than \$172 billion. To stop the run on money market funds, on September 19, 2008, the

U.S. Department of the Treasury announced a temporary deposit insurance covering all money market investments. This announcement stopped the run on money market funds and redemption requests promptly receded.

Nonetheless, investors interpreted the Lehman's bankruptcy as a signal that commercial paper, issued and sponsored by financial institutions, was far riskier than investors had previously thought. As Figure 1 indicates, financial commercial paper outstanding dropped by 29.5 percent, from \$806 billion on September 10, 2008 to \$568 billion on October 22, 2008. Over the same time period, asset-backed commercial paper outstanding dropped by a smaller 9.8 percent, from \$741 billion to \$668 billion. Also, as Figure 2 indicates, even though the total value of issuances did not go to zero, one could observe a significant jump in issuances which resulted from the replacement of long-term commercial paper with the short-term one. The level of issuances has stabilized by the end of 2008. Finally, the spreads of both asset-backed and financial paper significantly increased, though the change for financial commercial paper was more temporary.

Money market funds were a leading force in the decline of the commercial paper market. Even though money market fund investments were considered safe because of the newly introduced deposit insurance, money market funds themselves decided to reduce their holdings of commercial paper. As shown in Figure 4, within one month after Lehman's bankruptcy, commercial paper holdings fell from 24.2 to 16.9 percent of money market funds' assets. To offset the decrease in commercial paper holdings, money market funds expanded their holdings of government debt from 36.7 to 44.5 percent of asset holdings. This drastic change in asset holdings is often described as

flight-to-quality, that is, an episode during which risk-averse investors, such as money market funds, only want to hold assets of highest quality, such as government debt.

To the Rescue: Federal Reserve Interventions

Both the collapse of the asset-backed commercial paper market and Lehman's bankruptcy triggered immediate responses by policymakers. The responses were largely motivated by concerns about the impact of the commercial paper market on the real economy. In particular, many financial intermediaries used commercial paper to finance their lending activities and the difficulty to issue commercial paper sharply reduced their abilities to provide loans to firms and individuals. The difficulties in the commercial paper market also prompted non-financial corporations to draw on their back-up credit lines, which further negatively affected financial intermediaries. Since the non-financial sector accounted only for 20% of the commercial paper outstanding, the policy focus was primarily on stabilizing the market for financial and asset-backed commercial paper.

The policy interventions after the collapse of the asset-backed commercial market were smaller in scale and scope than those after Lehman's bankruptcy. The reason is that the collapse of the asset-backed commercial market was viewed as a lack of liquidity—that is, a lack of short-term financing—which could be remedied using conventional tools of monetary policy such as providing collateralized loans via the discount window. In contrast, Lehman's bankruptcy was viewed as a lack of solvency—that is, a lack of sufficient capital within the financial system to cover losses resulting from declines in asset values—which required broader policy interventions such as setting up deposit

insurance for money market funds, direct purchase of commercial paper, and capital injections for financial institutions (e.g., Philippon and Schnabl, 2009).

The Federal Reserve's efforts to assure liquidity to banks, partly because of their exposure to problems of the asset-backed commercial paper market, started on August 9, 2007. Over the following two days, the Federal Reserve used overnight repurchase agreements worth a total of \$62 billion to inject liquidity to the market so that banks could cover their short-term financing needs (Cecchetti, 2008; Brunnermeier, 2009).³ (Repurchase agreements are collateralized loans used for bank borrowing.) The next week, with conditions having deteriorated even further, the Federal Reserve reduced the discount rate by 50 basis points and extended the maximum term for discount-window loans to 30 days. On September 18, 2007, the Federal Reserve announced a new initiative called the Term Auction Facility (TAF)—a lending program that provided loans for a term of 28 to 35 days—longer than the usual discount-window practice. Over the following months, the Federal Reserve lowered its target interest rate seven times, totaling 325 basis points. In March 2008, the Fed increased the size of Term Auction Facility and announced its intention to conduct a series of term repurchase transactions totaling \$100 billion. These transactions could be collateralized by a variety of securities, including Treasury debt, agency debt, and agency mortgage-backed securities. The Federal Reserve also extended liquidity provision to other financial institutions, for example, allowing primary dealers (banks and securities broker-dealers allowed to trade directly with the Federal Reserve System) to use mortgage-backed assets to borrow overnight or for 28 days.

³ On the same day, the European Central Bank also pumped 95 billion Euros in overnight lending into the market—the largest loan in the bank's history.

These interventions seemed successful in improving financing conditions for large financial firms. Even though the investment bank Bear Stearns failed in March 2008, its failure had little impact on the commercial paper market. By mid-2008, the asset-backed commercial paper market had stabilized and larger conduits managed to issue commercial paper. Also, financial companies and corporations were still able to issue financial and corporate commercial paper.

However, with the bankruptcy of Lehman Brothers and the subsequent run on money market funds, the situation in the commercial paper market worsened again. Policy makers decided to roll out a number of new policy initiatives to contain the situation. As mentioned above, the U.S. Treasury announced on September 19, 2008 that the U.S. government would temporarily guarantee assets of money market funds. Since the guarantee did not stop the decline in the commercial paper market outstanding, the Federal Reserve announced several other initiatives to support the commercial paper market directly. On September 18, 2008, it announced a new lending program called Asset-backed commercial paper Money market mutual fund Liquidity Facility (AMLF). The AMLF—administered by the Federal Reserve Bank of Boston—was supposed to provide loans to commercial banks so that they could purchase high-quality asset-backed commercial paper from money market funds. These are non-recourse loans, that is, if the asset-backed commercial paper defaults, the Federal Reserve takes over the commercial paper instead of requiring repayment of the loan. As shown in Figure 5, AMLF started buying commercial paper on September 24 and its first two weeks of activity amounted to approximately \$150 billion worth of purchases. Over time, AMLF lowered its purchases and reduced its holdings almost to zero by October 2009.

On October 7, 2008, the Federal Reserve announced that, in addition to buying through AMLF, it would purchase three-month commercial paper directly from eligible issuers through the Commercial Paper Funding Facility (CPFF). Only U.S. issuers of commercial paper, including U.S. issuers with a foreign parent, were eligible to sell commercial paper to this facility. The interest rate on corporate and financial commercial paper was the three-month overnight indexed swap rate—a standard measure of borrowing costs in money markets—plus 200 basis points. Likewise, the interest rate on asset-backed commercial paper was the overnight indexed swap rate plus 300 basis points.

As shown in Figure 5, CPFF started purchasing commercial paper on October 26, 2008. The impact of these purchases on the size and spreads of the commercial paper market is immediately apparent in Figure 1 and Figure 3. The value of financial commercial paper outstanding came back to its pre-crisis level. Also, the spreads on all types of commercial paper significantly decreased. By the end of 2008, the total value of commercial paper purchased under CPFF program equaled \$335 billion dollars, out of which one-third was ABCP. As a result, the Federal Reserve was the single largest buyer of commercial paper (Federal Reserve Bank of NY, 2008). Initially, the program only purchased assets with maturities over 15 days and only from January 2009 it expanded to shorter-maturity assets. Also, like with AMLF, the value of assets purchased under CPFF has been gradually declining and reached about \$40 billion dollars in October, 2009 (see Figure 5).

On October 21, 2008, the Federal Reserve announced another lending program—the Money Market Investor Funding Facility (MMIFF) —intended to complement

AMLF. Similar to AMLF, the new program was supposed to provide non-recourse loans to money market funds. The main difference was that it was restricted to money market instruments other than asset-backed commercial paper, such as certificates of deposit, bank notes, and financial and corporate commercial paper. The New York Fed began funding eligible money market instruments under this program on November 24, 2008. However, the facility never took off and, as of October 2009, it has not provided a single loan to money market funds.

Why Did the Commercial Paper Market Collapse?

We discuss three possible explanations for the collapse of the commercial paper market: substitution to other sources of financing, adverse selection, and institutional constraints faced by money market funds. These explanations are not mutually exclusive, and we present evidence in favor of each of the explanations.

Substitution to Other Sources of Financing

One possible reason for the decline in commercial paper is that buyers of commercial paper, such as money market funds, learned during the financial crisis that commercial paper was riskier than they initially thought and therefore they revised upwards their expectations about the likelihood of commercial paper's default. For example, investors learned that asset-backed commercial paper was collateralized by assets for which liquidity in the secondary market could suddenly disappear. With Lehman's bankruptcy, investors in commercial paper learned that even large financial institutions could collapse overnight, causing the default of supposedly safe commercial

paper. As a result, investors required higher return to compensate them for bearing more risk, which substantially raised the cost of commercial paper funding.

Also, before the financial crisis, most investors believed that commercial paper almost never defaults and therefore had little incentives to invest in information gathering about issuers of commercial paper. Such poor information-gathering incentives can manifest themselves, for example, in low levels of funds' portfolio concentrations (e.g., Kacperczyk, Sialm, and Zheng, 2005; Kacperczyk, Van Nieuwerburgh, and Veldkamp, 2009). This behavior seemed to have taken place among money market funds as most of them held commercial paper from 50 or more issuers, in addition to holding other money market instruments. However, during the crisis, investors decided to invest more resources in information-gathering activities because the value of commercial paper was more sensitive to new information. As a result, the spread on commercial paper increased to compensate investors for the increase in costs of information gathering. This effect is likely to be particularly strong in the short run as investors need some time to adjust to the new market environment.

As a result of the higher costs of commercial paper, some issuers of commercial paper were forced to consider substitution to other sources of financing. In the case of the collapse of the asset-backed commercial paper market, the primary sources of alternative financing were the sponsoring financial institutions. The sponsoring financial institutions were required to repurchase the assets from conduits in case investors were unwilling to refinance maturing asset-backed commercial paper. Hence, sponsoring financial institutions used other sources of financing, such as bank deposits, certificates

of deposits, or even financial commercial paper to replace financing from the asset-backed commercial paper market.

In the period following Lehman's bankruptcy in September 2008, the situation was different. In this episode, the decline in asset-backed commercial paper looked much as it had in fall of 2007. However, the impact on financial institutions was stronger because—in addition to the financing requirements from conduits—financial institutions themselves were unable to issue financial commercial paper. Other short-term funding, such as repurchase agreements, also became unavailable at that time. Hence, many financial institutions faced severe liquidity problems, which eventually prompted the large-scale interventions by the Federal Reserve.

The effect on corporate commercial paper was less severe, but several issuers switched to alternative long-term financing, mostly as a response to growing uncertainty regarding commercial paper market. For example, on March 3, 2009, Coca Cola announced that it had sold \$0.9 billion of five-year and \$1.35 billion of ten-year notes to repay its maturing commercial paper. In the process, it agreed to pay 4.875 percent to replace short-term debt with an average yield of 0.41 percent. This swap amounted to about \$48 million in extra annual interest on every \$1 billion borrowed and used to replace commercial paper. Similarly, in February 2009, the largest U.S. health insurer by enrollment—WellPoint—sold \$1 billion of five-year and ten-year notes at rates as high as 7 percent to repay its commercial paper with an average yield of about 2 percent. Also, General Electric Co. cut its financing arm's commercial paper borrowing by about a third, to \$60 billion as part of a plan to reduce its overall debt (Keogh, Detrixhe, and

Coppola, 2009). Overall, the substitution to other debt market's instruments can explain a fair share of the decline in commercial paper funding, but probably not all of it.

Adverse Selection

During the financial crisis, many issuers found themselves unable to issue any commercial paper at all, independent of the interest rate offered. For example, during the decline in asset-backed commercial paper, Moody's Investor Services (2007b) reported that "... programs [conduits] found it difficult or impossible to issue commercial paper" and that "...issuing paper at longer maturities was unavailable." Similarly, after the Lehman's bankruptcy, the Wall Street Journal reported that "... the [commercial paper] market all but froze" (Mollenkamp, Whitehouse, Hilsenrath, and Dugan, 2009).

One possible explanation for the sharp decline in the market size is adverse selection between commercial paper's issuers and investors. Suppose that the highest-quality issuers left the commercial paper market because interest rates go up. This may happen if such issuers could obtain financing most easily and cheaply elsewhere. As a result, the average quality of the remaining issuers of commercial paper would decrease and assuming that investors could not tell quality difference between the remaining issuers they would further increase their required interest rates further, which would then prompt even more issuers to drop out. If this cycle continued, it could lead to a complete market freeze (Akerlof, 1970).

It is surely plausible that adverse selection can explain some of the decline in the commercial paper market; nonetheless, it is difficult to test for its presence in the commercial paper market because adverse selection primarily amplifies existing

substitution to other sources of financing. Notably, Covitz, Liang, and Suarez (2009) analyze the type of asset-backed commercial paper issuers that were leaving the commercial paper market. They find that in the first weeks of the 2007 crisis, almost all issuers were affected by the difficulties in issuing such paper. Over time, however, it was mostly the weaker conduits—as measured by the strength of the credit guarantees provided by their sponsors—that left the market. Assuming that unobservable quality measures are positively correlated with observable quality measures, this finding would suggest that adverse selection was less important, especially during the later weeks of the crisis in 2007.

In comparison, preliminary results using data on commercial paper outstanding around Lehman's bankruptcy suggest that adverse selection was more important in 2008. In our own work, we find that financial institutions with large drops in their share prices continued to issue commercial paper after Lehman's bankruptcy, while financial institutions with stable share prices reduced or stopped issuing commercial paper. Assuming that the decline in share prices is a good proxy for a financial institution's quality, this finding suggests that adverse selection may have amplified the decline in commercial paper outstanding in 2008.

Institutional Constraints

Money market funds are supposed to invest only in low-risk securities, and once a security no longer fits into that category, money market funds stop buying that security. This kind of constraint offers an alternative explanation for the decline in commercial paper holdings by a group of institutional investors. Moreover, if other investors face

fixed costs of entry into a given market—for example, because they have to invest in technology and personnel to manage commercial paper investments—then a decrease in demand by money market funds may not be offset by demand from other investors.

Before the financial crisis many investors in money market funds paid little attention to the holdings of their funds and instead relied on credit ratings to ensure that money market funds invested in safe assets. Over time, as money market investors searched for higher yields, money market funds responded by increasing their holdings of commercial paper because commercial paper offered higher yields than Treasuries. After the contraction of the asset-backed commercial paper market in 2007, money market funds stopped rolling over asset-backed commercial paper because it became too risky. For the same reason, money market funds stopped rolling over both asset-backed and financial commercial paper after Lehman's bankruptcy. This decrease in demand by money market funds surely contributed to the decline in commercial paper.

Overall, the decline in commercial paper from 2007 to 2009 probably arose because the financial crisis triggered a reassessment of riskiness of commercial paper, which then prompted issuers to substitute to other sources of financing. Adverse selection and institutional constraints probably amplified this effect. More research needs to be done to quantify the importance and the interactions of these explanations.

Conclusion

The commercial paper market has long been viewed as a bastion of high liquidity and low risk. But twice during the financial crisis of 2007-2009, the commercial paper market nearly dried up, and ceased being perceived as a safe haven. Major interventions

by the Federal Reserve, including large outright purchases of commercial paper, were eventually used to support both issuers of and investors in commercial paper.

Even though the commercial paper market has experienced a few disruptions in the past, the financial crisis of 2007-2009 was by far the largest decline in commercial paper, and in contrast to previous turbulent episodes, it mostly affected commercial paper issued by financial institutions. This crisis has also shown that the Federal Reserve is likely to respond aggressively to such a sudden decline of the commercial paper market. In fact, the scale of the Federal Reserve's response was unprecedented—including a blanket guarantee of money market investment worth \$3 trillion and direct purchases of commercial paper of up to \$370 billion. Such large-scale market interventions raise concerns about future moral hazard of commercial paper issuers, independent of whether these guarantees will remain implicit or not. Financial regulation will need to address the negative incentives generated by the expectation of future government interventions, either by directly regulating the risk of commercial paper issuers or by charging issuers for the insurance provided by the government.

The commercial paper market is far from being fully restored. At the time of our writing, the Federal Reserve is still in the process of unwinding its purchases of commercial paper, the amount of commercial paper outstanding is still quite low, and ABCP spreads are still at their historical highs. Issuers of commercial paper will remember for some time how commercial paper was much riskier than they had originally believed. Investors in commercial paper will remember for some time that commercial paper turned out to be much riskier than they had thought. The high level of

skepticism on both sides of the market for commercial paper suggests that the market will probably dwindle relative to its size before the financial crisis.

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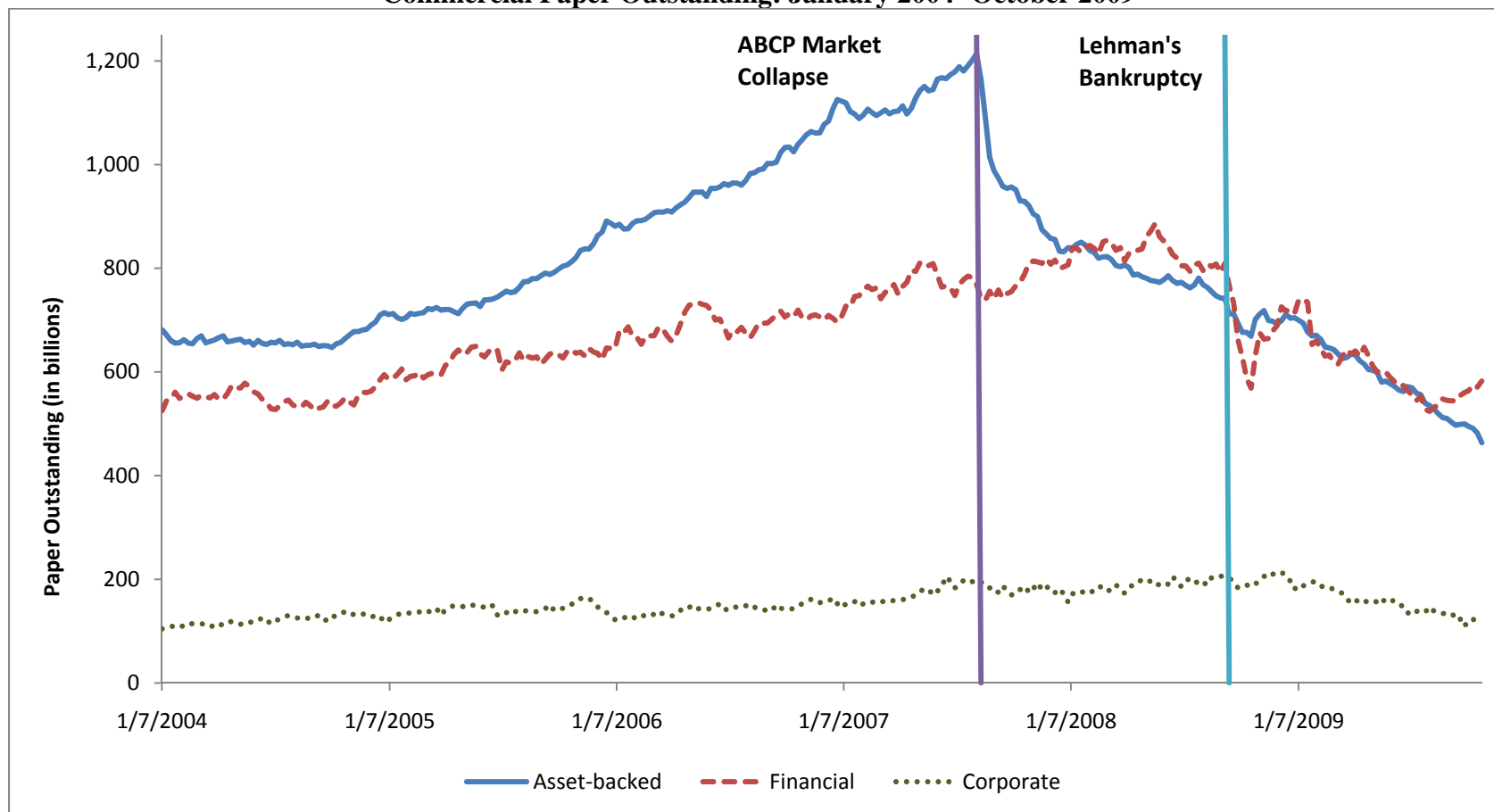
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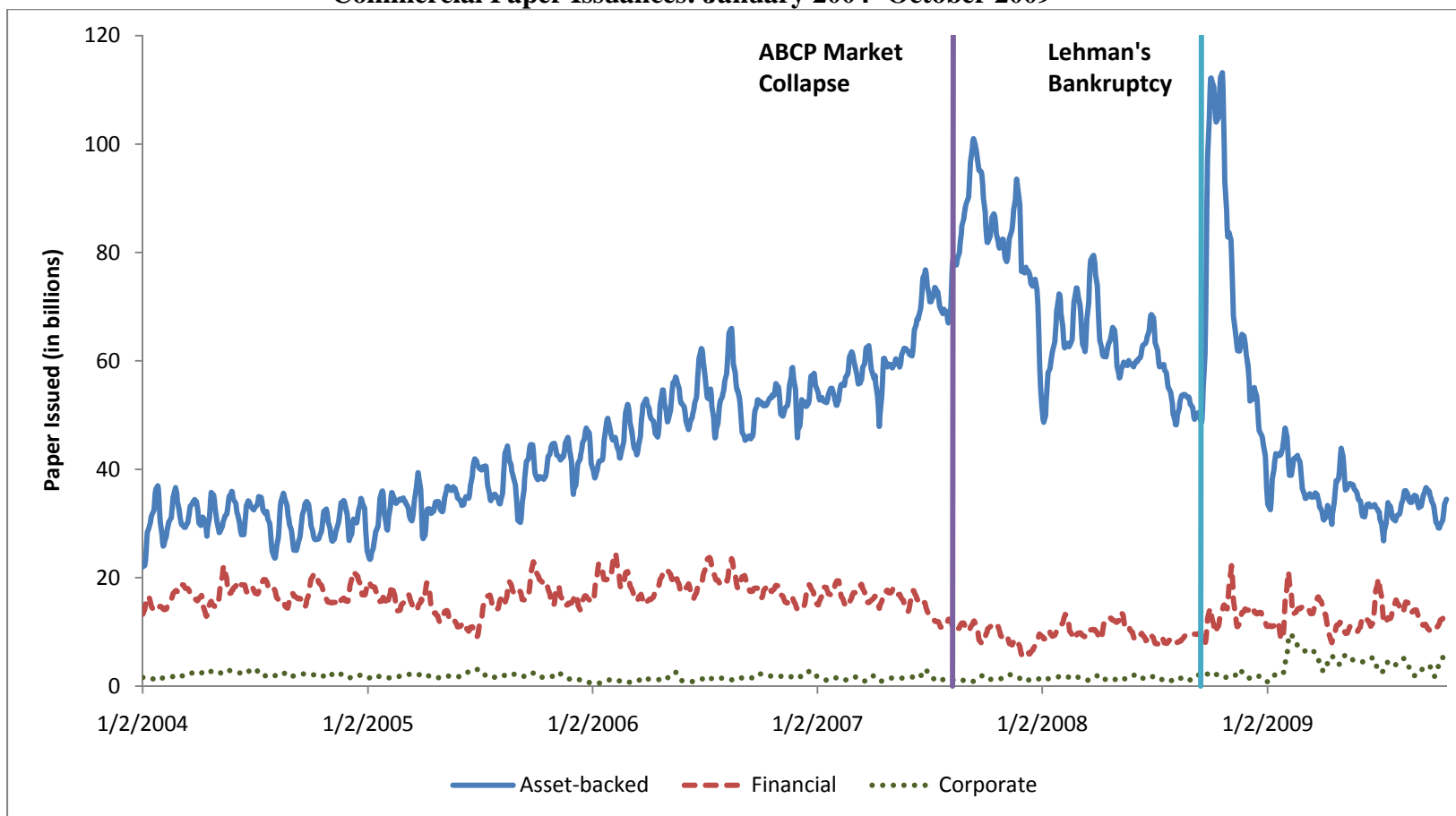
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Figure 1
Commercial Paper Outstanding: January 2004- October 2009



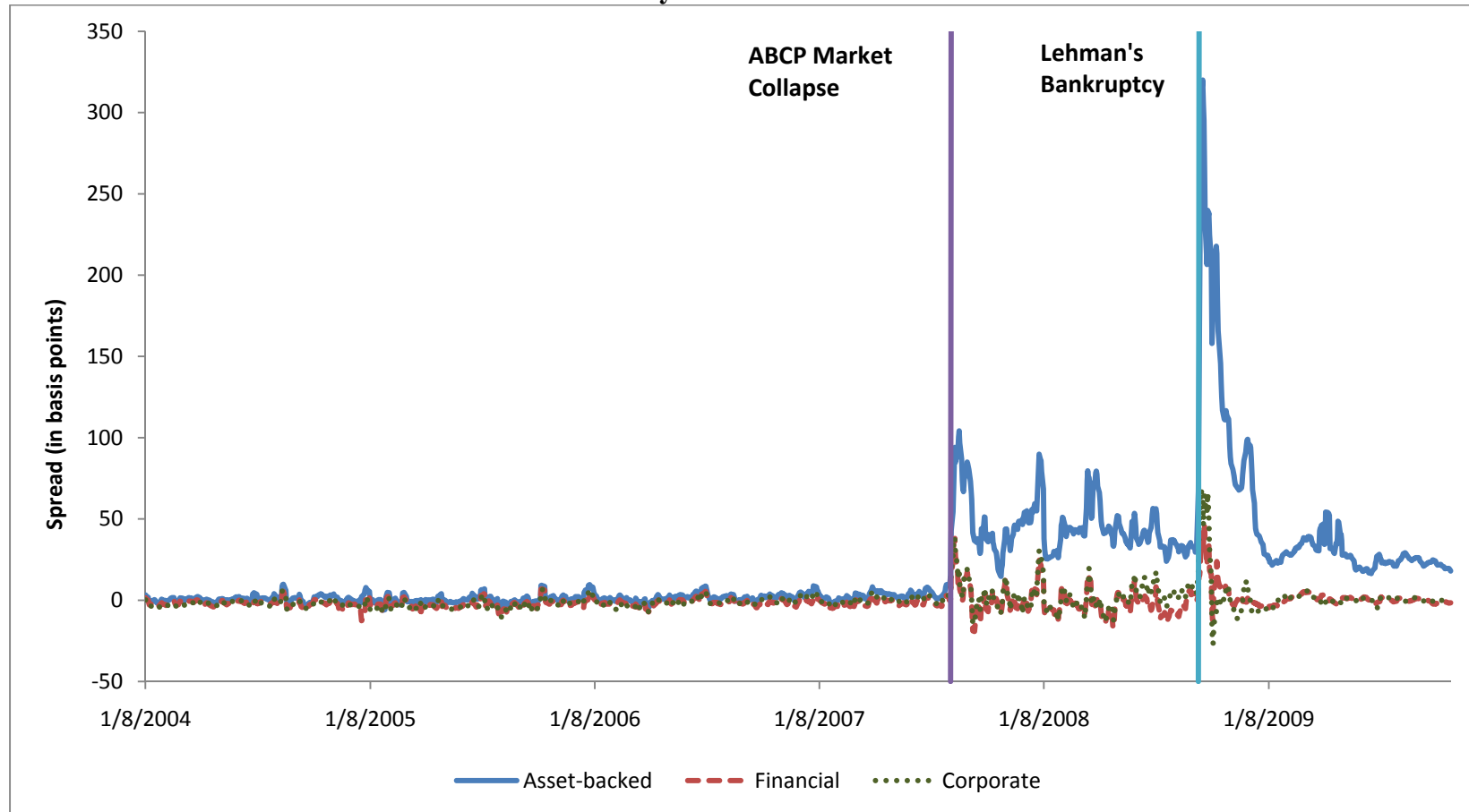
Note: Weekly commercial paper outstanding based on Federal Reserve Board data.

Figure 2
Commercial Paper Issuances: January 2004- October 2009



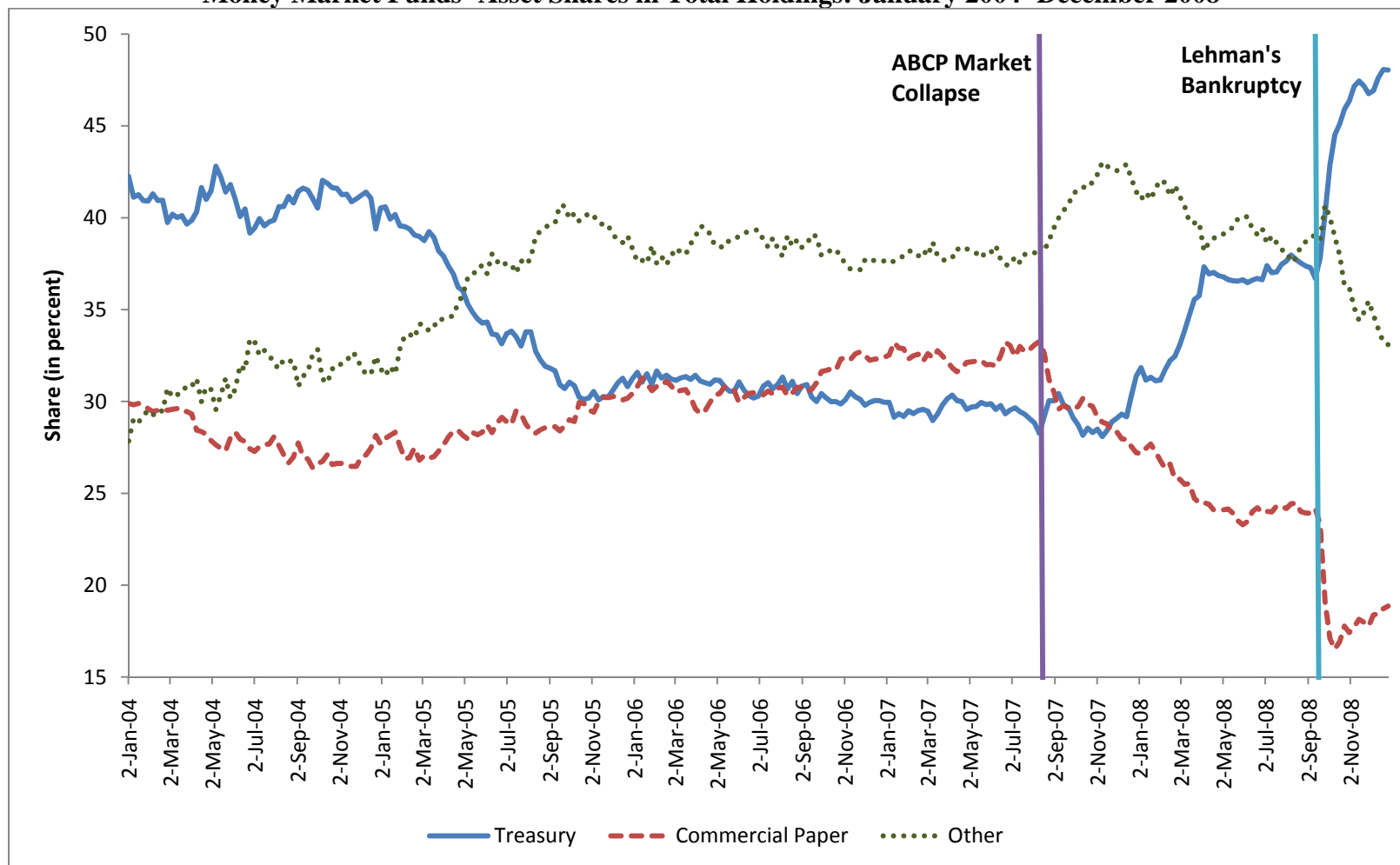
Note: Five-day rolling-window average of issuances based on Federal Reserve Board data.

Figure 3
Overnight Commercial Paper Spreads (net of Fed Funds Rate):
January 2004-October 2009



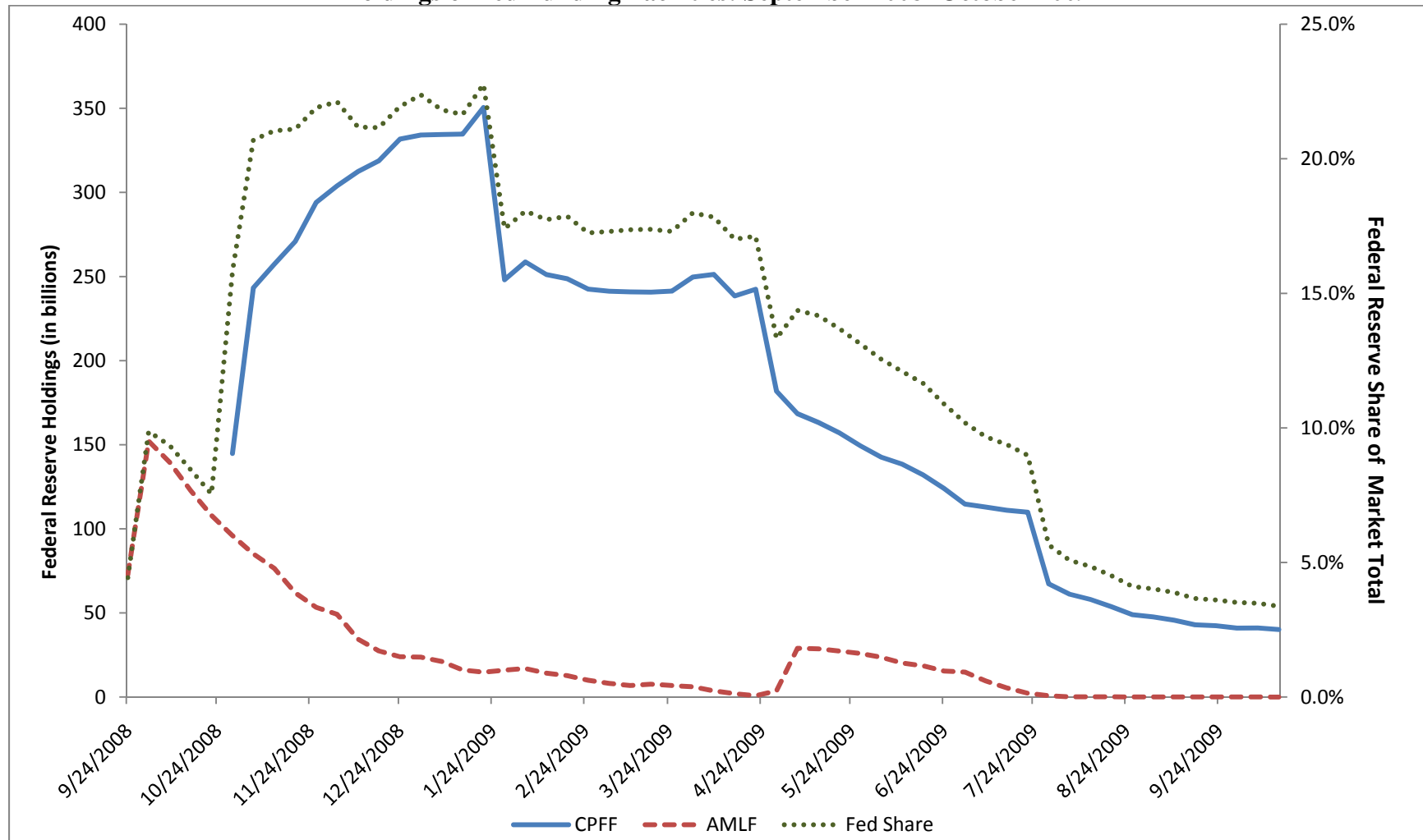
Note: Five-day rolling-window average based on Federal Reserve Board and New York Federal Reserve data.

Figure 4
Money Market Funds' Asset Shares in Total Holdings: January 2004- December 2008



Note: Authors' own analysis using iMoneyNet data on money market funds' holdings.

Figure 5
Holdings of Fed Funding Facilities: September 2008- October 2009



Note: Based on Federal Reserve Board and New York Federal Reserve.