Securitization without risk transfer[a]

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Abstract

We analyze asset-backed commercial paper conduits, which experienced a shadow-banking "run" and played a central role in the early phase of the financial crisis of 2007-09. We document that commercial banks set up conduits to securitize assets worth $1.3 trillion while insuring the newly securitized assets using explicit guarantees. We show that regulatory arbitrage was the main motive behind setting up conduits: the guarantees were structured so as to reduce regulatory capital requirements, more so by banks with less capital, and while still providing recourse to bank balance sheets for outside investors. Consistent with such recourse, we find that conduits provided little risk transfer during the "run": losses from conduits remained with banks rather than outside investors and banks with more exposure to conduits had lower stock returns.

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1. Introduction

Securitization was traditionally meant to transfer risks from the banking sector to outside investors and thereby disperse financial risks across the economy. Since the risks were meant to be transferred, securitization allowed banks to reduce regulatory capital. However, in the period leading up to the financial crisis of 2007-09, banks increasingly devised securitization methods that allowed them to retain risks on their balance sheets and yet receive a reduction in regulatory capital, a practice that eventually led to the largest banking crisis since the Great Depression. In this paper, we analyze one form of securitization, namely asset-backed commercial paper conduits (henceforth, conduits), as an example of how banks exposed themselves to such under-capitalized risks.

Conduits are special purpose vehicles managed by large commercial banks. Conduits purchase medium- to long-term assets, which they finance by issuing short-term asset-backed commercial paper (ABCP). Given this structure, conduits are similar to regular banks in many ways and form an integral part of financial intermediation that has over time come to be called "shadow banking." Put simply, shadow banking is that part of the intermediation sector that performs several functions that we traditionally associate with commercial and investment banks, but which runs in the "shadow" of the regulated banks in that it is off-balance sheet and less regulated.[1]

As shown in Panel A of Figure 1, ABCP outstanding grew from US$650 billion in January 2004 to US$1.3 trillion in July 2007.[2] At that time, ABCP was the largest money market instrument in the United States. For comparison, the second largest instrument was Treasury Bills with about $940 billion outstanding. However, the rise in ABCP came to an abrupt end in August 2007. On August 9, 2007, the French bank BNP Paribas halted withdrawals from three funds invested in mortgage-backed securities

[1] Adrian et al. (2010) document that shadow banking assets grew from an amount close to zero in 1980 to somewhere between $15 to $20 trillion by 2008. In 2007, conduits represented about 25% of total assets newly transferred to shadow banking. In terms of the stock of assets, as of July 2007, conduits held over $1.3 trillion, compared to securities lending of $0.6 trillion, broker-dealer repo of $2.5 trillion, and financial commercial paper of $0.8 trillion.

[2] ABCP outstanding is a good measure of the size of conduits because most conduits do not issue other liabilities. The only exceptions are Structured Investment Vehicles, which also issue medium-term notes and capital notes. In July 2007, medium-term notes and capital notes accounted for about $400 billion.

and suspended calculation of net asset values. Even though defaults on mortgages had been rising throughout 2007, the suspension of withdrawals by BNP Paribas had a profound effect on the market.[3]

As shown in Panel B of Figure 1, the interest rate spread of overnight ABCP over the Federal Funds rate increased from 10 basis points to 150 basis points within one day of the BNP Paribas announcement. Subsequently, the market experienced the modern-day equivalent of a bank "run" that originated in shadow banking, and ABCP outstanding dropped from $1.3 trillion in July 2007 to $833 billion in December 2007.[4] Apparently, investors in ABCP, primarily money market funds, became concerned about the credit quality and liquidation values of collateral backing ABCP and stopped refinancing maturing ABCP.

Our main conclusion in this paper is that, somewhat surprisingly, this crisis in the ABCP market did not result (for the most part) in losses being transferred to outside investors in ABCP. Instead, the crisis had a profoundly negative effect on commercial banks because banks had –in large part– insured outside investors in ABCP by providing explicit guarantees to conduits, which required banks to pay off maturing ABCP at par. Effectively, banks had used conduits to *securitize assets without transferring the risks* to outside investors, contrary to the common understanding of securitization as a method for risk transfer. We argue that banks instead used conduits for regulatory arbitrage.

We first document and describe the structure of the guarantees that effectively created recourse from conduits back to bank balance sheets. For the most part, these guarantees were explicit legal commitments to repurchase maturing ABCP in case conduits could not roll over their paper, not a voluntary form of implicit recourse. The guarantees could be structured as liquidity guarantees, a contract design that would reduce their regulatory capital requirements to at most a tenth of capital required to

[3] The announcement read: "[T]he complete evaporation of liquidity in certain market segments of the US securitization market has made it impossible to value certain assets fairly regardless of their quality or credit rating […] Asset-backed securities, mortgage loans, especially subprime loans, don't have any buyers […] Traders are reluctant to bid on securities backed by risky mortgages because they are difficult to sell […] The situation is such that it is no longer possible to value fairly the underlying US ABS assets in the three above-mentioned funds." (Source: "BNP Paribas Freezes Funds as Loan Losses Roil Markets," Bloomberg.com, August 9, 2007).

[4] Further, average maturity of asset-backed commercial paper outstanding declined from 32 days to 15 days over the same period.

hold for on-balance sheet assets (especially after this regulation was confirmed as a permanent exemption by regulators in the United States in July 2004, see Figure 2). Such liquidity guarantees would cover most assets' credit and liquidity risks and effectively absorb all losses of outside investors. For comparison, banks also had the option to use weaker guarantees that did not cover all of the assets' liquidity and credit risks or use stronger guarantees that had strict capital requirements.

We test for regulatory arbitrage using a novel panel dataset on the universe of conduits from January 2001 to December 2009. First, we analyze guarantees provided by, and the type of, financial institutions that manage ("sponsor") conduits. We find that the majority of guarantees were structured as capital-reducing liquidity guarantees and that the majority of conduits were sponsored by commercial banks (which among financial institutions are subject to the most stringent capital requirements). Also, we note (see Figure 2) that the growth of ABCP stalled in 2001 after regulators discussed an increase in capital requirements for conduit guarantees (following the failure of Enron which had employed conduit-style structures to create off-balance sheet leverage) and picked up again, especially the issuance of liquidity-guaranteed paper by commercial banks, after a decision against a significant increase was made in 2004.[5]

Second, we examine whether more capital-constrained commercial banks were more likely to be associated with setting up of conduits. Using the sample of commercial banks with more than $50 billion from 2001 to 2006, we find that liquidity-guaranteed ABCP was issued more frequently by commercial banks with low *economic* capital, measured by their book value of equity relative to assets. We use panel regressions to confirm that this result is robust to controlling for time trends, banks characteristics, and bank-fixed effects. Interestingly, we find a much weaker relationship between the issuance of liquidity-guaranteed ABCP and the bank's *regulatory* capital, measured as the Tier 1 regulatory capital relative to risk-weighted assets. And, we find no relationship between a bank's capital position and the issuance of non-liquidity guaranteed ABCP, which had no associated relief from a regulatory capital standpoint.

[5] Consistent with the importance of capital requirements, banks based in countries such as Spain and Portugal that did not allow such capital-reducing liquidity guarantees did not sponsor conduits.

These results are highly suggestive of regulatory arbitrage: the use of liquidity-guaranteed conduits allowed banks to reduce their economic capital ratio, while maintaining a stable regulatory capital ratio.

Third, we examine the effect of guarantees on conduits' ability to roll over maturing ABCP during the shadow-banking "run." The regulatory arbitrage hypothesis suggests that banks did not transfer risks to outside investors. We test for risk transfer using variation in the strength of guarantees and examine whether conduits with weaker guarantees had higher spreads, and were less likely to roll over ABCP, once the "run" took hold in August 2007. Using conduit-level data on daily spreads and weekly issuances, we find that starting August 9, 2007, conduits with weaker guarantees (namely, conduits with "extendible notes" and "SIVs") experienced a substantial decline in ABCP (or in other words, a decrease in their ability to roll over maturing ABCP) and a significant widening of spreads. Consistent with the lack of risk transfer, we find that conduits with stronger guarantees (namely, liquidity guarantees and credit guarantees) experienced a smaller decrease in issuances and a smaller rise in spreads.

Fourth, we analyze the extent of realized risk transfer by taking the perspective of an investor that was holding ABCP at the start of the "run" and studying whether the investor suffered losses by not rolling over maturing ABCP. The regulatory arbitrage hypothesis suggests that losses primarily remained with the sponsor financial institution (henceforth, sponsor) rather than with outside investors. Using hand-collected data from Moody's Investors Service's press releases, we identify all conduits that defaulted on ABCP in the period from January 2007 to December 2008. We find that all outside investors covered by liquidity guarantees were repaid in full. We find that investors in conduits with weaker guarantees suffered small losses. In total, only 2.5% of ABCP outstanding as of July 2007 entered default in the period from July 2007 to December 2008. Hence, most losses on conduit assets remained with the sponsoring banks. Assuming loss rates of 5% to 15%, we estimate that commercial banks suffered losses of $68 billion to $204 billion on conduit assets.

Finally, we examine the impact of a bank's exposure to conduits on bank stock returns. The regulatory arbitrage hypothesis suggests that banks were negatively affected by the "run" because they had insured conduits against losses. We focus our analysis on the narrow event window around the start of the financial crisis on August 9, 2007, to identify conduit exposure separately from the impact of other bank observables. We find that an increase in conduit exposure (measured as the ratio of ABCP to bank equity) from 0% to 100% (e.g., comparing Wells Fargo and Citibank) reduced the cumulative equity return by 1.1% during a three-day window. The estimate increases to 2.3% when we expand the event window to one month. The result is robust to controlling for a large set of observable bank characteristics, and we find no effects prior to the "run."

In summary, our results show that commercial banks used conduits to invest in long-term assets without holding capital against these assets. This evidence suggests that banks' investment decisions are at least partly motivated by activity aimed to circumvent regulatory constraints. Moreover, since these investments reflect significant maturity mismatch and only default in a severe economic downturn, banks are taking on rollover risk that is highly correlated within the financial sector. Hence, our analysis shows that regulatory arbitrage activity – if successful – can create significant concentrations of systemic risk in the financial sector. Indeed, regulatory arbitrage activity may result in a shadow banking sector that is intimately tied to the regulated banking sector, rather than transferring risks away from the latter.

The remainder of this paper is organized as follows. Section 1 discusses the institutional background. Section 2 presents our theoretical framework. Section 3 describes the data and discusses our empirical results. Section 4 analyzes the incentives of banks to set up conduits. Section 5 reviews the related literature. Section 6 concludes.

2. Institutional background

2.1. Conduit structure

A conduit is special purpose vehicle set up by a sponsoring financial institution. The sole purpose of a conduit is to purchase and hold financial assets from a variety of asset sellers. The conduit finances the assets by selling ABCP to outside investors. The outside investors are primarily money market funds and other “safe asset” investors.

Most conduits exhibit a significant maturity mismatch. They purchase medium- to long-term assets with maturities of three to five years and hold them to maturity. They finance these assets primarily by issuing ABCP with a maturity of 30 days or less. Conduits regularly roll over their liabilities and use proceeds from new issuances of ABCP to pay off maturing ABCP.

Conduits minimize their credit risk by holding a diversified portfolio of high quality assets. Typically, they are restricted to purchasing AAA-rated assets or unrated assets of similar quality. Some conduits exclusively purchase unrated assets originated by their sponsoring financial institutions. Other conduits exclusively purchase securitized assets originated by other financial institutions. Many conduits combine the two strategies by purchasing both securitized and unsecuritized assets from more than one financial institution.

Almost all sponsors provide guarantees to outside investors in ABCP. The guarantees are structured to ensure that ABCP is paid off even if the conduit’s cash flow is insufficient to satisfy investor claims. Outside investors consider ABCP a safe investment because of these guarantees. Moreover, ABCP is very short-term, so that investors can liquidate their investment quickly by not rolling over maturing ABCP.

Conduits generate significant risks for the sponsor. The sponsor’s guarantee typically covers the conduit’s rollover risk, which is the risk that the cash flows generated by the conduit cannot refinance maturing commercial paper, possibly because of a deterioration of conduit asset values. In that case, the sponsor has to assume the losses from lower asset values, because under the guarantee sponsors are required to repurchase assets at par. In exchange for assuming this risk, the sponsor receives the conduit profits.[6]

2.2. Guarantee structure

Conduit sponsors use four different types of guarantees which provide different levels of insurance to outside investors. The four types of guarantees, ranked from strongest to weakest, are credit guarantees ("credit"), liquidity guarantees ("liquidity"), extendible notes guarantees ("extendible notes"), and guarantees arranged via structured investment vehicles ("SIV"). We briefly describe the structure of each guarantee.

Credit guarantees (also referred to as credit enhancement) are guarantees that require the sponsor to pay off maturing ABCP independent of the conduit's asset values. As discussed in more detail below, from a regulatory perspective, credit guarantees are considered equivalent to on-balance sheet financing because they expose banks to the same risks as assets on the balance sheet. In practice, these guarantees are infrequently used by financial institutions that have to satisfy bank capital requirements but are more common among financial institutions that follow other forms of capital regulation.

Liquidity guarantees (also referred to as liquidity enhancement) are similar to credit guarantees with the main difference being that the sponsor only needs to pay off maturing ABCP if the conduit assets are not in default. Hence, there is the possibility that liquidity guarantees do not cover credit defaults but in practice liquidity guarantees are structured to prevent this from happening. In most cases, asset default is defined as a discontinuous function of a slow-moving variable such as a delinquency rate. This definition of default ensures that ABCP almost always matures before the assets are declared in default. Indeed, as we show below, throughout the entire "run" there is not a single instance in which outside

[6] The guarantees are also important from a regulatory perspective because they ensure that ABCP qualifies for the highest available rating from accredited national rating agencies. Credit ratings are important because the main purchasers of ABCP are money market funds, which are legally restricted to invest in securities with such ratings (Kacperczyk and Schnabl, 2010a).

investors in ABCP suffered a default under a liquidity guarantee. In practice, these guarantees are used primarily by commercial banks.

Extendible notes guarantees are similar to liquidity guarantees with the main difference being that the conduit issuer has the discretion to extend maturing commercial paper for a limited period of time (usually 60 days or less). By extending the maturity of the commercial paper, it is more likely that the conduit's assets are in default before the commercial paper matures. From the viewpoint of an outside investor, extendible notes guarantees are therefore riskier than liquidity guarantees. In practice, these guarantees are mostly used by financial institutions other than commercial banks.

SIV guarantees are similar to liquidity guarantees with the main difference being that, in addition to ABCP, conduits also issuer longer-maturity, uninsured debt. We consider SIV guarantees as providing weaker insurance to outside investors because of the presence of uninsured debt. In practice, these guarantees are used primarily by commercial banks and structured finance groups.

3. Theoretical framework

The economic rationale for imposing capital requirements on banks comes from the premise that individual banks do not internalize the costs their risk-taking imposes on other parts of the economy, in particular, other banks and the non-financial sector. For example, Diamond and Rajan (2000) explain why the market discipline provided by demandable debt may have to be counteracted with bank capital when bank assets contain aggregate risk. Acharya (2001) focuses on collective risk-shifting by banks in the form of herding to exploit their limited liability options; higher capital requirements on aggregate risky assets can serve as a way to counteract this incentive. Indeed, Gordy (2003) provides the foundation for the Basel I capital requirement framework based on the assumption that each bank is holding a diversified portfolio of economy-wide loans, thereby holding aggregate risk, and the job of the Basel I capital weights is to ensure that the resulting aggregate risk does not erode bank capital beyond a desired likelihood.

In effect, capital requirements increase bank owners' cost of capital with the intention of preventing them from undertaking certain risks that would otherwise seem privately attractive to banks. For instance, banks inherently perform maturity transformation, which is to borrow short and lend long. However, both on their (uninsured) liabilities and asset side, they are typically exposed to aggregate risk. To the extent that banks make profits by earning interest margins on the asset side, over and above their cost of financing, but the costs in aggregate risk states (such as credit crunch or more generally loss of intermediation) are not entirely borne by them, banks have a private incentive to raise leverage beyond the socially efficient level. The presence of explicit or implicit government guarantees in aggregate risk states would only serve to strengthen this incentive. Thus, in a world with imperfectly imposed capital requirements, banks would thus have incentives to "arbitrage" regulation and devise ways of synthesizing leveraged exposures to aggregate risks. In this paper, we examine this regulatory arbitrage hypothesis to explain the structure and performance of conduits. We test three hypotheses.

The first hypothesis is that commercial banks set up conduits to minimize regulatory capital requirements. In particular, capital-constrained commercial banks set up more conduits than other financial institutions, and more so, with guarantees that circumvent capital requirements. This is because (i) banks taking deposits may have a natural advantage in providing guarantees (e.g., lines of credit), as argued by Kashyap, Rajan, and Stein (2002), or because commercial banks have access to federal deposit insurance, which causes economy's savings to move into bank deposits during times of aggregate stress, as documented by Gatev and Strahan (2005) and Pennacchi (2006); and (ii) commercial banks are subject to the strictest capital requirements in the financial sector and thus have greater benefits from regulatory arbitrage.[7]

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[7] We note that, from an incentive perspective, the use of guarantees to align risks and rewards within the sponsor is consistent with the optimal allocation of control rights under asymmetric information. Sponsors often use conduits to purchase assets originated by their customers, their own origination department, or other close parties, and may be better informed about asset quality than outside investors. Guarantees thus ensure that sponsors have strong incentives to carefully screen the conduit's asset purchases (e.g. see Ramakrishnan and Thakor, 1984; Calomiris and Mason, 2004; and Keys et al., 2010). However, the lack of *any* risk transfer, as in the case of credit and liquidity

Further, if conduits are set up to primarily maintain regulatory capital ratios, banks with lower economic capital ratios would be more likely to be associated with setting up of conduits that relax regulatory capital requirements but not other types of conduits. And, the association with conduits that relax capital requirements should be weaker for regulatory ratios as the latter are being arbitraged through conduit activity in the first place.

The second hypothesis is that, ex-post, when asset quality deteriorates and there is credit and liquidation risk to assets, conduits experience a "run" from their short-term credit providers, leading to less ABCP issuance and higher spreads. The cost of redeeming debt that cannot be rolled over and the cost of higher spreads on new issuances are borne by the sponsors. This impact of asset quality deterioration should be larger for weaker guarantees.

The third hypothesis is that no realized losses are passed on to creditors of conduits that are fully guaranteed, with some losses passed on to creditors of conduits with weaker guarantees. In turn, banks with greater exposure to conduits (relative to their size) experience worse stock returns once the "run" on conduits is initiated because they have to absorb the losses on conduit assets.

Put together, these hypotheses amount to establishing that a significant part of the conduit activity is a form of securitization without risk transfer, that is, a way for banks to concentrate aggregate risks rather than disperse them, and do so without holding capital against these risks.

4. Empirical analysis

4.1. Data and summary statistics

We use several different data sources for the analysis in this paper. We collect ratings reports for all 938 conduits rated by Moody's Investors Service (henceforth, Moody's) from January 2001 to December 2009. Most reports are three to five pages and contain information on conduit sponsor, conduit

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guarantees is at odds with security design models unless the underlying assets are mostly all of low quality, an unlikely scenario especially when these conduits were set up.

type, conduit assets, and guarantees. Moody's publishes the first report when it starts rating a conduit and subsequently updates the reports annually. For some larger conduits, Moody's also publishes monthly reports that provide information on conduit size, guarantees, and conduit assets. In addition, Moody's publishes a quarterly spreadsheet that summarizes basic information on all conduits.

We construct our main data set based Moody's quarterly spreadsheets. We confirm with market participants that the data effectively represents the universe of conduits. We augment the data with information on asset types from ratings reports. We merge conduit observations with the same underlying portfolio but two separate funding operations (in most cases, separate funding operations for U.S. dollars and Euro). We drop ABCP issued by collateralized debt obligations because their guarantees are not comparable to the rest of the sample (292 out of 9,536 observations).

We merge our data with a proprietary data set on all ABCP transactions conducted in the United States from January 2007 to February 2008. The data set contains 777,758 primary market transactions by 349 conduits over 292 trading days. The data are provided by the Depository Trust and Clearing Corporation (DTCC), the agent that electronically clears and settles directly- and dealer-placed commercial paper. For each transaction, DTCC provides the identity and industry of the issuer, the face and settlement values of the transaction, and the maturity of the security. We use DTCC data to compute ABCP issuances. We compute ABCP overnight spreads as the annualized yield on ABCP minus the Federal funds target rate.

We use rating reports to identify the sponsoring institution that is providing guarantees to the conduit. We first identify the type of sponsor (e.g., commercial bank, mortgage originator, structured finance group, etc.). If the sponsoring institution is a commercial bank, we search for the sponsor in the Bankscope database. If we cannot identify a sponsor in Bankscope, we conduct an internet search. We match the sponsor to the consolidated financial company.

We use Bankscope to construct a data set of all commercial banks based in the United States, Europe, and Australia with more than $50 billion in the years 2000 to 2006. If the consolidated company and its subsidiaries have more than one entry in Bankscope, we only keep the consolidated company. We collect data on all banks in our data set for the fiscal years ending in the period from 7/1/1999 to 6/30/2007 (the last filing data prior to the shadow-banking run).[8] We drop banks that have less than six observations during the analysis period (54 observations). We drop banks that do no report data on Tier 1 ratios (137 observations). If a bank is only missing one observation on Tier 1 ratios, we interpolate the missing Tier 1 ratio (14 observations). We use the ISIN identifier provided in Bankscope to match bank characteristics to share price information in Datastream (88 banks). If a bank does not have an ISIN identifier, we verify with the bank's website that the bank is not listed.

We use Moody's Weekly Announcement Reports of rating downgrades from January 2007 to December 2008 to identify all conduits that were downgraded or withdrawn during this period. For all such conduits, we search for an affirmative statement by Moody's that all outside investors were repaid prior to the downgrade or withdrawal. If there is no such affirmative statement, we use announcements by the sponsor or other rating agencies to determine whether investors were repaid. If we do not find an affirmative statement that all investors were repaid, we assume that the conduit entered default. We note that this coding procedure may overestimate the extent of investor liquidation because investors may have been repaid without an affirmative announcement by either the sponsor or the rating agencies.

Panel A of Table 1 provides an overview of the ten largest conduits as of January 1, 2007. Most conduits hold highly rated assets originated in the United States or the United Kingdom. The main asset classes are residential mortgages and asset-backed securities. Panel B of Table 1 provides an overview of the ten largest conduit sponsors as of January 1, 2007. In the United States, the largest sponsor was Citigroup with conduit assets of $93 billion. For comparison, this is about the same size as Citigroup's regulatory capital (Tier 1) of $90 billion. In Europe, the largest sponsor was ABN Amro with $68 billion of conduits assets. ABN Amro's regulatory capital was $31 billion. (ABN Amro later merged with Royal Bank of Scotland.) Most sponsors are large commercial banks based in the United States and Europe.

[8] We assign the filing year based on the fiscal year. We therefore capture the fiscal years 2000 to 2006.

Panel A of Table 2 provides summary statistics for all conduits authorized to issue ABCP as of January 1, 2007. Panel A shows that there are 301 conduits with total ABCP of $1,236 billion. The average conduit size is $4.1 billion with a standard deviation of $5.1 billion. About 61% of ABCP (or $792.9 billion) is covered by liquidity guarantees, 13% is covered by credit guarantees, 18% is covered by extendible notes guarantees, and 7% is covered by SIV guarantees.[9]

Panel B of Table 2 presents summary statistics for all sponsors as of January 1, 2007. There are 127 sponsors, each of which, on average, sponsors $9.7 billion of ABCP. The largest sponsor type is commercial banks, which sponsor about 74% (or $911 billion) of ABCP. The second largest type is structured finance groups, which sponsor about 13% (or $156 billion) of ABCP. Contrary to commercial banks, structured finance groups usually do not have the financial resources to provide guarantees directly but purchase them from other financial institutions.[10] Other large sponsor types are mortgage lenders (6.1% or $76 billion), investment managers (1.4% or $18 billion) and investment banks (0.9% or $11 billion).

4.2. Conduits and capital requirements

4.2.1. History of capital requirements for conduits

Bank regulation requires banks to hold a certain amount of capital against its investments. One way to reduce one's capital requirements is to transfer the risks of investments to outside investors. Over the last two decades, securitization has emerged as one of the main risk transfer mechanisms for banks. Bank regulators have recognized such risk transfer and modified bank capital regulation to reduce capital requirements accordingly. However, our analysis suggests that banks used conduits for securitization

[9] Moody's rating reports suggest that almost all conduits are hedged against currency and interest rate exposure. The most common way for conduits to hedge their currency exposure is by matching the currency of the assets with the currency of the liabilities. Consistent with our earlier observation that most assets are originated in the United States, we find that 75% of ABCP is issued in U.S. dollars. About 18% is issued in Euro and the remainder is issued in Yen, Australian dollars, and New Zealand dollars.

[10] Some industry reports indicate that the main providers were large U.S. investment banks, which used internal rating models for computing capital charges (Nadauld and Sherlund, 2008). Internal rating models made less distinction between credit and liquidity guarantees in terms of capital requirements.

without transferring risks to outside investors. To explain the mechanics of such securitization, we first describe the history of capital regulation of conduits. Since almost all conduits were sponsored by banks based in the United States and European countries, we focus on bank regulation in these countries.

In the United States, bank regulators historically made a distinction between credit and liquidity guarantees. Credit guarantees were considered to cover credit risk and thus considered equivalent to on-balance sheet financing. Assets covered by credit guarantees thus had the same capital requirements as assets held on the balance sheet. Liquidity guarantees were considered to cover liquidity risk but no credit risk. Regulators required no capital for liquidity risk. Similarly, extendible notes guarantees and SIV guarantees were considered weaker forms of liquidity guarantees and did not require banks to hold any capital. This regulation generated a sharp discontinuity between the capital requirements for credit guarantees and other types of guarantees.

Over time, banks developed guarantees which were classified as liquidity guarantees but effectively covered credit risk. Banks created these guarantees by defining asset default such that ABCP almost always matured before assets were declared in default.[11] A number of industry publications describe the benefits of circumventing capital requirements by using liquidity guarantees. For example, a publication by Moody's Investors Service (2003) on the fundamentals of ABCP describes conduits as follows: "If a bank were to provide a direct corporate loan, even one secured with the same assets, it would be obligated to maintain regulatory capital for it. An ABCP program permits the sponsor to offer financing services to its customers without using the sponsor's balance sheet or holding incremental regulatory capital (p. 15)"

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[11] In practice, most sponsors defined asset default as downgrades below investment grade (rated assets) or increases in delinquency rates above pre-specified thresholds (unrated assets). Given the requirement that most assets were highly rated, or of similar quality, it was highly unlikely that assets entered default before the ABCP matured. The reason was that rating agencies usually provided ample warnings prior to downgrades (rated assets) and delinquency rates only moved slowly (unrated assets). Moreover, ABCP was very short-term with a median maturity at issuance of overnight and a median maturity of outstanding ABCP of 28 days. Hence, even though it was possible that assets entered default prior to the expiration of the ABCP, it was highly unlikely. Instead, outside investors could simply stop rolling over ABCP upon adverse news about the credit or liquidity risk of conduit assets. As a result, liquidity guarantees effectively covered the assets' credit risk without requiring banks to hold the same regulatory capital as that required for assets on the balance sheet.

In 2001, the Financial Accounting Standards Board (FASB) started a review of guarantees to conduits. FASB initiated this review because of the bankruptcy of the energy company Enron. Enron had used off-balance sheet vehicles for concealing its true leverage and these off-balance sheet vehicles were structured similarly to conduits. The FASB review generated considerable concern in the banking industry. For example, in July 2002, Moody's Investors Service (2002a) reports under the headline "FASB reacts to Enronitis" that FASB is proposing the consolidation of ABCP conduits on bank balance sheets. In October 2002, Moody's published a special report titled "The FASB Consolidation Proposal: The End of ABCP as we know it?" which suggests that sponsors may face difficulties with consolidation because it would raise regulatory capital requirements and might lead banks to violate their debt covenants (Moody's, 2002b).

In January 2003, FASB issued a directive for the consolidation of conduits under Interpretation No. 46 (FIN 46). In response, Forbes (2003) reported that "FASB Puts Banks in a Bind" because conduit consolidation would negatively affect bank balance sheets. The article quotes the FASB chairman as saying that "If you have risk and reward related to the operation, we thought it was enough to say it ought to be on your books." However, the FASB directive did not adequately specify the circumstances required for consolidation and several large banks requested more guidance from FASB. In December 2003, FASB issued a new directive called FIN 46R ("R" for revision) which clarified how to implement the directive and required commercial banks to consolidate conduits on bank balance sheets.

However, in July 2004, a consortium of bank regulators, namely the Office of the Comptroller of the Currency, the Federal Reserve Board, the Federal Deposit Insurance Corporation, and the Office of Thrift Supervision (henceforth, the Agencies), issued a new rule for computing capital requirements for conduits. The official press release (Federal Reserve Board, 2004) by the Agencies states that "[t]he final rule will permanently permit sponsoring banks, bank holding companies, and thrifts (collectively, sponsoring banking organizations) to exclude from their risk-weighted asset base those assets in ABCP programs that are consolidated onto sponsoring banking organizations' balance sheets as a result of FIN

46R." Hence, assets in conduits were not considered assets for the purpose of calculating capital requirements. Instead, bank regulators required banks to hold capital at a conversion factor of 10% against the amount covered by liquidity guarantees. This implied that regulatory charges for conduit assets covered by liquidity guarantees were 90% lower than regulatory charges for on-balance sheet financing (Gilliam, 2005).

The timeline of the FASB review coincides with changes in ABCP outstanding. As shown in Figure 2, the growth of ABCP conduits stalled in late 2001, around the time when FASB started its review of conduits. From late 2001 to late 2004, ABCP outstanding was flat after several years of significant growth. However, starting in late 2004, at the time bank regulators issued the exemption, growth in ABCP picked up again. This time-series evidence indicates that lower capital requirements played an important role in the decision to set up conduits.

In Europe, the history of capital requirements for ABCP conduits was slightly different. Before 2004, most European countries had similar capital requirements for guarantees as in the United States. Credit guarantees were considered to cover credit risk and required the same regulatory charges as on-balance sheet financing. Liquidity guarantees were considered to cover liquidity risk and had no capital charges. However, European banks started to adopt International Financial Reporting Standards (IFRS) in the early 2000s. IFRS, contrary to U.S. General Accepted Accounting Principles (GAAP), do not recognize asset transfers to conduits as a true sale. European banks were therefore required to consolidate conduits on their balance sheets once they adopted IFRS. However, most European bank regulators did not change capital requirements in accordance with IFRS. Hence, for the purpose of computing regulatory requirements and risk-weighted assets, conduits were considered off-balance sheet and European banks did not have to hold regulatory capital against conduit assets. As a result, European banks continued to benefit from lower capital requirements for conduits even after reporting financial statements according to IFRS.[12]

Another difference between the United States and Europe was that European bank regulators were in the process of adopting the Basel II framework in 2007, while U.S. commercial banks were still operating under Basel I. Under the Basel II standardized approach, the capital requirements for conduit assets covered by liquidity guarantees increased from 0% to 20% relative to on-balance sheet financing. Moreover, Basel II assumed lower risk weights for highly rated securities, which reduced the level of regulatory charges for both off-balance sheet and on-balance sheet financing. At the start of the financial crisis, several European banks had adopted Basel II rules, while others were still operating under Basel I. Importantly, both under Basel I and Basel II, there were lower capital requirements for liquidity relative to credit guarantees, albeit the benefit was smaller under the new regulation.

4.2.2. Conduit sponsors and capital

This section analyzes whether capital requirements played an important role in the decision to sponsor conduits. The three main sponsor types were commercial banks, structured finance companies, and mortgage originators. We note that the incentives to use liquidity guarantees were particularly strong for commercial banks because they were considered to have the strictest capital regulation of all financial institutions due to their deposit-taking status.

Figure 3 plots ABCP by sponsor type and type of guarantee from January 2001 to June 2009. Panel A shows that commercial banks were by far the most important sponsors with up to $900 billion of ABCP. They primarily used liquidity guarantees and the use of such guarantees increased markedly after the capital exemption was confirmed in 2004: liquidity-guaranteed ABCP increased from $500 billion in

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[12] We note that two European countries, Spain and Portugal, differed in their regulation of capital requirements from other European countries. These countries required sponsors to hold the same amount of regulatory capital for assets on balance sheets and for assets in ABCP conduits. Consistent with the regulatory arbitrage motive, we find that Spanish and Portuguese banks did not sponsor ABCP conduits (Acharya and Schnabl, 2010).

September 2004 to $900 billion in July 2007. In Panels B and C, we find no such effects for structured finance companies and mortgage originators. These types of sponsors were far less likely to use liquidity guarantees, and there was no change in the use of liquidity guarantees after 2004. These results are suggestive that commercial banks used conduits to circumvent capital regulation.

Next, we examine whether more capital-constrained commercial banks were more likely to be conduit sponsors. The main challenge in establishing this relationship empirically is that banks choose to engage in regulatory arbitrage in order to increase (or maintain) their regulatory capital ratio. In equilibrium, we therefore expect that capital-constrained banks do not necessarily have low regulatory capital ratios, precisely because they engage in regulatory arbitrage. As result, we expect that an empirical estimation of the relationship between the regulatory capital ratio and conduit activity is downward biased.[13] Nevertheless, it is also possible that the absence of a relationship between the regulatory capital ratio and conduit activity reflects a rejection of our regulatory arbitrage hypothesis in the data.

We address this issue as follows. We estimate first the relationship between the main regulatory ratio ("Tier 1 Capital") and conduit activity. We perform this estimation because even if the relationship is downward biased, it serves as a useful benchmark for our next step, which is to employ instead of the regulatory ratio the "leverage ratio", defined as the ratio of book equity to total assets. The leverage ratio serves as an alternative measure of whether a bank is capital constrained and is likely a better proxy for capital constraints faced by banks precisely because it is not targeted by banks to meet regulatory constraints. Indeed, most regulatory arbitrage activities have the characteristic that they reduce risk-weighted assets (and therefore regulatory ratios) while maintaining the same level of total assets.[14] This

[13] This can be considered as a consequence of Goodhart's Law (Goodhart, 1975): "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes."

[14] An analogy with the sovereign credit problems in the Eurozone of 2009-10 helps. Sovereign bond holdings on banking books were accorded zero risk-weights for regulatory capital purposes. Ex post, sovereign credit risk materialized and affected different banks in varied manner based on their exposures to sovereign debt. These risks were reflected in the leverage ratio (because sovereign debt was included in total assets) but not in the Tier 1 capital ratio (because sovereign debt had zero risk weights).

increase in total assets relative to risk-weighted assets is thus captured in the leverage ratio but not in the regulatory ratio.

This interpretation of the leverage ratio as a measure of capital constraints is consistent with empirical evidence from our bank sample. First, if leverage ratios are more informative about capital constraints than Tier 1 ratios, we expect more variation in leverage ratios relative to Tier 1 ratio. Indeed, we find that the coefficient of variation in the leverage ratio is 49% relative to 24% for the Tier 1 ratio. Second, we expect that as conduit (or similar regulatory arbitrage) activity increases, total assets increase relative to risk-weighted assets and, indeed, we find in our bank sample that the ratio of total assets to risk-weighted assets increased from 1.8 in 2000 to 2.2 in 2006. Third, we expect that leverage ratios are better predictors of financial distress once the banking sector suffered an aggregate shock. Consistent with this interpretation, Demirguc-Kunt, Detragiache, and Merrouche (2010) find that leverage ratio outperforms risk-weighted ratios in predicting bank stock returns during the financial crisis of 2007-2010.[15] In short, this evidence suggests that the variation in leverage ratio is a sensible way to proxy for the variation in whether banks are capital constrained during the analysis period.

In the tests, we focus our analysis on commercial banks based in the United States, Europe, and Australia with more than $50 billion in assets in the fiscal years 2000 to 2006. We compute a bank's conduit exposure as the ratio of ABCP relative to bank equity by type of guarantee.[16]

Panel A of Table 3 provides summary statistics. The average exposure to ABCP is 32.2% and the average exposure to liquidity-guaranteed ABCP is 25.2%. Panel B of Table 3 reports pair-wise correlations among the main variables. Consistent with the regulatory arbitrage hypothesis, we find a negative correlation of 20% between ABCP exposure and the leverage ratio. The correlation with Tier 1 capital is also negative but significantly lower at 3%. We also find that larger and less profitable banks were more likely to have high ABCP exposure.

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[15] Estrella, Park, and Peristiani (2000) also find evidence that leverage ratios are as good as risk-weighted ratios in predicting bank default using a sample from the early 1990s. .

[16] We winsorize ABCP exposure at the 1% level to ensure that the results are not driven by outliers. The results are stronger if we do not winsorize ABCP exposure.

We then use panel regressions to assess the relationship between ABCP exposure and bank equity. Our baseline specification is:

$$Exposure_{it} = \alpha_i + \delta_t + \beta CapitalRatio_{it} + \gamma X_{it} + \varepsilon_{it}$$

where $Exposure_{it}$ is ABCP exposure of bank *i* at time *t*, $CapitaRatio_{it}$ is the capital ratio of bank *i* at time *t* , X_{it} are time-varying control variables, α_i are bank-fixed effects, and δ_t are time-fixed effects. We use two measures for capital ratio: the *leverage ratio* measured as book equity relative to assets and the *regulatory capital ratio* measured as Tier 1 regulatory capital relative to risk-weighted assets. All regressions include controls for the natural logarithm of banks assets, return on assets, short term debt as a share of liabilities, deposits as a share of liabilities, and loans as a share of assets. We cluster standard errors at the bank-level to allow for correlation of error terms within banks.

Panel A of Table 4 presents the results for Tier 1 ratio. Our preferred specification includes bank fixed effects to control for cross-sectional variation in banks' capital ratios. As shown in Column (1), we find that more capital-constrained banks have higher ABCP exposure: a one-standard-deviation increase in the Tier 1 ratio reduces conduit exposure by 4.1% (about 10% of mean conduit activity). However, the coefficient is not statistically significant. In Column (2), we add interactions of year and country fixed effects to control for country-specific changes in capital ratios and the coefficient slightly increases. In Column (3), we estimate the main specification without bank fixed effects and the coefficient further increases. In Column (4), we estimate the main specification in first differences and the coefficient is again negative but not statistically significant. In Column (5), we lag the Tier 1 ratio and all control variables by one year and estimate the main specification in first differences and find that the coefficient is unchanged from Column (4). Overall, the coefficient is consistently negative but not statistically significant. This evidence is suggestive of a negative relationship between the regulatory capital ratio and conduit activity but the relationship is weak, possibly because of the downward bias discussed earlier.

We therefore turn to our results using the leverage ratio. Panel B of Table 4 presents the same specifications as in Panel A but we replace the Tier 1 ratio with the leverage ratio. As shown in Column

(1), we find that a statistically significant and negative relationship between conduit activity and the leverage ratio. The relationship is also economically significant: a one-standard deviation increase in the leverage ratio reduces conduit activity by 10.4% (about 40% of mean conduit activity). As shown in Columns (2) and (3), the relationship is robust to adding interactions of year and country fixed effects and estimating the relationship without bank fixed effects. As shown in Columns (4) and (5), the coefficient remains statistically significant when we estimate our main specification in first differences.

Overall, these results show that banks with higher leverage ratios sponsored less liquidity-guaranteed ABCP. Conversely, if we interpret lower leverage ratios as a proxy for whether a bank is constrained, these results suggests that more capital-constrained banks were more likely to engage in more regulatory arbitrage.

A possible concern with our results may be that we do not observe other time-variant bank characteristics that may affect the incentives to sponsor conduits. For example, banks may use conduits for pure investment purposes and the need for such investment is correlated with banks' leverage ratios. We therefore examine bank incentives to set up conduits with credit guarantees. These guarantees are almost identical to full-liquidity guarantees but do not reduce capital requirements.

Table 5 presents the results. We estimate the same regression as in Table 4 but replace the outcome variable with ABCP exposure to credit guarantees. As shown in Panel A and B, we find no association between capital ratios and ABCP exposure to credit guarantees. All coefficients are statistically insignificant and close to zero. Overall, our results suggest that the reduction in capital requirements was central for bank's incentives to set up conduits with liquidity guarantees.

4.3. Impact of guarantees on ABCP issuances and spreads

In this section, we examine the effect of guarantees on a conduit's ability to roll over maturing ABCP *after* the start of the financial crisis. As shown in Panel A of Figure 1, ABCP declined dramatically after the start of the financial crisis on August 9, 2007. By the end of year, the ABCP market was roughly 30 percent smaller than it was at its peak in July.

To test for the importance of guarantees in rolling over ABCP after August 9, 2007, we exploit cross-sectional variation in types of guarantees. As discussed in section 1.2, credit and liquidity guarantees covered almost all risks associated with conduits assets. However, extendible guarantees were weaker, because they allowed conduits to extend commercial paper for a limited period of time, an option that issuers were likely to exercise when there was adverse news about conduit assets. SIV guarantees were also weaker, because SIVs also had other liabilities without guarantees.

To understand the selection of sponsors and assets into guarantees, it is important to understand the sponsor's objective. Most sponsors aimed to put together a conduit structure (consisting of the guarantee, conduit assets, and the sponsor's financial strength) that allowed the sponsor to issue highly rated ABCP at rates similar to the Fed Funds rate (overnight) or LIBOR (30-days). Sponsors traded off various conduit characteristics to achieve this pricing on the ABCP. For example, conduits with lower quality assets were usually required stronger guarantees. Also, sponsors with higher financial strength tended to provide stronger guarantees. We therefore control for asset quality and sponsor type in our regressions.

To test the cross-sectional impact of guarantees formally, we compute weekly ABCP outstanding and daily spreads of overnight ABCP. We restrict our sample to the period four months before and four months after the start of the financial crisis on August 9, 2007. We choose this period because it captures the main decline in ABCP but excludes later events that may confound our analysis (e.g., Bear Stearns merger, Lehman bankruptcy). We find qualitatively and quantitatively similar results if we extend our data set to the period six months before and six months after August 2007.

We analyze the relationship between guarantees and ABCP outcomes using panel regressions. Our baseline specification is:

$$\mathrm{y}_{it} = \alpha + \beta_j Guarantee_j + \gamma_j After_t * Guarantee_j + \delta After_t + \varepsilon_{it}$$

where y_{it} is either the natural logarithm of the face value of ABCP outstanding of conduit *i* in week *t* or the overnight (1 to 4 days of maturity) ABCP spread over the Federal Funds rate on new issues by conduit *i* on day *t*. $Guarantee_j$ is an indicator variable by type of guarantee (omitted category is liquidity guarantee). $After_t$ is an indicator variable that equals one after the start of the crisis (after August 9, 2007) and zero before the crisis. We also estimate regressions in which we control for time-fixed effects, conduit-fixed effects, and sponsor-time fixed effects.

If the financial crisis makes investors more concerned about conduit risks, we expect that the interactions between indicator variables for weak guarantees and the $After_t$ indicator to be more negative than those for strong guarantees. Furthermore, if outside investors perceived that credit and liquidity guarantees provided the same level of protection, we expect that liquidity and credit guarantees perform similarly during the "run."

Columns (1) to (4) of Table 6 present results for commercial paper outstanding. As shown in Column (1), we find that the interaction between the $After_t$ indicator and the dummies for extendible notes and SIVs are negative. This result suggests that ABCP decreased more for conduits with weaker guarantees compared to conduits with liquidity guarantees. The coefficient on the interaction between the $After_t$ indicator and the credit guarantee indicator shows that there is no statistically significant difference between liquidity and credit guarantees. Columns (2) and (3) add time-fixed effects and conduit-fixed effects, respectively. We find that the coefficients of interest are robust to these control variables. Column (4) adds controls for sponsor-time fixed effects. These fixed effects control for all time-varying changes at the sponsor level such the coefficients are identified off variation across guarantees for the *same* sponsor. We find that the point estimates are robust to controlling for these fixed effects but the standard errors are somewhat larger.

Columns (5) to (8) present results for overnight ABCP spread. In Column (5), we find positive and statistically significant coefficients on extendible notes and SIVs. We find no statistically significant difference between credit and liquidity guarantees. As shown in Columns (2) and (3), the results are robust to controlling for time- and conduit-fixed effects. Column (4) controls for sponsor-time fixed effects and, again, the point estimates are robust but the standard errors are larger.

One possible concern with our results is that they reflect differences in asset quality or sponsor types. For example, conduits with weaker guarantees were more likely to hold asset-backed securities. Even though asset-backed securities were perceived of higher quality ex-ante, these assets may be of lower quality ex-post, which could bias our results. We therefore control for asset quality by including indicator variables for asset categories and sponsor types and interactions with the $After_t$ indicator.

Table 7 presents the results. As shown in Columns (1) to (4), the controls for asset categories have little effect on the coefficients of interest for outstanding ABCP. We confirm our finding that extendible and SIV guarantees have a significantly larger decline in ABCP outstanding relative to liquidity and credit guarantees. As shown in Columns (5) to (8), the controls reduce the coefficients of interest on ABCP spread, which suggests that some of the price variation potentially reflects underlying difference in asset and sponsor types. This result may also be due to the fact that because in a "run", the main effect is on the quantity margin, it may be econometrically difficult to discern price effects. Hence, a conservative inference is that the ability of conduits to borrow ABCP at pre-crisis spreads fell significantly post-crisis.

Overall, our results show that liquidity guarantees were affected similarly as credit guarantees, and less than extendible and SIV guarantees, during the "run." This finding is strongly suggestive of the lack of risk transfer through liquidity guarantees.

4.4. Losses of outside investors

This section examines the extent of *realized* risk transfer by analyzing whether outside investors in ABCP were fully repaid after the start of the financial crisis. We take the perspective of an investor that was holding ABCP at the start of the crisis and examine whether the investor suffered losses by not rolling over maturing ABCP. We test the performance of credit guarantees using Moody's Investors

Service announcement data from January 2007 to December 2008. Since all conduits are rated, Moody's Investors Service always issues an announcement if a conduit defaults on its obligation to pay off maturing ABCP.

Table 8 presents the results on the ex-post risk transfer. Column (1) reports ABCP outstanding per credit guarantee in July 2007. Columns (2) to (4) show the value-weighted percentage in three categories: (i) conduits that were closed down and repaid all maturing ABCP before December 2008; (ii) conduits that remained active and repaid all maturing commercial paper up to December 2008; and (iii) conduits that failed to repay maturing ABCP and entered default by December 2008.

We find that not a single conduit using credit or liquidity guarantees defaulted by December 2008. In contrast, 7.4% of ABCP covered by extendible notes guarantees and 16.6% of ABCP covered by SIV guarantees entered default by December 2008, respectively. Regarding the sponsor type, we find that conduits sponsored by structured finance firms and mortgage companies were significantly more likely to enter default than conduits sponsored by commercial banks. Overall, we find that 97.5% of outside investors in ABCP were fully repaid.

The total amount of conduit losses depends on the loss rate of conduit assets and, unfortunately, there is no publicly available information with respect to such rates. However, we can use different pieces of publicly available information to form an estimate. For example, State Street (2009) announced an after-tax loss of $3.7 billion on conduit asset of $21.8 billion, which amounts to a loss-rate of 22.6% (assuming a tax rate of 25%). Consistent with this estimate, the AAA-tranche of the ABX-index suggests that the value of collateralized mortgage obligations backed by subprime mortgages dropped by up to 60 percent over the same period. The losses on conduit assets are likely to be smaller because many conduits hold both mortgage and non-mortgage assets. In the case of mortgage assets, conduits usually hold prime mortgages rather than subprime mortgages. We therefore assume more conservative loss rates of 5% and 15%. Under these assumptions, we estimate total losses on conduit assets of $68 billion and $204 billion, respectively. The estimated losses for outside investors are $1.8 billion and $5.2 billion respectively.

Consistent with the lack of risk transfer, this analysis shows that most of the losses were borne by sponsors rather than transferred to outside investors. However, the level of the estimated losses is only suggestive because we lack the data to compute actual losses.

4.5. Effect of conduit exposure on sponsor stock returns

As our final piece of evidence, this section analyzes whether banks with higher conduit exposure experienced lower stock returns during the financial crisis. The difficulty in testing this hypothesis is that the financial crisis also affected banks in other ways, some of which may be correlated with conduit exposure. Hence, if we observe that banks with higher conduit exposure have lower returns, then this result may be driven by other bank activities that negatively affected stock prices and were correlated with conduit exposure.

To address this identification issue, we focus on the start of the crisis in the ABCP market on August 9, 2007. We believe this provides a good setting to identify the impact of conduit exposure for two reasons. First, the financial crisis arguably started with the announcement of difficulties in the mortgage market. As shown in Panel B of Figure 1, starting on August 9, 2007, investors drastically reduced refinancing of maturing ABCP and, as a result, overnight spreads jumped from 10 basis points to 150 basis points. Hence, it is unlikely that the event study is confounded by other events that happened just prior to August 9, 2007. Second, our analysis focuses on the narrow three-day window around August 9, 2007. This short event window reduces the likelihood that the results may be confounded by other events that happen around the same time.

Our sample is the group of commercial banks based in the U.S. and Europe with at least $50 billion in assets as of January 2007. We restrict the sample to banks that are publicly listed. To control for difference in observable characteristics, we estimate the baseline specification:

$$R_i = \alpha + \beta ConduitExp_i + \gamma X_i + \varepsilon_i$$

where R_i is the cumulative equity return of bank *i* computed over the three-day period from August 8, 2007, to August 10, 2007, $ConduitExp_i$ is bank *i*'s conduit exposure (all guarantees) as of January 2007, X_i are bank *i*'s observable characteristics as of January 1, 2007, and ε_i is a bank-specific error term. We estimate the baseline specification using heteroscedasticity-consistent standard errors.

Table 9 presents the results. Column (1) shows that an increase in conduit exposure from 0% to 100% (e.g., Wells Fargo to Citibank) reduces the stock return during the three-day event window by 1.4 percentage points. Column (2) controls for bank characteristics such as bank size, leverage ratio, share of asset funded with deposits, share of assets funded with short-term and non-deposit debt, and indicator variables for the country of the sponsoring institution's headquarters. The coefficient of conduit exposure decreases to 1.1 percentage points but remains statistically significant at the 5%-level.

We interpret these results as evidence that banks with higher conduit exposure were more negatively affected by the crisis in the ABCP market. The coefficient is probably a lower bound of the impact, because investors may have underestimated at first the severity of the downturn or may not have been fully aware of the (relatively opaque) credit guarantees provided to conduits. Also, investors may have anticipated some of the losses because of prior announcements about losses on subprime assets.

To ensure that the results are not driven by outliers, we construct an alternative measure of exposure. We compute the mean exposure of all banks with positive exposure to conduits and divide the banks in two groups: banks with low exposure (below mean) and banks with high exposure (above mean). We estimate the baseline specification using indicator variables for banks with low exposure and bank with high exposure and in unreported results find qualitatively and quantitatively similar effects. We also drop outliers in terms of conduit exposure and include banks with less than $50 billion in assets and our results are qualitatively and qualitatively unchanged.

We also examine the relation of conduit exposure and stock returns in August and the months prior to August 2007. For each month from January 2007 to August 2007, we estimate the same set of regressions as in Column (2). We find no statistically significant relationship between conduit exposure and stock returns from January 2007 to July 2007 (Columns 4 to 10). However, in the month of the crisis in the ABCP market, August 2007, we find a negative and statistically significant effect of conduit exposure on stock returns after controlling for the full set of observables (Column 3). The coefficient is about twice as large as the coefficient in Column 2. Again, this finding suggests that investors revised their expectation of the negative effect of conduit exposure on stock returns upwards for several days after the start of the financial crisis. However, we caution against a fully conclusive interpretation because the estimation is over a longer event window and therefore may be confounded by other factors.

5. Benefits to banks of securitization without risk transfer

The empirical analysis shows that banks suffered significant losses because conduits were unable to roll over maturing ABCP. This raises the question of how large was the benefit to banks from setting up conduits.

We can assess the benefits to banks by quantifying how much profit conduits yielded to banks from an ex-ante perspective using a simple back-of-the-envelope calculation. Assuming a risk weight of 100% for underlying assets, banks could avoid capital requirements of roughly 8% by setting up conduits relative to on-balance sheet financing. We assume that banks could finance short-term debt at close to the riskless rate, which is consistent with the rates paid on ABCP before the start of the financial crisis. Further assuming an equity beta of one and a market risk premium of 5%, banks could reduce the cost of capital by 8%*5%=0.004 or 40 basis points by setting up conduits relative to on-balance sheet financing.

It is difficult to estimate the profits generated by conduits because only a few banks report revenues from conduits. For example, Deutsche Bank reports in its annual report in December 2007 that conduits generated fees of Euro 6 million relative to a total commitment of Euro 6.3 billion. Bank of New York Mellon reports in December 2006 revenues of $3 million relative to a commitment of $3.2 billion (Arteta et al., 2008). Assuming that conduits have no costs and revenues are equal to profits, banks earned – until a “run” occurred – a carry of about 10 basis points on conduit assets.

Comparing the costs and benefits of conduits, it seems clear that conduits would not have been profitable if banks had been required to hold equity against the assets in their conduits to the same extent as for assets on their balance sheets. In fact, banks would have made a loss (negative carry) of 30 basis points on each dollar invested. However, given that banks were not required to hold equity to the same extent as for assets on their balance sheets, they could earn a "profit" of 10 basis points. Conduits were thus a relatively low-return activity but offered a way for banks to attract money-market savings and effectively increase bank size without increasing regulatory capital.

To see quantitatively how large was the capital saving for banks, Table 10 lists the 30 largest conduit sponsors. We find that "missing" capital - the additional capital if conduit assets had been on bank balance sheet - was on average 6.1% of total equity or about $68 billion in total across banks. This is not necessarily a large amount of equity capital, but it masks considerable heterogeneity across banks as the proportion of missing capital ranges from 1.7% to 79.9% of capital levels. The bank with the largest exposure relative to bank size, Sachsen Landesbank, was the first bank to be bailed out on August 17, 2007, because it was unable to provide the guarantees it had extended to its conduits. Other banks with large exposure, such as Westdeutsche Landesbank and ABN Amro (later bought by Royal Bank of Scotland), also suffered large losses due to recourse from conduits and had to be bailed out. Hence, for some smaller banks the conduit activities were in fact large enough to wipe out the entire bank capital. For larger banks, conduit activities were small enough to withstand the losses on conduit assets, but these banks were weakened as the financial crisis continued.

In summary, we point out that an ex-ante capital requirement of 8% against conduit assets would not have been sufficient to cover all possible losses from conduits when the assets declined in value. However, the key observation is that a capital charge for guarantees, similar to capital charges for on-balance sheet assets, would have most probably discouraged banks from setting up conduits in the first place.

6. Related literature

Gorton and Souleles (2007), Gorton (2008), Brunnermeier (2009), and Kacperczyk and Schnabl (2010a) provide examples of maturity transformation outside the regulated banking sector. Our focus, in contrast to theirs, is to provide an in-depth analysis of the structure of ABCP conduits: how risk transfer was designed to take place through conduits and how it materialized and contributed to the start of the financial crisis of 2007-09.

Ashcraft and Schuermann (2008) present a detailed description of the process of securitization of subprime mortgages, of which conduits were one component. Nadauld and Sherland (2008) study the securitization by investment banks of AAA-rated tranches – "economic catastrophe bonds" as explained by Coval et al. (2009) – and argue that the change in the SEC ruling regarding the capital requirements for investment banks spurred them to engage in excessive securitization. Nadauld and Sherland (2008) view the banks as warehousing these risks for further distribution whereas Shin (2009) argues that banks were concentrating highly-leveraged risk exposures (given the low capital requirements) by so doing. Our view in this paper is more along the lines of Shin (2009) (see also Acharya and Richardson, 2009, and Acharya and Schnabl, 2009), that banks were securitizing without transferring risks to outside investors, and in particular, conduits were a way of taking on systemic risk of the underlying pool of credit risks.

In other related literature that too is focused on the economic causes of the increasing propensity of the financial sector to take on such risks, Arteta et al. (2008) examine one class of conduits, namely "credit arbitrage" vehicles, and provide evidence consistent with government-induced distortions and corporate governance problems being the root causes (see also similar arguments in Calomiris, 2009). Beltratti and Stulz (2009) examine bank stock returns during the financial crisis and find that stricter country-level capital regulation is correlated with better bank performance during the crisis. Covitz et al. (2009) use data on ABCP and show that the decline in securitized assets was driven by both market-wide factors and program fundamentals. Kacperczyk and Schnabl (2010b) examine the incentives of money market funds to purchase ABCP during the financial crisis of 2007-09.

Finally, our results on the difficulty in rolling over ABCP and the rise in their spreads are somewhat akin to the analysis of the run on the repo market by Gorton and Metrick (2011). They document that a counterparty risk measure for the banking sector as a whole, the "LIB-OIS" spread, explained over time the variation in the credit spreads of a large number of securitized bonds and the rise in repo haircuts, that is, the difference between the market value of an asset and its secured borrowing capacity. However, there are important differences between our "laboratory" and theirs. While conduits resemble repo transactions to some extent, the presence of explicit guarantees to conduits by sponsoring financial institutions establishes a direct linkage between the ability to issue commercial paper and the guarantee provided by the sponsor. We can therefore test directly for the impact of the guarantees on commercial paper issuance and spreads using variation across and within conduit sponsors over time, rather than relying on market-wide measures of banking sector health.

7. Conclusion

In this paper, we analyze ABCP conduits and show how the structure of risk-sharing in these conduits implies recourse back to bank balance sheets. We find evidence supporting the view that exposure to these conduits was undertaken by commercial banks to engage in regulatory arbitrage, i.e., to reduce their effective capital requirements. We also find that outside investors who purchased ABCP suffered small losses even when collateral backing the conduits deteriorated in quality, supporting our main finding that conduits were a form of securitization without risk transfer. Consistent with the lack of risk transfer, the stock price deterioration of banks at the start of the financial crisis was linked to the extent of their conduit exposure relative to equity capital. Once the crisis broke out, ABCP spreads rose and issuance fell, and more so where guarantees were weaker and sponsoring banks were weaker.

Our analysis makes it clear that from an economic standpoint conduits are "less regulated banks" that operate in the shadow banking world, but with recourse to fully regulated entities, mainly commercial banks, that have access to government safety net. Our results also indicate that when these "less regulated banks" do not have such recourse (extendible notes and SIVs guarantees), they struggle to survive a systemic crisis. While some may interpret this finding to justify the accordance of government safety net to all those parts of the shadow banking world that perform maturity mismatch like banks, the bigger lesson in our view is that banks have incentives to get around regulatory capital requirements in order to invest in aggregate risks in a leveraged manner.

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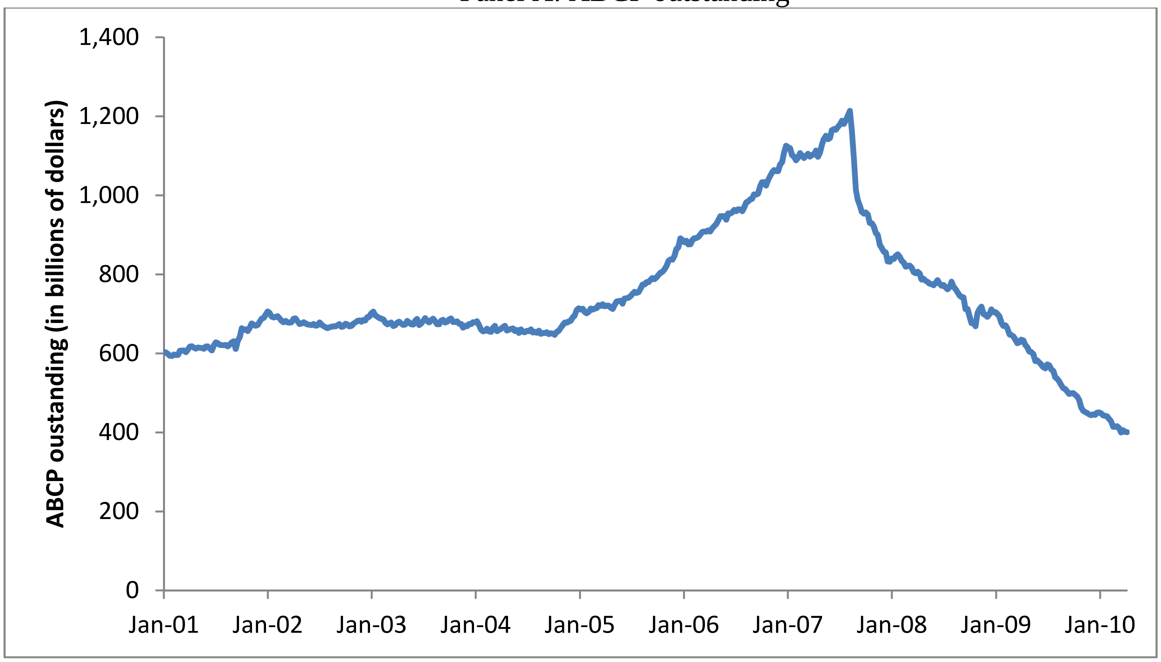
Fig. 1: ABCP outstanding and spreads

Panel A plots total ABCP outstanding in the U.S. market from January 2001 to April 2010. Panel B shows the spread of overnight ABCP over the Federal Funds rate from January 2007 to August 2008. The figures are based on weekly data published by the Federal Reserve Board.

Panel A: ABCP outstanding



Panel B: Overnight ABCP spread

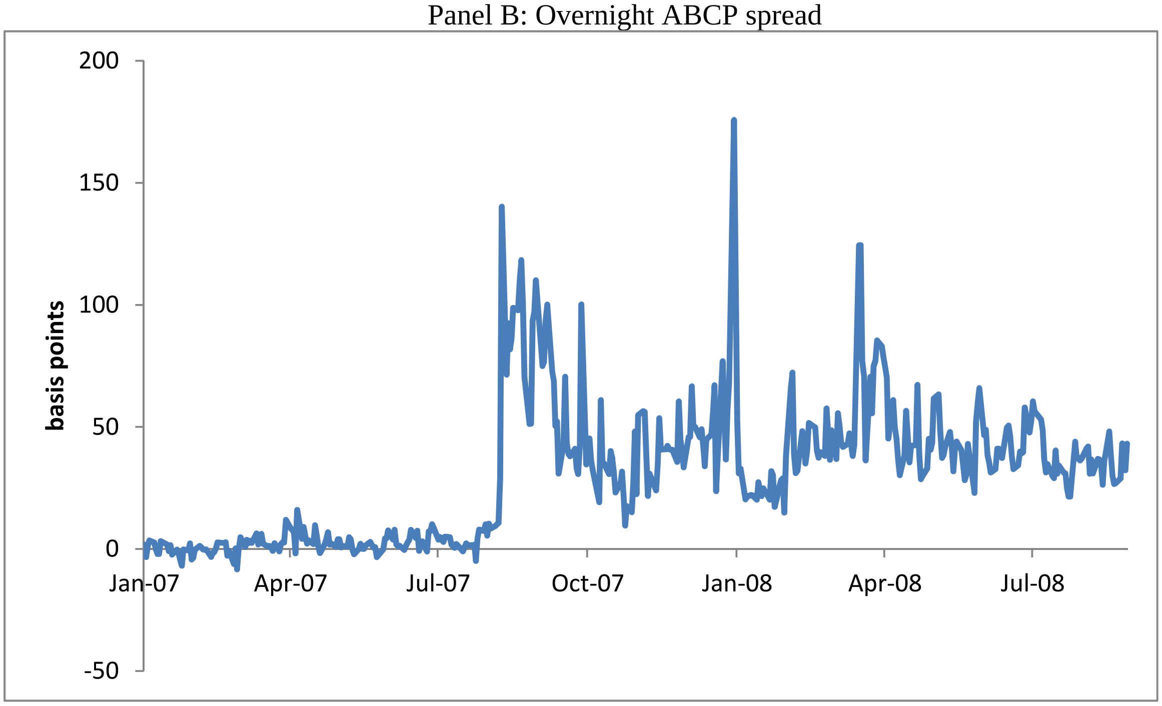


Fig. 2: ABCP outstanding and capital regulation

This figure shows total weekly ABCP outstanding from January 2001 to December 2006. The figure also shows the timeline of regulatory decisions on regulatory capital required for guarantees provided to conduits. The references for the regulatory decisions are in the text.

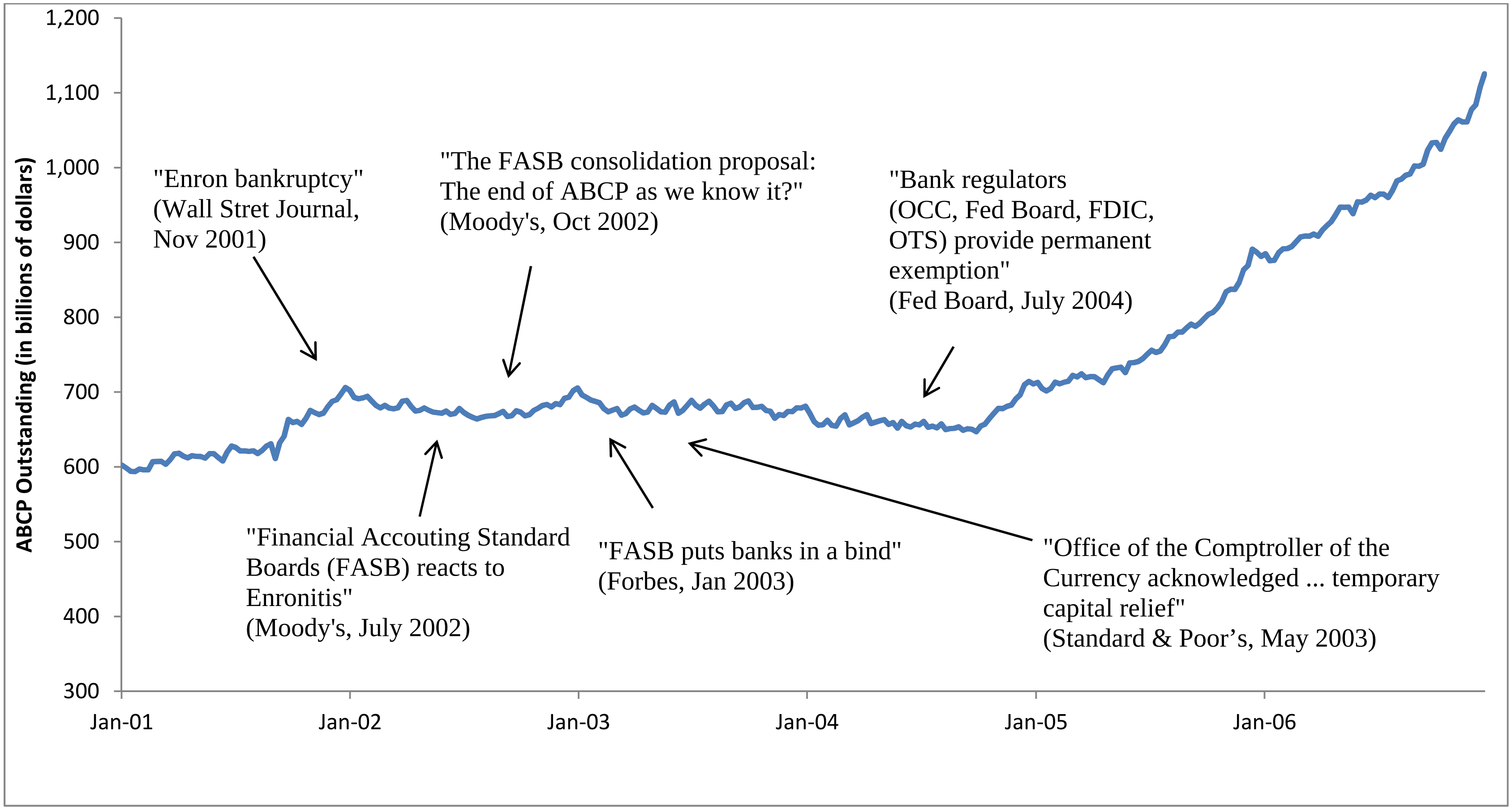
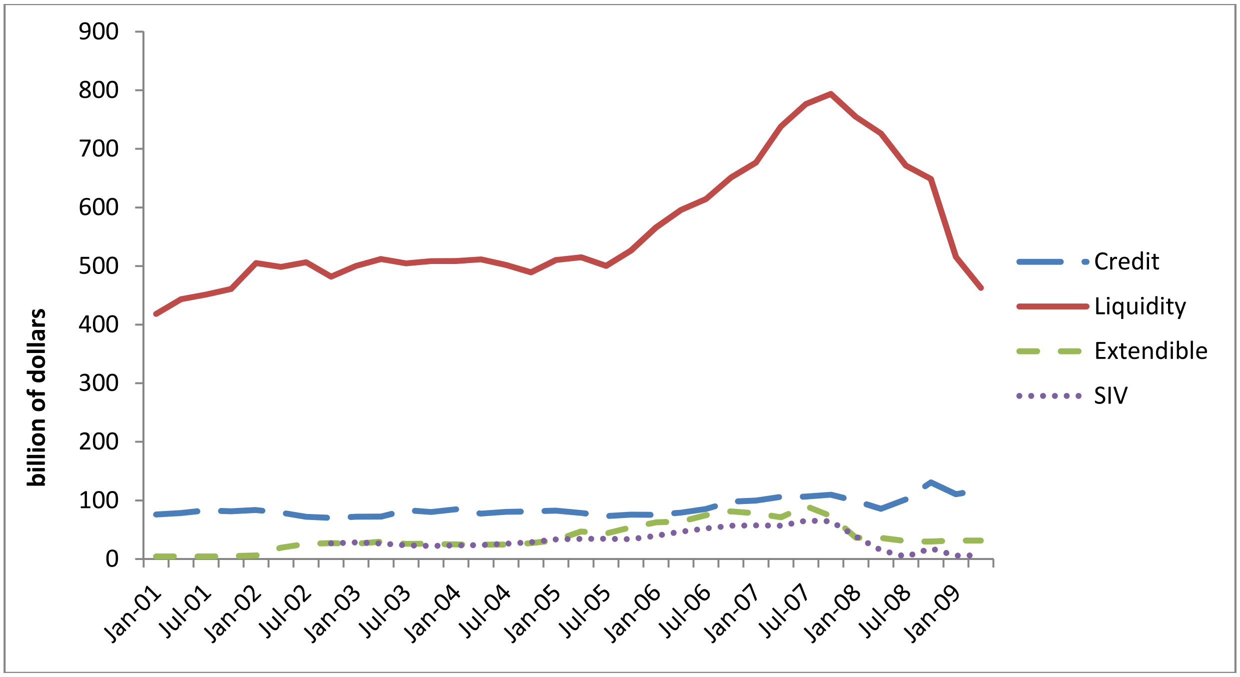


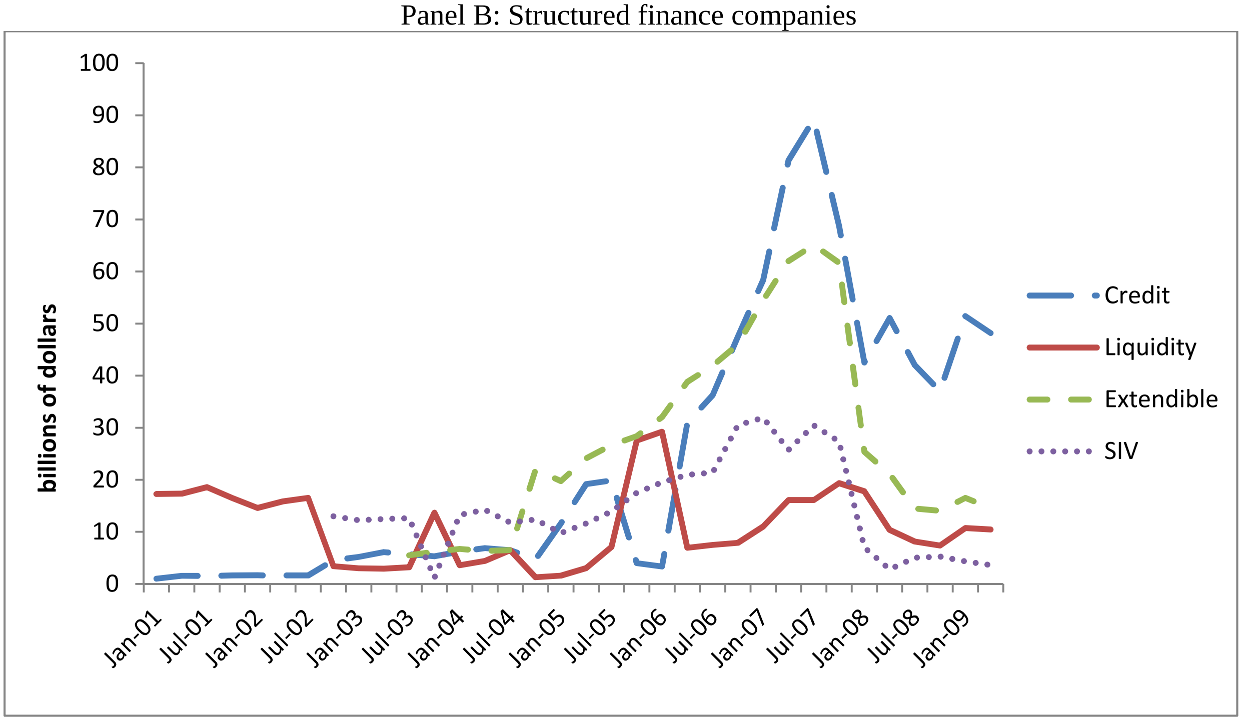
Fig. 3: ABCP outstanding by sponsor and guarantee

This figure shows quarterly ABCP outstanding by guarantee and sponsor type from January 2001 to April 2009. Panel A plots commercial banks, Panel B shows structured finance companies, and Panel C shows mortgage originators. The figures are based on data provided by Moodys' Investors Services.

Panel A: Commercial banks



Panel B: Structured finance companies



Panel C: Mortgage originators

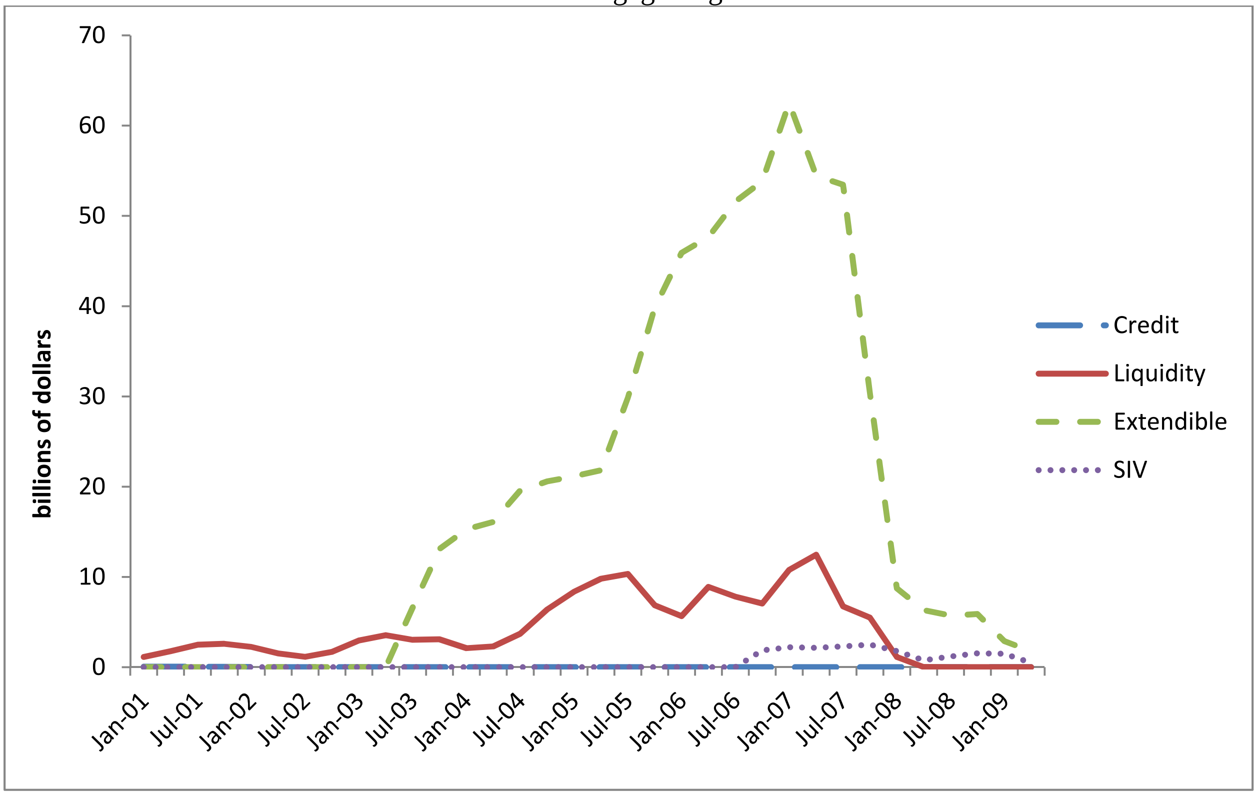


Table 1: Conduits and sponsors

This table shows the ten largest conduits and sponsors as of 1/1/2007. The sample is restricted to bank-sponsored conduits. The information is collected from Moody's Rating Reports and Bankscope. "ABCP (bn)" denotes ABCP outstanding per conduit (Panel A) and sponsor (Panel B). "Asset origin," "Asset rating," and "Asset type" denote characteristics of the main asset class owned by a conduit.

Panel A: Ten largest conduits

Program name	Sponsor	ABCP (bn)	Guarantee	Asset origin	Asset rating	Asset type (Share %)
Grampian Funding	HBOS	37.9	Liquidity	United States	AAA	Residential mortgages (36%)
Amstel Funding	ABN Amro	30.7	Liquidity	Netherlands	AAA	CDO/CLO (84%)
Scaldis Capital	Fortis Bank	22.6	Liquidity	United States	AAA	Asset-backed securities (77%)
Sheffield Receivables	Barclays	21.4	Liquidity	n.a.	NR	Mortgages (43%)
Morrigan TRR	Hypo Public	18.9	Credit	n.a.	n.a.	Bonds (51%)
Cancara Asset	Lloyds	18.8	Liquidity	Great Britain	AAA	Residential mortgages (43%)
Solitaire Funding	HSBC	18.5	Liquidity	United States	AAA	Residential mortgages (45%)
Rhineland Funding	IKB	16.7	Liquidity	United States	AAA	CDO/CLO (95%)
Mane Funding	ING	13.7	Liquidity	n.a.	AAA	Asset-backed securities (91%)
Atlantis One	Rabobank	13.5	Liquidity	United States	NR	Commercial loans (100%)

Panel B: Ten largest sponsors

Sponsor	Country	ABCP (bn)	Assets (bn)	Tier 1 capital (bn)	ABCP/Tier1 (%)	Tier1 ratio (%)
Citigroup	United States	92.7	1,884.3	90.9	102.0%	8.6%
ABN Amro	Netherlands	68.6	1,300.0	31.2	219.5%	8.5%
Bank of America	United States	45.7	1,459.7	91.1	50.2%	8.6%
HBOS Plc	Great Britain	43.9	1,161.7	44.0	99.7%	8.1%
JP Morgan	United States	42.7	1,351.5	81.1	52.7%	8.7%
HSBC	Great Britain	39.4	1,860.8	87.8	44.9%	9.4%
Deutsche Bank AG	Germany	38.7	2,070.0	31.0	125.0%	8.5%
Société Générale	France	38.6	1,260.2	29.4	131.3%	7.8%
Barclays Plc	Great Britain	33.1	1,956.7	45.2	73.2%	7.7%
Rabobank	Netherlands	30.7	732.9	34.8	88.3%	10.7%

Table 2: Conduit and sponsor statistics

This table includes all conduits rated by Moody's Investors Service as of January 1, 2007. Panel A shows summary statistics by conduit. “Risk transfer” refers to the sponsor guarantee. “Assets” is the main conduit’s main asset type. “Currency” is the conduit’s issuing currency. Panel B aggregates conduits by sponsor. “Sponsor type” is the sponsor type. “Country of origin” denotes the sponsor’s headquarters.

Panel A: Conduits

	Total		Size	
	# Conduits	Size (bn)	Mean	Std. dev
All Conduits	301	1,236.2	4.1	(5.1)
Risk transfer				
Liquidity	163	752.9	4.6	(5.7)
Credit	55	159.9	2.9	(4.6)
Extendible notes	55	230.9	4.2	(4.5)
SIV	28	92.6	3.3	(3.4)
Assets				
Asset-backed securities	91	387.4	4.2	(5.9)
Loans	39	65.3	1.6	(2.4)
Receivables	88	436.7	3.5	(4.9)
Mixed asset categories	59	272.9	4.6	(5.3)
Other	24	74.0	4.9	(4.7)
Currency				
U.S. dollar	233	973.0	4.2	(4.6)
Euro	33	220.0	6.7	(8.4)
Other	35	43.2	1.2	(1.6)

Panel B: Sponsors

	Total		Size	
	# Sponsors	Size (bn)	Mean	Std. dev
All programs	127	1,236.2	9.7	(14.7)
Sponsor type				
Commercial banks	67	911.4	13.6	(17.6)
Structured finance	19	155.8	8.2	(13.7)
Mortgage lender	18	75.5	4.2	(5.8)
Investment manager	5	17.6	3.5	(3.3)
Investment banks	4	11.0	2.7	(2.2)
Other	14	64.8	4.6	(6.2)
Country of origin				
United States	67	491.8	7.3	(14.7)
Germany	15	204.1	13.6	(11.6)
United Kingdom	10	195.7	19.6	(17.0)
Other	35	344.5	9.8	(14.4)

Table 3: Commercial banks and conduit activity

This table shows conduit exposure of commercial banks. Panel A provides summary statistics for commercial banks with more than $50 billion in assets headquartered in Europe or the United States for the fiscal years 2000 to 2006. "Conduit exposure" is the ratio of asset-backed commercial paper outstanding to total equity. "Leverage ratio" is the ratio of equity to assets. "Tier 1 ratio" is the ratio of Tier 1 to risk-weighted assets. "Assets" and "Log(Assets)" are total assets and the logarithm of total assets, respectively. "Return on assets" is the ratio of net profit to assets. "Share short-term debt," "Share deposits," and "Share loans" are short-term debt, banks deposits, and loans as a share of total assets, respectively. Panel B provides correlations between the main variables.

Panel A: Summary statistics (126 banks)

	Mean	Std. dev	Median	Min	Max	N
Conduit exposure (total)	32.20%	81.50%	0.00%	0.00%	999.10%	814
Conduit exposure (liquidity)	25.20%	63.20%	0.00%	0.00%	726.30%	814
Conduit exposure (credit)	1.80%	8.10%	0.00%	0.00%	89.70%	814
Leverage ratio	5.40%	2.60%	4.90%	0.80%	16.90%	814
Tier 1 ratio	8.41%	2.00%	8.00%	4.30%	19.00%	814
Assets (in $ billion)	260.8	326.4	134.9	9.7	2070	814
Log(Assets)	4.973	1.086	4.905	2.27	7.635	814
Return on assets	0.80%	0.60%	0.70%	-1.70%	3.10%	814
Share short-term debt	11.70%	9.90%	9.50%	0.00%	51.60%	814
Share deposits	57.60%	13.50%	59.80%	1.80%	86.80%	814
Share loans	54.20%	17.10%	55.90%	4.80%	85.90%	814

Panel B: Correlations (N=814)

	Conduit exposure (total)	Conduit exposure (liquidity)	Conduit exposure (credit)	Leverage ratio	Tier 1 ratio	Log Assets	Return on assets
Conduit exposure (total)	1						
Conduit exposure (liquidity)	0.7929	1					
Conduit exposure (credit)	0.2009	0.1445	1				
Leverage ratio	-0.2013	-0.1969	0.0119	1			
Tier 1 ratio	-0.0318	-0.035	-0.0265	0.2582	1		
Log(Assets)	0.2228	0.2542	0.2357	-0.3088	-0.0931	1	
Return on assets	-0.188	-0.2039	-0.0172	0.7243	0.3046	-0.2218	1

Table 4: Bank capital and conduit exposure (liquidity)

This table analyzes the relationship between bank capital and exposure to conduits sponsored with liquidity guarantees. The sample includes commercial banks with more than $50 billion based in Europe and the Unites States in the fiscal years 2000 to 2006. The dependent variable "Conduit exposure (liquidity)" is total outstanding asset-backed commercial supported with liquidity guarantees relative to bank equity. In Panel A, the main independent variable is the ratio of Tier 1 capital to risk-weighted assets ("Tier 1 ratio"). In Panel B, the main independent variable is the ratio of book equity to assets ("Leverage ratio"). All regressions include controls for total assets, return on assets, short-term debt share, loan share, deposit share, and year-fixed effects. Columns (1), (2), (4), and (5) include bank-fixed effects and columns (2) to (4) include interactions of country-year fixed effects. Column (4) is estimated in first differences. Column (5) is estimated in first differences with a one-year lag. Standard errors are clustered at the bank level (126 banks). ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Panel A: Conduit exposure (liquidity)				
Estimation	FE	FE	OLS	FD	FD-lagged
	(1)	(2)	(3)	(4)	(5)
Tier 1 ratio	-1.565	-0.578	-0.016	-0.183	-0.179
	(1.225)	(1.718)	(2.308)	(1.187)	(0.160)
Log(Assets)	0.093	0.120	0.094*	-0.128	0.034**
	(0.075)	(0.095)	(0.048)	(0.100)	(0.017)
Bank FE	Y	Y	N	Y	Y
Bank controls	Y	Y	Y	Y	Y
Country-year FE	N	Y	Y	Y	Y
Banks	126	126	126	126	126
Observations	814	814	814	687	564
R-squared	0.850	0.868	0.295	0.145	0.130

	Panel B: Conduit exposure (liquidity)				
Estimation	FE	FE	OLS	FD	FD-lagged
	(1)	(2)	(3)	(4)	(5)
Leverage ratio	-4.024**	-4.625**	-5.874**	-4.870***	-2.452**
	(1.903)	(1.944)	(2.709)	(1.389)	(0.970)
Log(Assets)	0.095	0.120	0.095**	-0.124	-0.080
	(0.078)	(0.093)	(0.048)	(0.104)	(0.067)
Bank FE	Y	Y	N	Y	Y
Bank controls	Y	Y	Y	Y	Y
Country-year FE	N	Y	Y	Y	Y
Banks	126	126	126	126	126
Observations	814	814	814	687	564
R-squared	0.850	0.868	0.295	0.145	0.130

Table 5: Bank capital and conduit exposure (credit)

This table analyzes the relationship between bank capital and exposure to conduits sponsored with liquidity guarantees. The sample includes commercial banks with more than $50 billion based in Europe and the United States in the fiscal years 2000 to 2006. The dependent variable "Conduit exposure (liquidity)" is total outstanding asset-backed commercial supported with liquidity guarantees relative to bank equity. In Panel A, the main independent variable is the ratio of Tier 1 capital to risk-weighted assets ("Tier 1 ratio"). In Panel B, the main independent variable is the ratio of book equity to assets ("Leverage ratio"). All regressions include controls for total assets, return on assets, short-term debt share, loan share, deposit share, and year-fixed effects. Columns (1), (2), (4), and (5) include bank-fixed effects and columns (2) to (4) include interactions of country-year fixed effects. Column (4) is estimated in first differences. Column (5) is estimated in first differences with a one-year lag. Standard errors are clustered at the bank level (126 banks). ***, **, * represent 1%, 5%, and 10% significance, respectively.

Panel A: Conduit exposure (credit)					
Estimation	FE	FE	OLS	FD	FD-lagged
	(1)	(2)	(3)	(4)	(5)
Tier 1 ratio	0.473	0.349	0.082	-0.139	-0.199
	(0.411)	(0.416)	(0.489)	(0.207)	(0.160)
Log(Assets)	0.013	0.009	0.025**	0.018	0.030*
	(0.024)	(0.031)	(0.011)	(0.025)	(0.015)
Bank FE	Y	Y	N	Y	Y
Bank controls	Y	Y	Y	Y	Y
Country-year FE	N	Y	Y	Y	Y
Banks	126	126	126	126	126
Observations	814	814	814	687	564
R-squared	0.850	0.868	0.295	0.145	0.130

Panel B: Conduit exposure (credit)					
Estimation	FE	FE	OLS	FD	FD-lagged
	(1)	(2)	(3)	(4)	(5)
Leverage ratio	-0.933	-0.834	0.145	-0.653	-0.179
	(0.591)	(0.652)	(0.464)	(0.402)	(0.160)
Log(Assets)	0.003	0.003	0.024***	0.021	0.034**
	(0.024)	(0.030)	(0.009)	(0.024)	(0.017)
Bank FE	Y	Y	N	Y	Y
Bank controls	Y	Y	Y	Y	Y
Country-year FE	N	Y	Y	Y	Y
Banks	126	126	126	126	126
Observations	814	814	814	687	564
R-squared	0.679	0.733	0.222	0.228	0.250

Table 6: Effect of guarantee on ABCP outstanding and spreads

This table shows the effect of guarantees on paper outstanding and spreads from April to December 2007. The dependent variable in Columns (1) to (4) is the weekly log of paper outstanding and in Columns (5) to (8) is the daily overnight spread over the Federal Funds Rate. "Credit," "Extendible," and "SIV" are indicators for the type of guarantee. "After" is an indicator for dates after August 9, 2007. Columns (2), (3), (6) and (7) include time-fixed effects. Columns (3), (4), (7), and (8) include conduit-fixed effects. Columns (4) and (8) include sponsor-time fixed effects. Standard errors in parentheses are clustered at the conduit level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Log(Outstanding)				Spread			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit*After	-0.068	-0.062	0.061	-0.005	0.023	0.025	0.041	-0.004
	(0.124)	(0.125)	(0.130)	(0.202)	(0.055)	(0.055)	(0.058)	(0.103)
Extendible*After	-0.725***	-0.748***	-0.880***	-0.681*	0.129**	0.093**	0.135***	0.068
	(0.201)	(0.204)	(0.200)	(0.404)	(0.054)	(0.047)	(0.050)	(0.110)
SIV*After	-0.697***	-0.694***	-0.563***	-0.454	0.316***	0.254***	0.260***	0.315**
	(0.156)	(0.157)	(0.157)	(0.290)	(0.099)	(0.082)	(0.093)	(0.132)
Credit	-0.419	-0.419			0.000	0.001		
	(0.376)	(0.377)			(0.005)	(0.005)		
Extendible	0.132	0.132			0.022**	0.022**		
	(0.204)	(0.204)			(0.009)	(0.009)		
SIV	-0.336**	-0.336**			0.001	0.006		
	(0.167)	(0.167)			(0.006)	(0.005)		
After	-0.213**				0.474***			
	(0.084)				(0.028)			
Observations	7,630	7,630	7,630	7,630	14,862	14,862	14,862	14,862
R-squared	0.053	0.057	0.849	0.937	0.444	0.717	0.843	0.952
Time-fixed effects?	No	Yes	Yes	No	No	Yes	Yes	No
Sponsor-time-fixed effects?	No	No	No	Yes	No	No	No	Yes
Conduit-fixed effects?	No	No	Yes	Yes	No	No	Yes	Yes

Table 7: Effect of guarantee on ABCP outstanding and spreads (robustness)

This table shows the effect of guarantees on paper outstanding and spreads from April to December 2007. The dependent variable in Columns (1) to (4) is the weekly log of paper outstanding and in Columns (5) to (8) is the daily overnight spread over the Federal Funds Rate. "Credit," "Extendible," and "SIV" are indicators for the type of credit guarantee. "After" is an indicator for dates after August 9, 2007. Columns (1), (3), (4), (5), (7), and (8) include time-fixed effects. Columns (1), (2), (4), (5), (6) and (8) include conduit-fixed effects. Columns (2) and (6) include sponsor-time fixed effects. Standard errors in parentheses are clustered at the conduit level. All columns include controls for type of assets and type of sponsor and interaction of the controls with "After." ***, **, * represent 1%, 5%, and 10% significance, respectively

	Log(Outstanding)				Spread			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit*After	0.065	0.023	0.007	0.073	-0.015	-0.1	-0.039	-0.061
	(0.135)	(0.212)	(0.145)	(0.141)	(0.054)	(0.077)	(0.053)	(0.048)
Extendible*After	-0.818***	-0.683*	-0.621***	-0.623***	0.021	-0.119	-0.069	-0.089
	(0.201)	(0.404)	(0.231)	(0.229)	(0.061)	(0.214)	(0.064)	(0.071)
SIV*After	-0.451**	-0.391	-0.544***	-0.451**	0.166	0.245**	0.171**	0.134
	(0.176)	(0.330)	(0.179)	(0.183)	(0.109)	(0.107)	(0.082)	(0.095)
Receivables*After	0.371**	0.212	0.370**	0.324**	-0.221***	-0.150*	-0.192***	-0.228***
	(0.153)	(0.228)	(0.148)	(0.145)	(0.074)	(0.089)	(0.060)	(0.069)
Loans*After	-0.384	-0.506*	-0.253	0.039	0.066	0.450***	0.158	0.063
	(0.289)	(0.278)	(0.255)	(0.208)	(0.171)	(0.083)	(0.161)	(0.179)
Bank*After			0.051	0.046			-0.148***	-0.185***
			(0.233)	(0.249)			(0.055)	(0.057)
Observations	7,630	7,630	7,630	7,630	14,862	14,862	14,862	14,862
R-squared	0.853	0.938	0.189	0.859	0.865	0.96	0.772	0.869
Time-fixed effects?	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Sponsor-time fixed effects?	No	Yes	No	No	No	Yes	No	No
Conduit-fixed effects?	Yes	Yes	No	Yes	Yes	Yes	No	Yes

Table 8: Estimated losses for sponsors and outside investors

This table shows the ex-post risk transfer by credit guarantee. “Pre-crisis” denotes total ABCP outstanding as of July 1, 2007. Post-crisis denotes the value-weighted share that is “Active” (conduit continues to issue), “Repaid” (conduit closed and repaid investors), and “In default” (conduit closed and investors were not repaid). “Estimated loss” estimates the losses of sponsor and outside investors assuming a recovery rate on conduit assets of 95% and 85%, respectively.

	Pre-crisis	Post-crisis			Estimated loss (bn)			
					Loss rate: 5%		Loss rate 15%	
	ABCP (bn)	Active	Repaid	In default	Sponsor	Investor	Sponsor	Investor
All	1,395.5	76.6%	20.8%	2.5%	68.0	1.7	204.1	5.2
Guarantee					0.0	0.0	0.0	0.0
Liquidity	844	87.9%	12.1%	0.0%	42.2	0.0	126.6	0.0
Credit	204.2	70.9%	29.1%	0.0%	10.2	0.0	30.6	0.0
Extendibles	243.1	47.0%	45.5%	7.4%	11.3	0.9	33.8	2.7
SIV	104.1	65.7%	17.7%	16.6%	4.3	0.9	13.0	2.6
Sponsor type					0.0	0.0	0.0	0.0
Commercial bank	1,035.6	83.0%	16.4%	0.6%	51.5	0.3	154.4	0.9
Structured finance	199.2	58.1%	36.4%	5.5%	9.4	0.5	28.2	1.6
Mortgage lender	60.2	44.5%	40.2%	15.3%	2.5	0.5	7.6	1.4
Other	100.4	63.3%	24.4%	8.9%	4.6	0.4	13.7	1.3

Table 9: Event study - effect of conduit exposure on stock returns

This table shows the effect of conduit exposure on stock returns. We restrict the sample to commercial banks that (i) have at least $10 billion in assets (ii) are located in the Europe or the United States, and (iii) have share price data available. In Columns (1) and (2), the dependent variable is the total stock return over the three-day period from August 8 to August 10, 2007. In Columns (3) to (10), the dependent variable is the stock return in the month indicated under "time." We measure "Conduit exposure (total)" as ABCP relative to equity. Columns (2) to (10) include country-fixed effects. The control variables are defined in the Appendix. We report heteroskedasticity-consistent standard errors in parentheses. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Dependent variable: Stock return (%)									
	Event regressions			Placebo regressions						
Time	8-10 Aug	8-10 Aug	Aug	Jan	Feb	Mar	Apr	May	Jun	July
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Conduit exposure	-1.443***	-1.096**	-2.334***	0.688	-0.373	0.322	-0.617	-0.588	1.420	1.083
	(0.437)	(0.465)	(0.690)	(1.298)	(0.417)	(0.600)	(0.872)	(1.442)	(1.513)	(0.953)
Log(Assets)		-1.391	0.967	-0.234	-0.053	-0.229	0.600	-1.018+	1.215	0.169
		(1.661)	(0.797)	(0.588)	(0.558)	(0.511)	(0.415)	(0.562)	(1.055)	(0.776)
Return on assets		-1.175**	-1.020	1.086	0.254	1.163	1.376	0.164	6.313	2.965
		(0.493)	(2.311)	(1.496)	(0.837)	(0.735)	(1.108)	(1.636)	(4.576)	(2.570)
Share short-term debt		-1.072	-6.381	5.781	-6.369	9.677	12.593*	-4.750	5.686	1.693
		(3.660)	(6.762)	(5.571)	(4.509)	(6.130)	(7.205)	(9.992)	(7.654)	(6.291)
Share deposits		-0.412	-3.651	-4.879	-1.725	-1.248	-0.767	-7.050	7.921*	11.743
		(2.820)	(6.322)	(4.680)	(4.329)	(3.153)	(5.354)	(4.683)	(4.655)	(7.820)
Share loans		-2.759	4.789	5.556	6.705*	0.592	1.716	-5.729	5.443	-8.896
		(3.591)	(6.058)	(4.296)	(3.984)	(3.503)	(3.789)	(5.400)	(7.055)	(5.878)
Country FE	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	88	88	88	88	88	88	88	88	88	88
R-squared	0.059	0.470	0.374	0.526	0.490	0.523	0.542	0.539	0.384	0.403

Table 10: Missing capital

This table lists the 30 largest bank sponsors of ABCP as of January 1, 2007. For each bank, we compute the required capital assuming ABCP requires a capital charge of 8%, i.e., ABCP*0.08=Total, expressed in billions of US dollars. We also compute the "missing capital" as a share of the bank's equity. We measure equity as Tier 1 capital. If a bank does not report Tier 1 capital, we multiply shareholder equity with the average Tier 1/equity shareholder ratio of banks that report both shareholder equity and Tier 1 ratio.

			Missing capital	
Name	Tier 1	ABCP	Total	%
Citigroup	90.9	92.7	7.4	8.2%
ABN Amro	31.2	68.6	5.5	17.6%
Bank of America	91.1	45.7	3.7	4.0%
HBOS	44	43.9	3.5	8.0%
JP Morgan Chase	81.1	42.7	3.4	4.2%
HSBC Holdings	87.8	39.4	3.2	3.6%
Deutsche Bank	31	38.7	3.1	10.0%
Société Générale	29.4	38.6	3.1	10.5%
Barclays	45.2	33.1	2.6	5.9%
Mitsubishi UFJ Financial Group	68.5	32.0	2.6	3.7%
Rabobank	34.8	30.8	2.5	7.1%
Westdeutsche Landesbank	9.5	29.9	2.4	25.1%
ING Groep	54.3	26.4	2.1	3.9%
Dresdner Bank	18.7	23.2	1.9	9.9%
Fortis	16.4	22.6	1.8	11.0%
Bayerische Landesbank	15.8	22.4	1.8	11.3%
Bayerische Hypo-und Vereinsbank	14.1	22.3	1.8	12.6%
State Street Corporation	24.1	21.9	1.7	7.2%
Crédit Agricole	6.5	19.5	1.6	24.1%
Hypo Real Estate	4.5	18.9	1.5	33.4%
Lloyds Banking Group	6.1	18.8	1.5	24.6%
Countrywide Financial Corporation	25.2	18.3	1.5	5.8%
GMAC	15.4	17.5	1.4	9.1%
Royal Bank of Scotland	75.2	15.8	1.3	1.7%
Royal Bank of Canada	52.3	15.6	1.2	2.4%
Bear Stearns Companies	19.1	13.8	1.1	5.8%
KBC Group	22.9	12.6	1	4.4%
Sachsen Landesbank	1.3	12.5	1	79.9%
BNP Paribas	62.3	11.6	0.9	1.5%
Bank of Montreal	45.3	11.5	0.9	2.0%
Total	1,124.0	861.5	68.9	6.1%

Appendix: Variable definitions

This appendix defines the variables used throughout the paper

Variable	Definition	Source
Conduit exposure (total)	Total ABCP outstanding divided by equity	Moody's, Bankscope
Conduit exposure (liquidity)	Total ABCP sponsored with liquidity guarantees divided by equity	Moody's, Bankscope
Conduit exposure (credit)	Total ABCP sponsored with credit guarantees divided by equity	Moody's, Bankscope
Assets	Total bank assets	Bankscope
Equity	Total bank equity	Bankscope
Leverage ratio	Equity divided by assets	Bankscope
Tier 1 ratio	Regulatory capital ratio	Bankscope
Return on assets	Net profit divided by assets	Bankscope
Share short-term debt	Short-term debt divided by assets	Bankscope
Share deposits	Deposits divided by assets	Bankscope
Share loans	Loans divided by assets	Bankscope
Spread	Overnight return on ABCP minus Fed Funds rate (annualized)	DTCC
Outstanding	ABCP outstanding	DTCC
Credit	Indicator variable for whether conduit has credit guarantee	Moody's
Extendible	Indicator variable for whether conduit has extendible guarantee	Moody's
SIV	Indicator variable for whether conduit has SIV guarantee	Moody's
Receivables	Indicator variable for whether conduit assets are primarily receivables	Moody's
Loans	Indicator variable for whether conduit assets are primarily loans	Moody's
Asset-backed securities (ABS)	Indicator variable for whether conduit assets are primarily ABS	Moody's
Mixed	Indicator variable for whether conduit assets are mixed	Moody's
Bank	Indicator variable for whether conduit sponsor is a bank	Moody's
Mortgage	Indicator variable for whether conduit sponsor is a mortgage originator	Moody's
Stock return	Equity return	Datastream