Who Ran on Repo?

By GARY B. GORTON, ANDREW METRICK, CHASE P. ROSS*

Repo finance is a multi-trillion dollar market that plays a central role in the modern financial system.1 From the second quarter of 2007 to the first quarter of 2009, net repo financing provided to U.S. banks and broker-dealers fell by $914 billion—more than half of its pre-crisis total. We argue in a series of papers that this “run on repo” played a crucial role in the recent financial crisis.2

Significant details of this run remain shrouded, however, because many of the providers of repo finance are unregulated cash pools. In this paper, we provide an updated picture of the dynamics of the repo run by supplementing the best available official data sources with a unique market survey and data from the footnotes of public companies’ filings. We provide evidence that the flight of foreign financial institutions, domestic and offshore hedge funds, and other unregulated cash pools predominantly drove the run on repo. Our analysis highlights the danger of relying exclusively on data from regulated institutions, which would miss the most important parts of the run.

There are two repo markets: “tri-party repo” and “bilateral repo.” Reliable data is available for only tri-party. In tri-party repo, a clearing bank stands between borrowers and lenders. Regulated institutions dominate tri-party repo, and thus the data on tri-party repo is relatively complete. However, accounting rules allow netting of offsetting repo liabilities and repo assets under certain conditions; ignoring offset repo risks underestimating the actual size of repo.

Unlike tri-party, bilateral repo is the home of hedge funds, many types of offshore institutions, and other unregulated cash pools. The data gap between tri-party and bilateral repo markets is significant; a 2005 survey by the Bond Market Association finds bilateral repo three times as large as tri-party repo in 2004.

Since the financial crisis, there have been several proposals for reform of repo markets and a nascent debate about the role of repo in the financial system. The most related paper to ours is Krishnamurthy, Nagel and Orlov (2014), who perform a detailed analysis of the tri-party and securities-lending market focused on money-market mutual funds. They analyze the same raw data used in the Flow-of-Funds and find only a small run by money-market funds on repo during the crisis. Based on this evidence, they conclude the run on repo was not central to the financial crisis. The evidence in our paper shows that this conclusion is premature, as it ignores the role of non-reporting institutions. Since money-market mutual funds make up only about two percent of the bilateral market, and the bilateral market is the main contributor to the $569 billion of statistical discrepancy that disappeared during the crisis, it is not possible to draw conclusions about the repo run by focusing only on money-market mutual funds and other regulated institutions.

I. Flow-of-Funds Evidence

Table L.207 in the Flow-of-Funds combines all the primary sources for tri-party repo with the available sources for bilateral repo. The Flow-of-Funds data on total repo liabilities is relatively complete, even for bilateral repo, because the borrowers are mostly banks and broker-dealers. The online appendix summarizes the sources used for each category in L.207. In contrast, the lenders come from both regulated

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1 A repo contract is an arrangement in which one party, the lender, provides cash to the other party, the borrower. The contract is collateralized and often overnight. The borrower (often a bank) provides collateral with a market value equal to or greater than the amount of cash the depositor provides. Gorton and Metrick (2012) describes repo contracts in detail.


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and unregulated sectors, so that the official totals for liabilities (borrowers) typically exceed those for assets (lenders), often by a significant amount, resulting in a meaningful “statistical discrepancy.” The statistical discrepancy was the single largest repo lender on the eve of the crisis, with a $632 billion difference between reported assets and liabilities. Over the subsequent seven quarters, this discrepancy completely disappeared. A first-order—albeit unsatisfying—answer to “who ran on repo?” is that “the statistical discrepancy ran on repo.” Discrepancy aside, there are several notable facts revealed by the Flow-of-Funds.

The largest repo borrowers are banks and broker-dealers. Figure 1 plots the combined net repo liabilities for the two groups since 1990. After growing at a steady rate beginning in the 1990s, financing exceeded $1.8 trillion by the eve of the crisis in the second quarter of 2007. During this buildup, broker-dealers became especially reliant on repo, with approximately 50 percent of their assets funded through these markets. Repo finance to broker-dealers and banks then fell over the next two years, reaching a local minimum below $900 billion in the first quarter of 2009.

Of the remaining categories, the two most significant are rest-of-world (ROW) at $519 billion and money-market mutual funds (MMFs) at $435 billion. MMFs are the leading domestic repo funders, with such funding taking place almost exclusively in the tri-party market. The ultimate source of ROW data in the Flow-of-Funds is the Treasury International Capital System, which is itself compiled from a variety of sources. As with other parts of the Flow-of-Funds, the ROW data necessarily relies on regulatory filings, and will not capture information from unregulated capital pools: any missing data from ROW will end up in the discrepancy. Combined, “discrepancy,” MMFs, and ROW constitute about 80 percent of net repo funding sources in 2007Q2.

The last column in Table 1 shows analogous information from 2009Q1. The three main categories all show striking changes. The discrepancy fell 90 percent to $63 billion: Half a trillion dollars of financing from non-reporting sources disappeared during the financial crisis. ROW also experienced a substantial reduction, dropping from $519 billion in 2007Q2 to $53 billion in 2009Q1. The drop represents only the reporting component of the ROW, with any non-reporting capital pools—both foreign and domestic—swept into the discrepancy.

Table 1 shows the primary holders of repo assets in 2007Q2, just before the first panic phase of the financial crisis, and in 2009Q1, after the worst part of the post-Lehman panic phase ended. In 2007Q2, the largest category is the “statistical discrepancy,” with $632 billion.

**Table 1—Net Repo Funding Sources**

<table>
<thead>
<tr>
<th></th>
<th>2007Q2</th>
<th>2009Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrepancy</td>
<td>632</td>
<td>63</td>
</tr>
<tr>
<td>Rest-of-World</td>
<td>519</td>
<td>53</td>
</tr>
<tr>
<td>MMF</td>
<td>435</td>
<td>578</td>
</tr>
<tr>
<td>Municipal</td>
<td>148</td>
<td>125</td>
</tr>
<tr>
<td>GSE</td>
<td>145</td>
<td>159</td>
</tr>
<tr>
<td>Other MF</td>
<td>43</td>
<td>24</td>
</tr>
<tr>
<td>Corporate</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Pension</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Holding/Funding</td>
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<td>28</td>
</tr>
<tr>
<td>Insurance</td>
<td>-12</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>1,926</td>
<td>1,049</td>
</tr>
</tbody>
</table>

*Note:* Net repo funding is equal to repo assets less repo liabilities. MMF is money-market funds; Municipal is state and local governments; GSE is government-sponsored enterprises; other MF is all other mutual funds; pension is private pensions and state and local government defined benefit retirement funds; holding/funding is holding companies and funding corporations. The totals in Table 1 are for all repo assets, and thus do not match the totals in Figure 1 for the liabilities of just banks and broker-dealers.

*Source:* Federal Reserve Flow of Funds Table L.207, as of April 2019.

Table 1 shows the primary holders of repo assets in 2007Q2, just before the first panic phase of the financial crisis, and in 2009Q1, after the worst part of the post-Lehman panic phase ended. In 2007Q2, the largest category is the “statistical discrepancy,” with $632 billion.
In contrast, MMFs increased their repo funding during the panic phases of the financial crises, with $435 billion in 2007Q2 rising to $578 billion in 2009Q1. At first glance, the increased funding from MMFs may appear inconsistent with the near-runs in MMFs themselves following the Lehman bankruptcy in September 2008. A resolution of this puzzle is more straightforward with a more dynamic picture of the repo funding during the crisis.

MMFs increased repo funding from about $200 billion in 2000 to over $400 billion just before the crisis. Then, panics in other short-term debt markets drove MMF dynamics. The first panic, in August 2007, manifested itself most clearly in runs in asset-backed commercial paper (ABCP) markets, as documented by Covitz, Liang and Suarez (2013). As MMFs were significant holders of ABCP, many funds faced pressure to maintain par value, and at least 44 funds received material support from their sponsors. (McCabe, 2010). After that support, MMFs appeared to be havens and received the inflow of cash exiting other short-term investments. Some of that inflow made it into repo. In the panic that followed the Lehman bankruptcy, however, sponsor support was insufficient. When the Reserve Primary Fund “broke the buck” by falling below $1 per share on September 16, only unprecedented government intervention averted an incipient run on MMFs. When this intervention arrived, the MMF industry stabilized with its repo funding still above its 2007Q2 levels.

In addition to the net funding losses coming from the ROW and the discrepancy, repo markets also suffered substantial reductions in gross interdealer funding. The left panel of Figure 2 shows both repo assets and repo liabilities for broker-dealers. Repo liabilities peaked over $3.1 trillion in 2007Q3 and stayed around that threshold for the next four quarters before falling steadily during the crisis to $1.8 trillion in 2009Q4. At the same time, repo assets also dropped. These dynamics are consistent with an initial shift from unsecured funding (e.g., commercial paper) to repo funding in interdealer markets following the first panic in August 2007, with even secured repo funding facing a run after Lehman.

The Flow-of-Funds does not, however, represent the total volume of repo lending and borrowing even for regulated sectors. Accounting rules let companies offset repo borrowing and lending (and other collateralized transactions) when the transactions are with the same counterparty, subject to a master netting agreement, and settle on the same day.\(^3\) Netting does not require the collateral underlying offsetting transactions to be the same or otherwise similar.

To understand the magnitude of this netting, we collect data from six large broker-dealers’ and banks’ quarterly filings.\(^4\) Companies report the total value of the collateral they received which they rep pled, along with the value of their own financial assets pledged in a footnote. The sum of these measures is the total instruments pledged, which we compare against the repo liabilities reported on the 10-Qs for the same six companies on the right panel of Figure 2. Other forms of collateralized lending, collateral received due to derivatives trading, and the allowable netting mentioned above explain the difference between total instruments pledged and the balance-sheet-reported repo liabilities.

Beyond the lack of data for unregulated capital pools, the large gap between instruments pledged and repo liabilities highlight limitations of the Flow-of-Funds data. First, Table L.207 does not include other forms of collateralized financing which are conceptually and legally similar to repo: securities lending, for example. Second, gross repo numbers in the Flow-of-Funds are lower than the actual gross numbers due to individual companies’ netting of offsetting positions. The magnitude of gross repo liabilities—before taking out offsetting transactions—better reflects the true extent of the financial system’s use of repo. The magnitude of offsetting transactions may be particularly important when different types of collateral underlie the offsetting transactions.

Gross volumes matter because the legs of offsetting repo transactions are linked. Broker-dealers’ largest use of repo is in their so-called matched book, where a broker-dealer enters into two offsetting repos (one an asset, the other a...
liability) by borrowing a security from counterparty A, pledging the collateral to counterparty B, and returning B’s cash to A. So long as these two legs meet the criteria mentioned, they can offset each other and will not appear on the broker-dealer’s balance sheet. Should the cash lender stop rolling the repo—or more likely, should the cash lender raise the haircut on their leg—the broker-dealer needs to find additional collateral elsewhere. It can be costly to find or finance additional collateral, especially when haircuts rise. The gross volume of the matched book better reflects the degree to which broker-dealers intermediate, even though the transactions do not appear on balance sheet, and therefore do not appear in the Flow-of-Funds.

The Flow-of-Funds data shows a significant drop in repo funding to banks and broker-dealers during the financial crisis. The drop was rapid, with net funding to banks and broker-dealers falling from $1.8 trillion in 2007Q2 to $900 billion in 2009Q1. Broker-dealers also contributed to the run on liabilities by withdrawing funding themselves. Although it is washed out in the net funding numbers, broker-dealers reduced both gross repo assets and gross repo liabilities, with the former dropping by about $490 billion just in 2008Q3, the quarter of the Lehman failure. Notwithstanding the large drops in reported repo funding from the institutions reporting in these categories, the most significant drop occurred for non-reporting cash pools. These pools end up as part of the statistical discrepancy in the Flow-of-Funds accounts, which saw a drop of about $570 billion from 2007Q2 to 2009Q1. These non-reporting pools could be both foreign and domestic, and it is necessary to turn to non-official sources to get some sense of the composition of these pools.

The difference between balance sheet reported repo liabilities and collateral pledged, although a coarse measure, suggests that the Flow-of-Funds underestimates the contraction in gross repo volumes even for regulated institutions. Across our sample of six broker-dealers and banks, instruments pledged halved between 2007Q2 and 2009Q1, as shown in Figure 2. Balance sheet repo liabilities for the same companies also approximately halved over the same period, but instruments pledged peaked at $4.5 trillion whereas repo liabilities peaked $1.1 trillion. The contraction in instruments pledged was not limited to firms that subsequently went bankrupt or were acquired; instruments pledged by firms that survived the crisis as stand-alone institutions also halved on average. The online appendix includes a figure of company-specific instruments pledged and repo liabilities.
II. Survey Evidence

The Bond Market Association conducted a dealer survey in September 2004 of bilateral repo, tri-party repo, and securities lending and borrowing. Fifteen primary dealers responded. The survey asked major market participants about the identity of their counterparties and provided estimates of market size by counterparty-type. The survey did not distinguish between borrowing and lending and did not reveal the methodology for its market-size estimates, so it is not possible to make a direct comparison to aggregate data in the Flow-of-Funds. Nevertheless, the survey is invaluable for the view it gives into the composition of counterparties, particularly those that do not report through official sources. For our purposes, the key findings from the survey—subject to caveats explained below—are (1) bilateral repo is about three times the size of tri-party repo; (2) money-market mutual funds comprise only about two percent of bilateral repo; and (3) hedge funds and other unregulated capital pools represent a significant fraction of the counterparties to dealers in bilateral repo.

Table 2 reproduces the summary data from the survey. The survey estimates the total market—including bilateral repo, tri-party repo, and securities lending—for secured borrowing at $7.8 trillion in June 2004. We focus on the totals for bilateral and tri-party repo, estimated at $3.9 and $1.4 trillion, respectively. Flow-of-Funds data counts assets and liabilities separately, but the survey does not distinguish between them, and thus the total may include double-counting. Given this limitation, we cannot directly compare the survey aggregates with the Flow-of-Funds. Instead, we focus on the percentages of the total, particularly for the non-dealer categories, where the ratios of borrowing to lending are likely to be similar across counterparties. Under any reasonable assumption for the proportion of borrowing and lending by counterparty, there is significantly more bilateral than tri-party repo. For example, even if there is no double-counting of tri-party repo and full double-counting of bilateral repo, the latter would still be nearly 50 percent larger than the former.

Within bilateral repo, interdealer transactions count for 41 percent of the overall total and about 60 percent of the domestic total. Outside of dealers, the largest category is “Other Investment Managers, Hedge Funds,” with 9 percent of the total. If we also include off-shore hedge funds (8 percent), then more than 17 percent of bilateral repo comes from hedge funds and other unregulated investment managers. These hedge funds may represent a significant component of the statistical discrepancy from the Flow-of-Funds: hedge funds do not report their repo activity, so Table L.207 sweeps their repo activity—as a residual—into the statistical discrepancy.

The other significant categories of bilateral
repo are “Other U.S.” (7 percent) and “Other Non-U.S.” (16 percent). “Other U.S.” represents all domestic counterparties that have been left unspecified by survey respondents. “Other Non-U.S.” is a catch-all category intended to lower the paperwork burden on survey respondents, by asking for less detail in the foreign section than the domestic section. This category includes foreign affiliates, foreign dealers, corporations, insurance companies, and managed funds. In general, most of these capital pools would not be captured in the underlying Flow-of-Funds data, and would also show up as part of the statistical discrepancy.

Overall, 30 percent of total repo—40 percent of bilateral repo—in the survey is hedge funds or “other,” with more than half of this amount coming from foreign sources. Very little—if any—of this amount comes from sources covered in the Flow-of-Funds. For comparison, the statistical discrepancy of $632 billion in the Flow-of-Funds repo data in 2007Q2 is about 13 percent of the total repo liabilities from all sources.

III. Conclusion

This paper analyzes the “run on repo” during the recent financial crisis using data from the Federal Reserve’s Flow-of-Funds, supplemented by companies’ public filings and a unique market survey conducted by the Bond Market Association. Net repo funding sources in the Flow-of-Funds withdrew about $900 billion in funding between 2007Q2 and 2009Q1. The Flow-of-Funds only captures half of the reduction in funding, mainly from the “rest-of-world.” The remaining decline shows up as a reduction in the “statistical discrepancy.” Evidence from the survey suggests that the Flow-of-Funds is missing about 40 percent of the bilateral repo market. This missing data comes predominantly from foreign and domestic hedge funds and other unregulated capital pools. The Flow-of-Funds also excludes offsetting transactions and other repo-like items, such as securities lending. Thus, the $2.7 trillion decline in instruments pledged from 2007Q2 to 2009Q1 for only the six largest broker-dealers and banks is double the fall in Flow-of-Funds banks’ and broker-dealers’ repo liabilities over the same period.

Our analysis demonstrates the danger of relying exclusively on official sources of data for repo markets. While it is tempting to focus where the data is most reliable, such analyses can be misleading. For repo, the tri-party market has the best data, and money-market mutual funds have the most detailed data within tri-party repo. As it turns out, MMFs were not representative during the crisis, with MMFs’ repo assets increasing by a third at the same time that net repo funding nearly halved.

REFERENCES


