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Federal Reserve Bank of New York
Staff Reports

Repo and Securities Lending

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Staff Report no. 529
December 2011

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Repo and Securities Lending

Tobias Adrian, Brian Begalle, Adam Copeland, and Antoine Martin

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Abstract

We provide an overview of the data requirements necessary to monitor repurchase agreements (repos) and securities lending markets for the purposes of informing policymakers and researchers about firm-level and systemic risk. We start by explaining the functioning of these markets, then argue that it is crucial to understand the institutional arrangements. Data collection is currently incomplete. A comprehensive collection should include six characteristics of repo and securities lending trades at the firm level: principal amount, interest rate, collateral type, haircut, tenor, and counterparty.

Key words: systemic risk, repo

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Introduction

The markets for repurchase agreements (repos) and securities lending (sec lending) are part of the collateralized U.S. dollar-denominated money markets. While smaller than other money market instruments, the markets for repos and sec lending are crucial for the trading of fixed income securities and equities.³ Repos are especially important for allowing arbitrage in the Treasury, agency, and agency mortgage-backed securities markets, thus enhancing price discovery and market liquidity. Securities lending markets play crucial roles for allowing shorting, both in fixed income and equity markets. Given the essential role of these markets to the functioning and efficiency of the financial system, it is important to better understand and monitor repo and sec lending.

The main purpose of this paper is to provide an overview of data requirements necessary to monitor repo and sec lending markets, and so inform policymakers and researchers about firm-level and systemic risk. One of the conclusions emerging from the paper is the need to better understand the institutional arrangements in these markets. To that end, we find that existing data sources are incomplete.

More comprehensive data collection is worthwhile to both deepen our understanding of the repo and sec lending markets and also monitor firm-level and systemic risk in these markets. Specifically, we argue that six shared characteristics of repo and sec lending trades need to be collected at the firm level:

1. principal amount,
2. interest rate,
3. collateral type,
4. haircut,
5. tenor, and
6. counterparty.

In addition to the above, we believe there would be value in collecting data at the firm level on the instruments in which securities lending cash collateral is invested. These data would create a complete picture of the repo and sec lending trades in the market, and so allow for a

³ Krishnamurthy, Nagel and Orlov (2011) offer a detailed comparison of these collateralized money markets. See Covitz, Liang and Suarez (2009) for an excellent overview of the market for asset-backed commercial paper, which constitutes another important secured money market.

deeper understanding of the institutional arrangements in these markets, and for accurate measurement of firm-level risk. Further, these data would allow for measures of the interconnectedness of the repo and sec lending markets, which allow for better gauges of the systemic risk in these markets.

Background on repurchase agreements and securities lending

A repurchase agreement is the sale of securities coupled with an agreement to repurchase the securities, at a specified price, at a later date (see Duffie 1996 and Garbade 2006). Sec lending agreements are economically similar to repo agreements.⁴ Both agreements resemble a collateralized loan, but their treatment under the U.S. bankruptcy law is more beneficial to cash lenders: in the event of bankruptcy, cash lenders can typically sell their collateral, rather than be subject to an automatic stay, as would be the case for a collateralized loan.

A repo or sec lending trade consists of six key variables: the size of the transaction, the interest rate, the type of eligible collateral, the haircut, the maturity date, and the counterparties. The haircut corresponds to the difference between the value of the cash and the value of the collateral, and is generally expressed as a percentage. For example, if \$100 of securities collateralizes a loan of \$98, the haircut is 2%. The level of haircut will typically reflect the quality of the collateral but may also vary by counterparty reflecting collateral provider creditworthiness.

Repo and sec lending trades are conducted in over-the-counter markets that intermediate between borrowers and lenders facilitating the exchange of securities and cash.⁵ Given that these are collateralized money markets, each transaction features a collateral provider and a cash lender. The motivation behind a specific repo or sec lending transaction can be either cash or security driven. A cash-driven transaction is one where the collateral provider is seeking to borrow cash, while a security-driven transaction is one where the cash lender is seeking to borrow securities. Among the financial intermediaries that participate in repo and sec lending markets, two sets of institutions are crucial. First, clearing banks and custodial agents are

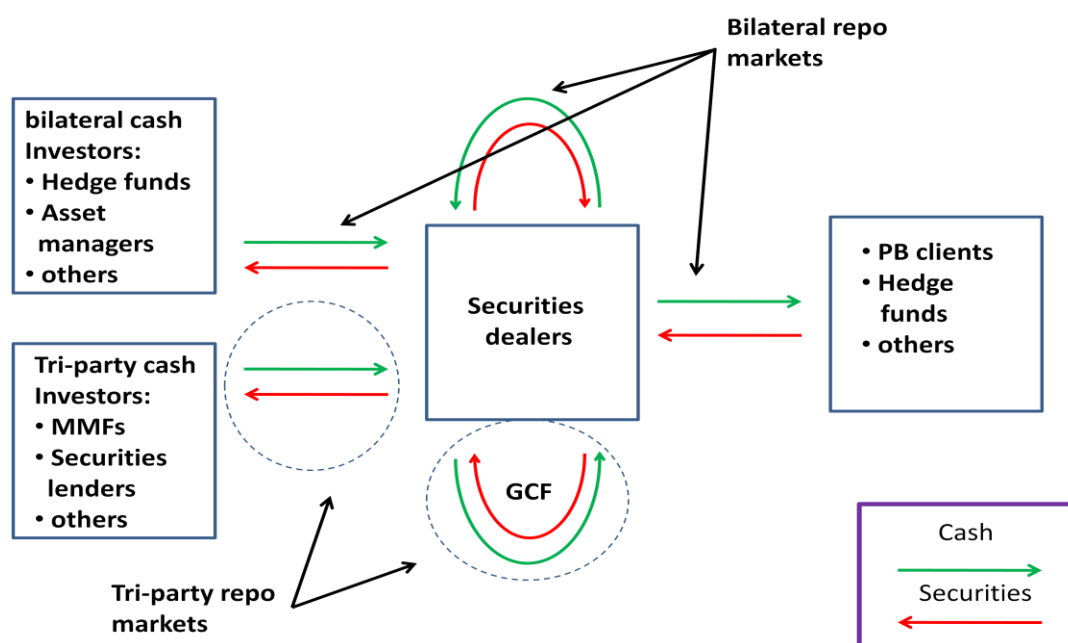
⁴ For a detail comparison of repo and sec lending agreements from a legal perspective see Ruchin (2011). In practice, repos are used more often to finance fixed income securities, while securities lending is used more often to obtain equities.

⁵ Sec lending agreements can accommodate the exchange of securities for securities. In the U.S., however, most sec lending transactions exchange securities and cash. In this article, we focus on this more common case.

primarily involved in the operations of the repo and sec lending markets. Second, security dealers are both lenders and borrowers due to their role as market makers.

A schematic of the US repo markets is provided in Figure 1. It illustrates the extensive intermediation role played by securities dealers. For example, securities dealers intermediate between financial institutions which are long in cash, such as money market mutual funds, corporate treasuries, and custodial agents, and those institutions which are short in cash, such as hedge funds and other dealers. Repo markets are also used to re-allocate securities both among securities dealers (e.g., the GCF repo market) and between securities dealers and hedge funds, asset managers and other financial institutions. The role of the clearing banks is hidden in Figure 1--they provide the operational support for the tri-party repo market (see the next section for details on the tri-party repo market).

Figure 1: U.S. Repo Markets



Source: Copeland, Duffie, Martin, and McLaughlin (2011).

Securities dealers also intermediate in the sec lending markets. In these markets, securities dealers are often borrowing securities from custodial agents and lending these same securities to hedge funds and other financial institutions. Part of the cash collateral that custodial

agents acquire in the sec lending market is typically invested in the repo markets, creating an important link between the sec lending and repo markets. The custodial business is fairly concentrated, with a few large players dominating the market as suppliers of general collateral and specific securities. Consequently, custodial agents are also large cash lenders in the market for repos.

While repo and securities loans may be open or term, most trades are open. An open loan has an overnight tenor, but continues until one of the counterparties decides to cancel it. In particular, if the borrower returns the securities, the lender must return the cash collateral.

The U.S. repo markets

Overview

It is useful to separate two broad classes of repos, distinguished by the way they are settled: bilateral and tri-party. Bilateral repos are repurchase agreements between two institutions where settlement typically occurs on a “delivery versus payment” basis. More specifically, the transfer of the collateral to the cash lender occurs simultaneously with the transfer of the cash to the collateral provider. Hence, the cash lender must have back-office capabilities to receive, track, value, and account for the securities.⁶ In a tri-party repo transaction, a third party provides a suite of collateral management and settlement services, such as settling the repos on its book, valuing the collateral, and making sure that the collateral adheres to the lender’s eligibility requirements. Because settlement occurs on the books of a third party to whom collateral management has been outsourced, the cash lender does not need the back-office capability to take possession of the collateral. Currently, the U.S. tri-party repo market is set-up to facilitate cash-driven repos. In contrast, bilateral repos are used both to obtain specific securities and cash.

The Bilateral Repo Market

The bilateral repo market provides for the exchange of cash and securities directly between collateral and cash providers. Use of this market may be preferable to other repo markets when two parties want to interact directly with each other, rather than through an agent or if specific collateral is desired. Dealers use bilateral repos to provide cash to hedge funds, real estate investment trusts, banks, and other institutions, primarily through their prime brokerage

⁶ The cash lender can also hire its custodial bank to perform these services.

activities. The collateral dealers obtain in this fashion can in some cases be rehypothecated in other repo markets, notably the tri-party repo market, as described below. Bilateral repos are also common in the interdealer market, either as a source of funding or to obtain specific securities.

Dealer often serves as the custodian for its prime brokerage clients. In such cases, they settle bilateral repos through which they provide cash to these clients on their books. Interdealer bilateral repos are typically settled on Fedwire securities or through FICC. One of the benefits of settling with FICC is that the settlement of a dealer's repos, reverse repos, buy-sell transactions, and auction awards are netted (see Garbade and Ingber 2005).

The Tri-party Repo Market

In the US, the tri-party repo market is set up to facilitate cash-driven transactions and serves as a key source of funding for securities dealers. Hence, the main collateral providers in the tri-party repo market are securities dealers and, in particular, primary dealers. Some large hedge funds and other institutions with large portfolios of securities also borrow in the tri-party repo market, but they represent a small share of the total volume.

The cash lenders are more numerous and diverse than collateral providers. There are over 4,000 individual firms active as cash lenders. However, despite this large number, there is some concentration among cash lender types as money market mutual funds represent between a quarter and a third of the cash invested in the tri-party repo market and sec lenders represent an additional quarter of cash invested. Securities lenders use the tri-party repo market to re-invest some of the cash collateral received from lending securities.

In the U.S., the role of the third party in the tri-party market is the tri-party agent, played by the two government securities clearing banks: JPMorgan Chase (JPMC) and the Bank of New York Mellon (BNYM). In addition to the responsibilities described above, current tri-party market practice results in the need for the clearing banks to finance the dealers' securities during the day.

Clearing banks "unwind" the tri-party repo trades each day. The unwind consists of sending cash back to the lenders' cash accounts and the securities back to the collateral providers' securities accounts, respectively, on the balance sheet of the clearing bank. This exchange results in the clearing banks extending intraday credit to the collateral providers, since the securities are no longer financed by the tri-party cash lenders.

The unwind gives collateral providers access to their securities during the day without requiring the clearing banks to invest in systems that can track and substitute collateral that is allocated to a repo. Dealers need access to their securities for their business activities. Using the current infrastructure, it is operationally complicated to substitute collateral in the cash lender's account at the clearing bank, especially for securities that are traded often such as Treasuries.

The GCF Repo® Market

The GCF repo® market is a blind-brokered interdealer market for Fedwire eligible securities where most interdealer repo transactions occur.⁷ Fleming and Garbade (2003) provide an overview of the market. This market is part of the tri-party repo market, as it settles on the books of the clearing banks. FICC guarantees settlement as soon as it receives the data from the broker and compares the transaction.

To participate, dealers must be netting members of FICC's Government Securities Division (GSD). The GCF Repo® service enables dealers to trade general collateral repos, based on rate, term, and underlying product, throughout the day without requiring intra-day, trade-for-trade settlement on a Delivery-versus-Payment (DVP) basis.

The U.S. securities lending market

Overview

In U.S. equity markets, securities lending is primarily driven by the prohibition on “naked” short selling; that is a short sale by an institution that does not borrow the security to make delivery.⁸ The ban on naked short selling creates a role for securities lending, which allows an institution that wants to sell a security short to borrow it.

In U.S. fixed income markets, securities lending is not only used for short selling, but also for other borrowing transactions such as security for security arrangements. An institution may also want to borrow a security for derivative hedges or to avoid “failing” on a delivery.

In the U.S., most securities lending is done against cash collateral. Typically, the lender of a security pays an interest rate to the borrower for the cash collateral. The scarcer the security is, the lower the interest rate paid by the securities lender. In addition to the return potentially

⁷ See http://www.dtcc.com/products/fi/fixed_income_gsd/gcf_repo.php for further information.

⁸ For SEC regulation SHO, see <http://www.sec.gov/divisions/marketreg/mrfaqregsho1204.htm>.

generated through the lending transaction, lenders of securities seek to earn an additional return by investing the cash.

The main lenders of securities are beneficial asset holders, such as pension plans, mutual funds, hedge funds, or insurance companies. These institutions typically own the securities outright and view sec lending as a way to enhance the yield of their security portfolio. Because borrowing securities is mainly used for short selling, derivative hedging, or avoiding fails, the main borrowers are hedge funds, asset managers, option traders, and market makers.

Custodian banks typically provide securities lending services (lending of securities as well as cash collateral reinvestment) to their clients, although some large beneficial asset holders may conduct these activities themselves. There are also some non-custodian third party providers of these services. Prime brokers usually facilitate transactions for borrowers of securities.

Crises in the repurchase and securities lending markets

During the recent financial crisis, both the repo and sec lending markets experienced runs. In this section, we describe what is known about these runs, with the aim of highlighting what additional data is required to better understand them.

U.S. repo markets

Both the bilateral and tri-party repo markets experienced runs, but of different natures. In a repo market, an increase in haircuts can force a borrower to de-lever because a smaller amount of cash is raised with the same amount of securities. Hence, a repo market can experience a run if haircuts for all collateral classes increase by a large amount.⁹ Similarly, an asset class can experience a run if the haircuts for that particular asset class increase. A run on one or several asset classes seems to be what happened on some bilateral repo markets during the crisis.

A different kind of run can occur in a repo market if haircuts do not increase. An institution that relies on a repo market for its funding may be forced into bankruptcy if its creditors refuse to extend repo financing. This seems to be what happened to Bear Stearns and Lehman Brothers in the tri-party repo market during the crisis, as lenders reacted to the creditworthiness of the counterparty as opposed to the quality of the collateral.

⁹ In addition Brunnermeier and Pedersen (2009), Gorton (2010), and Ashcraft, Garleanu and Pedersen (2010) suggest that haircuts are state variables for aggregate economic activity.

Our knowledge of the events in these markets come from recent empirical studies: Gorton and Metrick (forthcoming) analyze haircuts in the bilateral market, Copeland, Martin, and Walker (2010) and Krishnamurthy, Nagel, and Orlov (2011) focus on the haircuts in the tri-party repo market.

These studies suggest that haircuts in the bilateral and triparty markets behaved differently during the crisis. In the bilateral market, Gorton and Metrick show that haircuts increased rapidly, to high levels.¹⁰ Hence, Gorton and Metrick argue that there was a generalized “run” on this repo market that reduced the amount of cash that could be raised by borrowers. Corroborating evidence for Gorton and Metrick’s hypothesis is the high number of hedge fund failures due to margin calls. On July 31, 2007, two hedge funds operated by Bear Stearns filed for bankruptcy protection. Both hedge funds were highly levered mortgage funds that were primarily funded in the repo markets. A closely related bankruptcy occurred on March 5, 2008, when Carlyle Capital Corporation failed to meet margin calls due to increases in repo haircuts. In the fall of 2008, many more hedge funds and shadow banks failed, as they were unable to meet margin calls. These instances are labeled “repo runs” by Gorton and Metrick, though one could alternatively view them as forced deleveraging.¹¹

In contrast, haircuts barely moved in the tri-party repo market, as documented in Copeland, Martin, and Walker (2010). The difference between the haircuts in the bilateral and tri-party repo markets increased during the fall of 2008, peaked sometime in the first half of 2009, and came back close to their level of July 2008 by the beginning of 2010.

This evidence suggests that there was not a generalized run on the tri-party repo market, although Krishnamurthy, Nagel, and Orlov (2011) argue that there was a run on repo backed by non-agency MBS/ABS collateral. However, it appears that Bear Stearns and Lehman Brothers did experience runs and the loss of funding in the tri-party repo market contributed to their difficulties. So in the case of the tri-party repo market, stress seemed to affect specific counterparties, rather than broad collateral classes, perhaps with the exception of non-agency MBS/ABS.

¹⁰ Different counterparties may have faced different haircuts in this market, but data is not available.

¹¹ Adrian and Shin (2010) show that there is generally a close connection between repos and leverage of broker dealers. The increase of haircuts in the bilateral market thus maps into the deleveraging of the broker dealer sector following the Lehman bankruptcy, and the concurrent decline of outstanding repos.

Understanding the differences in the behavior between the bilateral and the tri-party repo markets is important. Rising haircuts, while problematic in their own right, can be viewed as an equilibrating phenomenon (Martin, Skeie, and von Thadden (2010)). Indeed, increasing haircuts reduce the amount of funding borrowers can obtain, but this does not shut them out of the market altogether. In addition, if the increase in margins is gradual, it may give time for institutions to adapt or find other sources of funding. In the tri-party repo market, the reduction in funding was precipitous, leaving little time for the firms to adapt.

Another difference between bilateral and tri-party repo during this time was the creation of the primary dealer credit facility (PDCF) by the Federal Reserve following the Bear Stearns crisis of March 13, 2008 (see Adrian, Burke, and McAndrews 2009). The PDCF was created to backstop the tri-party repo market and set of eligible collateral was broadened over time. The PDCF may have prevented some runs on securities dealers, although it could not prevent the trouble experienced by Lehman.

While the empirical studies discussed above present compelling evidence of the variety of behavior that occurs in repo markets, they also highlight the lack of comprehensive data. Gorton and Metrick (forthcoming) analyze data on one firm's activities in one repo market, and Copeland, Martin, and Walker (2011) describe quantity and haircut data on the tri-party repo market. Krishnamurthy, Nagel, and Orlov (2011) have collected firm-level data on all six elements of the repo transactions, but, as explained in detail later in the paper, these data are limited by their scope and frequency. This lack of data hinders a deep understanding of the drivers behind the different run dynamics observed in repo markets. Furthermore, the lack of data makes it much more difficult to evaluate the effectiveness of policy actions, such as the PDCF.

U.S. securities lending markets

Similar to repo markets, aspects of the securities lending market behaved differently during the recent crisis. As broad deleveraging took place, the degrees of credit risk and liquidity transformation associated with the investment of cash collateral were key to understanding the degree of liquidity stress and associated losses a securities lender might face as it was forced to return cash collateral as its securities were returned.

The crisis surrounding AIG is an illustrative example. Like many other large insurance companies, AIG engaged in securities lending. Before the recent financial crisis, its loans were mostly open and its pool of cash collateral was invested in particularly long-term and illiquid assets. This meant that it was performing considerable liquidity transformation, which can result in liquidity stress. This investment strategy yielded high returns before the crisis; however it contributed to AIG's liquidity squeeze during the crisis. AIG experienced something similar to a run as borrowers of its securities sought to return them, as part of the general market deleveraging that took place. The need to liquidate some illiquid assets to accommodate this return of securities contributed to a sizable share of AIG's losses. Maiden Lane II LLC was created to alleviate capital and liquidity pressures on AIG associated with the securities lending portfolio of several regulated U.S. insurance subsidiaries of AIG.¹²

The Economics of Collateralized Short Term Lending and Data Needs

The runs described in the previous sections suggest that understanding the fragility of repo and securities lending markets requires a good understanding of the institutional arrangements under which these contracts are traded. This means that disaggregated data is particularly useful to understand market participants' reactions under stress.

Liquidity transformation is one of the key functions of financial intermediation. In general, intermediaries tend to be funded with short term debt, and tend to hold longer term, relatively illiquid assets. This liquidity mismatch can give rise to fragility, as was pointed out in the seminal contribution by Diamond and Dybvig (1983). However, the inefficiencies arising in this simple setup can be solved with a variety of policies or financial innovations. More recently, a rapidly growing literature has been focusing on fragility that is arising due to rollover risk (see Acharya, Gale and Yorulmazer (forthcoming); Brunnermeier and Oehmke (2010), and He and Xiong (forthcoming)).

The key concerns related to repos and securities loans described in our examples are associated with the possibility of runs, which arise from liquidity transformation, and their potential spillover, which can occur when institutions are interconnected. This suggests that data about the degree of liquidity transformation being performed, notably the tenor of repos and

¹² See <http://www.newyorkfed.org/markets/maidenlane.html> for more details.

securities loans is particularly important. Information about interconnectedness of market participants engaged in these markets would also be very valuable.

In addition to providing insights about the amount of maturity transformation, information about the tenor of an institution's funding can serve as an early warning system. Difficulty in renewing long-term funding typically signals that an institution is under stress. Longer term funding gives the institution more time to find alternative sources of funding or take other measures to improve its odds of survival. A longer duration maturity profile also gives regulators more time to prepare for a potential rescue of the firm or an orderly unwind.

Repos are an important part, but not the only source, of funding for dealers. Getting a better picture of the various sources of dealer funding, both the markets in which dealers fund themselves and their counterparties in these markets is important for our understanding of the sources of dealer fragility. For example, Duffie (2010) suggests three potential sources of "runs" on dealers: OTC derivative counterparties trying to reduce their exposure to dealers, loss of prime brokerage business, and run on secured financing, including repo.

It is desirable to gauge the availability of different funding sources in times of stress, and to know the extent to which different funding source are substitutable. Understanding the differences in behavior between bilateral and tri-party repos contributes to that knowledge. In addition, understanding the interconnectedness between financial market participants can inform us about the possible propagation of stress through the financial system.

Another potentially interesting source of data is the type of collateral being financed in repo markets. This information may provide some insights into the risk appetite of institutions funding dealers. Changes in the type of assets serving as collateral, or the introduction of new asset classes, can provide insights into the evolution of funding markets.

In addition to this data, information about rates and haircuts would also be useful. In particular, information about interest rates and haircuts faced by a dealer could also be useful given the critical intermediating role they play. Given the differences in behavior observed in the tri-party repo market and in bilateral repo markets, interpreting that data could be difficult. Nevertheless, the data could help understand these markets better and also provide interesting cross-sectional information about different dealers. However, making cross-sectional data public could raise disclosure issues.

Existing Data and Data Gaps

Both repo and sec lending transactions can be fully characterized with six pieces of information: principal, interest rate, collateral, haircut, tenor, and counterparty. For regulatory purposes all six pieces of information are crucial in order to properly gauge systemic and firm-level risk. For example, in response to a rise in the perceived risk of a dealer seeking to finance its securities, cash lenders might ask for higher interest rates, higher quality collateral, increased haircuts, shorter maturities, or all of the above. Because they are heterogeneous, there is no standard response by cash lenders when faced with increased counterparty risk. As such, knowing a financial institution's counterparties is essential to understanding that firm's risk level. Furthermore, counterparty information would allow regulators and researchers to measure the interconnectedness of a repo or sec lending market. An important goal for regulators is to understand how difficulties arising in a firm will impact other firms in the market. This cannot be accomplished without information on counterparties.

There are a number of data sources which provide information on the 6 characteristics of repo and sec lending trades described above. Below we review what types of data on these characteristics are generally available to the public and discuss where more data should be collected.

Interest rates

There are a number of sources which provide average interest rate information on repo or sec lending transactions, conditional on the type of collateral offered and the tenor of the trade. Bloomberg, for example, provides daily averages of interest rates of repos by tenor and collateral type for general collateral repo trades. Data Explorer offers similar average interest rate data based on sec lending transactions.

These public data sources on interest rates are at the aggregate level and so do not provide insight on the interest rates paid by individual firms. But interest rates often reflect the perceived risk level of the financial institution borrowing the cash. As such, we argue that collecting interest rate data for repo and sec lending trades at the firm level is important to understanding the risks in these markets.

A source of firm-level interest rate data are SEC N-Q reports filed by publically traded money market mutual funds. These data are not reported in standardized form, but generally speaking these money market mutual funds report the total value of securities by type which they

have accepted as collateral for repo transactions as well as information on haircuts, maturity, interest rates and counterparties. Hence, these data provide a fairly detailed snapshot of money market mutual fund repo activities. Krishnamurthy, Nagel and Orlov (2011) have started to collect and organize these data for the larger money market mutual funds, focusing on the years encompassing the recent financial crisis. These data are promising because they provide firm-level information on all six characteristics of repo trades. Obtaining these data for all major repo and sec lending firms would provide enough information to accurately measure firm-level and systemic risk in repo and sec lending markets. Unfortunately, these money market mutual fund data are limited by their scope and frequency. Money market mutual funds are a large source of cash in US repo markets, but far from being a majority—for example, they account for one-quarter to one-third of total cash invested in tri-party repo. The snapshots of activity are also fairly infrequent, with new data on a money market mutual fund arriving semiannually. Furthermore, these snapshots may not be representative of their normal activity because these money funds may take into account that their repo transactions will be reported in their SEC reports (i.e., these data may suffer from the window-dressing problem).

Principal and Collateral

There are a number of data sources on the value of securities used in repo and sec lending transactions (i.e., the amount of collateral posted). Once again, Data Explorer offers a wealth of detailed information on the daily quantity of sec lending trades. As with interest rates, these data are only available at the market level, making it difficult to use these data to monitor individual firms.

There is additional data on the value of securities used in repo and sec lending transactions available from regular balance sheet filings with the SEC. Every publicly traded company has to file quarterly 10-Q and annual 10-K reports. For financial institutions that participate in repo and sec lending transactions, the 10-K and 10-Q reports will report those transactions to the extent that they occur on the balance sheet. While the 10-K and 10-Q reports contain balance sheet data at the consolidated holding company level, the SEC also collects balance sheet data on securities dealer subsidiaries. The Flow of Funds relies on these reports in aggregating broker-dealer balance sheet information.

The Federal Reserve form FR2004 assembles information on market activity from primary dealers.¹³ Primary dealers report the total value of securities purchased and sold through repo transactions by asset class. While the dealer-level data are confidential, aggregated information is made available to the public.

A relatively new source of information is provided by the Tri-Party Repo Infrastructure Reform Task Force.¹⁴ The total value of securities by asset class which are posted as collateral in the tri-party repo market on the seventh business day of each month is reported for public consumption. Also reported is the total value of securities by asset class posted in the GCF repo market.

The above data essentially provide snapshots of activity at the aggregate or firm-level. While interesting for some questions, these data are uni-dimensional.

Haircuts

Information on haircuts is limited. Beyond the aforementioned SEC data on money market mutual funds, there is aggregate data on haircuts in the tri-party repo market. Specifically, the Tri-Party Repo Infrastructure Reform Task Force provides information on the distribution of haircuts.

Tenor & Counterparty

As far as we know, the only public source of information on tenor and counterparties is the aforementioned SEC N-Q report data filed by money market mutual funds.

In summary, there are a number of public data sources which provide information on the interest rates and values of securities used in repo and sec lending trades. Much less is known about haircuts, tenor, and counterparties in these markets. Unfortunately, it is often difficult or impossible to piece together the information at the firm level. But we argue this is exactly the information needed to properly assess the risk level of a firm. While the overall amount of repo and sec lending trades of a firm is informative, the term structure of those trades is of first-order

¹³ See http://www.federalreserve.gov/reportforms/reportdetail.cfm?WhichFormId=FR_2004. For more information on primary dealers, see <http://www.newyorkfed.org/markets/primarydealers.html>. Adrian and Fleming (2005) provide an overview of the FR2004 data.

¹⁴ See http://www.newyorkfed.org/tripartyrepo/margin_data.html.

importance when assessing a firm's risk level. Similarly, counterparty, interest rate, and haircut information all significantly impact a firm's risk level. Consequently, it is important to collect this information at the firm level, in a comprehensive fashion.

In addition to the above like data, insight into the use of securities cash collateral provides value. As previously mentioned, in the U.S. market cash collateral is frequently provided against securities lending transactions and that cash is re-invested to earn an additional return. Individual lenders determine the degree of re-investment risk they desire, therefore investments can be across a broad range of instruments of varying credit quality and tenor, so collection of data related to instrument type, credit rating (if applicable) and tenor can help identify the degree to which securities lending cash collateral is supporting other markets as well as the degree of associated risk.

Conclusion

In a recent speech on the "Implications of the Financial Crisis for Economics", Chairman Bernanke distinguished between Economic science, Economic engineering, and Economic management.¹⁵ Specifically, "*Economic science* concerns itself primarily with theoretical and empirical generalizations about the behavior of individuals, institutions, markets, and national economies. Most academic research falls in this category. *Economic engineering* is about the design and analysis of frameworks for achieving specific economic objectives. Examples of such frameworks are the risk-management systems of financial institutions and the financial regulatory systems of the United States and other countries. *Economic management* involves the operation of economic frameworks in real time--for example, in the private sector, the management of complex financial institutions or, in the public sector, the day-to-day supervision of those institutions." He goes on to add that "With that taxonomy in hand, I would argue that the recent financial crisis was more a failure of economic engineering and economic management than of what I have called economic science."

Our argument in this paper is consistent with the Chairman's view and suggests that we need both better data and a better understanding of the institutional arrangements and the economic engineering in which key economic actors operate. The two go hand in hand. Good data helps to illuminate market functioning and can be useful to detect changes in market

¹⁵The speech can be found at <http://www.federalreserve.gov/newsevents/speech/bernanke20100924a.htm>

practices that could increase risk. A good understanding of institutional arrangements may be necessary to make sense of the patterns identified by the data and can suggest the need for new data as market infrastructure evolves.

Better data is particularly important for understanding repo and securities lending markets and monitoring developments that may be indicative of stress. Such early warning signals can be the basis for policy decisions that aim at stabilizing the financial system. These are the money markets at the heart of the market based financial system. While repo markets are primarily enhancing the efficiency of fixed income markets, securities lending markets play central roles for both fixed income and equity markets. Repo and securities lending markets are especially important for allowing arbitrage in the Treasury, agency, and agency MBS markets, thus enhancing price discovery, efficiency, and market liquidity. Securities lending markets play crucial roles for allowing shorting of securities. However, both markets also perform liquidity transformation roles and are thus exposed to the drying up of liquidity. The repo market experienced such liquidity shortages in the week prior to the Bear Stearns crisis, and the securities lending portfolio in Maiden Lane II illustrates the risk in liquidity mismatches of securities lending. The differences in behavior between the tri-party and the bilateral repo market underscore this point. In the bilateral market, stress manifested itself in the form of a large and rapid increase in haircuts, creating a generalized run on the market. In the tri-party repo market, haircut barely moved but some firms experienced dramatic decrease in the amount of financing they obtained in this market. Hence, the structure of each market, and the nature of their participants, appears to have an impact on how stress manifested itself. Understanding these differences remains important.

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