



The Future of Wholesale Funding Markets

A FOCUS ON REPO MARKETS POST U.S. TRI-PARTY REFORM

December 2015



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EXECUTIVE SUMMARY

An efficient and effective wholesale funding marketplace is critical to the proper functioning of the US and global financial system. The Financial Crisis of 2007-2009 (the “Crisis” or “Financial Crisis”) exposed weaknesses in the system, cash providers fundamentally lost confidence in banking organizations (“banks”) and the wholesale funding marketplace essentially collapsed. This, in turn, prompted unprecedented government intervention and the creation of a series of support programs, many of which continue to this day.

The Crisis brought to light unique risks of the excessive use of short term wholesale funding and repurchase agreements or “repo”, in particular, to the financing of bank operations and inventory. In short, a combination of the maturity mismatch (i.e., the liquidity of short term/ overnight funding used to finance longer term assets) endemic to wholesale funding, tri-party repo’s settlement mechanism and high reliance on secured intraday credit created fissures in the system that needed to be addressed in order to return the market to long term stability and lessen the risks of a future crisis. Additionally, money funds tended to regard the repo market as equivalent to a bank deposit from a risk perspective, creating additional issues in times of crisis, including a potential run on the system. Throughout the Crisis, this risk manifested when the threat of several funds “breaking the buck” shattered investor confidence in the money fund market and prompted further government intervention.

As a result of these factors, wholesale funding reforms became a cornerstone of U.S. regulators’ post Crisis efforts to reduce risk in the financial system. Much of the change was channeled through the Tri-party Repo Infrastructure Reform Task Force (the “Task Force”), which drove direct changes to market operations – partially redefining the value propositions of the bilateral and tri-party settlement mechanisms in the process. In April 2015, tri-party infrastructure providers marked the completion of the largest mandate of Tri-party Repo Infrastructure Reform (“Tri-party Reform”) – the “practical elimination” of secured intraday credit.¹ While Tri-party Reform has a further significant outstanding directive – the elimination of fire-sale risk – market participants agree that efforts to date led to a substantial improvement in the safety and soundness of the system.

As the wholesale funding industry marks a turning point, it is our hope that this paper helps preview a period of continued reform and market driven change. We, BNY Mellon, believe that our position as both the U.S.’s largest tri-party agent and holder of collateral gives us a unique perspective on this time of transition. The creation, adoption, and operationalization of regulations has dominated financial literature since the Crisis. In addition to progress made through Tri-party Reform, users of repo – most notably certain Global Systemically Important Banks (G-SIBs) – are working toward compliance with Basel III capital and liquidity measures and have largely reached compliance at the holding company level. It is important to note that this paper’s use of the term G-SIB(s) excludes ourselves and State Street, given the significant differences in business models and relationship with the wholesale funding markets. Continued retrenchment among the majority of G-SIBs is more likely to be driven by internal strategy and capital allocations than by overt regulatory pressure. While regulation and reform are not complete and will likely continue as mainstays of wholesale funding, strong market forces and the underlying structure and profitability of the business will likely begin to affect repo volumes, participant interactions, and views of risks in the system. This leads us to believe that it is time to change the narrative on wholesale funding away from the pure macro effects of reform to include firm specific strategies for implementation and the re-emergence of market driven change.

In creating this paper, we conducted in-depth interviews as well as a broad-based survey, receiving feedback from a comprehensive spectrum of market participants.² We conducted this research not only to understand the current drivers of the use of wholesale funding, but also to explore participants’ points of view and strategies for the future. Total interviews and survey respondents included nearly 100 repo market participants across the spectrum: large dealers with matched books, collateral providers, cash investors, interdealer brokers, and potential cleared repo providers. As a result, we drew three primary conclusions regarding the future of wholesale funding and the use of the repo markets:

1. Adopting the recommendations of the Task Force materially improved the safety and soundness of the system, but further change is yet to come from regulations affecting repo users. 75% of surveyed participants agree that the wholesale funding markets are less vulnerable to a future crisis than before reform.

Tri-party Reform simplified the trading day or processing day, reducing the need for secured intraday credit provided by the clearing banks. Furthermore, Tri-party Reform improved trading transparency and decreased operational risk through process improvements such as automated three-way deal matching. While Tri-party Reform drove direct changes to market operations, pending regulations will likely further affect repo users' behavior, most notably G-SIBs as regulated by the Supplementary Leverage Ratio (SLR)³, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). To become largely compliant, interviewed market participants expect G-SIBs to push the economics of these reforms to individual businesses and trading desks, causing downward pressures on repo activity in the next 12-18 months. Given certain G-SIB's traditional use of tri-party repo to finance their inventories, we expect these downward pressures will likely be reflected through lower overall tri-party volumes, although some new or existing entities less burdened by regulation are providing increased liquidity in the space.

2. Material involvement by the Federal Reserve (the "Fed")⁴ in the repo market is a near certainty for the foreseeable future.

The effort to increase the safety and soundness of the global financial sector has materially increased demand for high quality liquid assets (HQLA). This is because collective actions taken since the Crisis (i.e., the regulatory imperative to clear and collateralize over the counter swaps, the requirement to hold HQLA to meet liquidity standards, and the increased amount of cash in the system due to stimulus) create ongoing concerns around the availability of liquid collateral.⁵ In short, "collateral is the new cash," as HQLA can now be viewed as the financial system's most important commodity. Over 70% of survey respondents agreed that this increased demand will lead to a shortage of HQLA in tri-party repo in the next 12-18 months. To date, the Fed has provided HQLA to support cash investing needs through its Reverse Repurchase (RRP) facility. The RRP is now one of the largest participants in tri-party repo, an effective monetary policy

tool and a buffer to market anomalies. While certain market developments, such as increasing G-SIB repo volumes post the expansion of cleared repo, may provide the Fed with an easy exit from the RRP, interviewees –with near unanimity – feel that conditions will demand its prolonged existence. One such condition is pending Money Market Reform. These reforms, which are expected to be implemented in the second half of 2016, will potentially move up to \$1 trillion of cash from financing prime securities to government securities, in the process exacerbating the concerns around the supply of HQLA and increasing reliance on the RRP.

3. Expanding the availability of cleared repo in the US is the clearest path to giving G-SIBs balance sheet relief and addressing Tri-Party Reform's largest remaining concern – fire sale risk.⁶

77% of our surveyed participants agree on the need for a robust cleared repo solution, but this does not come without challenges. To support this conclusion, we review four relevant points regarding the adoption and evolution of cleared repo: (A) Repo volumes have faced downward pressures since the Crisis, with the prospect of more to come. Given this trend, many interviewed participants see cleared repo as giving some flexibility back into the marketplace. The participation of cash investors in a CCP is also key to increasing the size and scope of netting (i.e. the ability to use offsetting positions to calculate a single balance sheet value⁷) in the U.S. cleared repo market; however, cleared repo providers will need to create the appropriate value proposition to attract involvement from the buy-side. (B) Secondly, a CCP platform would be in the unique position to provide coordination to dealers and other counterparties in both pre and post-default fire sale situations. (C) Additionally, while there is general agreement on the inevitability of expanded cleared repo services in the U.S., key questions remain regarding the potential market structure of the repo industry such as the number of cleared repo platforms that will be offered and what asset classes they will clear. (D) Finally, while Tri-party Reform provided for more efficient movement of cash, we expect the next market evolution to result in a more seamless movement of collateral, culminating with the linkage of international central security depositories (ICSDs) and more integrated global operations of market participants.

The significant structural reform of the repo market is largely complete, and the changes we see on the horizon do not appear to be a continuation of the last six years. The equation facing market participants is now more complicated than that of simply addressing the ongoing requirements of regulation. Understanding and preparing for this more complex future is essential for anyone participating in or affected by the wholesale funding markets. To help participants prepare for what is to come, we developed four priorities in order to be prepared to meet the challenges ahead:

1. Understand the Current Role of Repo in Your Organization.

Perform a company assessment to provide a deep understanding of the nature and profitability/ costs of your repo and wholesale funding activities. From our discussions and survey, we found a high degree of variation regarding the nature, profitability and understanding of the current business. What are your true margins? How important is this business to your current client base? Is there an opportunity for re-pricing current business? Are both your use and mix of wholesale funding appropriate for your underlying business?

2. Analyze the Industry Landscape. Conduct a review of the current regulatory environment, and the structural and competitive forces affecting wholesale funding. Market participants have some clear views on where the marketplace is headed. What is less clear is whether the various scenarios and the timing of those scenarios have been adequately analyzed and modeled. What are some of the key scenarios you should model? What would the impacts be of a significant rate rise? What about a collapse in the Chinese economy and mass selling of Treasuries?

3. Create a Potential Future State around Repo. Revise business and operating models to incorporate expected changes in the repo landscape. The technology and operational requirements of complying with Tri-party Reform have been significant. We, like others in the marketplace, invested significantly in new technology and operational processes. While these investments will be leveraged in the

future market structure, transformation, understanding and incorporation of cleared repo and collateral connectivity into existing roadmaps and strategies will necessitate changes in future plans, budgets and allocation of resources. It will also likely impact current development and architecture activities as well as outsourcing and service contracts with key providers.

4. Achieve a Collateral Management Advantage. Develop a strategic roadmap to better coordinate and improve the uses of collateral across your organization. Many firms have taken important steps to better organize and manage their collateral. This includes improvements in collateral management technology and operational processes as well as organizational changes to efficiently manage the needs of desks that have collateral requirements (e.g., repo, futures, swaps, etc.). Going forward, the location and mobility of collateral will need to be further analyzed and taken into account in terms of cleared repo, custodian and collateral provider selection. This applies to both collateral owners and dealers as well as cleared repo providers.

This is a time of important change in the wholesale funding markets and calibrating your approach to the fundamental shifts in the market will be essential. We hope that this paper provides you with some market insight and understanding as you develop and execute your strategies moving forward. Let us thank PwC for their objective perspectives and contributions to the development of the conclusions within this paper, and we are grateful to our interviewed and surveyed colleagues for their invaluable time and industry perspectives.

We welcome and look forward to receiving your feedback and ideas.



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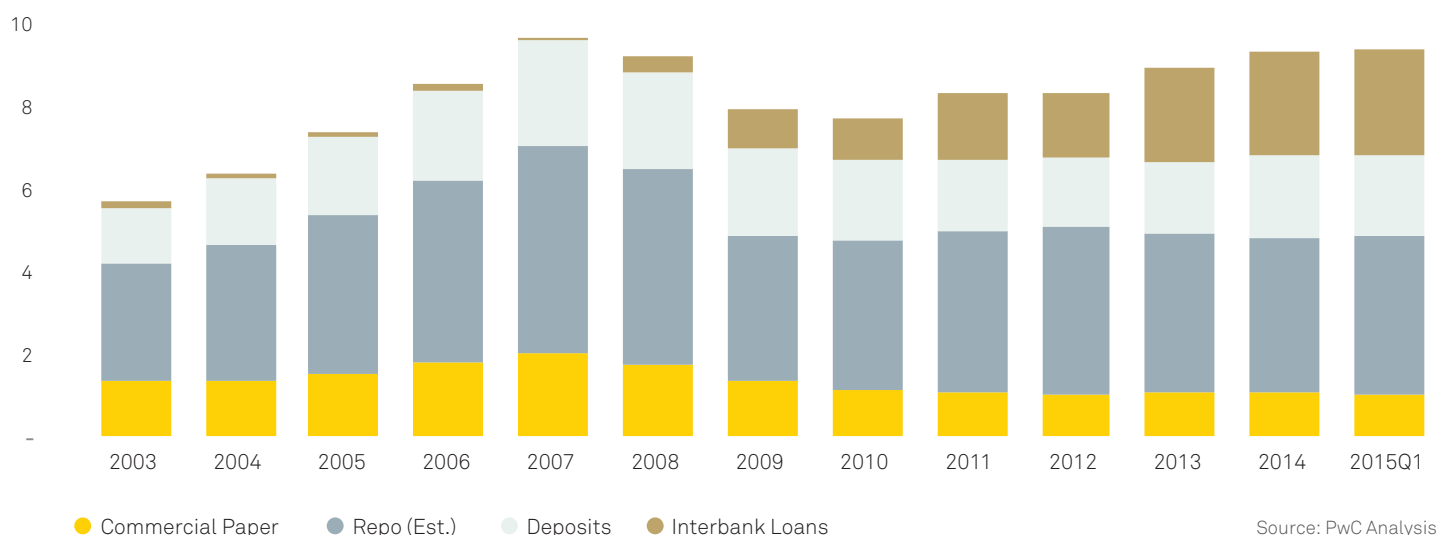
THE RELIANCE ON REPO WITHIN THE WHOLESALE FUNDING MARKETPLACE

Leading up to the Financial Crisis, from 2003-2007, market participants increasingly relied on wholesale funding, as trading expanded from 15% to 22% of industry revenues.⁸ This growth in revenues resulted predominantly from a growth in trading volumes and made the financial system more reliant on short term funding of trading inventories and other assets. Two specific types of wholesale funding – commercial paper (CP) and repo were used to facilitate the increased funding needs of broker dealers and certain other banks.

The Crisis influenced the composition of volumes within wholesale funding. By 2010, CP had declined to half of its previous volume. As money market funds found the asset class more unattractive, and CP issuers found it increasingly difficult to place paper with investors.⁹ Since 2012, volumes have remained constant, but financial CP declined in usage, while nonfinancial issuances helped to stabilize overall volumes

within this asset class. The total CP market was \$987 billion as of June 2015. Large time deposits (including CDs) are near their 2005 levels and comprise roughly \$1.9 trillion as of Q1 2015. Volumes grew consistently over the last three years, with foreign bank holdings accounting for more than U.S. chartered depository institutions. The interbank lending market became an important tool for the Fed to control the excess bank reserves of primary dealers by paying interest on deposits. The Fed's participation drove volumes in the interbank market, which grew from less than \$85 billion in 2007 to over \$2.5 trillion today.¹⁰ Activity in the repo market dropped over 30% in the wake of the Crisis.¹¹ In 2010, total repo volumes stabilized, and repo remains the most material component of the wholesale funding markets (comprising 41%-48% of total volumes over the period). The U.S. repo market, consisting of tri-party, bilateral, and General Collateral Finance (GCF) repo was estimated at \$3.7 trillion as of Q1 2015.¹²

U.S. WHOLESALE FUNDING MARKET (\$T)



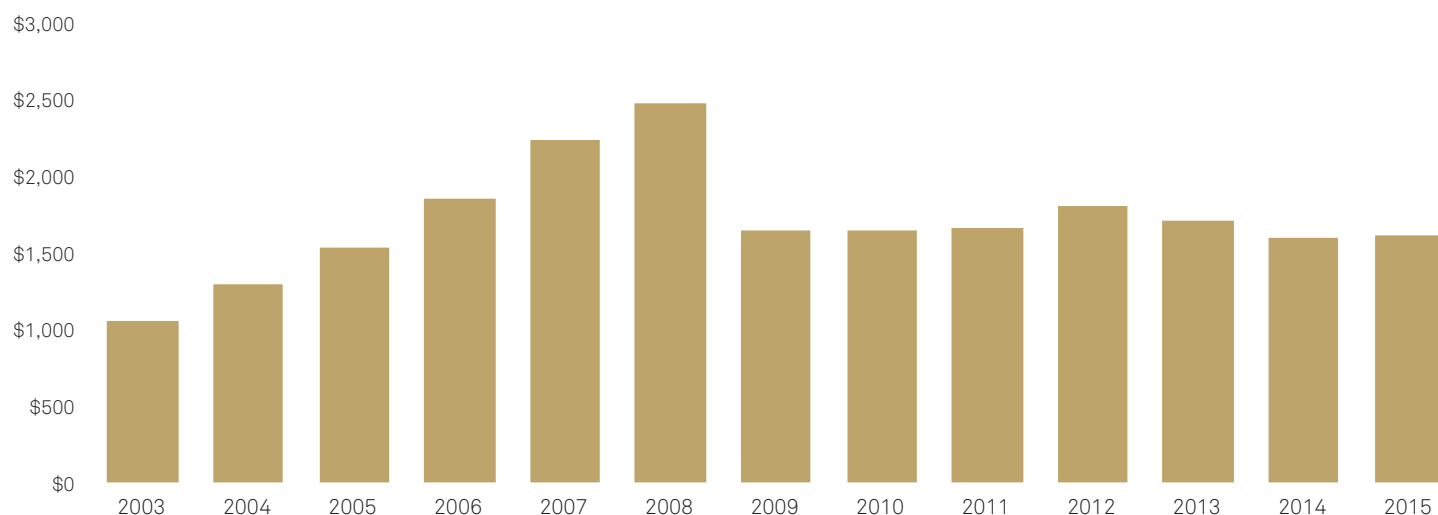
UNCOVERING THE RISKS OF REPO

Going into the Crisis, repo markets were mainly of interest to their participants and the tri-party clearing banks. Primary dealers dominated repo, principally running “matched book” businesses. Leverage in the financial system increased substantially. Additionally, many cash investors were counterparty focused, with less attention paid to the collateral risk they took. In addition to generating direct trading revenues, repo books supported dealer businesses across product areas. Primary dealers provided liquidity to the repo market - acting as buyers and sellers of collateral for clients, who included governments, sovereign wealth funds, money market funds, corporates, and other financial institutions. The large inventories of treasury collateral that dealers acquired assisted with the liquidity of smooth functioning U.S. Treasury markets, contributing to the largest and most liquid bond market in the world.¹³

The increased supply of repo during this period was met by an equivalent increase of demand from cash investors, as bank risks were viewed as well-diversified and investors had little concerns about providing banks with increased leverage. At the height of the market in 2007, repo books ballooned to over an estimated \$5 trillion, with tri-party repo representing nearly half of the volumes. In a Feb '13 speech, NY Fed CEO, William Dudley, succinctly summarized the convergence of supply and demand that drove this volume increase and ultimately made the risks of repo – most notably the mismatch of maturity and liquidity between repo assets and their financing – central to the broader financial community:

“On the demand side, it was more profitable to use shorter-term funds to finance longer-term assets. On the supply side, such funding was plentiful because it was viewed as safe and because of the growing institutionalization of savings with corporations and institutional investors in need of deposit-like products in which to place their cash balances. After all, the funds were only exposed for a short period of time, and in the case of repo, secured by collateral.”¹⁴

AVERAGE ANNUAL TRI-PARTY REPO VOLUMES (\$B), 2003 - AUGUST 2015



Source: Federal Reserve (http://www.newyorkfed.org/banking/tpr_infr_reform_data.html)

Two clearing banks, BNY Mellon and JPMorgan Chase, supported and controlled the most transparent piece of the repo market through the tri-party repo settlement process. Given the more opaque nature of the bilateral repo market, its volumes have been notoriously difficult to measure. Because 100% of tri-party settlements ran through the two banks, tri-party was the most centralized and transparent area for regulator involvement.

In addition, regulators and market participants identified weaknesses in tri-party settlement operations that needed immediate reform. Tri-party agents lacked risk measurements and control over the settlement mechanism they oversaw. For example, the clearing banks often did not know terms for the repos being unwound each day due to the lack of a three-way trade confirmation. Market participants also depended on secured intraday credit extended by the clearing banks for their use of tri-party, so as trades waited to be settled, tri-

party agents extended secured uncapped intraday credit to the counterparties. This left the tri-party agent with secured intraday credit exposure to the broker dealer for 9-10 hours. Hence, the market functioned on, what was referred to by the Federal Reserve Bank of New York (FRBNY) as, an "excessive reliance" on secured intraday credit.¹⁵ As was later realized, the extension of secured credit subjected the clearing banks to risks that could meaningfully impact themselves (due to the significant volumes relative to their own capital bases) and markets in times of stress. That is, if a clearing bank was not able to absorb the impact of a failing dealer or dealers, it would have a knock on effect of the clearing bank requiring intervention or even failing itself. These and other pre-2008 risks of the repo market were identified and addressed by Tri-party Reform.¹⁶

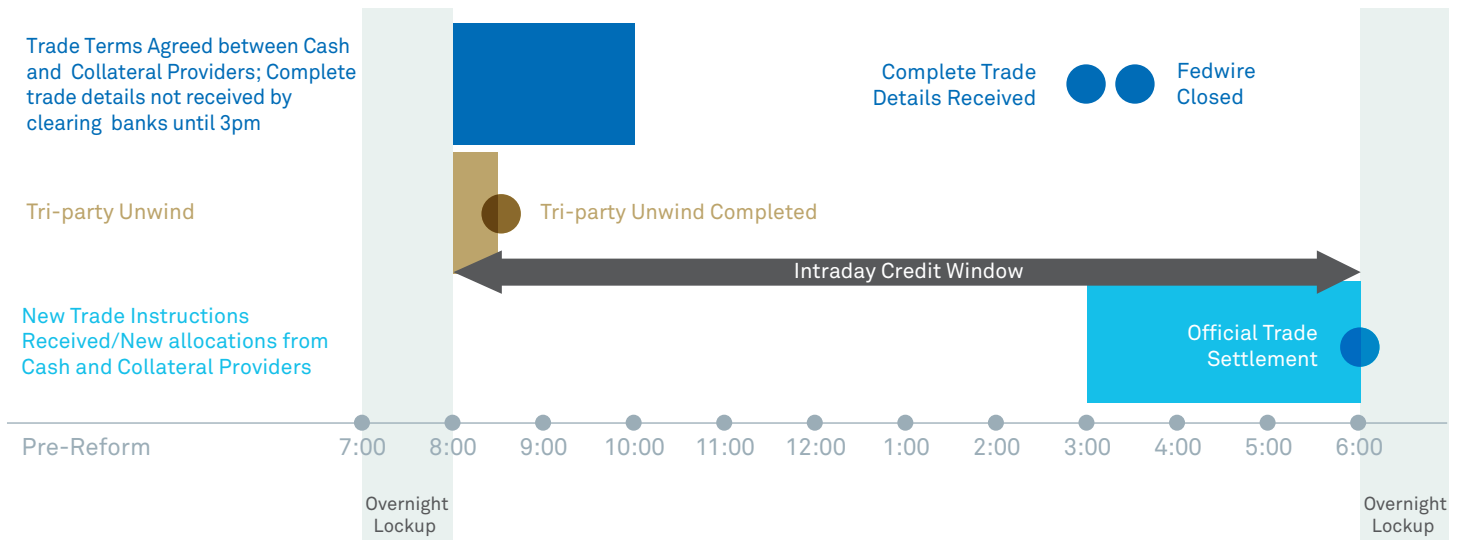
THE TASK FORCE FOR TRI-PARTY REPO INFRASTRUCTURE REFORM

“A stable and well-functioning tri-party repo market is critical to the health and stability of the U.S. financial markets and the U.S. economy.” – FRBNY¹⁷

The tri-party repo market underwent substantial change over the years following the Financial Crisis. At the request of the FRBNY, the Payments Risk Committee (PRC) founded the Task Force in 2009.¹⁸ The Task Force, made up of various market participants from clearing banks and hedge funds to dealers and the SEC, formed a common platform where tri-party market participants and regulators jointly created a set of recommendations to reduce systemic risks in the market. Implementing these recommendations shaped a distinct period in the history of tri-party with clearing banks, cash lenders, and collateral providers coordinating efforts to advance and safeguard the industry.

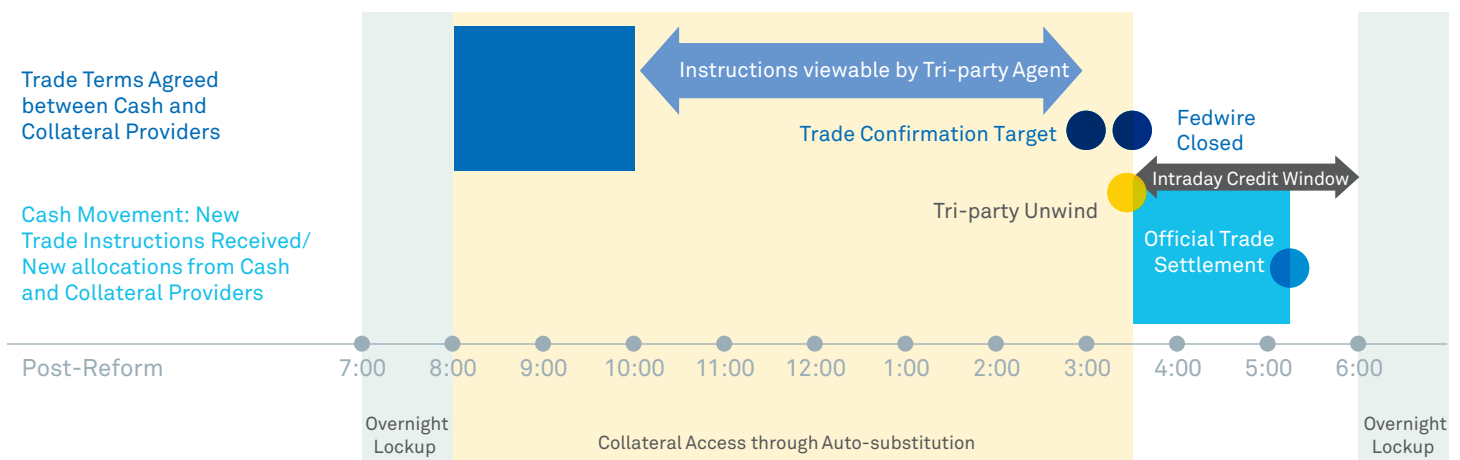
The Task Force identified three primary risks in the tri-party market structure, including: 1) the system’s excessive reliance on secured intraday credit provided by clearing banks; 2) the settlement processes that left credit and liquidity risk largely unknown to collateral providers and cash lenders; and 3) the inability to ensure against a destabilizing fire sale of collateral following a dealers default.¹⁹ Subsequent to this, members of the Task Force published draft recommendations on specific weaknesses within the infrastructure of tri-party repo including: operational arrangements, liquidity management, margining practices, contingency planning and transparency of the market.²⁰ Overall, the Task Force’s recommendations provided the foundation for the “practical elimination” of secured intraday credit – defined as 90% reduction of intraday risk related to tri-party.²¹

Tri-party Reform efforts are best viewed and understood through the changes that occurred in the tri-party trading day including the introduction of automated collateral substitution (auto-substitution) and three-way deal matching as well as the change of the daily unwind time. In the years leading up to 2008, tri-party repo trades unwound at 8:30am and rebooked at 3:30pm. Tri-party agents lacked complete trade details, full legal terms of trades, and certainty around settlement times. In the late afternoon (after the close of the Fedwire) dealers would allocate collateral to trades, using proprietary optimization tools.²² Overnight (ON) from 6:30pm-8:30am, the clearing banks locked collateral in cash investor accounts, prohibiting dealer access. Then, in the morning, the tri-party agent unwound the material balance of tri-party repo trades, regardless of maturity date. Unwinds occurred at 8:30am and secured intraday credit was extended until the completion of the end of day (EOD) settlement process at 6:00pm. This process, for example, exposed [The Bank of New York Mellon] up to 9-10 hours [FN] of credit risk daily (amounting to \$1.44 trillion in secured credit extended daily).²³



Three-way deal matching and auto-substitution provided added value propositions to the market through their efficiencies. Three-way deal matching helped to establish that clearing banks received identical instructions from both dealers and investors prior to settling a tri-party repo trade, providing more transparency to the market and more certainty in settlement. Furthermore, three-way trade confirmation permitted collateral providers and cash investors to submit or confirm tri-party repo

trade instructions with the clearing banks.²⁴ Auto-substitution helped replace the need for a full-scale unwind, enabling cash (or another eligible security) to be replaced in term trades without unwinding the entire trade. Moreover, it allowed the tri-party agent to facilitate the movement of collateral intraday and permitted the agent to keep collateral locked up for the duration of the day.

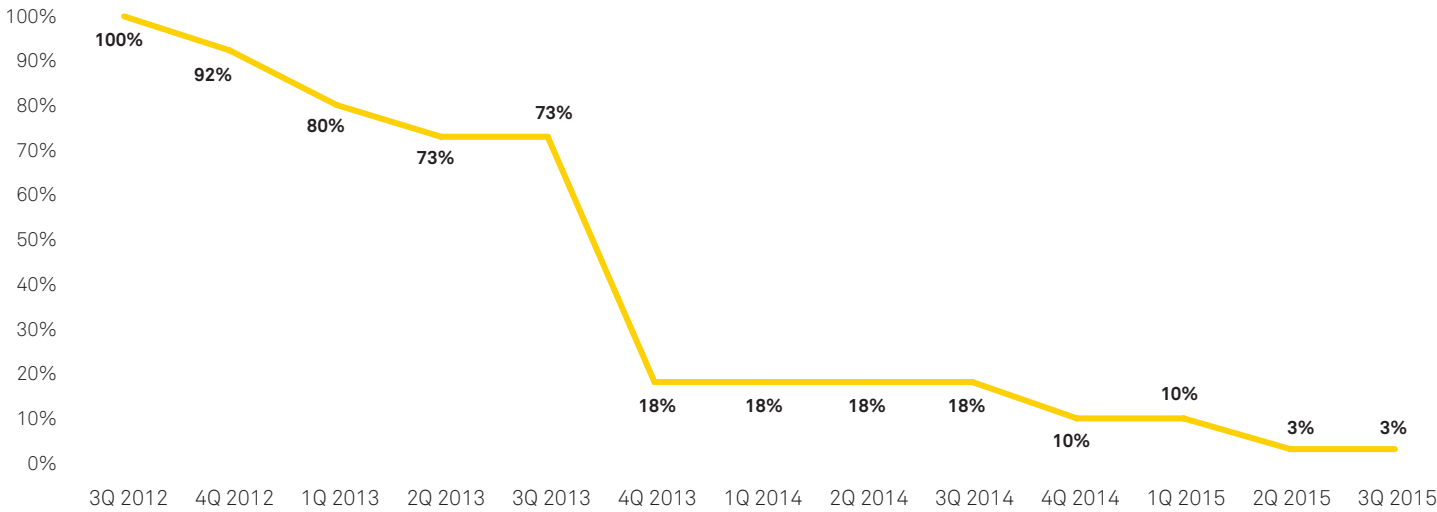


* The industry achieved more than a 95% reduction in intraday credit risk.

Auto-substitution allowed the clearing banks to move the unwind to 3:30pm. A standard settlement window was set from 3:30pm-5:15pm, and cash investors received their cash proceeds later in the day. Dealers could continue to trade securities held in either term or overnight deals, which would not have otherwise unwound until the afternoon. These changes made by clearing banks streamlined and further automated collateral allocation and optimization and also integrated tri-party and GCF settlement processes. Looking at this through

the lens of secured intraday credit risk, tri-party clearing banks previously extended secured intraday credit for 100% of the daily tri-party volumes during the trading day. By moving the unwind of maturing tri-party repo trades to 3:30pm, secured intraday exposure reduced from 10 hours to approximately 2.5 hours. With the completion of improvements to the settlement processes from Tri-party Reform,²⁵ our total volumes of secured intraday credit extended reduced to 3% of all tri-party repo collateral.

INTRADAY CREDIT EXTENDED OF U.S. TRI-PARTY REPO COLLATERAL



Source: FRBNY (www.newyorkfed.org/banking/riskreduction.pdf);
Estimates based on plans or announcements made public by JPMorgan Chase and Bank of New York Mellon. GCF not included.



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CONCLUSIONS FROM RESEARCH

While reform is not complete and will continue as a mainstay of wholesale funding, strong market forces – most notably the post regulatory imperative for cleared repo and the profitability of repo – will likely begin to affect repo volumes, participant interactions, and views of risks in the system. The three primary conclusions drawn from our research support this thesis that repo markets are in a time of transition:

1. Market participants agree that adopting the recommendations of the Task Force materially improved the safety and soundness of the system. Additionally, pending regulations on collateral providers and cash investors – designed to increase safety and soundness of the broader system – will put downward pressure on repo volumes in the near term.
2. Continued high demand for HQLA to meet liquidity ratios and collateralize transactions, implies that “collateral is the new cash.” The combination of this new dynamic – the short term downward pressure on repo volumes and likely developments that will further increase demand for HQLA (such as Money Market Reform) – implies that involvement by the Fed in the repo market, through its RRP facility, is a near certainty for the foreseeable future.
3. Expanding the availability of cleared repo services in the U.S. is the most direct path toward giving G-SIBs balance sheet relief (through netting) and addressing the Tri-party Reform’s remaining concern – fire sale risks. This, coupled with the current development of several cleared repo platforms, leads us to believe that several cleared repo solutions will likely be introduced into the U.S. market in 2016 and at least one will be successfully adopted in the near to medium term.

As we look to the future of U.S. wholesale funding, we expect repo to serve as the circulatory system for broader financial markets who have become increasingly reliant on the smooth transfer of collateral. This section addresses the transformation that is occurring within the industry across reform and regulation, the Fed's involvement in tri-party, and the likely expansion of cleared repo in the U.S. While there is a range of potential outcomes, some scenarios are thought to be more likely than others. We address these and more as we consider the future of the industry.

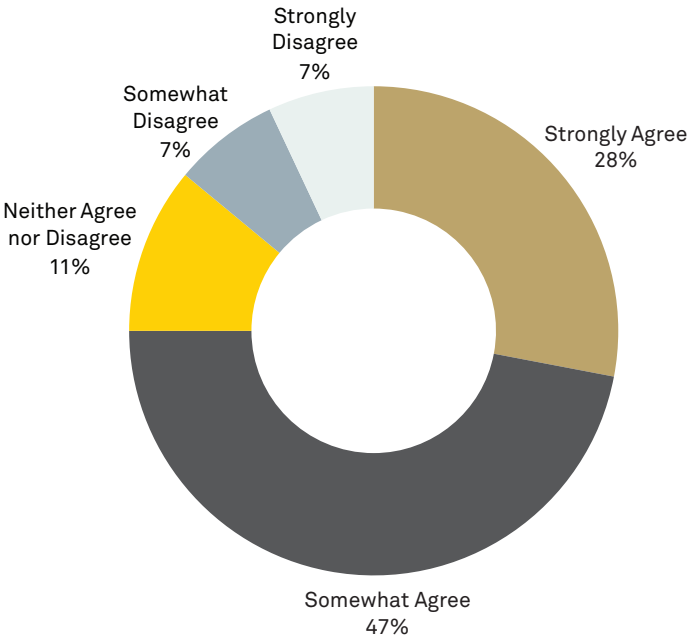
SAFETY & SOUNDNESS

Adopting the recommendations of the Task Force materially improved the safety and soundness of the system. 75% of market participants feel that tri-party repo is less vulnerable to a crisis than before reform. The risk reduction initiative that encompassed tri-party repo took four years. We provided approximately a \$100 million investment in technology to achieve their “practical elimination” of daylight risk.²⁶ This reduced our exposure in the tri-party market from roughly \$1.4 trillion of uncapped daily credit to less than 10% of our total tri-party book. Furthermore, it afforded us the opportunity to develop new and innovative technology solutions for us and

our broker-dealer and investor client base as well as the ability to accommodate any future growth in the repo market. The implementation was a multi-year collaboration with broker dealers, regulators, and institutional investors (among others) and resulted in a more technologically advanced and safer secured funding marketplace where transactions are settled efficiently.

The infrastructure of repo was not the only area of the industry to be impacted by reform. New and pending regulations are affecting both collateral providers and cash investors. The SLR, LCR and NSFR have the effect of applying higher capital requirements to repo transactions, increasing their cost, and pushing more repo out to term. We expect further downward pressure on repo volumes in the next 12-18 months from these regulations as G-SIB's more stringently allocate capital to the business unit level. Additionally, a surcharge on the SLR, the eSLR, disadvantages the largest US banks versus their foreign peers, making repo comparatively more attractive outside the U.S.²⁷ There could be some relief on repo volumes from non G-SIB participants, as they realize opportunities left behind by the larger dealers. Overall, however, we expect the pressures from regulation on G-SIBs to force tri-party volumes to decline, at least in the short term.

As a result of Tri-party Reform, 75% of surveyed market participants view the wholesale funding markets as less vulnerable to a future crisis



A. THE IMPACT OF TRI-PARTY REFORM

Tri-party Reform achieved its goal of the “practical elimination” of secured intraday credit and dramatically improved the tri-party repo settlement processes. Its settlement mechanism has become much more streamlined, tightly controlled, and monitored, largely by the internal risk and compliance checks of the two tri-party agents, JPMorgan Chase and ourselves. In aggregate, Tri-party Reform measures drastically reduced the amount of securities requiring intraday credit and provided the tools to ultimately reduce and cap secured intraday credit usage. The two banks capped dealer credit to less than 10% of their entire tri-party repo book. Additionally, the reduced secured intraday credit time window allowed the banks to review trade confirmations and other parameters ahead of the unwind. Improvements were not only attributable to the tri-party agents, but also improvements provided dealers with new tools and functionality (linked to the systems of tri-party agents). Lastly, the centralization and restructuring of collateral management along with algorithmic improvements facilitated a more efficient allocation of capital and better risk management.

One of the key Tri-party Reform areas of focus – fire sale risk – has not been resolved by actions to date. Surveyed market participants recognized this systemic risk, as 56% agreed this is the biggest outstanding risk to tri-party repo participants. Interviewed market participants reiterated this risk, and many expect a natural mitigant to emerge through cleared repo (discussed in detail in the Inevitability of Cleared Repo Solutions section).

Repo users and providers agree the system is safer, but interviewed participants' thoughts on the effects of reform on the ease of day to day operations were mixed. For collateral providers, collateral is available through the auto-substitution mechanism, which increases collateral liquidity but augments pressure on the collateral management mechanisms for banks and broker dealers. On the cash investor side, cash is not available until the end of day unwind, forcing cash investors to carefully manage their end of day cash movements. These changes also pose a problem for market participants looking to trade across repo markets, as timing schedules, trade pairing and intraday cash movements (e.g., deadlines, timeframes, when money hits an account) differ depending on the particular repo market. For example, although GCF and tri-party repo unwind at 3:30pm, new funding may not occur with GCF until 4:30pm, which leaves a funding gap of one hour. On the positive side, investors are not as exposed to tri-party agents since deals remained locked until 3:30pm. Finally, investors have greater transparency regarding collateral through online reporting and can better specify which collateral they would like for a transaction. Cash and collateral providers improved trade security through deal matching, which helped to establish the correct implementation of trade parameters. Despite the mixed effects on ease of operations, overall interview and survey feedback on the success of reforms was resoundingly favorable with regard to the improved safety and soundness of the tri-party repo settlement mechanism. Finally, surveyed market participants agreed that the top three benefits of Tri-party Reform were: (1) reduced reliance on tri-party clearing bank's secured intraday credit, (2) three-way automated deal matching, and (3) dealer improvements to liquidity risk management and planning.

CASE STUDY: THE EFFECTS OF THE “PRACTICAL ELIMINATION” OF INTRADAY CREDIT

In May 2013, The FRBNY published an analysis on the risk of fire sales in tri-party repo²⁷, which helps demonstrate the material change in safety and soundness of the system brought about by the “practical elimination” of secured intraday credit.

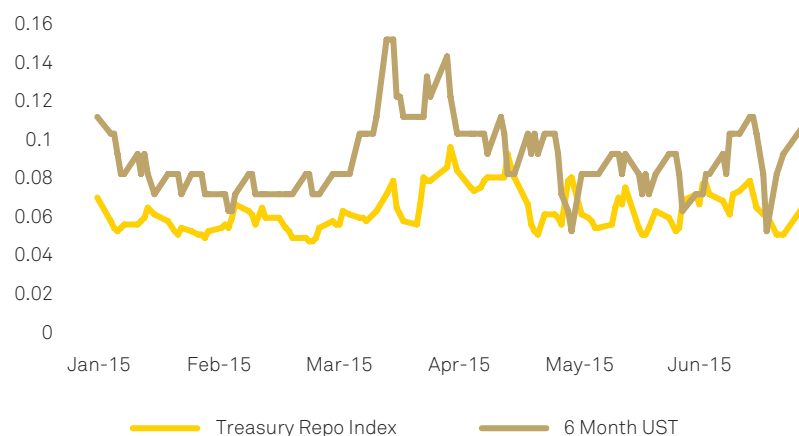
Before the crisis, the largest tri-party portfolios averaged roughly \$200 billion in total exposure (both overnight and term). With the clearing banks extending secured intraday credit for the full value of the portfolio, they would take ownership of the securities after a credit event. The FRBNY estimated an amount of each security class that could be liquidated in a day without depressing the market price and used that amount to calculate the days necessary to liquidate each asset class. Then, applying a historical average volatility, they calculated a 99% confidence interval VaR for a tri-party agent, respective to their largest clients.

In the event of a largest dealer default, uniform application of the 97% reduction in secured intraday credit reduces the \$6 billion expected loss to less than \$200 million. This material benefit raises the question, what were the trade-offs for this increase in security? Did repo become less liquid and/or more expensive as secured intraday credit was removed from the system? BNY Mellon's Repo Index²⁸ (a weighted average of repo rates for the three largest tri-party asset classes) shows a decrease in the spread between U.S. Treasury repo rates and 6 month Treasury bill rates in May 2015, as market participants processed the insecurities created from the implementation of reduced intraday credit and capped dealer credit facilities; however, this spread soon returned to prior norms.

Asset Class	Portfolio Value (B)	Share of Portfolio	Daily Liquidation Amt (M)	Days to Liquidate	99% VaR (M)
U.S. Treasuries & Strips	\$71	35.3%	\$7,500	9	\$679
Agency Debt	\$11	5.3%	\$2,000	3	\$69
Agency MBS and CMO	\$88	44.2%	\$4,000	22	\$2,385
Corporate Bonds	\$7	3.4%	\$250	27	\$627
Equities	\$11	5.5%	\$500	22	\$2,550
ABS	\$4	1.9%	\$125	30	
All other	\$4	4.4%	--	--	
Total	\$200	100.0%			\$6,310

Expected pre-reform loss by a clearing bank after largest dealer default

BNY MELLON TREASURY REPO INDEX VS. 6 MONTH US TREASURY BII



B. REGULATING REPO USERS WITH KEY RATIOS

While addressing fire sale risk is the outstanding material element of Tri-Party Reform, new and pending regulations affecting both collateral providers and cash investors will likely affect repo volumes in the near to medium term. Stemming from Basel III, regulations (most notably SLR, LCR, and NSFR) are leading banks and broker dealers to reduce their balance sheets and streamline operations, which includes optimizing posted collateral and allocating capital more stringently to business lines. On the other hand, small and mid-sized participants could realize opportunities left behind by the larger dealers in the tri-party repo market. This is also likely in the more opaque bilateral market, with over half (53%) of those surveyed seeing greater liquidity coming from this space. We review the main regulations affecting repo users as well as their near term influence on absolute volumes and relative volumes in the following paragraphs.

ABSOLUTE VOLUMES

Regulations and reporting requirements will indirectly force repo volumes to decline in the near term. The impact on G-SIB repo activity is different for each regulation and includes applying leverage-based capital to the balance sheet and off-balance sheet exposures. Hence, more capital will need to be held against repo (SLR), the amount of HQLA held against short term funding will need to increase (LCR), and the cost of short term funding will rise (LCR and NSFR). Each regulation will likely have a negative effect on repo volumes. A summary of these regulations, their expected effects on repo, and their respective implementation schedules can be found in the corresponding table:

Supplementary Leverage Ratio (SLR)

$$\frac{\text{Tier 1 Capital}}{\text{Total Leverage Exposure}}$$

Liquidity Coverage Ratio (LCR)

$$\frac{\text{High Quality Liquid Assets}}{\text{Net Cash Outflow over a 30 day Stress Period}}$$

Net Stable Funding Ratio (NSFR)

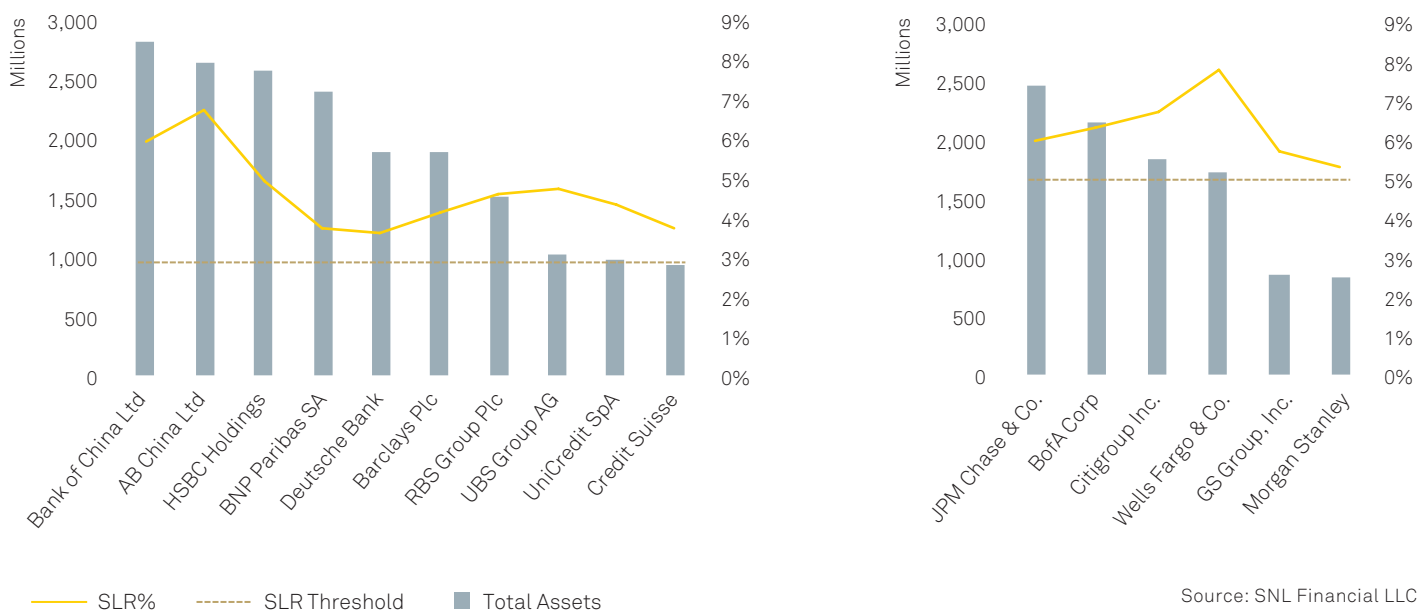
$$\frac{\text{Available Stable Funding}}{\text{Required Stable Funding}}$$

REGULATION	GENERAL EFFECT (G-SIBs)	EFFECT ON REPO	IMPLEMENTATION
SLR	<ul style="list-style-type: none"> – Limits supply of balance sheet – Increases Tier 1 capital – Reduce off-balance sheet exposures – Cost of holding cash becomes more expensive 	<ul style="list-style-type: none"> – Grosses up the balance sheet – Increases capital needed against repo transactions – Likely impacts capital allocated to repo 	<ul style="list-style-type: none"> – 2015, disclosure began – 2018, banks must be compliant to SLR and eSLR
LCR	<ul style="list-style-type: none"> – Increases supply of liquidity to survive a short-term (one month) stress scenario – Requires banks to hold unencumbered HQLA – Cost of holding cash becomes more expensive 	<ul style="list-style-type: none"> – Reduces the supply of HQLA collateral – Limits amount firms can assume as automatic or rollovers – Makes short term funding more expensive due to corresponding HQLA requirement – Pushes repo out from overnight to term 	<ul style="list-style-type: none"> – U.S. banks fully compliant by 2017 – Phase-in transition with 80% by 2015, 90% by 2016, and 100% by 2017
NSFR	<ul style="list-style-type: none"> – Increases supply of liquidity to survive a long-term (one year) scenario 	<ul style="list-style-type: none"> – Pushes repo out to longer term – Increases the cost of repo – Discourages matched books 	<ul style="list-style-type: none"> – Rule has not been proposed in the U.S.; although international standards mandate compliance by 2018

While G-SIBs are making changes to comply with these metrics at the holding company level, their effects on banks and repo users are not fully realized (as illustrated by the SLR graph below detailing requirements and ratios). G-SIB management is currently more focused on retrenchment, efficiency, and competitive advantage than revenue growth. This has led to the development of much more rigorous and accurate capital allocation programs. Compared to other trading desks or products, the post-Crisis economics of repo are difficult to

isolate. As such, it is likely that repo will be subsidized by other desk’s use of bank capital. In addition, the economics of repo as a stand-alone business (i.e., matched books) are not favorable – especially considering the SLR and NSFR. As a previously almost capital free business, repo is specifically affected by the introduction of leverage based capital. While difficult to scope, several interview participants agreed that this will put a downward pressure on their volumes.

Q2 2015 SLR THRESHOLD FOR NON-US BANKS VS. eSLR THRESHOLD FOR U.S. BANKS (TOTAL ASSETS VS. SLR %)



Our analysis focuses on SLR because it most directly affects the economics of repo. 80% of market participants surveyed see the SLR contributing to reduced repo market liquidity. Additionally, the SLR is the most direct driver of capital held against repo positions, and 75% of surveyed participants view capital constraints as the biggest impediment to volume growth and profitability. Declines in G-SIB tri-party volumes (14% decline from 2013 through Q2 2015) directly reflect banks activities to reach SLR compliance, as reduced repo activity is an immediate and effective method for reducing leverage. With banks working toward compliance at the holding company level, we predict that

national/regional SLR implementations will likely affect repo volumes in two ways:

1. Changes to final rules may make the SLR more restrictive. As this paper neared publication, a salient example emerged with Switzerland’s announcement that it will require a 5% SLR for Swiss G-SIBs.²⁹ Repo will most likely see further global volume declines if higher capital thresholds, such as the proposed Swiss or U.S. rules, are put in place. Furthermore, a potentially more material effect would be if national/ regional rules bridge the current gap between the

eSLR, which uses daily average balance sheet reporting, and the SLR, which uses each month end for its quarterly average calculation. In its current state, the SLR allows for quarter end “window dressing” – the elimination of which would create material downward pressure on non-Fed tri-party volumes (10%-15% if uniformly applied outside of the US).

2. Advances in capital allocations will expose repo to the economics of a stand-alone business. Before Basel III, repo was an almost capital free business as the predominance of high quality assets and overnight contracts allocated little risk weighted capital to the business. Post-Crisis, firms have been seeking to understand the economics of their individual businesses (down to the trading desk level) and to more stringently allocate capital than before.

We expect the effects of compliance to be felt in G-SIB operations and further downstream on client's repo volumes. Through the release of specific statements or general presentations, G-SIBs have reported that they are phasing in compliance with LCR. Dealers were also materially compliant with the NSFR as early as 2013,³⁰ despite it being the last of the three ratios to be finalized by the Basel Committee on Banking Supervision (October 2014) and it not yet being proposed in the U.S. The primary effect on repo of LCR and NSFR will be a shift to term, as HQLA and/or dedicated financing must be held against shorter term or riskier repo transactions. We see further nuances in the effects of these ratios as follows:

1. LCR will affect investor cash and costs to the end client.
 - (1) Post-Crisis, firms are increasingly less willing to accept investor cash because of the increased costs of holding it and the difficulty employing it in a low rate environment.³¹ LCR treats cash held by dealers from entities such as alternative asset managers (as opposed to retail deposits)³² more punitively. We expect a continued downward pressure on repo volumes from this requirement; however, effects will be firm-specific and dependent on how the economics of holding cash and executing repo are pushed to the end client.
 - (2) Financing of non-HQLA will be penalized more under LCR than prior regulations. For example, in a repo transaction financing a corporate bond position for 30 days or less, the dealer must also hold HQLA equivalent to the value of the corporate bond being financed.

2. NSFR will push overnight repo to term and increase operational burdens. Short term liabilities will receive a more punitive Available Stable Funding (ASF) score, requiring a longer term funding mix or assets with a less onerous Required Stable Funding rating. In addition to pushing transactions to term, we expect increased operational complexity with repo from NSFR. The RSF metric requires transaction standards to adjust to different counterparties, with financial and non-financial counterparties requiring different treatments. As a result, G-SIBs will need to adapt their operational infrastructure to these counterparty-specific requirements.

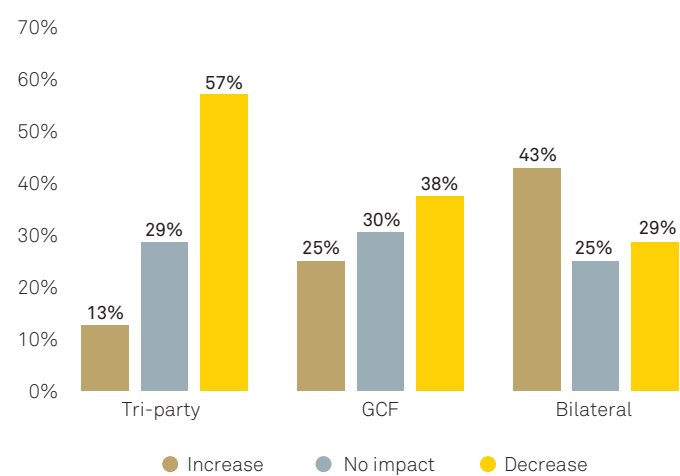
As a result of these and other changes, the vast majority of market participants postulated that non G-SIB dealers may increase trading volumes, filling the gap left by G-SIBs. We reviewed this hypothesis and found that, indeed, non-GSIBs had indeed increased volumes roughly 20% from January 2014 to mid-September 2015. For some perspective, the overall change in volumes was +3%.³³ Non G-SIBs may be subject to domestic regulations (e.g., stressed capital in both the US and Europe); however, they are not covered by the most stringent balance sheet and capital restrictions. This provided an opportunity for non G-SIB participants to take additional volumes.

Other potential regulations affecting repo market participants include the G-SIB surcharge in the United States and counterparty credit limits. The Fed recently finalized the G-SIB surcharge in the U.S. Unlike the Basel Committee's G-SIB surcharge framework, the U.S. rule has an additional factor for reliance on wholesale funding. This wholesale funding factor increases the G-SIB surcharge to 1.0% to 4.5% under the U.S. rules, up from a range of 1.0%-2.5% under the Basel framework.³⁴ Additionally, U.S. regulators are considering counterparty credit limits, which would limit the exposure a dealer can have to a single counterparty or a group of connected counterparties (i.e., restricting how much exposure G-SIBs can have with another dealer). This rule also follows a final Basel Committee framework limiting exposures among counterparties.³⁵

RELATIVE VOLUMES

As repo users can attest, each clearing mechanism has distinct features that provide benefits for specific trading strategies or collateral uses. In the most general sense, tri-party provides operational efficiencies, bilateral offers more bespoke qualities, and GCF provides netting benefits and the ability to face a central counterparty (CCP). Each has compelling value propositions, however, we expect changes in absolute volumes over the next 12-18 months to be unequally distributed between these three markets. G-SIBs are the dominant collateral providers in tri-party, and as such, it is not a surprise that market participants expect the decline in absolute volumes to be caused by retrenchment in tri-party. 57% of surveyed respondents expect tri-party repo volumes to decline in the next 12-18 months. A plurality of respondents (43%) expect an increase in bilateral volumes while GCF repo volume predictions were largely mixed, with 25% of respondents predicting an increase versus 38% for a decrease. In the paragraphs that follow, we explore the rationale behind these expectations in more detail.

EXPECTED CHANGE IN REPO VOLUMES (12-18 MONTHS)



We expect volumes to be more resilient than some believe. Non-U.S. G-SIBs moving to daily average balance sheet reporting for SLR calculations would drive roughly a 15% decline in non-Fed tri-party volumes. However, in the short term, the potential for coordinated regulatory movement (nationally or regionally) seems unlikely. Also, as previously discussed, we expect continued downward pressure on volumes from capital allocations. These pressures on repo volumes are more difficult to scope, as they are more firm specific than national/ regional leverage ratio changes. In aggregate, we expect non-Fed tri-party volumes to not likely decrease by more than the 20% predicted by some.

While repo users recognize downward pressure in tri-party volumes, tri-party repo has advantages and disadvantages, some of which are increasingly notable post Tri-party Reform.

1. Tri-party provides for economies of scale. Once links have been established with a tri-party clearing bank, the infrastructure for tri-party becomes more automated. This automation and economies of scale are more valuable post Tri-party Reform, as collateral optimization across a bank’s portfolio has taken on greater importance to minimize balance sheet and related capital usage.
2. Tri-party allows for auto-substitution. If a security needs to be returned through substitution, only the delivery instruction is required, and the tri-party agent’s system is able to perform the necessary logistics, pulling the security back and substituting it with cash (or another eligible security) without unwinding the trade, which would necessitate additional liquidity.
3. The main disadvantages for tri-party include less control over specific collateral types and rigid adherence to the tri-party settlement schedule. Collateral is given up to the tri-party agent who facilitates the clearing and settlement of the trade. Given the number of CUSIPs that flow through tri-party clearing banks, tri-party repo requires strict schedules in the timing of unwinds and cash payments.

52% of respondents anticipate doing more bilateral business over the next 12-18 months, but volume figures remain infamously opaque.

1. Bilateral is a more bespoke process, providing the ability to choose collateral by CUSIP. Interviewed dealers, specifically, preferred the ability to choose collateral for reverse repo as well as determine haircuts and maturity structures, which can be customized between the two parties. Moreover, our interviews suggested that a material portion of bilateral volume is driven by broker dealers looking for specific securities to close short positions (i.e., “specials”).
2. Bilateral provides more flexibility in the timing of cash flows. The return of cash on the maturity date can be earlier in the day than with tri-party. Thus, if a market participant is time sensitive, bilateral repo would be a preferred option.
3. The disadvantage of bilateral is its significant operational burden. The manual nature of collateral value calculations and cumbersome operational CUSIP identification require significant time and overhead. This manual process makes substitutions more difficult and requires a full unwind of the trade. These disadvantages continue to present a cost to dealers as well as a barrier to entry for some market participants.

Client to client strategies in the bilateral market may eventually disintermediate primary dealers; however, adoption of these strategies has been slow. Thus far, these transactions have only been executed by the most mature market participants.³⁶ Given that most primary dealers typically finance their securities through tri-party, dealer disintermediation would mean a move in relative volumes toward bilateral. However, to date, this trend has been negligible, as sourcing the right collateral and appropriate counterparty has significant hurdles.

Market participants expect GCF volumes to remain flat to moderately down in the short term, with 38% expecting a decline in volumes. GCF repo comprises a small subset of the repo market, as it is a dealer to dealer clearing platform. GCF processes roughly \$200 to \$235 billion of Fed-eligible collateral in net repo transactions daily, placing GCF transactions at 5% of the roughly \$3.7 trillion US repo market.³⁷ GCF volumes dropped nearly 33% over the past 5 years, which we believe is driven by the broader reduction in dealer balance sheets. Similar to tri-party repo, we expect GCF volumes to experience declines, as G-SIB capital constraints further affects their use of repo.

In addition to impacting absolute and relative volumes, post-Crisis, the profitability equation for broker dealers is more complicated as a result of reform and regulation. Specifically for repo transactions, the introduction of leverage based capital (SLR) and liquidity measures (LCR, NSFR) to the profitability/financing equation means that profitability is more nuanced than before reform. For example, increased capital requirements mandate larger capital bases, as these companies become safer, financial markets will likely require lower costs of funding. While Tri-party Reform did not affect capital requirements, it simplified the trading day for repo users by mitigating operational burdens. Increased costs of liquidity, as secured intraday credit was capped, nonetheless, give Tri-party Reform an inconclusive effect on repo user profitability. Despite these nuances, surveyed market participants (56%) agree that repo profitability is under significant pressure from capital constraints.

PROFITABILITY

Regulatory Changes ¹	Capital Requirement	Risk Appetite	Reliance on Wholesale Funding	Cost of Funding	Cost of Operations ²	RoE
Tri-party Reform	=	=	+/-	=	=	+/-
SLR/ eSLR	+	+	=	+/-	=	+/-
Basel III: LCR/ NSFR	+	-	-	+	+/-	-

■ (+) Increasing Effect ■ (-) Decreasing Effect
■ (=) Not Affected (+/-) Affected Inconclusively

Source: "Overview of the potential implications of regulatory measures for banks' business models"; European Banking Authority; 09 Feb 2015 and PwC Analysis³⁸

(1) For costs, a positive sign denotes a decrease (e.g. a lower cost of funding or lower cost of operations), for all others a positive sign denotes an increase in the flow or ratio

(2) Excludes the cost of implementing the regulatory measures

"Requiring that banks hold much higher capital and liquidity and rely less on wholesale short-term debt has raised funding costs. Regulation has also raised the cost of funding inventories through repurchase agreement (repo markets). Thus, regulation may have made market making less attractive to banks."
 - Governor Jerome H. Powell, Federal Reserve Board Governor, August 3, 2015³⁹

THE FED'S RRP FACILITY & THE INCREASED DEMAND FOR HQLA

While there has been a reduction in dealer leverage and collateral provided to the market, the buy-side remains awash with cash after the easing of recent years, creating concerns about the availability of collateral available for repo. The Fed's RRP facility mitigates these concerns by supplying collateral, predominantly to money market funds. Additional reforms, however, affecting cash investors, specifically Money Market Reform, risk disrupting what most feel is a tenuous balance. In this section, we review these important dynamics and expectations for market participants in the near to medium term.

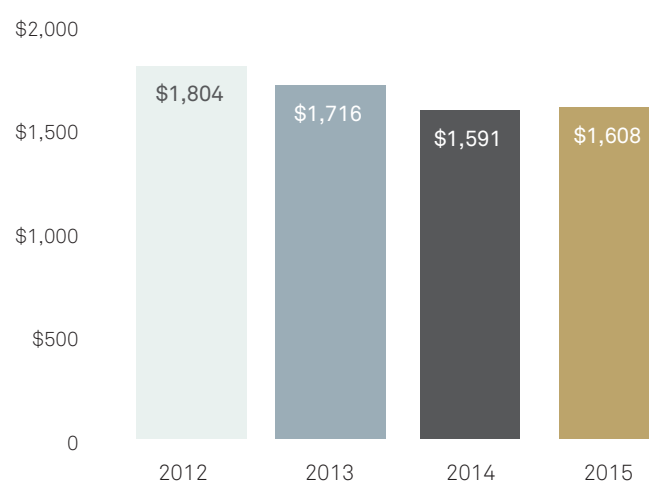
A. THE CASH-COLLATERAL CONCERN

Through the recent past, the Fed intermittently provided a liquidity buffer to tri-party markets. From 2008-2010, the FRBNY established the Primary Dealer Credit Facility (PDCF) and the Term Securities Lending Facility (TSLF) for times of market stress, which served as a cushion to the tri-party repo infrastructure. In this capacity, the Fed was, indeed, the “lender of last resort”⁴⁰ to tri-party repo. Subsequent to the PDCF and TSLF, the Fed’s RRP facility went online in September 2013 “as a supplementary policy tool to help control the federal funds rate.”⁴¹ Since its inception, the RRP has been the most significant change in the mix of tri-party market participants, filling much of the volumes forgone by primary dealers. While repo markets show material declines from 2012-2015 (as G-SIBs prepared for leverage and liquidity ratios), non-Fed tri-party volumes dropped by a larger degree of magnitude with the Fed stepping in to replace lost volumes and control short term rates.

Cash investors, largely buy-side investors, and other approved counterparties (banks, GSEs, etc.) are able to turn to the Fed’s RRP facility, which provides both a return on cash invested and the ability to reverse repo against a zero risk weighted counterparty.⁴² Structured as a daily auction, participants can submit one bid to the FRBNY’s Open Market Trading Desk with a minimum of \$1 million and a maximum of \$30 billion (and an indicative interest rate). Bids are pooled together and interest rates determined by a daily auction, with lower interest rate bids given priority access to the \$300 billion daily pool. Currently, the daily limit is \$300 billion. Additionally, the Federal Open Market Committee (FOMC) uses term RRP operations as an additional supplementary federal funds policy tool, typically at quarter ends. Size limits for term RRP operations are determined on a case by case basis, but have a historical take-up of \$200-250 billion.⁴³

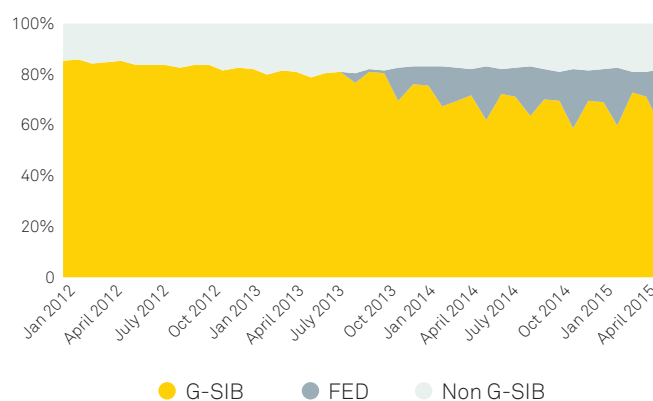
The Fed’s activity in the tri-party repo market increases at quarter ends (both overnight and term) as non-U.S. G-SIBs restrict activity for reporting. While seemingly a nuance in the definition, the Basel III leverage ratio calculates its denominator based on the quarterly average month end totals of on-balance sheet assets. The U.S. eSLR, however, also requires quarterly reporting, but on a daily average basis of on-balance sheet assets, and off-balance sheet items use month end averages. As might be expected, the effect of these different calculations places considerable pressure on the distribution of quarter end collateral. As shown in the graph on page 23, the take up of the Fed’s RRP facility at quarter ends greatly exceeds its intra-quarter volumes.

U.S. TRI-PARTY REPO COLLATERAL VALUE (\$B)



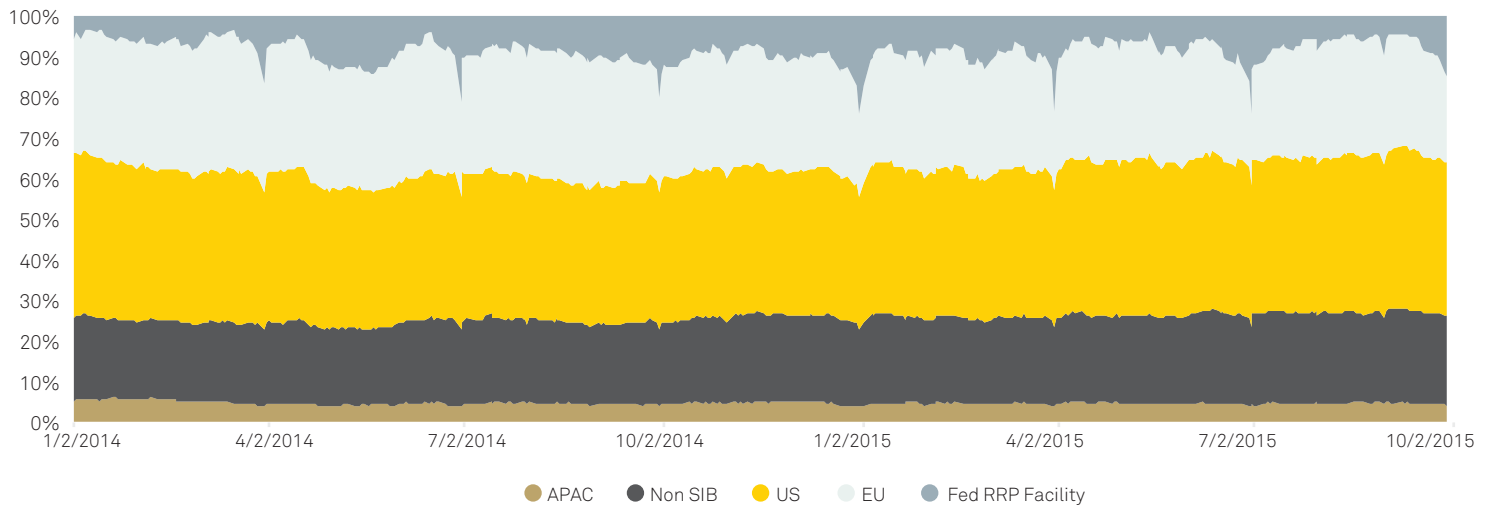
Source: NewYorkFed.org

TRI-PARTY REPO VOLUMES G-SIBS & THE FED VS. NON-GSIBS



Source: BNY Mellon

BNY MELLON DAILY TRI-PARTY VOLUMES BY REGION



Through the RRP facility, the Fed established a tool to manage the short end rate environment. Without the RRP, excess cash would most likely put downward pressure on short term rates, effectively turning rates negative. As the Fed considers its first rate increase since the Crisis, it has stated a desire to raise short term rates while keeping long term rates low, which will likely put increased reliance on the RRP. In June 2015, the Fed announced it would “allow aggregate capacity of the ON RRP facility to be temporarily elevated to support policy implementation and will use other tools, such as term operations, as necessary.”⁴⁴

The Fed’s RRP facility, however, provides more to markets than managing front end rates, it gives the Fed a tool to address the collateral challenge.⁴⁵ Decreases in broker dealer repo volumes, excess cash with the buy side, and Money Market Reform (described in the subsequent section) suggest that the Fed may need to maintain and/ or provide additional collateral to market participants over the short to medium term. The Fed’s current balance sheet is around \$4.5 trillion in assets,⁴⁶ which suggests that the RRP facility could have room to grow.

There is consensus among market participants that the RRP will continue to play a steady role in the market moving forward and could even increase in size. Interviewed repo users believe that short term repo usage and regulatory trends provide little opportunity to wind down the program. In our survey, 56% of participants expect rate normalization to have no impact on tri-party volumes, and roughly a third (35%) expect repo volumes to increase as a result.⁴⁷

B. MONEY MARKETS & THE BIFURCATION OF COLLATERAL

While the majority of post-Crisis press coverage and regulation focused on banking organizations, the Crisis also brought to light risks of the buy-side, which are being addressed by regulators. The most notable illustration of buy-side risks was the \$62 billion Reserve Primary Fund “breaking the buck” (i.e., when its net asset value fell below \$1), and the subsequent run on seemingly safe investments. In 2010, the U.S. Securities and Exchange Commission (SEC) implemented rules for money market funds through Rule 2a-7. Initial SEC rulings required money market funds to reduce the weighted average portfolio maturity to less than 60 days and applied more stringent restrictions on credit rating allocations. In addition, regulation

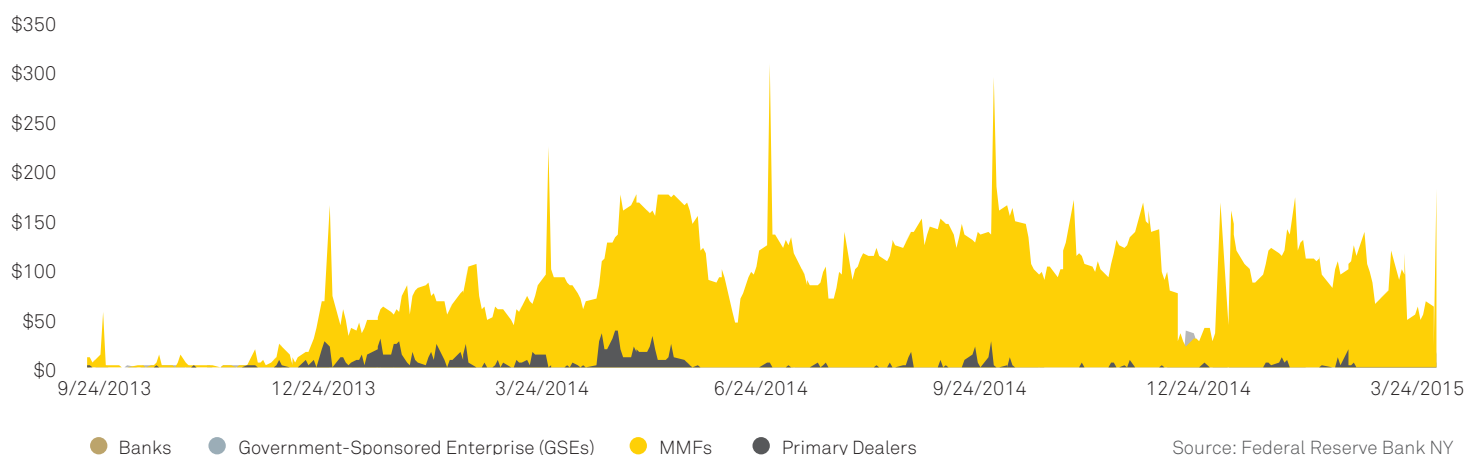
applied daily and weekly mandates on liquidity as well as restrictions on credit terms, diversification of securities, operational enhancements (e.g., stress testing), and reporting requirements. The SEC proposed further amendments in 2014, adopting improvements to Rule 2a-7, which will come into effect in October 2016. These included floating net asset values (NAVs), liquidity fees, and redemption gates. For the repo market, the new definitions for government and institutional prime money market funds will have a fundamental impact on how funds structure themselves and the collateral acquired through repurchase agreements. Government funds will be able to have a stable NAV (as opposed to institutional prime funds that are required to maintain a floating NAV) and will not be subject to liquidity fees and redemption gates. Generally, these terms make government funds more attractive to investors.

Investments currently in institutional prime funds will be re-designated to government funds, bifurcating the market for collateral and creating additional demand for government securities. For cash investors in repo, Money Market Reform will lead to significant changes in the choices fund companies offer. Many fund companies already announced product offerings for new government funds as well as conversions of existing funds from prime to government.⁴⁸ The industry belief is that most institutions would prefer a stable NAV albeit with a lower yield compared to incrementally higher yields and a floating share price. As a result, we expect Rule 2a-7 to remove funding from the market for non-government securities while further saturating the cash supply in government security financing, leading to potential imbalances in both markets. Over half (58%)

of those surveyed see Money Market Reforms decreasing overall liquidity to the market, and 49% believe these reforms have decreased the availability of HQLA. Additionally, some estimate that \$1 trillion in assets could move to government securities.⁴⁹ If migration to government funds becomes significant, then further demand for HQLA may push repo rates negative, making government assistance through the RRP even more imperative to control short end rates.

Money Market funds are already the largest counterparties of the RRP, suggesting that the relationships and infrastructure exist for further reliance as assets shift from prime to government funds. As of Q2 2015, 90% of the take up of bids for the RRP facility came from money market funds. Money market funds seek repo collateral from the RRP, as it is both a sound counterparty for investments and a provider of short term (overnight) liquidity. Many funds require overnight investments to address possible redemption requests and SEC liquidity restrictions; however, their traditional repo counterparties are funding more in term investments to mitigate balance sheet costs and implications of the NSFR. Additionally, money markets can only invest with rated counterparties, which further limits the supply of collateral and number of counterparties available. Over the past couple years, this symbiotic relationship has become more well-established, with the RRP continually adding new reverse repo counterparties. As such, we expect an even greater reliance on the Fed's RRP facility to provide liquidity and a source of portfolio returns as the money market industry takes on reform of its own.

TAKE-UP BY THE FED'S RRP FACILITY (OVERNIGHT)



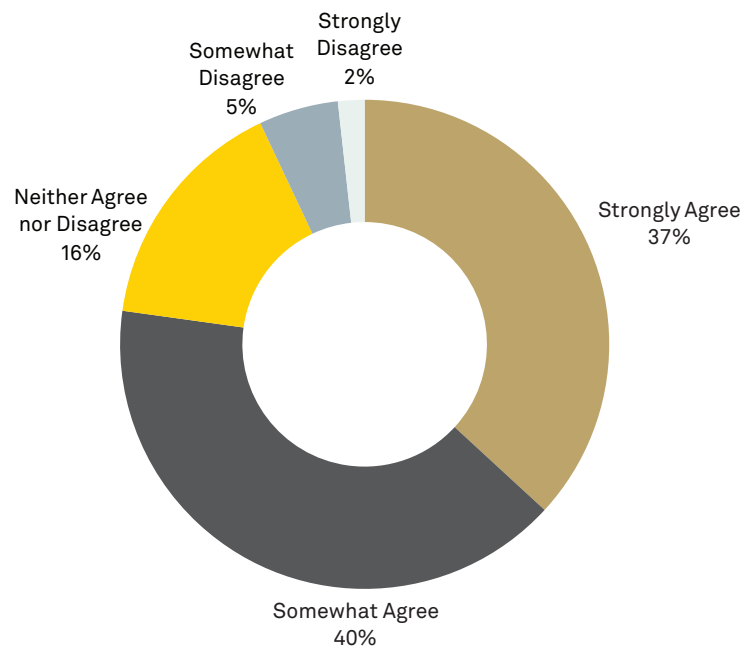
INEVITABILITY OF CLEARED REPO SOLUTIONS

Like most members of the financial community, repo participants are optimistic that post-Crisis challenges are drawing to a close, regulations are nearing complete implementation, and the next wave of industry change will be market driven. As repo market participants emerge with stronger clearing and settlement processes and compliant with the new reforms and regulations, finding ways to increase profitability in the new environment is at the forefront of their agendas. Repo's traditional low risk/ high leverage structure makes change impacting the bottom line most likely to come in the form of a unique cleared repo solution for the U.S. market. G-SIBs look to such a solution as the most likely path to shrink balance sheets, reduce capital, and/ or, perhaps, to increase repo volumes without changing allocated capital. Moreover, in the absence of a clearing solution (and if leverage based capital is directly allocated to the repo desk), interviewed participants

believe that repo rates and spreads will need to increase significantly to make an acceptable return on capital.

The overwhelming majority of market participants interviewed and surveyed (77%) believe the US repo market would benefit from an increased availability of CCP services. With increased balance sheet restrictions, netting has become a significant value proposition for G-SIBs, giving them the ability to reduce exposures and improve portfolio liquidity especially under stress conditions.⁵⁰ Our surveyed market participants provided input on the services of a CCP through their knowledge of the U.S. GCF CCP platform. Netting was favored by a third (33%) of surveyed market participants as the most value added service that a CCP could provide. Additionally, 32% believed an increased participant base would improve the current GCF CCP model. Finally, many also expect a CCP to increase market stability by mitigating fire sales and by offering services such as uniform haircuts and better transparency of price and counterparty exposures.

77% of surveyed participants believe repo market would benefit from an increased availability of CCP services over the next 3-5 years.



Given the needs of the market, a CCP could have been an organic outcome, so why has one not emerged? We see three reasons behind the absence of a CCP in the U.S. market:

1. Lack of incentive for market participants. Before leverage restrictions, there was little opportunity cost associated with expanding balance sheets; hence, dealers lacked acute incentive to seek out relief from netting. Also, post-Crisis, the aforementioned reforms and regulations required the time and resources of the majority of repo participants. Additionally, U.S. buy-side firms are necessary to expand the cash base for a cleared repo solution. Potential cleared repo providers have only recently become amenable to finding solutions for buy-side mutualized loss restrictions.
2. Lack of incentive for cleared repo providers. Launching a cleared repo platform involves a centralization of risks that requires sophisticated understanding and metrics. With high barriers to entry, most institutions lack the regulatory credibility, industry relationships, and risk management capabilities to provide the services needed for cleared repo. Pre-Crisis, the services of a CCP were more of an added benefit, and the substitute of leverage was easily available to market participants.
3. Potentially limited collateral base. To be viable commercial ventures, clearinghouses require standards-based calculations for haircuts and initial margin. Costs may be prohibitively high for cleared repo of less liquid asset classes, as standards based (i.e., VaR) calculations of initial margin could prove uneconomical compared to market based tri-party or bilateral haircuts.

A unique cleared repo solution is a growing industry imperative, leading market participants to search for viable commercial clearinghouse models. Multiple global clearinghouses are exploring models for the U.S. market.⁵¹ Some potential providers are engaging regulators to look at the structure and risk profiles of proposed CCPs, focusing on their ability to withstand a stress event. Costs associated with protecting a CCP from such an event, nevertheless, make this business less economically viable. Specifically, if the costs of contributing to

a default fund outweigh the commercial benefits of netting, the members of a CCP may not be compelled to participate. In the following sections, we explore this as well as the advantages and disadvantages to market participants of a unique cleared repo solution emerging in the U.S. and cleared repo's potential to address fire sale risk. We raise key questions and briefly discuss what the U.S. repo market will look like with a cleared repo solution. Finally, we introduce the concept of "collateral connectivity," which, we believe, will ultimately help the global market resolve its collateral challenges.

A. THE BUY-SIDE IMPERATIVE

The increased importance of cleared repo to the U.S. market centers on the benefits of netting to minimize leverage and capital costs. To expand the pool of available cash, the market needs to develop a cleared solution that allows for both buy and sell-side participation; however, the benefits of netting to the buy-side are not as significant. Buy-side participation is necessary, nonetheless, because the bulk of dealers' repo activities involve supplying collateral to the market. As such, buy-side participation is viewed uniformly by market participants as the logical and intuitive way to expand available liquidity and increase netting.

A CCP structure, however, faces some buy-side challenges: first in attracting participants, then in providing the necessary features to encourage participation. That is, attracting the buy-side requires appropriate value propositions. Principally, propositions include: (1) appropriate risk sharing, (2) increased collateral availability, (3) decreased liquidation risk, and (4) flexibility around timing of cash flows.

1. Appropriate risk sharing. There is little overt economic value to a buy-side firm being a full CCP member given they do not receive the same benefits from netting as G-SIBs. Additionally, many buy-side firms are restricted from participating in mutualized risk models due to covenants. Furthermore, as the provider of cash, the buy-side brings little to no risk to the table compared to a levered collateral provider. Potential solutions involving a tiered membership structure with appropriate risk sharing and limited liability to cash providers would make CCP membership more attractive.

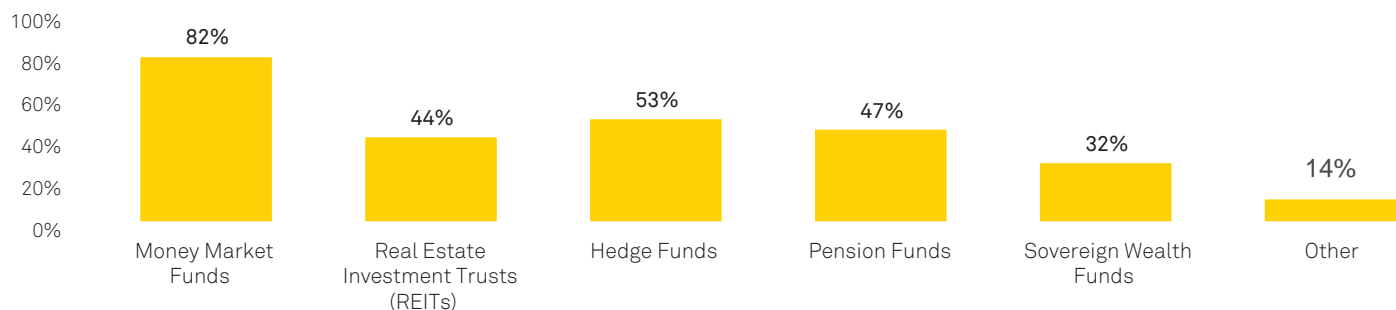
2. Increased collateral availability. Declines in industry leverage have materially reduced collateral available to cash investors (as addressed in the RRP section). Cleared repo has the potential to increase the available collateral through two effects. Firstly, G-SIBs will feel balance sheet relief through netting, which will allow allocated capital to more efficiently support repo volumes. Secondly, an expanded cleared repo offering may attract some traditional bilateral volumes with the ease of sourcing collateral, increasing visibility into collateral in the system.
3. Decreased liquidation risk. A benefit to some buy-side participants is the decreased risk of an immediate liquidation of a large amount of collateral resulting in a fire sale. Other participants, however, would value the opportunity to liquidate collateral in trades given that most repo is high quality collateral that appreciates in crises. Mutual funds rely heavily on providing investors with liquid assets and a stable NAV. Any collateral accepted via reverse repo into a fund's

portfolio would contribute fundamental risk to the portfolio. Hence, mitigating this risk is essential.

4. Flexibility around timing of cash flows. With access to vast amounts of collateral and cash, a CCP could provide more flexibility around timing to cash investors. The importance of the timing of cash flows extends to returning cash to investors.

The unique features of the U.S. market require formal stay provisions. These will likely be necessary to give a CCP adequate time to liquidate trades and return cash to the buy-side. Buy-side funds, however, require highly liquid instruments that must be able to meet withdrawal requests on a daily basis. Extended liquidation periods increase the chance of a run in these markets. As such, initial proposals for formal stays have had lukewarm reception from the buy-side, but shortening the liquidation window is a key – and most feel a surmountable – hurdle for buy-side participation in a CCP.

WHO WOULD YOU EXPECT TO BECOME MEMBERS IN A CCP?



“...82% of surveyed market participants expecting money market funds to become members of a CCP.”

Provisions concerning appropriate risk sharing, specifically via liquidation stays, received resistance from the buy-side and are currently being revisited. Market participants expect cleared repo providers to reach solutions to these issues, with 82% of surveyed market participants expecting money market funds to become members of a CCP.

B. FIRE SALE CONSIDERATIONS

“Current reforms do not address the risk that a dealer’s loss of access to tri-party repo funding could precipitate destabilizing asset fire sales, whether by the dealer itself, or by the dealer’s creditors following a default.” – William C. Dudley, President and Chief Executive Officer of the FRBNY, October 4, 2013⁵²

Fire sale proposals address the mitigation of fire sales both pre and post dealer default. Pre-default fire sales are defined by the FRBNY as a dealer’s “loss of access to secured funding” requiring the dealer to sell assets, while post-default fire sales are defined as the rapid sale of collateral by counterparties following a dealer default.⁵³ Proposals to mitigate fire sale risk pre-default include laddered term funding, which would spread the risk of larger repo transaction out over smaller denominations and set maturity out over consecutive dates. Proposals also include providing for access to both regular and emergency “lending authorities” such as the discount window and the PDCF. Post-default fire sales proposals provide for liquidation rules, sources of liquidity, and allocation of possible losses. While regulators have said that the creation of an entity to provide these services may not be required, we believe a unique cleared repo solution would be in the best position to provide these services to the market.

A cleared repo solution would be in the unique position to provide “collective action”⁵⁴ to dealers and their counterparties in both pre and post-default fire sale situation. Interviewed market participants felt with near unanimity that an expansion of cleared repo in the U.S., if adequately margined and capitalized, would be the most effective way to address fire sale risk. With a focus on collateral, a CCP could address the initial issues related to a fire sale by mediating the preemptive and future risks to the cash lender and collateral provider.

Post-default, a CCP utility would also be in the systemically important position of managing the organized liquidation of collateral of a market participant default as well as absorbing any losses through its waterfall structure. As a member of a CCP, each investor would share in the mutualization of risk and losses and hence, the CCP would act as a liquidity buffer in times of market stress. Through an organized sale of depressed collateral, the CCP would absorb cash investors’ losses and facilitate auto-substitution through a clearing bank into a non-defaulting member’s account. Additionally, this waterfall structure would function through a participant-funded default fund, which would further help to mitigate losses.

Pre and post dealer default terms and “collective action” measures of a clearinghouse is not a *fait accompli*. A cleared repo solution should also require a continuous analysis of the risk of each asset class allowed on the CCP platform. One benefit of the repo market is that it is predominantly comprised of Treasury and agency securities, which are liquid, low risk, and, most importantly, tend to be negatively correlated with other asset classes in times of stress. Thus, incorporating a majority of these assets would not only provide alternative sources of funding or securities to auto-substitute in times of stress, but also they would provide stability to the CCP.

C. POTENTIAL MARKETPLACE STRUCTURE

Infrastructure providers and market participants seek a broad range of solutions from deciding which products and services will initially be launched to how the industry will eventually mature. Adding complexity to the mix, multiple market participants are looking to offer cleared repo solutions. While the market will likely evolve towards an optimal cleared repo structure over time, open questions remain regarding what the structure will look like now, as it evolves, and as regulators and market participants adapt.

Questions regarding market entrants and products

1. How many platforms will be launched? Several existing service providers, across markets are exploring either expanding existing services (e.g., GCF) or launching new platforms in the U.S. in 2016. With the potential for multiple clearing platforms to emerge, the market may become overcrowded. It should be noted, however, that while CCPs segmented by collateral pools would provide benefits in terms of diversification of risks, multiple CCPs may diminish the economies of scale of both cost and netting – the principal value propositions of a CCP. In the long term, we expect the industry to consolidate into two or three platforms.
2. What products will they clear? Many feel that cleared repo should initially trade in only Fedwire securities, leaving large collateral pools of corporate bonds and mortgage backed assets in the tri-party and bilateral repo markets. Equity clearing as a singular cleared repo asset class is emerging as well; however, volumes in this market are much smaller than government securities.⁵⁵ As such, we anticipate that initial cleared repo platforms will be narrowly focused or even asset class specific and will potentially later evolve to clear across the asset class spectrum via a pure central clearing counterparty.
3. How will they be structured? There are a variety of CCP structures being utilized today in different markets – from liquidity agent to fully novated counterparty. Among the known potential cleared repo providers, GCF proposed an expansion of its existing service to include buy-side members, while other platforms are reviewing their proposed structures with U.S. regulators.⁵⁶ With that said, users of repo will potentially be drawn to different structures by participant types (e.g., G-SIBs, other broker dealers, Money Markets, etc.) according to their specific needs. Cleared repo platforms, therefore, will be keen to develop services suitable to various participant types (and not just collateral types).

Questions regarding services and service providers

4. What services will they provide? In a pure CCP, the services should include: risk management, netting, default funds,

100% principal guarantees, coordinated transfers and settlement with a clearing bank, general electronic counterparty ledger, bespoke haircuts, and collateral classifications. While there are existing tri-party agent services that will naturally be leveraged by a CCP, it is also possible that a clearinghouse may expand services into existing tri-party offerings such as clearing, settlement, and collateral optimization.

5. What is the existing tri-party service providers' role in this new marketplace? With the world's largest tri-party platforms, clearing banks could become a natural part of the cleared repo infrastructure. There are operational advantages within tri-party that can be applied to a CCP model such as: high speed margining, asset valuation and asset mobilization. In addition, mature trade pairing, which rests within the tri-party infrastructure, further augments the netting process. As capital markets businesses become better collateralized, the need for collateral pooling and optimized collateral management increases. Coordination with a tri-party agent to provide collateral optimization services would help differentiate the services of a CCP by providing additional relief to broker dealer's cost of capital.

Question regarding regulation

6. Finally, how will regulators deal with concentration and other risks created by CCPs? A CCP derives the vast majority of its risk through its counterparties and the assets provided as collateral. Mitigating factors to these risks would include analyzing correlations between the pools of collateral held, netting benefits, and portfolio diversification benefits. A significant amount of focus has been given to counterparty risk; however, concentration and fire sale risk are also considerations for the collateral being margined. Focus should be given toward a risk-weighted collateral-driven model, with margin adequately accounting for the possibility that in a liquidation scenario the cash investor would not receive the full value of the repo collateral. Moreover, in an ideal state, participants in the market should understand their risk from both the perspective of the effort and time it takes for collateral to be converted into cash as well as from the counterparty.

As the market evolves past the 3-5 year mark, we expect the majority of the aforementioned questions to be resolved. In resolving these questions, users of repo may look to place further demands on infrastructure providers to help facilitate the sourcing and movement of collateral.

D. COLLATERAL CONNECTIVITY

With Tri-party Reform, we saw a more efficient movement of cash, but with greater demands being placed on collateral, there is an increased need for its efficient movement between providers and users across platforms and geographies. Collateral connectivity will likely come in two phases. The first phase will require an aggregation of collateral pools to view the collateral available, and the second phase will involve linking ICSDs for the movement of collateral between platforms. In the target state, a cash investor or collateral provider would have a holistic view of cash or assets available for repurchase across ICSDs, geographies, and legal entities. Through linked systems, the cash investor or collateral provider would be able to reach in and have access to an available pool of global collateral as well as the ability to mobilize it and use it among different products. To facilitate the efficient and effective movement of

collateral, technology systems and bridges should be put in place, risk management protocols will need to be agreed upon and standardized, and new processes and personnel will need to adapt to a common framework.

Longer term, we believe linkages and movement between collateral pools will become essential to the wholesale funding markets and broader financial system. Regulators' push to clear transactions with some asset classes (e.g., swaps) may be felt in the repo market if a centralized, risk-driven model doesn't develop through market participant initiatives. A fear of concentration risk would make it more likely that more than one cleared repo solution will ultimately be successful in the US market. As mentioned though, the existence of multiple CCPs reduces the netting benefits through diminished economies of scale. Because of this, longer term, we expect the market will develop solutions across cleared repo platforms (e.g., cross product and cross platform netting). These solutions will require even greater collateral visibility and mobility, making the ability to seamlessly move collateral from one account to another, across collateral pools and geographies, and at any point in time a key development in the next generation of the repo markets.

HIGHLIGHT: THE BENEFITS OF COLLATERAL OPTIMIZATION TECHNOLOGIES

Given the scarcity of HQLA in the marketplace, the benefits of financial technology in collateral management are becoming more sought after. 70% of market participants surveyed expect a further shortage of HQLA over the next 12-18 months.

The tri-party mechanism provides operational support for dealers in collateral transactions. Collateral optimization opportunities provided by tri-party agents help minimize balance sheet usage. Although difficult to quantify, the growth of collateral management will boost familiarity with and demand for tri-party repo services, furthering the value proposition of tri-party repo and supporting its volumes.

Collateral optimization involves an efficient and cost effective use of assets without impacting the balance sheet. Given the demand for HQLA in the marketplace, financial technology in collateral management will further help to optimize the balance sheet. With many dealers realizing the limitations placed by regulations, optimizing balance sheet collateral will help to alleviate some of the pressure on the repo market and

this fundamental source of funding. Collateral optimization facilitates a more efficient and timely method of allocating collateral to trades. Additionally, it takes into consideration business preferences, changing market conditions, cost of carry, and cross-margin to optimize the portfolios of market participants. Moreover, significant economic savings can be achieved with lower funding costs and reduced balance sheet collateral required. Less collateral can also be required to receive the same amount of funding, additional, high quality collateral can be deployed for other uses within the company, and automating the allocation process frees up human resources to focus on higher value-added activities within the organization. There is little downside to the development of this technology, which is likely to support not only tri-party services but also the industry's evolution into cleared repo.



3

PRIORITIES FOR MARKET PARTICIPANTS

While reform and regulation will continue to affect the market, firms must also understand market driven changes – such as cleared repo – to refresh their strategies around repo and remain competitive. Reviewing the following four priorities should be a beneficial exercise to help market participants better understand, prepare for and coordinate their goals regarding the market changes discussed in this paper.

UNDERSTAND THE CURRENT ROLE OF REPO IN YOUR ORGANIZATION

Given the changing economics of repo, some repo desks may need to be viewed as providing financing and liquidity for other desks instead of as stand-alone profit centers. Repo can be profitable as a stand-alone asset class to the market, however, by one of two ways: growth as an industry or the creation of

customer value. As we have seen in our earlier discussions, the repo industry is no longer in a growth phase, so businesses should focus on improving their value propositions while managing costs to drive profitability. The creation of customer value requires an understanding and careful management of a customer's willingness to pay versus its costs. Access to sophisticated tools such as auto-substitution and tri-party collateral management mechanisms will likely also provide for increased value. For cash investors, liquidity management procedures and the management of the timing of cash flows should be a focus to increase yield. Cash investors benefitted from having a relatively risk free counterparty through the RRP for the past few years. As interest rates normalize, yield and the market supply of liquid collateral may be easier to come by, but an early focus on efficiency, process and procedure management should likely pay further dividends as the investment environment changes.

ANALYZE THE INDUSTRY LANDSCAPE

While regulators maintain a neutral stance, repo faces the tangible prospect of regulated central clearing similar to the swaps industry, which would likely significantly increase the compliance and regulatory reporting burden on market participants. Identifying obstacles and developing long term plans around compliance and regulatory concerns could ensure that any forthcoming regulatory structure is proactively managed and/ or mitigated. The more preemptive industry participants are about managing risk and setting compliance goals the stronger the social infrastructure becomes for the industry and, in turn, less direct regulation could be necessary. While industry participants may need to come together to provide additional reform measures or a common dialogue to mitigate things such as fire sale risk, participants also need to recognize that they are doing their part to proactively strengthen their firms internal risk and compliance policies and procedures. Lastly, repo participants can engage in dialogues with regulators and other stakeholders to identify concerns and ultimately shape the industry's regulatory dialogue and potential future requirements.

Industry trends and drivers could have competitive implications to how market participants align themselves or respond to threats. For example, the market could see disintermediation of repo trading desks with the emergence of a CCP, with the buy-side finding a natural platform to be able to transact with similar entities. To continue to provide repo solutions, dealers could look to optimize collateral posted in repo transactions to drive profitability. As previously discussed, many expect cleared repo to play an increasing role. With the potential emergence of a cleared repo solution, market participants are now questioning not only how they will respond, but also how their market peers will respond. How much would a CCP rely on tri-party services? How much will services be built in house or outsourced to FinTech players?

CREATE A POTENTIAL FUTURE STATE AROUND REPO

Integrating potential changes into future target operating models requires a comprehensive assessment of one's business, with repo collateral management becoming more refined and technology-driven. Even though repo could be viewed as a utility, its ability to fill the gap of core activities across the spectrum of market participants will drive the industry toward stronger proprietary risk management and collateral optimization models associated with repo. For users of the tri-party settlement mechanism, we anticipate technology to allow increased functionality and provide a platform for repo that will become more bespoke and similar to bilateral in nature. With cleared repo solutions and the interconnectedness of technology and operational platforms becoming more apparent, collateral management and transparency are likely to become a focus for market participants.

Many participants across various aspects of the value chain are investing in new technologies and refining operational processes, but these changes are far from complete. Participants still see some systems as antiquated and in need of linkages with other platforms or industry participants. While Tri-party Reform helped considerably to simplify the tri-party settlement process, further action needs to be taken to make the industry more transparent. Cleared repo is a step in the right direction, but ultimately, an understanding of collateral connectivity and mobility will help industry participants create collateral management roadmaps. These plans guide the implementation of corporate strategy, ensuring repo is used for its ideal purpose – efficiently filling the gaps in corporate funding while minimizing both systematic and firm-specific risks.

ACHIEVE A COLLATERAL MANAGEMENT ADVANTAGE

Firms have increased the sophistication and efficiency of collateral management; however, a comprehensive collateral management roadmap can bring competitive advantages. A roadmap should help firms be aware of and understand the general expectations of other constituents. To help mitigate the effects of LCR and NSFR, firms need to better understand the types of securities and transactions that are driving markets (i.e., what's good collateral for a 30 or 60 day trade is not the same as for a longer maturity trade). To address this, roadmaps should include regulatory considerations (e.g., the potential for more restrictive final rules of Basel ratios), potential optimization challenges, an understanding of the impacts of the Fed's RRP program on a firm's use of repo, and the potential influence of centrally cleared repo.

Collateral management technology, operational processes, and organizational structures are evolving to improve how repo desks function and how tri-party agents service their clients. These changes risk being myopic if they merely service immediate client needs and demands. 78% of repo market participants are looking for collateral optimization solutions. These technologies need to evolve and be able to adapt to forward-looking market innovations. Collateral transformation, trade optimization, and custom term repos (i.e., under one day) can be incorporated into a roadmap to provide user flexibility as well as helping to further reduce risk to the market as a whole. As we look to the future of repo, the location, mobility, and connectivity of collateral will be a paramount concern across repo participants. Overall, the evolution of these products and services require robust collateral management process with systems and analytics that are iterative and adaptable to a new and changing market structure.



4 CLOSING REMARKS

While post-Crisis reforms made tri-party repo safer, important changes face the industry and its participants. This paper highlighted three of the most significant developments we expect to come to pass: (1) pending regulations on repo users will dampen repo volumes in the near term, most directly through the allocation of capital and liquidity ratios to the desk level; (2) the increased demand for HQLA and potential further increase brought by Money Market Reform indicate that the Fed will likely maintain the RRP facility for the foreseeable future; and (3) expanding cleared repo services in the U.S. is now considered an imperative given the need to address fire sale risk and G-SIBs' search for balance sheet relief.

Each of these developments raises multiple considerations for market participants. The incentives in addressing these considerations vary greatly across collateral providers, cash investors, matched books, interdealer brokers, and regulators (e.g., netting is a driving concern for G-SIBs and of minimal importance to money markets). This complex array of priorities increases the importance of a comprehensive collateral roadmap to guide firm strategy through interactions with market participants.

The change we see coming to the wholesale funding markets and broader financial industry is profound. Institutions must

review their current position, understand the industry, revise business and operating models, and organize collateral capabilities around this changing environment. Regulation will continue to shape the safety of the markets, but we expect a focus on collateral management and cleared repo to be at the forefront of change, helping markets and clients alleviate pressures from risk, regulation, and operational burdens. In closing, we believe repo participants should understand the concept of collateral connectivity and the benefits that both an integrated view of custody accounts and the ability to post collateral across current boundaries (CSDs and countries) would provide to their organizations. While development of these capabilities will likely be driven by institutions with material global operations, we believe collateral connectivity is the most notable and identifiable long term trend in the repo market that firms should begin to understand and plan for now.

We hope this paper was insightful, and helped you, our clients, colleagues, and repo market participants better understand the changes coming to the industry. We thank PwC for their instrumental contribution to the production of this paper, and we are grateful to our interviewed and surveyed colleagues for their invaluable time and insight.



5 APPENDIX

A SHORT ANALYSIS OF WHOLESALE FUNDING

While wholesale funding does not have standard definition, it is broadly defined as the use of deposits, federal funds, and short-term liabilities (e.g., repurchase agreements) to service the financing, operational, risk or liquidity management needs of a bank or other financial institution.⁵⁷ This type of funding includes commercial paper, overnight and term repo, non-retail time deposits, and interbank loans.⁵⁸ The market segments into either unsecured or secured funding. Unsecured funding (CDs, commercial paper, term, call and overnight deposits) is typically across a term of up to one year;⁵⁹ secured funding (repo and asset backed CP) is also short dated but seen in longer maturities. Due largely to their short-term nature, these instruments provide flexible and affordable short-term financing.

Banks and dealers rely on wholesale funding liquidity, but the importance of this market to asset managers, corporates, hedge funds, pension funds, and institutional investors among others also remains significant. Cash investors use wholesale funding

instruments to gain yield on very short term investments, and, especially in the persistent low rate environment, their appetite for these investments remains strong. For example, money market funds invest generally across the spectrum of wholesale funding given their investment mandates. While the different types of wholesale funding share liquidity profiles and risks, they are used for different purposes. Repo and CP are used to finance broker dealer operations, but the decline in CP issuance by financial firms has left repo as the material form of wholesale funding used in financing broker dealer activities.

As now a material portion of wholesale funding, interbank lending grew significantly since 2008 in volume due to the increase in excess bank reserves. The interest rate on excess reserves (IOER) provides a beneficial risk/reward profile for a large short term loans. It is important to note that excess deposits at the Fed are included in SLR calculation as part of Tier 1 capital, so there is little incentive to deposit excess reserves tied to Basel III or other regulation. Looking forward, however, it is difficult to determine what reserves may flow into other areas of wholesale funding and the impact this will have.

U.S. REPO MARKET HISTORY

In the 1970s, the bilateral repo market introduced tri-party agents to the bilateral repo trade to eliminate the “double” financing charge imposed on dealers.⁶⁰ Double charges occurred when securities pledged to a cash lender were returned too late in the day to be redelivered as collateral to a new cash lender. At this time, the trade settlement was a very manual process and subject to high levels of operational risk. Following multiple dealer defaults in the 80s, dealers approached the clearing banks for “safekeeping” arrangements, where the clearing bank acted as a joint custodian (or limited agent for both parties in the repo). In the late 1980s, the clearing banks made investments to automate the settlement process and reduce risk.

From 2005 to 2008, new laws, the rise of prime brokerage activity, and market participant activity contributed to the growth of tri-party repo. The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 expanded the exemption from automatic stay to a wider range of collateral to be used for repo transactions. It is estimated that prime brokerage activity also increased during this time and provided an efficient way for prime brokerage customers to finance against non-government securities. In a response to an increased demand, clearing banks invested in infrastructure advancements that allowed dealers and cash investors to optimize their use of the platform.⁶¹

Throughout Tri-party Reform, clearing banks’ initiatives phased in risk reduction initiatives through a series of further operational and technology changes and improvements. The clearing banks worked closely to coordinate with market participants to complete the recommendations. In 2012, we reduced 15% of our risk by eliminating approximately \$270 billion of exposure to the Depository Trust Company (DTC) sourced collateral from unwinds and substitutions. In December 2013, we exceeded our 70% risk reduction goal, achieving an 80+% risk reduction by eliminating exposures associated with FRBNY sourced collateral. And in May 2014, we exceeded the 90% risk reduction goal set forth in the Target State and

achieved 92-95% risk reduction, with the implementation of rolling settlements of GCF interbank collateral. Finally, as of April 23, 2015, we fully transitioned to committed credit, eliminating discretionary credit, and committed credit was capped, thus achieving a 97% reduction in risk.

The U.S. repo market, as a whole, is currently estimated to be around \$3.7 trillion. The U.S. tri-party market was approximately \$1.6 trillion as of June 2015,⁶² and the US bilateral repo market, based on overall primary dealer volumes, was estimated by the Federal Reserve to be around US\$1.9 trillion as of October 2014.⁶³ On average, U.S. Treasuries and agency debt comprise the majority of tri-party repo volumes (36% and 46% respectively, over the past five years). Agency debentures and MBS shrank by approximately 25% (by \$200 billion) over this period. Equities have experienced the fastest growth rate, having more than doubled (from \$78 billion to \$167 billion).

REPO PARTICIPANTS & SETTLEMENT MECHANISMS

At a high level, repo market participants can be segmented into two major groups: collateral providers (cash borrowers) and cash investors (collateral takers). More diversified participants can be classified as broker dealers/matched books who both invest and finance, interdealer brokers (IDBs) and the Federal Reserve. Banks and broker dealers use repo to finance inventories of their own securities as well as to provide on demand liquidity to clients (e.g., corporates, pension funds, high net worth individuals, etc.), facilitating market-making purposes. Collateral providers use repo to finance short-term funding gaps. Conversely, cash investors (e.g., mutual funds, pension funds) look to invest cash and enhance returns on their portfolios. IDBs typically broker transactions between cash investors and collateral providers. Finally, the role of the Fed has become substantial in the repo market through both overnight and term RRP operations.

THE REPO CONTINUUM

	Bilateral Repo	Tri-party Repo	Clearing House Lite	Centrally Cleared Repo
DOCUMENTATION	– Individual GMRAs	– GMRAs and CRMAs – Clearing bank agreements	– GMRAs, clearing bank agreements – Membership agreements	– Clearing house rules – CCP membership agreements
TRADE EXECUTION	– Collateral eligibility defined by cash lender – Trade details: repo term, haircut, and interest charged		– Anonymous counterparty – Repo term and interest determined by cash lender	– OTC platform – Determined by counterparties (e.g., tenor of trade)
TRADE CONFIRMATION	– Back offices confirm to cash and collateral providers	– Three-way deal matching		
COLLATERAL MANAGEMENT	– Substitution is allowed but cumbersome	– Repos segregated until unwind	– Collateral is restricted to Fed-eligible securities – Netting of collateral and cash	– Ability of the CCP to reliably price – Netting of collateral and cash
CLEARING / SETTLEMENT	– Counterparties execute on a Delivery vs. Payment (DvP) basis	– Clearing bank segregates securities, manages the transfer of cash/collateral and unwind – Auto-substitution of collateral		
LIQUIDATION	– Cash lender must liquidate the collateral on the open market – Cash lender exposed to a loss if the haircut/ collateral incorrectly valued		– Clearing house facilitates liquidation – Participant-funded default fund	– CCP hedges and can retain positions into the future – Participant-funded default fund
RISK MANAGEMENT	– Cash/collateral providers each responsible for counterparty collateral monitoring	– Clearing bank monitors pledged collateral with daily revaluations and margin management	– Counterparty risk remains between collateral provider and cash lender	– Trade novated by CCP, mitigating individual counterparty risk
PARTICIPANTS	– Predominantly broker dealers and their prime brokerage (PB) clients	– Governments, broker dealers (BDs), MMFs, alternatives, corporates, other financial institutions	– Broker dealers & their clients (PB clients) other financial institutions, MMFs, alternatives	– Broker dealers & expanded clearing house members (MMFs, alternatives)

Repo settlement mechanisms can be looked at as a continuum of activity, with bilateral at one end of the spectrum, followed by tri-party repo (clearing banks), then various “clearing house lite” models, and finally, a pure CCP at the other end. This illustrates the particular settlement mechanisms of the U.S. repo markets: bilateral and tri-party and the direction in which the market is likely to evolve. Furthermore, the continuum shows the value chain of activities of repo from pre-trade documentation and settlement to post-trade processing and liquidation management (in the case of default). The main function and

value proposition of tri-party agents is to coordinate settlement between collateral providers and cash lenders. Furthermore, the tri-party agent maintains custody of the collateral securities, processes payment and delivery between the cash borrower and the cash investor as well as provides other services such as the settlement of cash and securities, the independent valuation of collateral, and the optimization of collateral allocation. The clearing house lite model provides risk mutualization and loss waterfalls without full novation.



6 GLOSSARY

BNYM Repo Index: The indices represent a volume weighted median of repo rates negotiated between cash and collateral providers for the three largest tri-party asset classes. They provide daily overnight interest rates on U.S. tri-party repo transactions collateralized by U.S. Treasuries, agency mortgage backed securities (agency MBS), and U.S. agency debt.⁶⁴

Commercial Paper (CP): Commercial paper is an unsecured debt instrument issued by corporations to help with short term financing needs. Short term financing typically includes accounts receivable, inventories, and other short-term liabilities. Maturities, correspondingly, are short term and generally less than 270 days.⁶⁵

Fedwire Eligible: Fedwire is a payment and securities transfer system operated by the United States Federal Reserve Banks, where financial institutions can electronically transfer funds among Fedwire participants.⁶⁶ Fedwire eligible securities are repo eligible securities for transactions with the Fed and include: U.S. Treasuries (and STRIPS), agency debt, agency MBS, and agency collateralized mortgage obligations (agency CMOs).⁶⁷

Financial Commercial Paper: Commercial paper issued by domestic and foreign firms including: financial companies, banks, insurance, securities, and industrial firms.⁶⁸

DTC Eligible: DTC Eligible refers to non-Fedwire eligible repo that can be transferred to or from the Depository Trust Company into a repo allocation.⁶⁹

DTC sourced collateral: This includes equities, municipal and corporate bonds, commercial paper, asset-backed securities, and non-agency mortgage-backed securities.

Delivery Repo: Repo transaction where collateral moves from the account of the seller into the buyer's account. The collateral is under the buyer's control for the term of the repo.⁷⁰

General Collateral (GC) Repo: GC repo refers to transactions where the repo seller has discretion on which collateral to deliver, with the buyer specifying only the general type (e.g., government bonds). GC makes up the bulk of repo traded in the U.S. and is driven by the need to borrow or lend cash rather than collateral.⁷¹

General Collateral Finance (GCF): The GCF market is blind-brokered and solely trades with Fed-eligible collateral.

High Quality Liquid Assets (HQLA): Per Basel III, HQLA is defined as “assets considered liquid in markets during times of stress and in most cases eligible for use in central bank operations.” Furthermore, HQLA has been divided into two levels (the second level having two additional sub levels) based on liquidity: level 1 (cash, central bank reserves, sovereign-backed securities), level 2A (GSE debt, government securities, covered bonds, corporate debt), and level 2B (MBS, equities, lower rated corporate debt).

Liquidity Coverage Ratio (LCR): The LCR requires that banks must have enough liquid assets such that the LCR minimum is ratio is 1 or 100%. This regulation ensures that banks have sufficient liquidity to survive a short term stress scenario lasting one month. As such, banks are required to hold unencumbered high quality liquid assets. It is defined by HQLA divided by the net cash outflow over a 30 day stress period.

Matched book: Matched book refers to the reverse-in of securities and the simultaneous repo-out of the same securities where the terms to maturity of the agreements are identical.⁷²

Maturity mismatch: The use of short term/ overnight funding to finance longer term assets.

Net Stable Funding Ratio (NSFR): The NSFR will look to ensure that banks have sufficient stable funds to survive a long term stress scenario lasting for 1 year. It is defined as the amount of Available Stable Funding divided by the amount of Required Stable Funding. The ratio should be equal to at least 100%.

Non-Fedwire Eligible: Repo not eligible for transactions with the Fedwire include ABS, private label CMOs, corporate debt, equities, money market instruments, collateralized debt obligations, international securities, municipal debt, and whole loans.⁷³

Nonfinancial Commercial Paper Issuers: Nonfinancial issuers include public utilities, and industrial and service companies.⁷⁴

Repurchase Agreement (repo transaction): Repos finance inventories, earn short term interest, provide necessary liquidity, facilitate the movement of cash and securities, and service

other needs. Fundamentally, a repo transactions consists of a sale of securities (i.e., the collateral) paired with an agreement for the seller to buy back the securities (to “repurchase” them) from the buyer at a future time/ date.⁷⁵ That is, a cash lender provides funds against collateral to a borrower who agrees to repurchase the assets plus interest at a confirmed later date.⁷⁶ The interest rate on the transaction (also known as the repo rate) is the spread between selling price and the repurchase price. Other terms of a repo transaction include: the collateral, the haircut (adjusted collateral value), the term or maturity date, and the counterparty.

Specials: Repo collateral that rapidly gains in popularity and drops in yield as a result. This occurs when the repo transaction is driven by a need to borrow a certain type of collateral rather than gain a return on cash invested.⁷⁷

Supplementary Leverage Ratio (SLR): The SLR (and eSLR) requires the largest banking organizations to hold more Tier 1 capital, particularly to support leverage and off-balance sheet exposures, which may pose greater risks during periods of stress. It is defined by Tier 1 capital divided by total leverage exposure. The eSLR is applicable to U.S. based Systemically Important Financial Institutions (SIFI) and requires SIFI banks to maintain a buffer on top of the SLR of more than 2%; hence, this requires SIFIs to maintain an SLR in excess of 5%.⁷⁸

Term Repo: A term repo contract extends beyond one day, and has been a more favored product as banks and large dealers look to spread their funding risk over longer time periods.⁷⁹

Time horizon: Short term is defined as less than 18 months; medium term is defined as 18 months to 3 years; and long-term as greater than 3 years.

Tri-party agent: A tri-party agent performs post-trade processing for tri-party repo transactions, which typically includes: collateral selection, settlement, payment processing and custody.⁸⁰

Overnight Repo: An overnight repo agreement consists of a 1-day tenure, where cash is lent out overnight and repaid (with interest) the following day. While cheaper than term repo, it exposes borrowers to the risk of not being able to finance themselves in times of market or firm-specific stress.

- ¹ Please note that JPMorgan Chase completed their secured intraday credit risk reduction and capped credit facilities goal (excluding GCF) as of March 2014. “Tri-Party Repo Infrastructure Reform.” *NewYorkFed.org*. Federal Reserve Bank of New York. Web. November 2015.
- ² The key objective of the research conducted by BNY Mellon was to gauge the opinions of senior wholesale funding industry leaders on the possible future shape of the U.S. wholesale funding industry. The themes included were: repo market trends, current market risks, data and analytics, liquidity, central clearing, industry/ market reforms, fire sales, and market disruptions. BNY Mellon’s Market Research & Client Insight group distributed and analyzed this survey. The survey was developed in collaboration with PwC subject matter experts. The target population was senior heads of repo desks and of institutions across the wholesale funding landscape. A total of 57 surveys were completed from senior respondents across cash investors, collateral providers, matched book intermediaries, and advisors, with average repo books ranging from less than \$10B to greater than US\$100B. The survey was live during a four week period from August 5th to August 31st 2015.
- ³ We refer to all national/ regional implementations generally as the SLR. Where appropriate, we refer to the U.S. final rule as the eSLR while other national implementations retain the SLR designation.
- ⁴ The majority of oversight of the repo industry (including the implementation of the Reverse Repurchase facility) has been conducted through the Federal Reserve Bank of New York; however, we use a more general term to account for influence from other parts of the Federal Reserve System.
- ⁵ “Collateral Management: A Review of Market Issues.” *BNYMellon.com*. BNY Mellon, October 2015. Web. November 2015.
- ⁶ GCF integration with the full tri-party repo settlement process also remains incomplete according to the reform proposals laid out by the Task Force. “Update on Tri-Party Repo Infrastructure Reform.” *NewYorkFed.org*. Federal Reserve Bank of New York. Web. November 2015.
- ⁷ “Netting Definition.” *investopedia.com*. Investopedia, 24 November 2003. Web. 19 November 2015.
- ⁸ Includes trading revenue for all US and EU G-SIBs (excluding State Street and BNY Mellon). Source: Capital IQ
- ⁹ Adrian, Tobias, Karin Kimbrough, and Dina Marchioni. “The Federal Reserve’s Commercial Paper Funding Facility.” *NewYorkFed.org*. Federal Reserve Bank of New York. Web. November 2015.
- ¹⁰ The interbank lending market before the 2007-2008 Financial Crisis, interbank lending was made up mostly of transactions between financial institutions - i.e., banks with excess reserves loaned to those with short-term funding shortfalls. At the same time, a small amount of bank excess reserves (<\$75b) was left with the Fed, earning no interest. Post 2007-2008 Financial Crisis and as part of its effort to stabilize the economy, the Fed began paying interest on these excess reserve balances (IOER). The volume of excess reserves grew to \$2.5 trillion as of Q1 2015. This \$2.5 trillion is included as part of the total interbank lending volume and functions as a series of short-term loans that the Fed pays interest on. However, this financing is a source of risk-free return for banks, and may not be considered funding. Interbank lending in its traditional form still exists, but is dwarfed by the volume of funds held at the Fed (~\$400B vs. \$2.5T).
- ¹¹ Bilateral repo numbers are estimated based on overall primary dealer volumes.
- ¹² “Financial Accounts of the United States.” *FederalReserve.gov*. Board of Governors of the Federal Reserve, 18 September 2015. Web. 19 November 2015.
- ¹³ “Has U.S. Treasury Market Liquidity Deteriorated?” *Liberty Street Economics*. Federal Reserve Bank of New York, 17 August 2015. Web. November 2015.
- ¹⁴ Dudley, William C. “Fixing Wholesale Funding to Build a More Stable Financial System.” *NewYorkFed.org*. Federal Reserve Bank of New York, 1 February 2013. Web. September 2015.
- ¹⁵ “New York Fed Releases White Paper On Tri-Party Repurchase Agreement (Repo) Reform.” *NewYorkFed.org*. Federal Reserve Bank of New York, 17 May 2010. Web. November 2015.
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- ¹⁸ “The Payments Risk Committee is a private sector group of senior managers from U.S. banks that is sponsored by the Federal Reserve Bank of New York.” “Payments Risk Committee.” *Ny.frb.org*. Federal Reserve Bank of New York. Web. November 2015.
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- ²⁰ Jaswal, Anshuman. “Triparty Repo in the US Well Begun But Far from Done.” *Celent* (2011). Web. 9 June 2015.
- ²¹ “As a result, the share of triparty repo volume that is financed with intraday credit from a clearing bank has dropped markedly, from 100 percent as recently as 2012, to a level averaging 3 to 5 percent today (as compared with the Task Force’s original target of no more than 10 percent).” “Update on Tri-Party Repo Infrastructure Reform.” *NewYorkFed.org*. Federal Reserve Bank of New York, 24 June 2015. Web. November 2015.
- ²² Most clients used proprietary optimization tools of Bank of New York Mellon. In addition, some clients used their own and some allocated manually.
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