FSB FINANCIAL STABILITY BOARD

Securities Lending and Repos: Market Overview and Financial Stability Issues

Interim Report of the FSB Workstream on Securities Lending and Repos

27 April 2012

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Introduction

At the Cannes Summit in November 2011, the G20 Leaders agreed to strengthen the regulation and oversight of the shadow banking system, and endorsed the Financial Stability Board (FSB)'s initial recommendations[1] with a work plan to further develop them in the course of 2012.[2] Five workstreams have been launched under the FSB to develop policy recommendations to strengthen regulation of the shadow banking system, including securities lending and repos (repurchase agreements).[3]

The FSB Workstream on Securities Lending and Repos (WS5) under the FSB Shadow Banking Task Force is developing policy recommendations, where necessary, by the end of 2012 to strengthen regulation of securities lending and repos. In order to inform its decision on proposed policy recommendations, the Workstream has reviewed current market practices through discussions with market participants, and existing regulatory frameworks through a survey of regulatory authorities.[4] The Workstream has identified a number of issues that might pose risks to financial stability. These financial stability issues will form the basis for the next stage of its work in developing appropriate policy measures to address risks where necessary.

This report documents the Workstream's progress so far. Sections 1 and 2 provide an overview of securities lending and repos markets globally, including the main drivers of the markets. Section 3 places securities lending and repo markets in the wider context of the shadow banking system. Section 4 provides an overview of existing regulatory frameworks for securities lending and repos, and section 5 lists a number of financial stability issues posed by these markets. Additional detailed information on the market segments and a survey of relevant literature survey can be found in the annexes.

The FSB welcomes comments on this document. Comments should be submitted by 25 May 2012 by email to fsb@bis.org or post (Secretariat of the Financial Stability Board, c/o Bank for International Settlements, CH-4002, Basel, Switzerland).

1. Market Overview: Four market segments

The securities financing markets can be divided into four main, inter-linked segments: (i) a securities lending segment; (ii) a leveraged investment fund financing and securities borrowing segment; (iii) an inter-dealer repo segment; and (iv) a repo financing segment, as described below.[5]

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1 http://www.financialstabilityboard.org/publications/r_111027a.pdf.

2 See paragraph 30 of the G20 Leaders Summit Communiqué at Cannes (http://www.g20-g8.com/g8-g20/g20/english/for-the-press/news-releases/cannes-summit-final-declaration.1557.html).

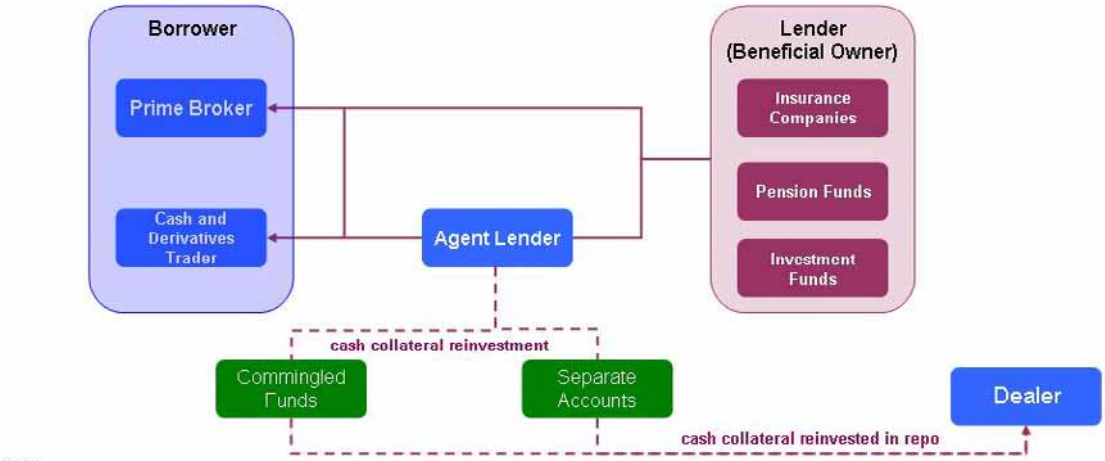
3 For the current status of the FSB's work on shadow banking, see FSB Progress Report submitted to the G20 on 20 April 2012 (http://www.financialstabilityboard.org/publications/r_120420c.pdf).

4 Securities lending and repo operations by central banks are not addressed in this Report as they do not form part of the shadow banking system and are conducted for monetary policy purposes.

5 Note that the arrows in Exhibit 1-5 point to entities that typically post margin/haircuts, i.e. they actively seek to borrow cash/securities in securities financing transactions. Throughout this report, "margin" and "haircut" are used interchangeably to refer to the degree of over-collateralisation in securities financing transactions.

The ***securities lending segment*** (Exhibit 1) comprises lending of securities by institutional investors (e.g. insurance companies, pension funds, investment funds)[6] to banks and broker-dealers[7] against the collateral of cash (typical in the US and Japanese markets, and comprising a minority share of the European market) or securities. According to one industry estimate, the total securities on loan globally, as of April 2012, are estimated to be about US$1.8 trillion.[8] In general, borrowers may borrow specific securities for covering short positions in their own activities – for example arising from market-making activities – or those of their customers; or for use as collateral in repo financing and other transactions. Lenders (or beneficial owners) may reinvest cash collateral through separate accounts or commingled funds[9] managed by their agent lender[10] or a third party investment manager. Cash collateral is also reinvested through the *repo financing segment* described later in this section.

Exhibit 1: The securities lending segment



Note:
1. This diagram is intended to provide a general picture of the market only. Actual practices may differ across jurisdictions.
2. Comingled funds include both registered money market funds and unregistered funds.
3. The arrows in the diagram point to entities that typically post margins/haircuts, and the blue boxes represent entities that are usually part of a banking group.

The ***leveraged investment fund[11] financing and securities borrowing segment*** (Exhibit 2) comprises financing of leveraged investment funds' long positions by banks and broker-

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6 Banks may also engage in securities lending as lenders.

7 Banks and broker-dealers typically borrow securities through their prime brokerage units and/or cash/derivatives trading operations.

8 Estimates based on Data Explorers' data.

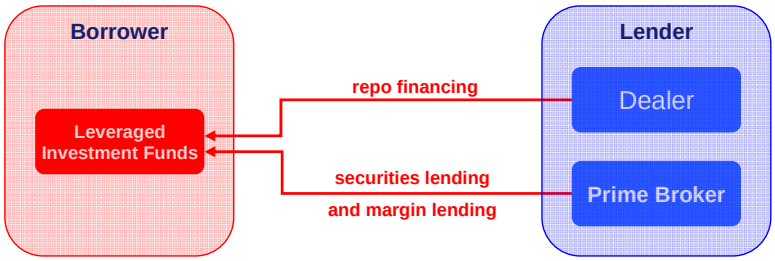
9 These funds may be registered money market funds (MMFs) in the US or EU funds under the Undertakings for Collective Investment in Transferable Securities (UCITS) Directives ("UCITS funds"), typically located in Ireland or Luxembourg; or they may be non-registered cash reinvestment pools.

10 Agent lenders are custodian banks and other financial institutions that manage securities lending business of lenders.

11 Leveraged investment funds include hedge funds but also EU UCITS funds (e.g. so-called "140:40" funds that can use leverage up to 140% of the value of the fund and run short positions up to 40%) and US investment funds registered under the Investment Company Act of 1940 ("1940 Act" funds). We note that some US "1940 Act" funds borrow securities for example in connection with short selling. However, such funds that engage in short selling are required to set aside liquid assets equal to their obligation under the short sale (less any margin pledged with the broker-dealer), which limits their risk of loss, and limits the amount of leverage the fund can undertake as well as any potential increase in the speculative character of the fund's common stock.

dealers using both reverse repo and margin lending secured against assets held with prime brokers, as well as securities lending to hedge funds by prime brokers to cover short positions. This segment is closely linked to the *securities lending segment*, which is used by prime brokers to borrow securities to on-lend to hedge funds.[12] The cash proceeds of short sales by hedge funds, in turn, may be used by prime brokers as cash collateral for securities borrowing. Hedge funds may give prime brokers permission to re-hypothecate assets, usually up to a proportion of their current net indebtedness to the prime broker (e.g. 140% in the US[13]). Re-hypothecated assets may then be given as collateral to borrow cash or securities by prime brokers in the *repo financing or securities borrowing segments*.

Exhibit 2: The leveraged investment fund financing and securities borrowing segment



Note:
1. This diagram is intended to provide a general picture of the market only. Actual practices may differ across jurisdictions.
2. The arrows in the diagram point to entities that typically post margins/haircuts, and the blue boxes represent entities that are usually part of a banking group.

The ***inter-dealer repo segment*** (Exhibit 3) comprises primarily government bond repo transactions amongst banks and broker-dealers. These may be used to finance long positions via general collateral (GC) repos (primarily against government securities), or to borrow specific securities[14] via special repos. In the US, Europe and Japan, the inter-dealer repo segment is typically cleared by central counterparties (CCPs). Transactions are predominantly at an overnight maturity. Total repos and reverse repos outstanding (including both the inter-dealer repo segment and the repo financing segment) are estimated around US$2.1-2.6 trillion in the US, US$8.3 trillion in Europe and US$2.4 trillion in Japan.[15]

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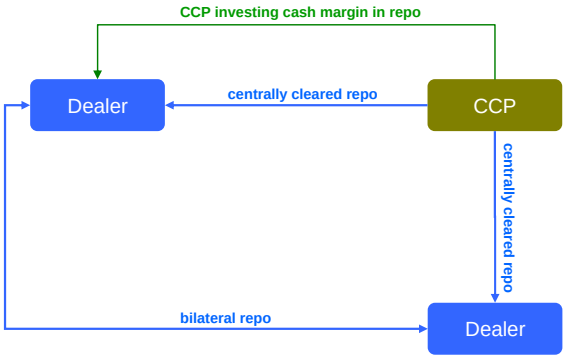
[12] Prime brokers may also borrow securities (usually fixed-income) in the *inter-dealer repo market segment*.

[13] For example, a client with $500 in-custody assets, of which $200 has been borrowed against, will allow the prime broker to re-hypothecate 1.4 x $200 = $280 in client assets.

[14] Banks and dealers may borrow specific securities to cover short positions, to hedge trading positions, to support their market-making activities or to take interest rate risk in the case of term repos.

[15] Estimates based on the Federal Reserve data for US, International Capital Market Association (ICMA) repo survey for Europe and Japan Securities Dealers Association (JSDA)'s statistics for Japan. The latter two are overestimated by double counting (the US figure adjusts double counting).

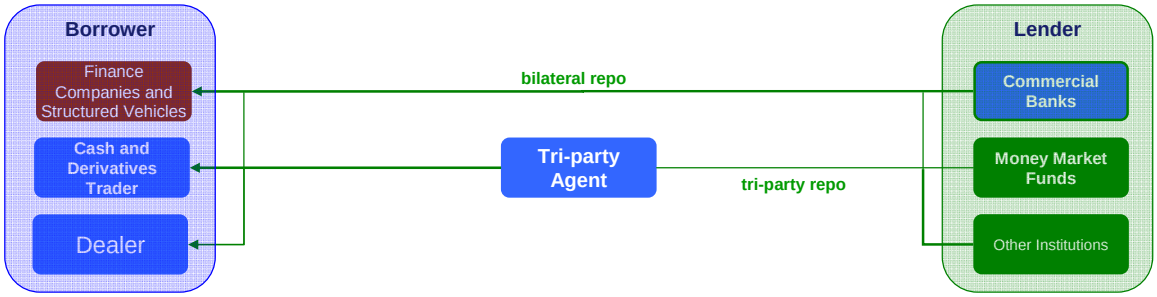
Exhibit 3: The inter-dealer repo segment



Note:
1. This diagram is intended to provide a general picture of the market only. Actual practices may differ across jurisdictions.
2. The arrows in the diagram point to entities that typically post margins/haircuts, and the blue boxes represent entities that are usually part of a banking group.

The ***repo financing segment*** (Exhibit 4) comprises repo transactions primarily by banks and broker-dealers to borrow cash from "cash-rich" entities, including central banks, retail banks, money market funds (MMFs), securities lenders and increasingly non-financial corporations. As described in the next section, the drivers of this market segment are primarily the short-term financing needs of banks and broker-dealers, as well as the desire of institutional cash managers to hold collateralised, "money-like" investments. Increasingly in the US and Europe, collateral movements and valuation are outsourced to tri-party agents (the so-called "tri-party repo"). Collateral includes government bonds, corporate bonds, structured products, money market instruments and equities. The share of asset-backed securities (ABSs) used as repo collateral has declined sharply since the crisis. Transactions are predominantly short-term but the European market also includes a growing, longer-term element.

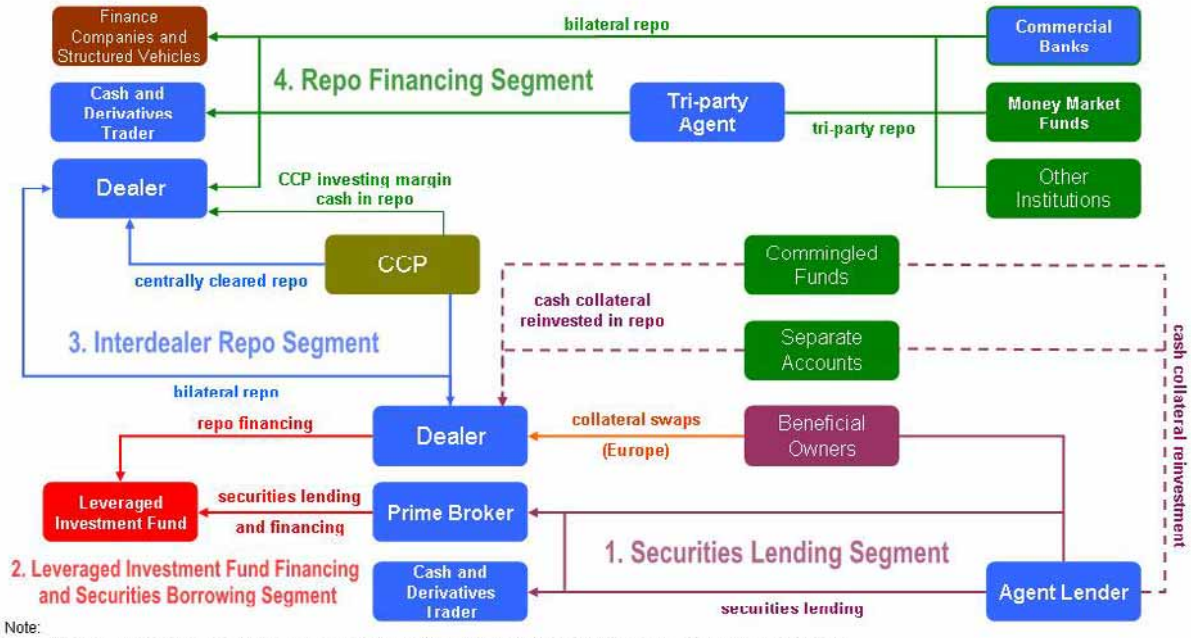
Exhibit 4: The repo financing segment



Note:
1. This diagram is intended to provide a general picture of the market only. Actual practices may differ across jurisdictions.
2. Other Institutions in the repo financing segment may include pension funds, insurance companies and corporations.
3. The arrows in the diagram point to entities that typically post margins/haircuts, and the blue boxes represent entities that are usually part of a banking group.

The above 4 market segments can be combined to form a complex network of securities lending and repos as shown in Exhibit 5.

Exhibit 5: Four market segments in securities lending and repos



Note:
1. This diagram is intended to provide a general picture of the market only. Actual practices may differ across jurisdictions.
2. Beneficial Owners in the securities lending segment may include pension funds, insurance companies and investment funds.
3. Comingled funds include both registered money market funds and unregistered funds.
4. Other Institutions in the repo financing segment may include pension funds, insurance companies and corporations.
5. The arrows in the diagram point to entities that typically post margins/haircuts, and the blue boxes represent entities that are usually part of a banking group.

2. Five key drivers of the securities lending and repo markets

The Workstream has identified the following five key drivers of the securities lending and repo markets that contribute to better understanding of the characteristics and developments of the four market segments described in section 1. These drivers are not ranked in order of importance and may overlap.

2.1 Demand for repo as a near-substitute for central bank and insured bank deposit money

The first key driver, particularly for the repo financing segment, is *demand by certain risk-averse institutions for "money-like" instruments* to support their primary investment objectives of preserving principal and liquidity. Such institutions may not have access to central bank reserves; may be ineligible for deposit insurance or have cash holdings that exceed deposit insurance limits; and/or find that Treasury bill markets do not have an adequate supply or depth, or do not match their maturity requirements. These repo investors include:

(i) MMFs;

(ii) entities seeking to reinvest cash collateral from securities lending activities;

(iii) official reserves managers;

(iv) commercial banks that are required to hold a regulatory liquidity buffer;

(v) pension funds, investment funds and insurance companies;

(vi) non-financial corporations;

(vii) other specialist entities, e.g. CCPs[16] and the US Federal Home Loans Banks;

(viii) structured finance (e.g. securitisation) vehicles.

A key attribute of repo is that it allows banks, broker-dealers and other intermediaries to create "collateralised" short-term liabilities provided they can access underlying collateral securities meeting the credit and regulatory requirements of the cash lenders. The institutional demand for money-like assets has grown significantly over the last twenty years. Pozsar (2011) estimates that the total size of MMFs, cash collateral reinvestment programmes and corporate cash holdings in the US rose from $100 billion in 1990 to a peak of over $2.2 trillion in 2007 and stood at $1.9 trillion in Q4 2010.

2.2 Securities-based financing needs

The second key driver is *the financing needs of leveraged intermediaries.* Regulated banks and broker-dealers dominate, using these markets both as part of their wider wholesale funding and more particularly for securities dealing. But some unregulated non-bank intermediaries, such as ABCP conduits and CDOs, did make use of repo financing alongside other sources of money market funding such as ABCP issuance before the crisis as part of the shadow banking system.

For most large global banks, the inter-dealer repo market has almost replaced unsecured money markets as the marginal source and use of overnight funds. In particular, repo financing markets have become an increasingly important source of borrowing at maturities from overnight to twelve months or even longer. With access to liquid repo and securities lending markets, broker-dealers can:

(i) quote continuous two-way prices in the cash market (i.e. market-making) in a reasonable size without carrying inventory in every security;

(ii) prevent a chain of settlement delivery failures from developing;

(iii) finance long positions and cover short positions more effectively; and

(iv) hedge against their credit or market risk exposures arising from other activities, e.g. government auctions, corporate bond underwriting, and trading in cash instruments and derivatives.

Liquid securities financing markets are therefore critical to the functioning of underlying cash, bond, securitisation and derivatives markets. For instance, before the crisis, the acceptability of senior tranches of ABSs as repo collateral contributed significantly to the growth of the securitisation leg of the shadow banking system.

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[16] In the euro area, some CCPs have access to central bank reserves as they are licensed as "credit institutions" (albeit in some cases with restrictions on certain activities).

2.3 Leveraged investment fund financing and short-covering needs

The third key driver, primarily of the leveraged investment fund financing and securities borrowing market segment, is *facilitation of hedge fund and other investment strategies involving leverage and short selling*. Some hedge funds are insufficiently creditworthy to borrow cash unsecured or to borrow securities directly from institutional investors. They therefore rely on prime brokers for financing as well as to locate and borrow the securities they want to sell short. By pooling the supply of lendable securities in the market, prime brokers can also provide hedge funds with stable securities loans allowing them to maintain short positions while providing securities lenders with the liquidity to recall securities loans if they wish: for example, in order to sell the underlying holdings (securities on loan) or exercise shareholder voting rights.

Short-sale proceeds may be used by hedge funds as cash collateral against borrowed securities. That cash is in turn used by prime brokers to collateralise securities borrowing from securities lenders that reinvest the cash in the separate accounts or commingled funds (e.g., registered MMFs or unregistered cash reinvestment funds), which vehicles may invest in repo. In this way, short selling may have the effect of temporarily re-directing cash intended for investment in equity or bond markets into the money markets, creating additional demand for wholesale "money-like" assets (the first driver described above).

In addition, market participants told the Workstream that some pension funds use repos to finance part of their bond holdings. This is notably the case of funds running liability-driven investment (LDI) strategies, with one such strategy consisting of repo-ing out holdings of high-quality long-term assets, usually for term, to raise cash for liquidity management or return enhancement purposes, and by doing so to achieve some degree of leverage.

2.4 Demand for associated "collateral mining" from banks and broker-dealers

The fourth driver of the markets is *the increasing need for banks and broker-dealers to gain access to securities for the purpose of optimising the collateralisation of repos, securities loans and derivatives*. As mentioned earlier, the creation of money-like repo liabilities requires collateral, and therefore the borrowing capacity of banks and broker-dealers depends on the total amount of non-cash collateral available to them. "Collateral mining" refers to the practice whereby banks and broker-dealers obtain and exchange securities in order to collateralise their other activities.[17] Increasingly, banks and broker-dealers are seeking to centralise collateral management in order to use collateral in the most efficient and cost-effective way across the firm's activities. That may include:

(i) Ensuring that repo, securities lending and derivatives counterparties are delivered the cheapest collateral acceptable to them, for example, by using tri-party services;

(ii) Using the securities lending and collateral swap markets to upgrade lower quality collateral into higher quality collateral that is more acceptable to other counterparties, for example, in the repo financing markets or at CCPs, or which is eligible for regulatory liquidity requirements;

[17] See Pozsar and Singh (2011) for more detailed explanation of the concept.

(iii) Re-using collateral delivered by other counterparties in repo, securities lending or OTC derivatives transactions;

(iv) Taking advantage of opportunities to re-hypothecate client assets from prime brokerage activities; and

(v) Taking advantage of the option to deliver from a range of eligible collateral in bilateral agreements (e.g. credit support annexes supporting ISDA derivatives agreements) in order to deliver collateral securities at the lowest cost to the firm, which is typically the securities with the lowest credit quality or highest yielding.

2.5 Demand for return enhancement by securities lenders and agent lenders

The fifth driver, particularly of the securities lending market segment, is *seeking of additional returns by institutional investors*, such as pension funds, insurance companies, and investment funds. Most lend out securities in order to generate additional income on their portfolio holdings at minimal risk, to help offset the cost of maintaining the portfolio, or to generate incremental returns. Agent lenders may take a share of their clients' lending income (net of borrower rebates paid out) arising from lending fees or cash collateral reinvestment.

In general, the loan fees paid by borrowers to the lenders represent what borrowers are prepared to pay for "renting" ownership/use of particular securities, for example, in order to create a short position.

Some securities lenders, however, also treat lending against cash collateral as a source of financing for leveraged investment in search of additional returns, making market activity "supply-led". For example, government bonds can usually be lent to raise cash collateral, which can be reinvested with proceeds split between the securities lender and its agent, net of the fixed "rebate" percentage paid to the party borrowing the securities and posting cash. Securities lenders may thereby run a cash reinvestment business through which they seek higher returns by taking credit and liquidity risk.

One major asset manager also told the Workstream that it intended to use securities lending as a means of raising cash collateral for treasury purposes, in particular, to collateralise OTC derivative positions where bank counterparties are no longer willing to take uncollateralised counterparty risk following regulatory changes.

3. Location within the shadow banking system

It is important to note that banks play important roles in these markets and many of the policy issues concern their use of collateral. Arguably, our main focus from a *shadow banking* perspective should be on four areas[18]:

(i) Borrowing through repo financing markets, including against securitised collateral, which creates *leverage* and facilitates *maturity and liquidity transformation*. Repo allows banks as well as non-banks – such as securities broker-dealers, pension

[18] Note that the following describes how securities financing transactions may be used to conduct shadow banking activities, and does not necessarily imply that such activities require policy responses.

funds, and (to a greater extent before the crisis) conduits and investment vehicles – to create short-term, collateralised liabilities. Because repo financing is typically short-term but collateralised with longer-maturity assets, it often has embedded risks associated with maturity transformation. It can also involve liquidity transformation depending on the type of securities used as repo collateral.

(ii) The extent to which leveraged investment fund financing leads to *maturity transformation* and *leverage*;

(iii) The chain of transactions through which the cash proceeds from short sales are used to collateralise securities borrowing and then reinvested by securities lenders, into longer-term assets, including repo financing. This activity can mutate from conservative reinvestment of cash in "safe" collateral into more risky reinvestment of cash collateral in search of greater investment returns (prior to the crisis, AIG was an extreme example of such behaviour).

(iv) Collateral swaps (also known as collateral downgrades/upgrades) involving lending of high-quality securities (e.g. government bonds) against the collateral of lower-quality securities (e.g. equities, ABSs), often at longer maturities and with wide collateral haircuts. Banks then use the borrowed securities to obtain repo financing, which can further lengthen transaction chains, or hold them to meet regulatory liquidity requirements.

4. Overview of regulations for securities lending and repos

The major participants in securities lending and repo markets are generally regulated institutions. By comparison with "financial market intermediaries" such as *banks* and *broker-dealers (securities firms)*, regulations and activity restrictions on lenders such as *investment firms, pension funds* and *insurance companies* vary considerably by jurisdiction and type of entity. In general, these regulations are focused more on investor/policyholder protection than financial stability considerations. As for the channels for disclosure (transparency) related to securities lending and repo activities, they are not significantly different from the general requirements for public disclosures through financial reporting and regulatory reporting.[19]

The FSB Workstream on Securities Lending and Repos (WS5), in cooperation with the IOSCO Standing Committee on Risk and Research (SCRR), conducted a survey exercise in autumn 2011 to map the current regulatory frameworks in member jurisdictions. This section provides a high-level summary of the results of the regulatory mapping exercise based on the survey responses from 12 jurisdictions (Australia, Brazil, Canada, France, Germany, Japan, Mexico, the Netherlands, Switzerland, Turkey, UK and US), the European Commission, and the European Central Bank (ECB).

[19] There are exceptions such as US regulated insurers involved in securities lending program that are required to file added disclosure regarding reinvested collateral by specific asset categories and stress testing.

4.1 Requirements for financial intermediaries: banks and broker-dealers

Risk exposures (including counterparty credit risk) arising from securities lending and repo transactions are typically taken into account in the regulatory capital regimes for *banks* and *broker-dealers*. Under the Basel capital regime, for example, banks are required to hold capital against any counterparty exposures net of the collateral received on the repo or securities loan, together with an add-on for potential future exposure. But netting of the collateral is only permitted if the legal agreement is enforceable under applicable laws. Capital requirements must also continue to be held against lent or repo-ed securities.

In addition, banks and securities broker-dealers are subject to other requirements that are designed to enhance investor protection and improve risk management. Unlike regulatory capital requirements that apply consistently across jurisdictions (e.g. Basel III for banks), there is diversity in the tools and the details each jurisdiction has adopted for risks that need to be addressed. For example, a number of jurisdictions have established regulations for the use (re-hypothecation) of customer assets by banks and broker-dealers but the details differ:

- In *Australia* and the *UK*, a bank or broker-dealer is permitted to re-hypothecate (i.e. use for its own account) customer assets transferred for the purpose of securing the client's obligations where permitted under the terms of the relevant legal agreement (e.g. a prime brokerage agreement with a hedge fund). Once the assets have been re-hypothecated, title transfers to the bank or broker-dealer, and the client's proprietary interest in the securities is replaced with a contractual claim to redelivery of equivalent securities.
- In *France*, re-hypothecation is subject to several caps. The use of re-hypothecation is authorised in a specific framework[20] for a maximum amount of 100% of the contracted loan (from the prime broker to the hedge fund) for ARIA[21] funds and 140% for ARIA EL[22] funds. There is no regulatory cap for contractual funds.
- In the *US*, re-hypothecation by a broker-dealer is subject to a 140% cap as proportion of client indebtedness.[23] In the *UK*, no similar regulatory cap exists but re-hypothecation is only permitted where securities are transferred for the purpose of securing or otherwise covering present or future, actual or contingent or prospective obligations. Under *UK* regulations, prime brokers are required to set out for the client a summary of the key provisions permitting re-hypothecation in the agreement, including the contractual limit (if any) and key risks to the client's assets, and report to the client daily on the amount of re-hypothecated assets.

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[20] French hedge funds operate in practice with prime brokers that are based abroad (mostly in London) and, under French law, every French law fund has to have a custodian based in France, the use of a prime broker not based in France relies on a triparty agreement between the hedge fund, the custodian and the prime broker.

[21] ARIA (Agréés à Règles d'Investissement Allégées, i.e. Approved for Relieved Investment Rules).

[22] ARIA EL (Agréés à Règles d'Investissement Allégées avec Effet de Levier, i.e. Approved for Relieved Investment Rules with Leverage).

[23] SEC rule 15c3-3.

4.2 Requirements for investors: investment funds and insurance companies

For institutional investors (e.g. MMFs, other mutual funds, ETFs, pension funds, college endowments, and insurance companies) that act as "investors" in the securities lending and repo markets, risk exposures arising from their involvement in the markets tend to be regulated by the relevant regulatory requirements and/or activity restrictions designed to protect investors.

4.2.1 Counterparty credit risk

Counterparty credit risk arising from securities lending and repo transactions can be mitigated by *restrictions on eligible counterparties* (e.g. based on credit ratings or domicile) and *counterparty concentration limits* (e.g. percentage of total capital or net asset value).[24] Some jurisdictions measure counterparty risk on a gross (no collateral benefit) basis; while others measure on a net basis (adjusted by collateral).

4.2.1.1 Restrictions on eligible counterparties

There is a divergence across jurisdictions in the entities that are eligible as counterparties for securities lending and repo transactions.

- In *France*, for MMF and UCITS[25], the eligible counterparties for securities lending transactions are limited to UCITS depositaries; credit institutions headquartered in an OECD country; and investment companies headquartered in an EU member state or in another state in the European Economic Area (EEA) Agreement, with minimum capital funds of 3.8 million euros.
- In *Mexico*, for mutual funds and pension funds, their counterparties can only be banks and brokerage firms.
- In the *UK*, counterparties of regulated funds are generally restricted to European banks, investment firms and insurers, US banks and US broker-dealers.
- In the *US*, registered investment company (RIC)[26] lenders are generally required to approve counterparties, and may not lend securities to affiliated counterparties except with express approval of the SEC. [27]

4.2.1.2 Counterparty concentration limits

In addition to restriction on eligible counterparties, some jurisdictions set counterparty concentration limits to mitigate the impact of a large counterparty's default. A number of

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[24] Other mitigants for counterparty credit risk (borrower defaults) may include: (i) loan indemnification provided by agent lenders; and (ii) over-collateralisation.

[25] Undertakings for Collective Investment in Transferable Securities (UCITS) are investment funds or collective investment schemes that are qualified to operate throughout the EU by satisfying various conditions/requirements set by the EU Directive.

[26] RIC includes mutual funds, MMFs, closed-end funds, and ETFs which are registered with the SEC.

[27] There are additional US SEC regulations applicable to RIC's securities lending counterparties. In the US, insurance companies, state and local pensions, and the Employee Retirement Investment Security Act (ERISA) plan lenders are not subject to these same regulations, but may be subject to different regulations.

jurisdictions measure counterparty risk on a gross (no collateral benefit) basis while others measure it on a net basis (adjusted for the value of the collateral). For example:

- In the *EU*, the UCITS Directive allows securities lending (securities borrowing is not allowed) by UCITS funds but limits net counterparty exposure of a fund (i.e. adjusted for collateral received) to 10% of NAV. The directive also includes a reference to repo and securities lending transactions in the context of calculating global exposure, requiring these to be taken into account when they are used to generate additional leverage or exposure to market risk. Future changes to the UCITS Directive are likely to include a range of issues relating to securities lending such as rules on collateralisation and gross limits.
- In the *US*, for MMFs, no counterparty can be greater than 5% of the fund's total assets unless the repo is fully collateralised by cash or US government securities, in which case the MMF may look to the issuer of the collateral for the purposes of the 5% limit on exposure to a single issuer.

4.2.2 Liquidity risk

Restrictions on the term or maturity of securities loans and repos are used in a few jurisdictions to mitigate liquidity risk arising from securities lending and repo transactions for insurance companies (Australia, Brazil, Mexico, US) and MMFs (Brazil, Canada, Germany, Japan, Mexico, US). The maturity limits range from 30 days to around one year. The requirement to allow securities lending transactions to be terminable at will is relatively common.

4.2.3 Collateral guidelines

Some jurisdictions have introduced collateral guidelines that apply either generally or specifically to securities lending and repos. Such guidelines may include various regulatory tools such as: *minimum margins and haircuts*; *eligibility criteria for collateral*; *restrictions on re-use of collateral and re-hypothecation*; and *restrictions on cash collateral reinvestment*.

4.2.3.1 Minimum levels of margins and haircuts

A few jurisdictions have imposed minimum levels of haircuts/margins. For example:

- In *Canada*, haircut requirements for repos are applied to mutual funds and require collateral with a market value of at least 102% of cash delivered.
- In the *UK*, exposures of regulated funds arising from securities financing transactions must be 100% collateralised at all times.
- In the *US*, RICs must maintain at least 100% collateral at all times, regardless of the type of collateral received (but RICs may only accept as collateral cash, securities issued or guaranteed by the US government and its agencies, and eligible bank letters of credit).

4.2.3.2 Eligibility criteria on acceptable collateral (eligible collateral)

Some jurisdictions set criteria for eligible collateral for certain financial institutions to restrict assets acceptable as collateral so as to ensure the quality of collateral. Such criteria are usually

based on credit ratings, currency-denomination, market liquidity, instrument types and correlation risk.

4.2.3.3 Restrictions on the re-use of collateral / re-hypothecation

Restrictions on re-use of collateral/re-hypothecation by investment funds and insurance companies have been imposed in a few jurisdictions. These usually take the form of simple ban on such activities, a quantitative cap (based on client indebtedness), or are based on considerations of ownership. For example, in France, pursuant to Article 411-82-1 of the AMF General Regulation[28] non-cash collateral cannot be sold, re-invested or pledged.

4.2.3.4 Cash collateral reinvestment

Canada, Germany, the UK and the US have restrictions on cash collateral reinvestment for UCITS and RICs (including MMFs). These restrictions usually take the form of *limits on the maturity* or *currency-denomination* of the investments, or *are based on asset liquidity considerations*.

- In *Canada*, mutual funds can use cash received in a securities lending transaction to purchase qualified securities with a maturity no longer than 90 days, or purchase securities under a reverse repurchase agreement. During the term of a securities lending transaction, a mutual fund must hold all non-cash collateral delivered under the transaction, without reinvesting or disposing of it. For cash received under a repo transaction, the maximum term to maturity of securities in which the cash can be reinvested is 30 days.
- In *Germany*, for MMFs and UCITS, deposits may be (re)invested in money market instruments denominated in the respective currency of the deposits; or (re)invested in money market instruments by way of repurchase agreements.
- In the UK, regulations on UCITS restrict the types of cash collateral reinvestment to a certain set of financial instruments[29], and require that cash collateral reinvestment be consistent with the fund's investment objectives and risk profile.
- In the *US*, for RICs (including MMFs), cash collateral reinvestment is generally limited to short-term investments which give maximum liquidity to pay back the borrower when the securities are returned.

4.2.4 Transparency (Disclosures)

Disclosure requirements for securities lending and repo activities are not significantly different from the general requirements for public disclosures and regulatory reporting, e.g. disclosure as appropriate in registration statements, financial statements, and other periodic SEC filings for US RICs, and reporting of outstanding positions for banks. One exception is in the case of US regulated insurers involved in securities lending program. They are required

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[28] Transposition of CESR's Guidelines on Risk Measurement and the Calculation of Global Exposure and Counterparty Risk for UCITS (CESR/10-788) – Section 4.1 on Collateral.

[29] Deposits (with approved bank, repayable on demand and matures in less than 12 months), certificate of deposit, letter of credit, marketable securities, commercial paper with no embedded derivative content and qualifying MMF.

to file added disclosure regarding reinvested collateral by specific asset categories and stress testing. Such disclosures will highlight the duration mismatch and require a statement from the company on how they would deal with an unexpected liquidity demands.

5. Financial stability issues

Based on the results from the market practices survey and regulatory mapping exercise, the Workstream has preliminarily identified the following seven issues that could be considered from a financial stability perspective. These issues are not equally relevant to all market segments. For example, securities financing markets for high-quality government bonds tend to have higher levels of transparency and contribute less to procyclicality of system leverage.

5.1 Lack of transparency

Securities financing markets are complex, rapidly evolving and can be opaque for some market participants and policymakers. Market transparency may also be lacking due to the usually bilateral nature of securities financing transactions. It may be appropriate to consider, from a financial stability perspective, whether transparency could be improved at the following levels:

(i) Macro-level market data - Prior to the crisis, some jurisdictions faced difficulties in assessing and monitoring the risks in certain aspects of those markets. Some data is available based on surveys carried out by the authorities or trade associations and from data vendors that collect information from intermediaries for commercial purposes. The lack of transparency is serious especially for bilateral transactions (i.e. not involving tri-party agents, who may publish aggregated data on the transactions they process, or agent lenders, who may report transactions to commercial data vendors) and synthetic transactions, where currently no market data is readily available and authorities have to rely on market intelligence.

(ii) Micro-level market data (transaction data) – Since securities lending and repo are structured in a variety of ways, it can be difficult to understand the real risks individual market participants entail or pose to the system without detailed transaction-level information/data. This is especially so for bilateral transactions.

(iii) Corporate disclosure by market participants – In most jurisdictions, cash-versus-securities transactions (e.g. repo, reverse repo, cash-collateralised securities loans) are usually reported on-balance sheet. However, (i) in some limited cases (e.g. repo to maturity or over-collateralised repos), repos can be off-balance sheet depending on the accounting standards used; and (ii) limited disclosure is provided in financial accounts of securities-versus-securities transactions (e.g. securities loans collateralised by other securities), that are typically “looked through” for the purposes of financial reporting. The ability of financial institutions to engage in off-balance sheet transactions without adequate disclosure may contribute to their risk-taking incentives and hence the fragility of the financial system.

(iv) Risk reporting by intermediaries to their clients – Prior to the crisis, many prime brokers did not provide sufficient disclosure on re-hypothecation activities to their

hedge fund clients. For example, following the collapse of Lehman Brothers International, many hedge funds unexpectedly became unsecured general creditors because they had not realised the extent to which it had been re-hypothecating client securities. In addition, some securities lenders, in particular some less sophisticated ones, have alleged that they were not adequately informed of the counterparty risk and cash collateral reinvestment risk of their securities lending programmes by the agent lenders.

5.2 Procyclicality of system leverage/interconnectedness[30]

Securities financing markets may allow financial institutions (including some non-banks) to obtain leverage in a way that is sensitive to the value of the collateral as well as their own perceived creditworthiness. As a result, these markets can influence the leverage and level of risk-taking within the financial system in a procyclical and potentially destabilising way.

This procyclical behaviour of securities financing markets depends, in addition to changes in counterparty credit limits, on three underlying factors: (i) the value of collateral securities available and accepted by market participants; (ii) the haircuts applied on those collateral securities; and (iii) collateral velocity (the rate at which collateral is reused).

5.2.1 The value of collateral securities available and accepted by market participants

The value of collateral that repo counterparties and securities lenders are willing to accept as collateral will fluctuate over time with market values, market volatility and changes in credit ratings. Sudden shifts, however, have tended to follow unexpected common shocks to a large section of the collateral pool, such as the deterioration in the US housing market affecting ABS markets, and doubts about the creditworthiness of some European government issuers affecting government bond and repo markets. These can cause market participants to exclude entire classes of collateral from their transactions, creating a vicious circle as contraction in the securities financing markets damage underlying cash market liquidity, reducing the availability of reliable prices for collateral valuation.

Changes in the market value of lent securities (e.g. equities) feed directly into changes in the value of cash collateral required against securities lending and then reinvested in the money market. This creates a procyclical link between securities market valuations and the availability of funding in the money markets. For example, the value of securities lending cash collateral reinvestment declined sharply in the autumn of 2008, as equity markets fell, according to data from the Risk Management Association (RMA).[31]

5.2.2 Haircuts

Most securities financing transactions are subject to "haircuts" which may further contribute to procyclicality. The importance of changes in haircuts since the crisis seems to have varied

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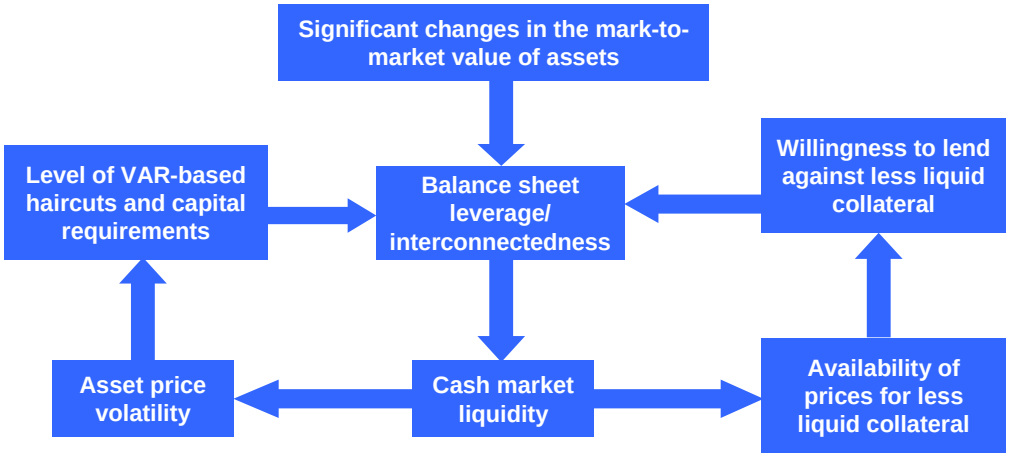
[30] The term "procyclicality" in our context refers to the tendency of financial variables to fluctuate together with the economic cycle.

[31] According to data from the Quarterly Aggregate Composite survey conducted by the RMA, the total value of US$ cash collateral reinvestment globally fell from $1.8 trillion in Q2 2008 to $1.0 trillion in Q3 2008.

across different market segments. Securities lenders and providers of short-term repo financing appear to have kept haircuts relatively stable and mainly adjusted counterparty limits and/or collateral eligibility restrictions. In the bilateral inter-dealer repo market against G7 government bond collateral, market practice[32] often does not require haircuts and CCPs in those markets have also kept haircuts stable. But haircuts on lower quality assets (e.g. ABS) did increase sharply in the inter-dealer repo and leveraged investment fund financing segments. And in the European government bond market, CCPs increased haircuts significantly on repo of government bonds issued by peripheral euro area government as yield differentials between bonds issued by different euro area governments widened.

Procyclical variation in haircuts may not simply be driven by over- and under-exuberance. For example, haircuts should reflect the potential decline in the price of the collateral between the final variation margin call prior to a counterparty's default and the point at which the non-defaulting party can sell the collateral. That will vary with the volatility and correlation of asset prices and market liquidity, both of which are likely to be procyclical. Nonetheless, some element of the procyclicality of haircuts observed in certain segments of the markets may have reflected over-optimistic haircuts before the crisis that could have been corrected, at least in part, by setting of more conservative haircuts in good times.

Exhibit 6: Procyclicality – flow diagram



5.2.3 Collateral velocity

Collateral re-use (re-hypothecation) and collateral velocity, or the length of collateral re-use chains, can also be procyclical. According to Singh (2011), the length of "re-pledging chains" has shortened significantly since the crisis. Immediately after the failure of Lehman Brothers, some securities lenders withdrew from the market entirely. Market participants told the Workstream that most securities lenders are now lending again. However, many will only accept high-quality government bonds as collateral or cash collateral that they will reinvest at short maturities in high quality government bond repo, Treasury bills and/or in MMFs.

[32] In the US, bilateral inter-dealer repo market practices involve haircuts.

5.3 Other potential financial stability issues associated with collateral re-use

In addition to the potential for heightened procyclicality, there are other financial stability risks associated with collateral re-use, whether arising from repo, securities lending, re-hypothecation of customer assets or margining of OTC derivatives. These include the potential for increased interconnectedness amongst firms and for higher leverage; and whether problems could arise following the default of multiple firms if they had provided the same securities as collateral to their secured creditors as a consequence of collateral re-use.

5.4 Potential risks arising from fire-sale of collateral assets

Securities lending and repo transactions are typically undertaken on the basis that non-defaulting counterparties will sell collateral securities immediately following a default in order to be able to realise cash or buy back lent securities in the market. As seen during the financial crisis, collateral fire sales may lead to market turmoil, and as discussed by Acharya and Öncü (2012), especially when a defaulting party's collateral assets pool is large relative to the market and concentrated in less liquid asset classes. If markets are already under stress, further selling would put downward pressure on the already stressed price of the collateral assets, with contagion to other financial institutions that have used those securities as collateral or hold them in trading portfolios. Individual market participants that establish appropriate risk management requirements or operate under regulatory exposure limitations (e.g. collateral credit quality, counterparty limitations, diversification, and haircuts) can mitigate exposure on their own secured transactions with a particular counterparty, but lack the visibility to assess that counterparty's aggregate transactions and collateral pool across the market and assess the overall market impact of its default.

5.5 Potential risks arising from agent lender practices

Securities lending practices may entail risks for the market participants involved. One of the most important is the risk of shortfall of assets held by financial intermediaries in their capacity as custodians. For example, the EU adopted in 2011 the Alternative Investment Fund Managers Directive which makes the depositary of a hedge fund strictly liable for any loss of assets held in custody bar force majeure.

Many agent lenders offer indemnities to their customers against the risk of borrower default. The terms of these indemnities, their scope and any caps applicable vary. There is a need to consider what consequences different market practices in relation to indemnities have for incentives to manage risks and whether this has any implications for market stability. For example, if an agent lender indemnifies a loan against borrower default, this could lead to the lender looking to the agent lender as its effective counterparty, and no longer screen and monitor the borrower.

5.6 Shadow banking through cash collateral reinvestment

By reinvesting cash collateral received from securities lending transactions, any entity with portfolio holdings can effectively perform “bank-like” activities, such as credit and maturity

transformation, thereby subjecting its portfolio to credit and liquidity risks. As illustrated by AIG's behaviour as a securities lender prior to the recent financial crisis, lenders can use securities lending as a means of short term funding for financing leveraged investment in instruments that, while highly rated when purchased, can become illiquid, risky, and lose value quickly. That may give rise to the risk of a "run" if securities borrowers start terminating the securities lending transactions and ask for their cash collateral to be returned.

Discussions with market participants indicate that AIG's pre-crisis behaviour was quite atypical of broader activity at that time. We have been told by some agent lenders that most cash reinvestment programmes are currently more focused on preservation of capital than they were pre-crisis. But the majority of cash collateral reinvestment programmes are managed by agent lenders, who, like most agents, share in the reinvestment profits but not the losses. Some have argued that this can create potential conflicts of interest. Others have argued that this is not the case because securities lending clients that are part of an agent lender's programme approve the cash reinvestment guidelines and are responsible for monitoring the agent lender's compliance with their guidelines.[33]

In addition, cash collateral may be reinvested by agent lenders into commingled funds, which offer less control and transparency than separate accounts and may create an incentive for clients to "run" first in the event of any problems.[34] Market participants told the Workstream that an increasing number of clients are moving towards separate accounts and the number of commingled funds has decreased significantly since the crisis. However, many clients still seem to use commingled funds for cash collateral reinvestment.

5.7 Insufficient rigor in collateral valuation and management practices

When the prices of mortgage-backed-securities (MBS) fell during the early stage of the financial crisis, a number of financial institutions did not mark-to-market their holdings of MBS or based decisions on prices generated by overly-optimistic models, and later suffered significant losses when they eventually had to do so. Arguably, the decline in the prices of MBS would have caused less of a major disruption in financial markets should such price changes have been reflected in financial institutions' balance sheets earlier and more gradually through continuous marking-to-market.

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[33] Also, if an agent lender is not cognisant of the risks when it reinvests cash collateral, and the reinvestment leads to losses, the agent lender risks losing the beneficial owner as a client as well as damage to its reputation.

[34] In the US however, the industry seemed to be largely successful in preventing runs on commingled cash collateral reinvestment pools by restricting cash redemption rights.

Annex 1: Details of the Four Market Segments

1. Securities lending segment

1.1 Market structure

This market segment involves lenders of assets lending their securities to broker-dealers/banks. Lenders typically engage an agent or several agents to manage their securities lending business. In the past, the securities lending agents were custodian banks and they remain the largest players, but today a number of non-custodial agents also act as intermediaries in this business. Securities lending transactions involve the following key steps:

(i) The terms for the loan are agreed between the beneficial owner and the borrower. The agent lender, if one is used, usually negotiates the terms on behalf of the beneficial owner. Terms may include issuer and amount of securities to be lent/borrowed, duration of the loan, basis of compensation, eligible collateral, amount of collateral and collateral margins.

(ii) The beneficial owner delivers the securities to the borrower and the borrower delivers the collateral, either in the form of cash or securities, as agreed upon, to the beneficial owner.[35]

(iii) During the life of the loan, the collateral and the lent securities are valued daily to maintain sufficient levels of collateralisation and the margin required is increased or decreased accordingly. The beneficial owner's agent lender usually manages this process.

(iv) If the collateral is in the form of cash, it is often reinvested in money market assets, usually through a separate account, or a commingled fund, managed by the agent lender, in which cash collateral of several of the agent lender's securities lending clients will be commingled and reinvested. Collateral in the form of securities may also be kept in separate or commingled accounts.[36]

(v) When the loan is terminated, equivalent securities[37] are returned to the beneficial owner and equivalent collateral is returned to the borrower.

In return for lending its securities, the beneficial owner receives a fee from the borrower if the collateral is non-cash. Lending fees can vary greatly depending on the nature, size and duration of the transaction, the demand to borrow the securities, and other factors. Agent lenders are typically compensated for their services through an agreed split of the revenue generated by the lending programme. The size of such splits may vary depending on a number of factors such as the services and protection (i.e. loan indemnification) provided by the agent lender and the type and size of the beneficial owner's portfolio of assets.

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[35] Either directly to the lender or its custody account at an agent lender.

[36] Most non-cash collateral in the US is held by third-party custodians on behalf of the lenders.

[37] Usually securities with the same identification number.

In case of cash collateral, the securities lender, typically through its agent lender, will pay the borrower interest on the cash collateral (the "rebate"), usually expressed as a spread below overnight market interest rates unless the lent securities are in very high demand, in which case the borrower will pay the lender a fee (known as a "negative rebate"). The remainder of the cash reinvestment income is typically shared between the beneficial owner and its agent lender, with the beneficial owner typically receiving the lion's share. The lending agent may also receive a separate asset-based fee for managing the cash collateral, and in some cases a fixed administrative fee.

Securities are usually lent on an open basis with no fixed maturity date. This gives lenders the flexibility to recall their securities at any day (subject to normal settlement timetables) if, for example: they are dissatisfied with the terms of the loan, no longer like the credit risk of the borrower; want to sell the securities; want to exercise voting rights on equities that have been lent out; or for any other reason. Borrowers may also return the security at any time, if, for example, they decide to terminate a short position that utilises the borrowed security.

Most securities lending occurs under industry-standard master agreements. Securities lending agreements used outside the US[38] involve transfer of legal title, with the borrower becoming legal owner of the securities on loan and the lender becoming legal owner of the collateral. Except in the US, both the borrower and lender can therefore sell or use assets received under securities lending transactions as collateral in other transactions.[39] The agreement between the parties is designed to return all the economic benefits and risks associated with ownership, such as dividends and coupons, to the original owners. [40] For example, the lender remains exposed to any change in the market value of the lent securities and the borrower is required to make payments to the lender equal to any dividends or coupons received on the lent securities, net of tax at the lender's tax rate. But the lender's economic exposure to the lent securities is entirely synthetic arising from its contract with the borrower.

1.2 Key participants

Lenders are typically institutional investors such as public and private pension funds, ERISA plans, insurance companies, registered investment companies (e.g. mutual funds, MMFs, and ETFs), and college endowment funds. Agent lenders, including custodian banks and third-party specialists, are employed by lenders to lend their securities for them. If the collateral received on the securities loan is cash, the agent lenders often also reinvest the cash on behalf of the lenders through their asset management businesses. Cash reinvestment may either be through separate accounts or through commingled funds that pool the cash collateral received by the agent lender's clients. Benefits of employing an agent lender include economies of

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[38] The US Master Securities Loan Agreement (MSLA) does not refer to transfer of title of the loaned securities, but rather to a transfer of "all of the incidents of ownership of the Loaned Securities." The MSLA also does not refer to a transfer of title to the collateral to the lender, but rather provides that the lender shall have a first priority interest in the collateral, and that the lender may invest the cash collateral (at its own risk).

[39] In the US, under the master loan agreement, unless the lender is a broker-dealer or the borrower defaults, the lender does not have the right to re-hypothecate non-cash collateral. In such a case, the non-cash collateral would not be accounted for as the lender's asset.

[40] In the US, certain dividend income is sometimes taxed at a lower rate than ordinary income. Under the US laws, the payments made by borrowers back to lenders equal to the dividends on the lent securities are not considered "dividends". Therefore, such payments may be taxed at a higher rate than the dividends on the lent securities, depending on a number of factors.

scale, securities lending expertise and systems that the beneficial owner may not have, specialised market knowledge, and better access to borrowers. Most agent lenders also provide indemnification to lenders against the default of the securities' borrower, but usually not against losses incurred on the reinvestment of cash collateral.[41]

Borrowers of securities include market makers and cash/derivatives traders who borrow securities for their own purposes, e.g. market making, hedging, facilitation of trade settlement or short-covering, and principal intermediaries (e.g. prime brokers) that borrow securities in order to lend to client institutions, such as hedge funds.

1.3 Market characteristics

Lenders typically have minimum eligibility requirements for non-cash collateral, for instance only accepting collateral with a credit rating of AA- or better. In addition, lenders define their own collateral eligibility schedules, even when they conduct securities lending through an agent lender. Since the crisis, the Workstream understands that the trend has generally been to move away from ratings-based schedules and towards asset class-based schedules. In addition to cash, many lenders will accept government bonds as collateral but equities are also becoming increasingly accepted in some jurisdictions.

Agent lenders told the Workstream that they would only accept non-cash collateral for which current market prices are available, with a number of them referring to a "3-day stale-price policy", whereby securities for which a market price cannot be obtained after 3 days automatically becomes ineligible. Agent lenders also told the Workstream that generally they and the lenders agree on a list of approved borrowers for their securities, and sometimes tailor acceptable collateral to the borrower in question.

Some securities borrowers, such as banks/broker-dealers, may give haircuts/margins, which are privately agreed and in some cases are based on minimum regulations. Margins tended to follow market norms before the crisis (e.g. 102-105%), but have now become more differentiated with respect to asset type and maturity. VaR models and stress tests are increasingly used to test adequacy of haircuts/margins. However, agent lenders said that haircuts tended to be adjusted infrequently, with reductions in the value of outstanding loans being the main tool used in response to any counterparty credit concerns.

CCPs are attempting to move into the securities lending market but penetration has been very limited so far. A key problem is the increased financial costs for lenders to use a CCP; market participants are currently considering viable solutions to overcome this problem.

1.4 Collateral swaps

There has been increased demand from banks in the past year to undertake collateral swap transactions (also known as liquidity swaps and "collateral upgrade/downgrade" trades), a type of securities lending transaction that involves borrowing high-quality and liquid securities, such as government bonds, in return for pledging relatively less liquid securities,

[41] The terms and conditions of indemnities, and the ways in which agent lenders manage risks arising from them may vary greatly across the industry.

such as RMBS.[42] Banks may use the high-quality securities to meet regulatory liquidity buffer requirements, raise cash in the repo market or as collateral for CCPs or bilateral derivatives transactions. Although these transactions do not in themselves involve cash borrowing, banks' motivation is to obtain liquid assets for financing and liquidity purposes – so they are a hybrid between the securities lending and repo financing segments of the market, and by design involve liquidity transformation.

Collateral swaps can take a variety of forms and are typically arranged for a minimum – and usually relatively long – term (as long as a few years) rather than being open to termination at any time like traditional securities loans. Collateral swaps are typically based on pools of securities, allowing either the lender or borrower to substitute securities lent or collateral pledged over time. This gives each party flexibility in the management of their assets. Collateral swaps typically do not involve agent lenders.

1.5 Regional variations

Institutional investors in most countries lend securities globally. But typically, lending programmes are run by agent banks located in London, New York, Tokyo or Hong Kong.[43]

According to the Risk Management Association (RMA), the total value of US securities on loan globally was around $0.7 trillion as of Q3 2011[44], of which 26% was against non-cash collateral, 74% was against US$ cash collateral, and less than 0.1% was against euro cash collateral. In comparison, the total value of European securities on loan globally was around $0.2 trillion, of which 59% was against non-cash collateral, 24% was against US$ cash collateral, and 17% was against euro cash collateral. Cash collateral reinvestment had been largely seen as a market centred around US and Japanese lenders. However, non-US institutions lending US securities may also be receiving cash collateral and hence subject to cash collateral reinvestment risk.

In Europe, some securities lending programmes are also run by post-trade market infrastructures (International Central Securities Depositories) for the purpose of enhancing securities settlement efficiency. In Japan, the proportion of cash collateral for bond lending was around 97% in 2011 according to JSDA.

1.6 Recent history

During the 2007-2008 financial crisis, AIG experienced substantial losses on the securities lending programme operated by some of its life insurance subsidiaries. AIG ran the

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[42] The Workstream understands that collateral swap transactions would not involve US registered investment company (RIC) lenders, which may only accept cash, securities issued or guaranteed by the US government or its agencies, or certain irrevocable standby letters of credit issued by eligible banks.

[43] There are also regional agent lenders servicing primarily domestic clients or borrowing needs of domestic securities that are operating from other locations, such as Toronto.

[44] The total amount of securities on loan globally according to the RMA survey is significantly lower than that according to Data Explorers, due to a smaller sample size.

programme primarily as a source of financing for leveraged investment. Cash was pooled and reinvested in relatively long maturity instruments, including ABS, to maximize returns. [45]

Meanwhile, the cash reinvestment programmes of a number of large agent lenders suffered from the illiquidity of US money markets, with the estimated secondary market value of reinvestment assets falling below the lender's obligation to return cash collateral. Where the cash collateral was reinvested in commingled pools, some lending agents restricted the ability of clients to completely redeem their assets from the pools, offered repayment in kind rather than in cash, and/or permitted limited cash redemption, in small monthly percentages ("gates") or in the case of "ordinary course" redemptions only. These measures were taken in part to address the illiquidity of the reinvestment pools, and to address the incentive of some clients might have to withdraw their cash collateral, which could have further eroded the liquidity of the cash reinvestment pools to the detriment of those remaining in the pools. Agent lenders also provided incentives for borrowers to maintain loans in order to avoid the need to liquidate cash collateral pools, including by raising rebate rates and offering to reinvest new cash in term repo with borrowers. A number of reinvestment programmes also experienced investment losses following defaults of Lehman Brothers and some SIV investments. Some legal actions have been commenced by lenders against agent lenders in relation to losses on cash reinvestment programmes (generally these suits allege breach of contract as to the investment guidelines and breach of fiduciary duties). The Workstream understands generally that, notwithstanding the losses in the value of the securities in which the cash was invested, the securities continued to generate income and during this period lenders continued to receive income, in some cases substantial, from their cash collateral reinvestments.

In 2008, the size of the securities lending market shrank significantly. [46] This was due in large part to sharp falls in the market value of lent securities but also to a lesser extent because some lenders and borrowers withdrew from the market, reflecting a combination of concerns about counterparty creditworthiness and illiquidity in cash reinvestment portfolios, reputational concerns following regulatory bans on short selling, and realisation that they did not sufficiently understand the risks inherent in their securities lending activities. Lehman Brothers had been a significant securities borrower prior to its collapse but its default was managed relatively smoothly by securities lenders, with collateral in most cases being sufficient to avoid losses according to market participants.

Since 2008, agent lenders report that the majority of lenders have returned to the market. But the Workstream has been told that lenders have generally tightened their non-cash collateral schedules, moved to less risky cash reinvestment mandates, and required more frequent and detailed reporting from agent lenders. The Workstream has also been told that lenders with larger programmes have also shifted away from pooled reinvestment vehicles towards separate accounts in order to reduce the risk of liquidity runs (which are a risk when using

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[45] According to AIG's state insurance regulators, almost all of the US cash collateral was invested in AAA-rated securities; however, approximately 60% of the US collateral pool was invested in mortgage-backed securities; with more than 50% of that pool comprised of subprime and Alt-A mortgages. See: http://banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=8ee655c8-2aed-4d4b-b36f-0ae0ae5e5863

[46] According to Data Explorers, around $3.55 trillion of securities were on loan globally at the beginning of 2008; this declined to around $1.77 trillion by the end of 2008.

commingled pools for cash collateral reinvestment). In the US, lenders may reinvest cash collateral in rule 2a-7 funds (registered MMFs), or unregistered funds that may follow some but not all of the requirements of rule 2a-7 funds (and/or separate accounts). Lenders reinvesting the cash in commingled funds, and looking to the cash reinvestment as a profit centre may invest the cash in non-2a-7 funds. Meanwhile, lenders reinvesting the cash in commingled funds with capital preservation as the primary goal, are more likely to invest in 2a-7 funds, or short-term repo, or similarly conservative investments.

2. Leveraged investment fund financing and securities borrowing segment

2.1 Market structure

This market segment covers banks and broker-dealers lending securities and providing financing to leveraged investment funds (most of which are hedge funds) via market-based securities lending and repo transactions, and through margin lending as part of the prime broker relationship.

Prime brokers are typically large banks and securities firms that offer a range of services to their clients, most of which are hedge funds.

The prime brokerage agreement is based on a pledge over the hedge funds' total in-custody assets, and is thus very much relationship-based. Hedge funds are able to borrow cash or securities up to this value less a margin, with margins typically calculated on a portfolio basis, drawing on VaR type calculations and stress testing. Financing of long positions can be collateralised with the underlying securities purchased, while securities borrowing to cover short positions can be collateralised with the cash proceeds. Margin requirements are met from net assets.

Prime broker margin lending occurs alongside repo and securities lending transactions that the hedge fund may enter into with other banks and broker-dealers. Typically, equity funds rely more on prime broker margin lending whereas larger fixed income funds transact directly across multiple banks/broker-dealers using repo.

A key role of a prime broker is to locate securities that hedge funds wish to sell short through the securities lending and other markets and on-lend them to hedge funds.[47] These loans are typically "at call" so that the prime broker is not exposed to a contractual maturity mismatch. The prime broker's reputation, however, rests on never needing to recall securities from a hedge fund client. A good prime broker will protect its hedge fund clients from a "short squeeze" in the market to a certain extent through access to multiple securities lenders and other sources of securities. In some cases, prime brokers will pay securities lenders for exclusive access to "hard-to-borrow" portfolios (e.g. emerging market equities) over a defined period. Some lenders have a business model of periodically auctioning these exclusive portfolios to the prime broker prepared to pay the highest fee. Index funds and ETFs are

[47] A "pre-borrow" or "locate" requirement is in certain jurisdictions a regulatory requirement for short-selling. A pre-borrow requirement ensures that (certain) short-sellers have borrowed securities they do not own before selling them. A locate requirement ensures that (certain) short-sellers have entered into a borrowing agreement or taken other measures allowing them to borrow securities before selling them.

valued by prime brokers because they have stable portfolios and are less subject to the risk of recall because of investment decisions by asset managers. They may therefore command higher lending fees.

Prime brokerage agreements usually give the prime broker the right to re-use pledged assets it holds on behalf of the hedge fund up to a proportion of its net indebtedness, a practice known as "re-hypothecation". This is often separate from securities lending and repo transactions, which typically take place under industry-standard master agreements and involve full temporary transfer of title of the underlying securities and collateral.

In the US, the extent to which prime brokers can re-hypothecate client assets is limited by SEC regulations to 140% of the client's net indebtedness towards the prime broker. No such regulatory cap exists in the UK, another market where prime brokerage is active, but hedge funds typically have contractual limits on re-hypothecation with their prime brokers, which have been converging towards 140% of client indebtedness since the crisis. UK regulation does require regular reporting of re-hypothecation by prime brokers to hedge funds. Prime brokers can sell assets within agreed limits on re-hypothecation or use them as collateral for securities borrowing or repo financing transactions. Outside these limits, assets must be held in custody for the hedge fund client.

Similar to securities lending and repo transactions, the obligation of the prime broker in relation to re-hypothecated assets is to return "equivalent securities" [48] rather than the "exact same"[49] securities. For liquid securities, prime brokers may be confident that they can buy or borrow the securities in the market to return to the hedge fund client without necessarily going back to the counterparty of the original transaction. In the case of illiquid, hard to source securities, prime brokers however told the Workstream that they are careful to ensure that they can return the exact securities re-hypothecated. For example, they said it was not common practice to lend re-hypothecated assets to other hedge funds for short covering.

Prime brokers also told the Workstream that re-hypothecation is critical to their business model because it makes the business more "self financing". Hedge fund cash balances are used to collateralise borrowing from securities lenders for on-lending to hedge funds and, likewise, re-hypothecated securities are used to collateralise repo financing and securities borrowing for on-lending to hedge funds. [50] Before the crisis, prime brokerage activities could generate excess cash and collateral for use elsewhere in a bank's business. But now prime brokers said that lower limits on re-hypothecation negotiated by hedge funds, higher haircuts by securities lenders and, importantly, additional liquidity buffers required by regulators such as the UK FSA against possible withdrawal of hedge fund cash balances mean that prime brokerage is a net consumer of liquidity from the rest of the bank, rather than a net generator of liquidity.

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[48] Usually securities with the same identification number.

[49] In the case of fungible securities held in electronic form, "exact same" securities have no meaning in any case.

[50] Hedge funds can usually require that their assets are not re-hypothecated, but the cost of funds would be commensurately much higher.

2.2 Regional variations

The global prime brokerage industry is mainly concentrated in New York and London, and activities elsewhere, if any, are usually dominated by major US and European investment banks, with some exceptions where domestic prime brokers are also active (e.g. Toronto). Prime brokers told the Workstream that most London-based hedge funds now set a limit on re-hypothecation of 140% of client indebtedness, the same as the US regulatory limit, but some are still prepared to allow higher limits up to 200%.

2.3 Recent history

In 2008, after a run from hedge funds, Bear Stearns, a large prime broker, became illiquid and was bought by JP Morgan. Another prime broker, Lehman Brothers, declared bankruptcy later in the year due to large losses on its exposures to subprime mortgages. As a result, haircuts on hedge fund financing increased sharply during the crisis, particularly against ABS collateral, forcing many hedge funds to reduce leverage.

Following Lehman Brothers' collapse, clients of Lehman Brothers' prime brokerage business experienced delays in recovering client assets and client money held with the firm. In particular, many clients had granted Lehman Brothers unlimited rights to re-hypothecate assets to obtain funding and were therefore unsecured creditors when Lehman Brothers declared bankruptcy. This exposed the risks run by hedge funds in allowing their prime brokers to re-hypothecate assets beyond their net indebtedness position.

Since the crisis, hedge funds have responded by diversifying their financing sources via multiple prime brokers, becoming more sensitive to the creditworthiness of their prime brokers, improving collateral monitoring and modifying their contracts to limit re-hypothecation. Some have also made arrangements to transfer any "excess" assets on a regular basis to custody accounts with third party custodian banks or custodian sister companies of the prime broker (e.g. ring-fenced from the prime broker's lien).

3. Inter-dealer repo segment

3.1 Market structure

This segment consists primarily of repo transactions between banks and broker-dealers. At the beginning of a repo transaction, the cash borrower sells securities with a simultaneous agreement to repurchase equivalent securities at a future date for the original value plus a repo rate.[51] During the term of the repo, any divergence between the market value of the securities sold (collateral) and the cash received should be eliminated by margin maintenance, usually on a daily basis, i.e. if the market value of collateral falls, the buyer calls for extra collateral or requests the difference be refunded in cash and vice versa. If, on the contrary, the market value of a collateral rises and exceeds the price at the time of agreeing the repo by an agreed percentage, the difference is called either an initial margin if the collateral is calculated as a premium over the cash value, or a haircut if the cash is calculated as a discount under the collateral value.

[51] The repo rate is usually reflected in a higher repurchase price rather than being paid separately.

Transactions are either against "general collateral (GC)"[52] or specific securities. GC trades dominate the inter-dealer repo market and are driven by the cash leg of the transaction, with banks looking to lend and borrow cash in a secured way for financing purposes or to take yield curve positions. Repo transactions to borrow specific securities may be to cover short positions for market making, settlement or hedging purposes.

3.2 Key participants

Participants in this market segments are major banks and broker-dealers with an international trend towards central clearing of repo transactions through CCPs. Inter-dealer GC repo trading in US dollar, euro and sterling government bond repo markets is primarily conducted through anonymous electronic trading systems linked to CCPs.

3.3 Market characteristics

The inter-dealer government bond repo market is of key importance to banks for squaring their positions in the overnight money markets and for hedging short-term interest rate risk. This market is also central to the ability of broker-dealers to manage inventories as well as make markets and provide liquidity to government bond cash markets. Volumes are greatest for overnight transactions. However, unlike the unsecured interbank market, transactions also take place at longer maturities, reflecting the lower credit risk and capital requirements for repos.

Bilateral transactions in the short-term inter-dealer government bond repo market do not usually involve haircuts, reflecting the equal credit standing of the two parties, the perception of zero credit risk on the collateral, and the collection of variation margin usually on a daily basis to reflect any change in the value of the underlying collateral. However, this is not necessarily the case in bilateral repo transactions in the US, or for repos conducted against lower quality collateral (e.g. low quality corporate bonds) or with other types of counterparties (e.g. hedge funds).

A CCP, acting as the counterparty to both parties, takes margin/haircut from both sides of the trade. The benefits of trading through a CCP rather than bilaterally include (i) reduced counterparty credit risk (and more favourable treatment for regulatory capital purposes) and (ii) balance sheet netting.

Unlike the repo financing market – which overwhelmingly involves a one-way flow of cash from "cash-rich entities" to banks and broker-dealers in exchange for securities collateral – the inter-dealer repo market is a two-way market amongst banks and broker-dealers. Moreover, banks and broker-dealers will often re-use collateral received, so the velocity of collateral in the inter-dealer repo market is relatively high.[53]

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[52] GC (general collateral) refers to securities selected by the cash borrower meeting general requirements set by the cash lender, e.g. government bonds. Selection of the actual securities may be undertaken by a tri-party agent, Central Securities Depositories (CSDs) or International Central Securities Depositories (ICSDs) following algorithms.

[53] This may be driven by the dealers' trading of repo rates. For instance, a dealer may borrow a specific security for a one-month term and lend each day at overnight maturity in order to profit from an expected increase in the special repo rate for that security.

3.4 Regional variations

Government bond inter-dealer repo markets exist in most developed countries and are closely linked to debt management and central bank monetary policy operations. This market segment is also usually viewed as a core funding market given its centrality to banks' funding and its important role in supporting the liquidity in the government cash bond markets.

While a considerable proportion of inter-dealer government bond repo trading is already centrally cleared in the US, UK, euro area and Japan, the Australian and the Canadian repo markets are exclusively bilateral, although a CCP has recently been introduced in Canada to clear repo transactions on specific Canadian government securities and is expected to expand over time.[54] The US has the largest inter-dealer market in repos backed by non-government bonds, primarily now in US Agency MBS and debentures.

3.5 Recent history

According to the ICMA repo survey, the size of the European repo market (sum of repo and reverse repos outstanding) fell from a peak of 6.7trillion euros in June 2006 to a bottom of 4.6trillion euros in December 2008, before rebounding back to 6.2trillion euros in December 2011.[55]

The European sovereign bond crisis has led to a flight to quality in the euro government bond repo market, with a significant widening of spreads between repo rates on core and periphery sovereign bonds between August and early December 2011, although the spreads narrowed markedly following the ECB's 3-year long term refinancing operations (LTRO). CCPs initially raised margin requirements on repos of Italian, Irish, Portuguese and Spanish government debt, but subsequently reduced the margins as market conditions improved. Repo market participants told the Workstream that the inter-dealer repo market for some periphery sovereign bonds had almost disappeared beyond overnight maturities, although there has been some significant improvement following the ECB 3-year LTROs.

In the US, the inter-dealer repo market for private label ABS and CDOs that existed before the crisis largely dried up after 2008. Gorton and Metrick show data on how haircuts in this market widened rapidly from zero before the crisis to up to 100%.[56]

4. Repo financing segment

4.1 Market structure

This segment of the market is used primarily by banks and broker-dealers, and by some other market participants, to finance holdings of securities or for short-term financing. It also provides risk-averse cash investors with a "money-like", short-term means of lending and investing excess cash in wholesale markets.

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[54] Work is progressing on shifting the Canadian repo market to a CCP model following its identification as a core funding market. The first phase of the CCP was launched on 21 February 2012.

[55] This includes both inter-dealer repos and dealer-to-client repos. Figures are outstanding volumes for a moving panel of dealers and might be double counting repos and reverse repos.

[56] Gorton, Gary B. and Andrew Metrick (2011).

4.2 Key participants

The main cash borrowers are investment banks and broker-dealers. Lenders include retail/private banks but also a wide range of non-bank entities, including MMFs (up to one third of the US tri-party repo market), securities lending cash collateral reinvestment funds (up to one quarter of the US tri-party repo market), official reserves managers, non-financial corporations and other bodies such as the US Federal Home Loan Banks and CCPs.

In Europe, the Euro Money Market Survey (among credit institutions only) published by the ECB on 30 September 2011 indicates that the repo market is concentrated among a few dominant players with the top 20 reporting institutions from an overall panel of 170 accounting for 81.1% of secured financing market activity in 2011. With regard to non-bank intermediaries, available data is rather scarce but market intelligence suggests that MMFs and large insurance companies are large lenders. Some large companies have also reportedly begun to use reverse repos instead of bank deposits.

4.3 Market characteristics

Trades can either be conducted on a bilateral or on a tri-party basis. Tri-party agents provide services including: trade matching; collateral allocation and optimisation; settlement; collateral valuation and margining; as well as custody and reporting on behalf of the parties. They are remunerated by the cash borrowers. The main tri-party service providers globally are global custodian banks, with CCPs and CSDs/ICSDs competing in Europe. Cash borrowers usually give haircuts, but there is no market standard and a wide degree of dispersion exists, even for a given category of assets.[57] Tri-party repo developed predominantly as means for broker-dealers to finance their inventory on an ongoing basis (akin to sequential overnight trades), and as a facility to optimise collateral mapping across institutional cash providers.

Some repo lenders insist on receiving government bonds only as collateral. Tri-party repos, however, facilitate the acceptance of a wider range of collateral and investment banks are prepared to pay a higher rate and higher haircuts on broader collateral that can be less easily (or more expensively) financed elsewhere, corresponding to the securities they carry on their balance sheets. Prior to the crisis, collateral eligibility was typically defined by credit rating, with ABS commonly used. Now, lenders tend to focus more on asset types, market liquidity and availability of prices for valuation. The proportion of collateral consisting of ABS has declined markedly since the crisis, while equities have become more widely accepted.

Unlike the inter-dealer repo market, cash lenders in the repo financing market do not typically re-use collateral as most are not leveraged entities with a need to collateralise borrowing. This may change in the future however with, for example, demand for collateral against derivatives positions with CCPs.

The 2011 ECB survey includes data on activity in the secured market cleared through CCPs (as a subset of the repo market). The share of these transactions in the secured market was revised upward to 51% for the second quarter of 2010 and remained stable at 50% for the second quarter of 2011. The share of tri-party repos reached 12% of the segment, at the expense of the non-CCP cleared bilateral repos which accounted for 38 %.

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[57] See http://www.newyorkfed.org/tripartyrepo/margin_data.html.

4.4 Regional variations

Repo financing markets are most developed in the US and Europe where tri-party arrangements have a significant and growing market share. Tri-party is less or not at all used in Australia, Canada and Japan where bilateral trading remains typical. Overnight tri-party repo financing remains predominant in the US but in Europe longer-term transactions have grown recently alongside overnight and open maturities.

Tri-party collateral in the US market comprises mostly Agency MBS and debentures, and US Treasury bonds, with a smaller share of corporate bonds and equities. In Europe, government bonds also comprise the largest share of tri-party collateral with corporate bonds, equities and covered bonds also comprising material components of the acceptable collateral universe. In Japan, Japanese government bonds account for most of the repo financing segment where broker-dealers borrow cash from trust banks and other institutional investors, with a very small portion of corporate bonds and equities.

4.5 Recent history

Unlike the inter-dealer market, Copeland et al (2011) show that haircuts in the US tri-party repo financing market were generally stable during the crisis, with the response to counterparty credit concerns largely taking the form of reduction in lending volumes. In Europe, market participants told the Workstream that tri-party haircuts had been increased during the crisis but in a measured way. Collateral eligibility had also changed, with lenders excluding ABS and adopting criteria based on asset type and liquidity rather than purely ratings.

Annex 2: Data on securities lending and repos

1. Securities lending segment

Data Explorers, SunGard's Astec Analytics, and the Risk Management Association (RMA), among others, collect, aggregate, and provide data on securities lending to their clients/members. No data is currently available to the public. All collect data on a global basis rather than by geographical location. RMA data below is based on survey returns from 15 large agent lenders. Data Explorers collects data from lenders, agent lenders and broker-dealers. It claims its dataset encompasses more than 90% of global transactions. Table 1 shows "lendable assets" (i.e. securities held within lending programmes) and assets on loan (i.e. securities actually lent at the time of the survey) as a proportion of total outstanding assets by market value. It also shows the proportion lent against cash collateral (based on the RMA survey data). The remainder are lent against the collateral of securities.

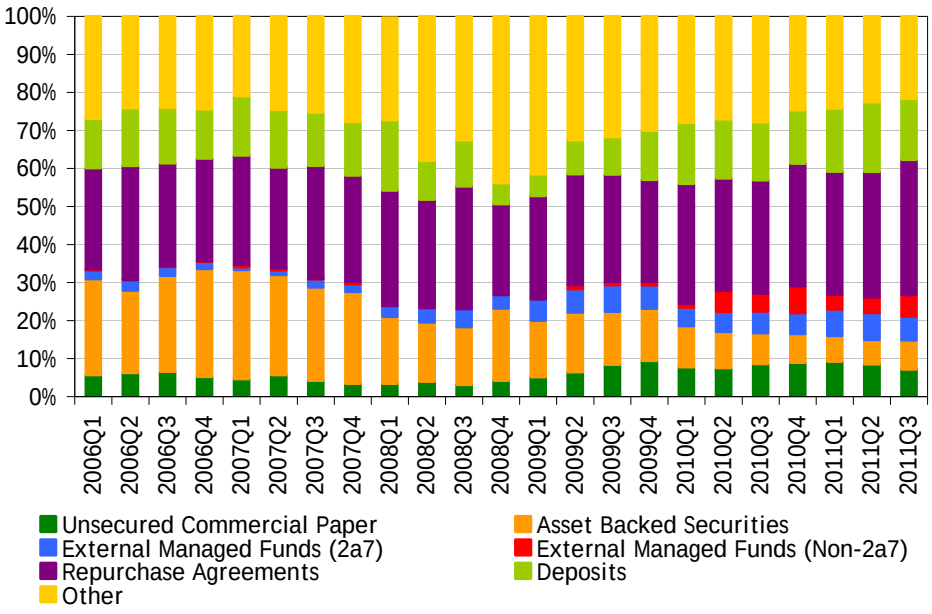
Table 1: Securities lending by asset class

As at Q3 2011			**Data Explorers**		**RMA**		
Asset Class		**Total market value** (US$ bil)	**Lendable Assets** (% of total outstanding)	**On Loan** (% of total outstanding)	**Lendable Assets** (% of total outstanding)	**On Loan** (% of total outstanding)	**% vs. Cash Collateral** (% of on loan)
US	US Treasuries/Strips	9,200	10	4	10	4	55
	US Agencies	2,400	12	2	8	2	78
	US MBS (Non-Agency)	700	n/a	n/a	17	Less than 1	67
	US Corporate Bonds	7,700	17	1	17	1	98
	US Equity	14,045	23	2	25	2	96
Europe	France Government Bonds	3,645	6	2	2	1	57
	Germany Government Bonds	3,198	10	5	3	1	50
	UK Government Bonds	1,600	17	8	11	4	19
	Other European Government Bonds	2,834	13	4	4	1	53
	UK Equity	3,100	19	1	15	1	25
	Other European Equities	10,972	3	Less than 1	4	Less than 1	50

Source: Data Explorers, RMA, BIS

Chart 1, based on the RMA survey data, shows a time series of the split of cash collateral reinvestment by asset type.

Chart 1: Cash collateral reinvestment – breakdown by asset type

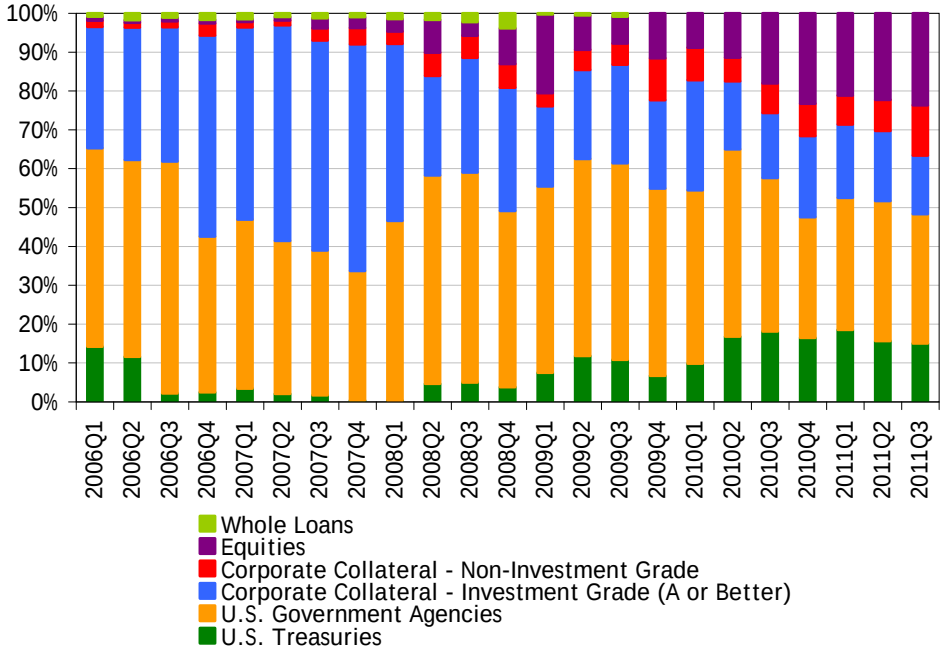


Note: Other includes funding agreements, other Corporates and all other funding instruments that can not be categorized.

Source: RMA

Chart 2, again based on the RMA data, splits the repurchase agreements element in Chart 1 by collateral type.

Chart 2: Cash collateral reinvested in repo – breakdown by collateral type



Source: RMA

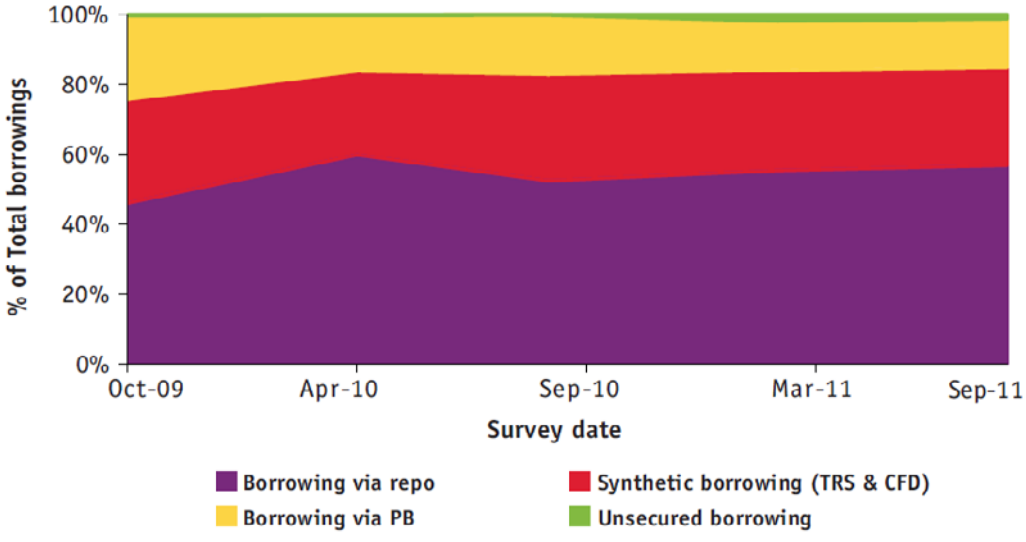
2. Leveraged investment fund financing and securities borrowing segment

Estimates from public databases show the size of hedge fund assets under management (AUM) globally to be between $1.7 and $2.5 trillion.[58] The UK Financial Services Authority (UK FSA) has been collecting exposure and risk data on a small sample of hedge fund managers based in the UK through its Hedge Fund Survey (HFS), which started in October 2009. The latest HFS for September 2011 captured around 50 hedge fund managers and 100 hedge funds, representing approximately $400bn in assets under management.

For hedge funds in this sample, repos account for roughly 55% of aggregate hedge fund borrowing, followed by synthetic borrowing[59] (29%) and collateralised borrowing under prime brokerage agreements (15%). Since the first survey in October 2009, collateralised borrowing via prime brokers has declined as a proportion of total borrowing, from 24% to 14%, driven mostly by increases in other forms of borrowing.

In addition, the UK FSA collects data on UK-based banks and prime brokers' exposures to hedge funds through its Hedge Fund as Counterparty Survey (HFACS).[60] The latest data for the HFACS for October 2011 estimated total "cash-out"[61] reverse repo financing provided to hedge funds was $390 billion. This survey also showed that over 74% of repo financing between surveyed banks and their hedge fund counterparties comprised G10 government bonds as collateral, which has remained relatively unchanged across recent surveys.

Chart 3: Source of Hedge Fund Borrowing



Source: FSA HFS

[58] Different databases provide different estimates. For example, the Eurekahedge database estimates the global industry at $1.7 trillion, the Hedge Fund Research (HFR) and the BarclayHedge (including Managed Futures (CTA) but excluding fund of funds) report $2 trillion and $2.1 trillion respectively, and the Hedge Fund Network (HFN) database reports $2.5 trillion. However, these are likely to underestimate the size of the global industry as not all funds are expected to report to public databases.

[59] Synthetic borrowing includes total return swaps or contracts for difference.

[60] The HFACS covers 14 of the largest UK FSA-authorised banks. The hedge funds for which they report data on the nature of their exposures may not correspond to the survey population of hedge funds captured by the HFS.

[61] Cash-out financing essentially covers reverse repo with hedge fund counterparties outside prime brokerage relationships.

3 and 4. Interdealer repo segment and repo financing segment

Separate estimates for the interdealer repo segment and the repo financing segment are available only in the US. Therefore only aggregate statistics are presented in this section. Moreover, when calculating the size of the repo market, many studies simply sum up the total amount of repos and reverse repos outstanding on financial institutions' balance sheets, leading to significant double counting (since one bank's reverse repo asset may be another bank's repo liability).

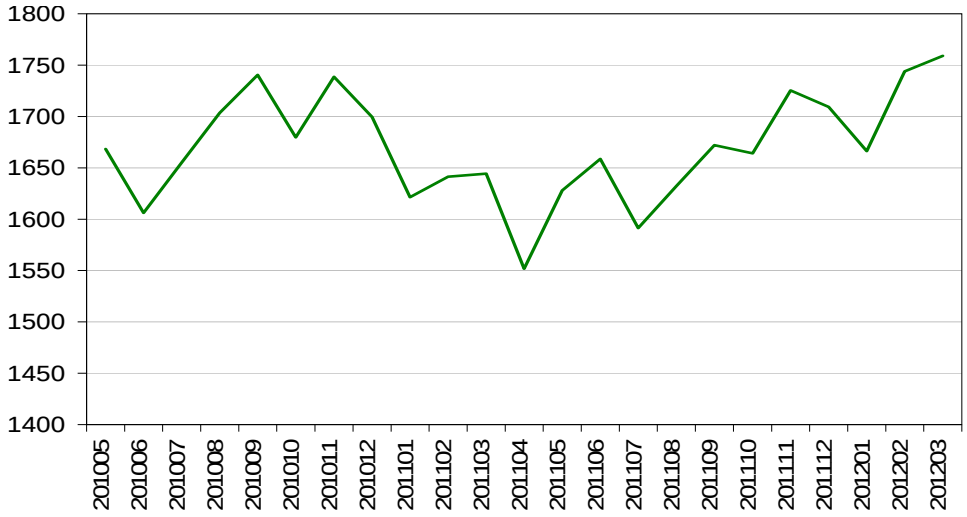
The US and euro area have by far the largest repo markets in the world. The Federal Reserve Bank of New York (FRBNY) facilitates the industry's publication of detailed data on tri-party repos on a monthly basis, whereas the most comprehensive statistics available on the European repo markets (including Sterling and Swiss franc) are the semi-annual surveys conducted by the International Capital Markets Association (ICMA).

The total size of the US tri-party repo market was roughly US$1.8 trillion as of March 2012, having reached a peak of over $2.8 trillion in April 2007. Note that statistics on the size of the US repo market are measured by the total amount of collateral held through two tri-party agents (JP Morgan and Bank of New York Mellon) and are not subject to double counting. The distribution of collateral between Treasuries/Agencies/Agency MBS and other assets was 84.5% and 15.5% respectively as of March 2012.

In addition, the Fixed Income Clearing Corporation (FICC) also publishes data on GCF (General Collateral Financing) repos, a blind-brokered interdealer market centrally cleared by FICC. Total volume on the GCF platform on 18 April, 2012 was $357 billion (these statistics do not include the interdealer broker trades, which always net to zero by virtue of the broker's role in the transaction).

The US tri-party repo market is predominantly part of the repo-financing segment. Bilateral (Delivery-versus-Payment, DVP) repos span both the interdealer and repo financing segments. Anecdotal evidence suggests that tri-party repo activity may account for between 65% and 80% of the total US repo market. The total size of the US repo market might therefore be roughly $2.1-2.6 trillion (excluding the interdealer repos that have been netted through a CCP).

Size of the US tri-party repo market ($billion)

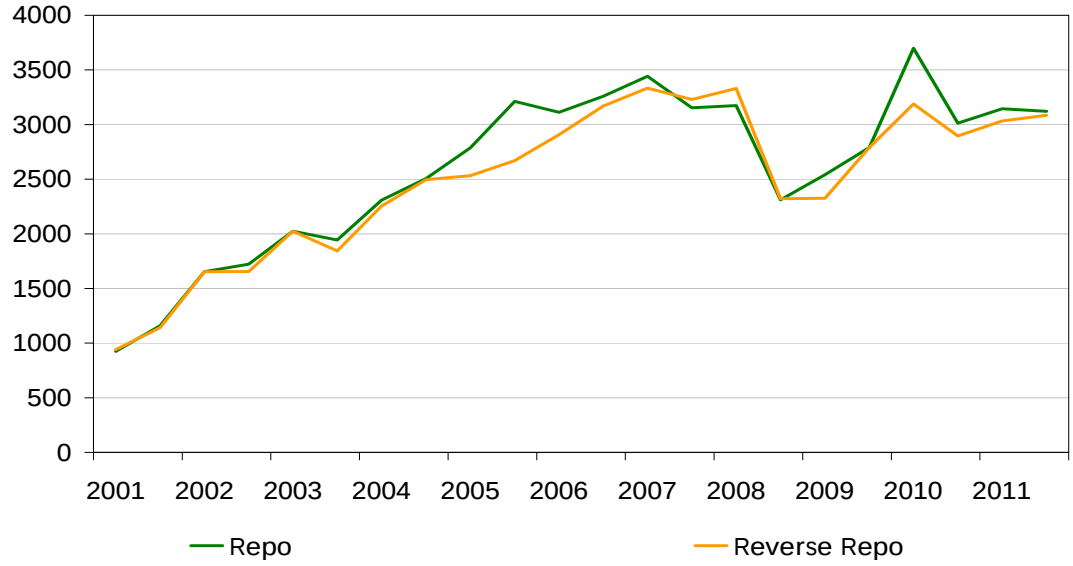


Source: FRBNY

The latest ICMA survey (December 2011) covers 59 financial institutions involved in the European repo market, as well as automatic repo trading systems (ATS), tri-party repo agents in Europe, and the London-based Wholesale Market Brokers' Association (WMBA). The total value of repo contracts (sum of repos and reverse repos) outstanding on the books of the surveyed institutions was 6.2 trillion euros ($8.3 trillion). However this number included double counting of repo transactions between those institutions. Moreover, the time-series trend was affected by changes in the survey participants.

Nonetheless, the survey results provide interesting statistics on the characteristics of the European repo market. For example, the overall share of repos traded on ATS and centrally cleared through a CCP was 32%, up 1.5% from June 2011, comprising predominantly overnight inter-dealer transactions. The share of tri-party repo was 11%, unchanged from June 2011, comprising primarily open trades but with a growing share of long-term (>12 months) transactions. Repos negotiated through voice brokers included a large share of forward-starting transactions. Finally, the top 10 banks accounted for 64% of the total European repo market.

European Repo Market Size (Billions euros)



Source: ICMA

Apart from the US and Europe, other significant repo markets include those against Canadian and Japanese government bonds. According to data from the Office of the Superintendent of Financial Institutions (OSFI), the size of the Canadian repo market was C$213 billion ($ 218 billion) as of August 31, 2011, measured by the sum of reserve repo assets and repo liabilities of the six largest Canadian banks. The size of the Japanese repo market was estimated to be JPY 182 trillion ($ 2.4 trillion) as of December 2011 according to the Japan Securities Dealers Association (JSDA), measured by the sum of reverse repos and repos of the members of JSDA.[62] In addition to JSDA's statistics, the Bank of Japan conducts Tokyo Money Market Survey which covers stocks as well as credit terms (e.g. counterparties, collaterals, maturities and haircuts) of securities lending/repos.

[62] Note that figures for the Canadian and Japanese repo markets are subject to double-counting. Japanese figure includes bonds lending with cash collateral as well as repurchase agreements.

Annex 3: Review of the Literature on Securities Financing Transactions

1. Literature on securities lending

The existing academic literature focusing specifically on securities lending is limited and mostly studied pricing implications, e.g. Duffie, Gârleanu and Pederson (2002) and Kaplan, Moskowitz and Sensoy (2010). One of the few academic papers that examine securities lending from a risk management perspective is by D'Avolio (2002), which highlights the "recall risk" in securities lending transactions, i.e. a stock lender's option to cancel the loan at any time imposes risk on the short seller. According to D'Avolio (2002), although recall events are rare, they can lead to a "squeeze" on the short seller in a rising market. In addition, Harrington (2009), among others, discusses the potential contagion risk stemming from cash collateral reinvestment in securities lending transactions in the context of AIG, whose securities lending programme contributed to the liquidity issues of the organisation during the recent financial crisis.

2. Literature on repurchase agreements (repo)

Meanwhile, there has been ample research on markets for repurchase agreements (repo), although earlier studies again tended to be in the asset pricing field, e.g. Duffie (1996) and Buraschi and Menini (2002). After the recent financial crisis, the academia started to closely examine the financial stability implications of the repo market, e.g. the role that the repo market played as a funding source and in the propagation of the crisis, in particular with regards to the procyclicality of margin requirements and haircuts. However, there is only a limited number of empirical studies vis-à-vis theoretical contributions. Moreover, the available evidence is almost exclusively based on the US repo market, while few analyses exist for other countries or regions, e.g. the euro area.

On the theoretical side, many studies have shown that procyclical margins and haircuts can have destabilizing effects on financial markets. Brunnermeier and Pederson (2009) provide a model in which margins can increase in illiquidity given uncertainty over the nature of price shocks. As long as speculators are subject to capital constraints, they will reduce their positions and market liquidity declines, which will then lead to higher margins and a so-called liquidity spiral. Brunnermeier and Pederson (2009) suggest that regulators should improve market liquidity by boosting speculator funding conditions during a liquidity crisis. Jurek and Stafford (2010) characterise financing terms in collateralised lending markets through a theoretical model and show that securities that have quickly declining recovery values (e.g. junior tranches of structured products) are financed at higher spreads/haircuts and respond much more strongly to market fluctuations. Jurek and Stafford (2010) argue that the risk profile of the underlying collateral alone can explain the massive shifts in repo haircuts during the recent financial crisis. Other papers on this topic include Valderrama (2010), Rytchkov (2009), Geanakoplos (2010) and Acharya, Gale and Yorulmazer (2011).

The procyclicality of margins and haircuts has been confirmed by a number of empirical studies, based on evidence from the US market. For example, Adrian and Shin (2010) showed that repo transactions have accounted for most of the procyclical adjustment of the leverage of investment banks. However, Adrian and Shin (2010) did not explain whether the procyclical

fluctuations in repo are associated with constraints on the liability side of the dealer balance sheets, or with the behaviour of the dealer clients. Gorton and Metrick (2010a) and Gorton and Metrick (2011) present direct evidence on the haircuts in the interdealer market. They show that interdealer repo haircuts increased dramatically with the unfolding of the financial crisis, and that the increases are correlated with proxies for counter-party risk and collateral quality. This evidence is consistent with the interpretation that interdealer lending behaves in a procyclical fashion. In addition, the procyclical leverage of the dealer balance sheets might reflect internal risk management constraints that tend to be set relative to historical risk measures. More broadly, changes in the constraints on funding liquidity faced by financial intermediaries (which include haircuts) can have a first-order impact on asset prices and market dynamics, and thus propagate and amplify financial shocks throughout the financial system (Fontaine and Garcia (2012)).

Copeland, Martin and Walker (2011) find that there are significant differences between haircut practices in bilateral and tri-party repos. During the crisis, haircuts and funding in the bilateral repo market changed dramatically, whereas haircuts and funding in the tri-party repo market stayed fairly stable, for the same categories of instruments. The authors provide three explanations as to why investors in the tri-party repo market tend not to use haircuts as much to manage risk: (i) some cash investors are not willing or allowed to take possession of the collateral (ii) tri-party repo investors (mostly MMFs) pre-emptively withdraw funding due to low tolerance for liquidity and credit risk and (iii) cash investors may feel that they can always pull away from troubled dealers as tri-party repos are mainly overnight (and even the term repos are "unwound" on a daily basis to allow for the substitution of collateral), making the management of haircuts less important. Martin, Skeie and von Thadden (2011) use a theoretical model to show that market microstructure can explain the different behaviour of haircuts between bilateral and tri-party repo markets. According to the authors, the haircut for each collateral class is included in the custodial undertaking agreement between the three parties and takes much more time to change than bilateral contracts. This will make the tri-party repo market more susceptible to runs, evident in the Lehman Brothers case, as haircuts may not adjust sufficiently to protect the investors.

While several papers emphasise the role of the run on the repo market during the financial crisis (e.g. Gorton and Metrick (2011)), some empirical evidence suggests that the effect of repo contraction on the shadow banking sector is relatively limited. Krishnamurthy, Nagel and Orlov (2012) find that prior to the crisis only 3% of outstanding non-Agency MBS/ABS was financed by repos from MMFs or securities lenders, and 22% was financed by ABCP. During the crisis, from Q2 2007 to Q2 2009, they found that there was a $1.4 trillion contraction in short-term funding of non-Agency MBS/ABS of which $662bn came from the reduction in outstanding ABCP while only $151bn came from the disappearance of repos. So the contraction of repos as an available funding source for financing non-Agency MBS/ABS appeared small for the shadow banking system as a whole. However, they also find that the contraction in repo played a more significant role for systemically important dealer banks. For example, for Merrill Lynch, Goldman Sachs, Morgan Stanley and Citigroup, nearly 50% of their repo transactions with MMFs prior to the crisis were backed by non-Agency MBS/ABS and corporate debt, and almost all of this repo financing from MMFs disappeared during the crisis.

A number of papers discuss how minimum margin requirements could be used as a macro-prudential tool to constrain risk-taking and the build-up of excessive leverage, e.g. Gai, Haldane and Kapadia (2011) Goodhart et al (2011), Brumm et al (2011), Stein (2011) and Gorton and Metrick (2010b). Gai, Haldane and Kapadia (2011) develop a model of interbank network in which (i) contagion arises from haircut spirals and (ii) greater complexity and concentration in the network can contribute to fragility. In addition to minimum margin requirements, they propose a range of policy options, including liquid asset requirements and capital surcharges for systemically important financial institutions. Goodhart et al (2011) analyse the effects of increasing margin requirements on repo transactions in a stylized general equilibrium model, and show that margin restrictions may partially impede risk sharing and raise the cost of mortgage borrowing. On the other hand, Biais, Heider and Hoerova (2012) analyse the role of margins in hedging transactions and their impact on risk-taking. Because of their indirect effect (less severe moral hazard), margins reduce the risk-sharing cost of incentives. This makes the risk-prevention effort more attractive, and hence tends to reduce risk-taking. However, because of their direct effect (cash available to pay insurance in case of counterparty default), margins also reduce the value of risk-prevention effort. This can encourage risk-taking. Therefore, the overall effect of margins on risk is ambiguous.

In addition to minimum margin requirements, more radical policy options to reduce systemic risks in the repo market have been proposed. Gorton and Metrick (2010b) suggest that repos are akin to bank deposits and have the same vulnerabilities as bank-created money, and propose that (i) repo collateral be limited to the highest-quality securities for banks, and (ii) permission to obtain leverage through securities financing markets be restricted to entities subject to particular regulatory requirements. Acharya and Öncü (2012) propose a set of resolution mechanisms to address the systemic risks associated with fire sales of repo collateral during a crisis. Specifically, the authors' proposal is to create a "Repo Resolution Authority (RRA)" in jurisdictions with significant repo activities. In case of counterparty default, the repo collateral will not be exempt from the bankruptcy of borrowing firms (except highest-quality government bonds). Instead, the RRA will make a "liquidity" payment to repo lenders and seek to liquidate the collateral in an orderly fashion. In addition, the RRA will charge repo lenders an ex ante fee and impose a set of eligibility criteria on repo lenders.

Other aspects of the repo market have also been studied. Heider and Hoerova (2009) provide a theoretical model of repo markets secured by risky collateral (mortgage-backed securities) and safe collateral (government bonds). The model predicts that, following a shock to the return on the risky collateral, repo rates secured by risky collateral should increase, but repo rates secured by safe collateral should decrease and become more volatile, due to the scarcity of high-quality collateral. The authors recommend that a wider range of collateral be accepted in central bank operations to ease the tension in interbank markets. In the accounting literature, Ong and Yeung (2010) examine the legal and accounting treatments of repos and securities lending transactions, and how Lehman Brothers used repos to manipulate its balance sheets.

Another important aspect related to the repo market is the use of CCPs. Biais, Heider and Hoerova (2011) analyse the optimal design of clearing systems, focusing on counterparty risk insurance and prevention. The main advantage of centralized clearing is the mutualisation of counterparty risk. However, while mutualisation is useful to share idiosyncratic risk, it cannot

provide insurance against aggregate risk. When the latter is significant, it is necessary that protection buyers retain some exposure to counterparty risk.

A number of recent papers examine the practice of re-hypothecation (the collateral posted by clients to prime broker is reused by the prime broker for its own purposes) and more generally the re-use of collateral in the repo market and the financial system. On re-hypothecation, Singh and Aitken (2009, 2010) estimate that the size of re-hypothecation in the US declined from $4.5 trillion at the end of 2007 to $2.1 trillion at the end of 2009, and that the churning factor of collateral (the extent to which the collateral has been reused) is around 4. They also highlight the fact that US regulations caps re-hypothecation at 140% of the customer's debit balance, whereas no similar rules exist in the UK, and call for policy actions to limit leverage and jurisdiction arbitrage. Council on Foreign Relations (2010) also propose that the financial regulations of the UK and other major financial centres be tightened so that segregation requirements for customer assets are at least as restrictive as current US requirements. On re-use of collateral in general, Bottazzi, Luque and Páscoa (2011) provide a theoretical framework of re-hypothecation in the repo market and how it is used by agents to leverage their positions. Singh (2011) discusses the "velocity" of collateral (the frequency at which financial collateral is re-used) and its role in the financial market, and documents significant declines in both source collateral and collateral velocity after the collapse of Lehman Brothers. Poznar and Singh (2011) look at "collateral mining" (banks receive funding through the re-use of pledged collateral "mined" from asset managers) and "reverse maturity transformation" (long-term savings are invested by asset managers into short-term liquid assets), and argue that regulatory efforts to limit the leverage of the banking sector should take into account the sizable volumes of bank funding coming from non-bank asset managers via source collateral and institutional cash pools.

Another important aspect of the repo market is the liquidity operations of central banks that are typically carried out with repo transactions. Fegatelli (2010) provides an extensive overview of these issues and Dunne, Fleming and Zholos (2011) examine how the changing characteristics of ECB official interventions affected the efficiency and reliability of the interbank repo market during the crisis.

3. Literature on shadow banking and macro-prudential policy

In addition to the above, there are a number of academic studies that focus on the shadow banking sector as a whole. Pozsar et al (2010), Gorton and Metrick (2010b) and Ricks (2010) provide a good description of the shadow banking system and discuss its risks to financial stability and potential regulatory responses. Adrian and Ashcraft (2012) provide a review of the growing literature on shadow banking and various regulatory reform efforts and their implications to date. Pozsar (2011) looks at the rise of the shadow banking system from a demand-side perspective, i.e. the supply of Treasury bills is insufficient to meet institutional investors' need for safe and liquid instruments, and the shadow banking system rose to fill the gap. The paper proposes that the supply management of Treasury bills should be adopted as a macro-prudential tool to control the size of the shadow banking system. Gennaioli, Shleifer and Vishny (2011) develop a theoretical model of shadow banking in which intermediaries originate, securitise and trade loans, financed externally with riskless debt. The paper shows that although the shadow banking system is stable and welfare-improving under rational

expectations, it can create financial fragility and lead to a liquidity crisis when investors and intermediaries neglect tail risks. The paper argues therefore regulators should continuously monitor intermediaries' exposures and financial innovations and intervene when necessary.

There is a new strand of literature which concentrates on the interaction between different macro policies, in particular between monetary policy and macro-prudential policies. Angelini, Neri and Panetta (2010) and Beau, Clerc and Mojon (2011) analyse the interaction of monetary and macro-prudential policy in a dynamic stochastic general equilibrium (DSGE) model with financial frictions. They both emphasise the importance, from a welfare point of view, that the two authorities act independently pursuing their own objectives but take into account the impact of the policies implemented by the other authority. Other papers that study such interaction include Lambertini, Mendicino and Punzi (2011) and Agur and Demertzis (2011). Maddaloni and Peydró (2011) empirically analyse the interaction between low monetary policy rates and macro-prudential instruments, e.g. LTV ratio, in the build-up of risks prior to the recent financial crisis.

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