EUROPEAN
QUANTITATIVE CREDIT.
STRATEGY & ANALYSIS

Global Corporates

5 September 2008

EUROPE

CONTRIBUTING RESEARCH STRATEGIST

Matt King
+44 (0) 20 7986-3228
matt.king@citi.com
London

Are the brokers broken?

- **Nearly half of brokers' own assets are funded on repo**
- **Under normal times, this would not present a problem**
- **But pressure for change is growing from regulators**
- **Gross repo usage is actually much, much larger**
- **In coming months, we expect a significant overhaul of all the brokers' business models**
- **This would lead to reduced returns on equity, and increased illiquidity in markets in general**

Contents

Are the brokers broken?

Much of the focus on financials during the credit crunch has been upon writedowns. First on subprime and CDOs of ABS, then on ABCP, ARS and a string of other products, and now on more normal loan portfolios. Investors have been almost obsessive about finding the next 'shoe to drop'.

Yet from a credit perspective, the major question facing all financials going forward is not one of writedowns but one of funding and leverage. After all, it was the catastrophic loss of funding caused by a sudden evaporation of confidence which led to the demise of both Bear Stearns and Northern Rock, not anything to do with writedowns.

The common strand linking those two institutions was their dependence on wholesale markets for funding. And yet their models were not so different from those of many other financial institutions today. The other US broker-dealers, in particular, are funded heavily through short-term repo and secured lending markets, and do not have the diversification implied by a large deposit base. Does this mean that they too are similarly vulnerable? And if so, what should be done to avert future failures?

This note tries to answer these questions by looking in more detail at broker funding, focusing in particular on repo/secured lending[1]. As we have argued elsewhere, and as is demonstrated by the failure of so many hedge funds, the very same features which are designed to make repo safe for cash lenders do tend to create risks for those who depend on it for their borrowing.

Moreover, and despite increasing scrutiny from regulators, we get the impression that repo remains extremely poorly understood by most investors, in part because accounting is confusing. In particular, we argue that brokers' and banks' gross usage of repo, revealed in footnotes of 10-Qs, far exceeds that which shows up on balance sheet. Although in principle much of this is for clients (mostly hedge funds), it still makes their business as a whole much more dependent on the continued availability of repo funding than might otherwise be appreciated.

In more normal times, such heavy dependence on repo would not have been a problem. But in the light of Bear Stearns, we think that regulators will now find it increasingly unacceptable. Indeed, the 10-Q footnotes already reveal dramatic and rapid shifts in the nature of some brokers' funding, which are at the same time concerning and yet which have not been widely commented on. As a result, we argue that over the next few years all of the existing broker-dealers will need to radically change their business model. We expect them to need to sell assets, issue significantly more unsecured term debt, and perhaps to raise equity too. These changes would not only lower their returns on equity, but also result in a permanent increased in illiquidity in markets in general.

[1] Although there are legal differences between the two transactions, economically they are very similar. We tend to use the terms interchangeably hereafter.

The note consists of three broad parts. First, we look at how the brokers fund themselves generally, and at what proportion of their direct funding comes from repo. Second, we look at recent shifts in their funding and explain how these are revealed in their footnotes. Finally, we look at why the regulators are worried and at what seems likely to happen next. The Appendix contains some more detailed guidance on understanding the intricacies of brokers' balance sheets. Although the note focuses on the US broker-dealers, whose status as non-depository institutions makes their dependence on repo much greater than that of banks, much of the analysis and part of the conclusions apply also to investment banks and other financial institutions, both in the US and elsewhere.

How the brokers are funded

Like other institutions, broker-dealers' funding comes from a mixture of debt and equity. The debt, in turn, can be divided into long- and short-term unsecured debt (mostly corporate bonds and commercial paper respectively), and secured funding. Uniquely, though, this secured funding – much of it short-term – finances almost half of their financial assets.

The reason for this is fairly straightforward. For the sorts of the sizes the brokers want to do, repo is much cheaper than the alternatives. It would simply not be possible for institutions to raise hundreds of billions in commercial paper markets, for example. And executing those sorts of volumes in unsecured term debt would be much more expensive. Indeed, because in repo the cash lender receives securities as collateral for the life of the transaction, which they are entitled to keep in the event of the borrower defaulting, they are typically prepared to lend money at a lower rate than on a similar-maturity unsecured transaction. Haircuts and daily variation margin further help to insure the lender against the effect of any price falls in the collateral.[2] Moreover, because the lenders are often different institutions from those which buy regular unsecured debt (and indeed, because the lending is secured), the borrowing is typically considered very differently from that in unsecured markets by investors and rating agencies alike.

How much is funded on repo?

It is not difficult to work out how much of different banks' and brokers' own assets are funded on repo. However, nor is it entirely straightforward. The ultimate answer – nearly half – can be arrived at only by amalgamating on-balance-sheet information with information from 10-Q footnotes.

Each broker's balance sheet has a line item on the asset side showing "Financial instruments owned".[3] Either in brackets, or as a sub-item, they then report the proportion of this "pledged to counterparties", i.e. funded on repo or its economic equivalent.

---

[2] For a much fuller explanation both of these safeguards and of the functioning of repo and secured lending generally, see our recent note *Where should hedge funds keep their cash?,* 2 September 2008

[3] Of course, repo also features more explicitly in the liabilities, but here it is tough to distinguish between places where it is financing client assets and places where it is financing an institution's own. A fuller guide to understanding the various (and confusing) line items is given in the Appendix.

However, this is not the whole story. Paragraph 15 of the accounting rule FAS 140 stipulates that the amount referred to on the balance sheet statement need only be "collateral pledged to counterparties which can be repledged to other counterparties". A further portion of the financial instruments owned – which is in many cases substantial – is reported in the 10-Q footnotes of "collateral pledged to counterparties which cannot be repledged". An example might be tri-party repo, where until recently some custodians could not cope with the administrative complications of re-repoing received collateral. Although the assets themselves have always featured on the balance sheet, the fact that this non-repledgeable portion too is funded on repo is less widely appreciated. The combined volume – once it is arrived at – comes close to 50% of all financial instruments owned, with the number being higher for the likes of the 'pure' brokers than for those with a large retail franchise, such as Merrill (Figure 1).

Figure 1. Financing of Broker-Dealer Financial Instruments (Dollars in Billions)

	31-May-08 MS	31-May-08 GS	31-May-08 LEH	27-Jun-08 ML	29-Feb-08 BSC	2Q Sum
Financial instruments owned	390,393	411,194	269,409	288,925	141,104	1,501,025
of which pledged (and can be repledged)	140,000	37,383	43,031	27,512	22,903	270,829
of which pledged (and can not be repledged)	54,492	120,980	80,000	53,025	54,000	362,497
of which not pledged at all	195,901	252,831	146,378	208,388	64,201	867,699
% own financial instruments pledged	50%	39%	46%	28%	55%	42%

Source: Company 10-Qs.

Repo's vulnerability

In normal times, there would not be much wrong with this. Repo markets are large and liquid – with more than €6 trillion outstanding in Europe alone – and are backed, especially on tri-party, by well-understood processes for haircuts and margining.[4]

Yet the very same processes which make repo safe for lenders make it risky for borrowers. It is not really a question of default risk: the simultaneous default of both counterparty and underlying collateral, within the space of a single day or so (before additional variation margin can be received), is so remote that it can be almost summarily dismissed.

Liquidity risk, though, and the potential for losses on that front, is a different matter. If a counterparty were to default, lenders might find themselves wanting to liquidate collateral into an extremely volatile market. Of course, this is why variation margin must be paid by the cash borrower if collateral sells off, and why haircuts can be changed as and when each repo transaction rolls. But given potential exposure to some counterparties running into the billions of dollars, and given the psychological fear of censure by senior management and shareholders, the temptation for lenders is often to pull back whenever a borrower begins to look as though they are in trouble. The withdrawal might consist of an increase in haircuts, a refusal to repo more illiquid types of collateral, a reduction in maturity, or a cessation of trading with a given counterparty altogether. But any and all of these steps, while combining to help stabilise and reassure the market overall, do tend to create instability for the borrowers.

[4] Again, see *Where should hedge funds keep their cash?* 2 September 2008 for more details.

Perhaps what it boils down to is a basic mismatch of the maturity of assets and liabilities. The average term of repo is much, much shorter than either that of unsecured term debt or of the assets which tend to be financed through repo. Hedge funds like Carlyle Capital and Peloton Partners were forced to close down, not because of redemptions (indeed, their prior performance had often been excellent) but because of haircut increases and margin calls. Those haircut increases in turn were made possible because the short-term nature of the funding meant that it frequently came up for renegotiation. Banks and brokers which finance themselves on repo are significantly less vulnerable – a lower proportion of their assets are funded on repo, and of course they are somewhat protected by virtue of their size and diversification – but they are hardly immune from the same risks.

In recent quarters, brokers have taken both to reducing their overall usage of repo to finance assets (now 42% of financial instruments owned, down from 48% at end 2007), and to terming out the maturity of it. Yet even here, the detail is probably more disturbing than the numbers first suggest.

Figure 2 shows the average maturity of secured financing reported by the various brokers. At first sight, it seems quite long: over a month for all the brokers, and more than three months for Goldman. Yet here (as elsewhere) averages can be somewhat misleading. A dealer with, say, one-third of its book financed overnight, one-third with a maturity of one week and one-third with a maturity of three months will still have an average maturity of over one month. Yet it sounds much less reassuring to say that you have to roll over two-thirds of your assets every week than to say that you have an average maturity of 32 days.

Figure 2. Average Maturity of Secured Funding

	Maturity (days)
Goldman Sachs	>90
Lehman Brothers	>40
Morgan Stanley	>40

Source: Company 10-Qs. Typically excludes repo of government bonds and agencies.

Worse still, to understand the true picture we really have to know how it varies across assets. The maturities may vary substantially – with the lowest-quality assets typically tending to have the shortest maturities. An institution which wanted to boost its 'average' maturity could easily do so by taking supranational or other high-quality collateral and deliberately repoing it for a year – yet would have done nothing whatsoever to have improved the liquidity of its book. Similarly, the weighted average life of over 90 days for Goldman Sachs' "secured funding" looks at first sight to be extremely impressive, and much longer than that of any of the other houses. But closer examination of its 10-Qs strongly suggests that this figure has been boosted by the inclusion of multi-year property leases on the buildings it occupies. While still technically "secured financing" and hence accurately reported, an average that includes this is not quite what most investors would have been hoping for.

In sum, the true picture at each institution can only really be gleaned through full analysis of the maturity breakdown of repo and other funding for each and every asset they hold, not simply through the use of averages. Yet this information is something neither brokers nor investment banks provide.

Which assets are financed like this?

A further reason not to worry would be if the only assets financed on repo were highly liquid ones. In this case, even if repo funding were to evaporate, the assets could be sold into the open market for a small loss, and the institution could carry on regardless. Once again, though, the numbers are simply too large for this to be true: in recent years, almost every institution has tended to fund illiquid assets through repo as well – an addiction they are now finding it hard to give up.

Figure 3 shows how we know this to be the case. It compares the breakdown of each institution's own assets with the total volume of assets funded on repo shown in Figure 1. Even if we assume that repo is used primarily for liquid assets, with less liquid securities being financed primarily through unsecured term debt or equity, the numbers are simply too big. Across the five brokers shown, there are $633 billion of assets financed on repo, yet only $228 billion in government bonds and agencies. Every institution must also be using repo to finance equities, credit or more likely both. And at every institution, the size of the repo financing of equity or credit is substantially greater than that of cash held on the balance sheet, meaning that, if it were to evaporate, they could be forced to sell a sizeable volume of potentially illiquid paper into the market.

Figure 3. Repo Financing Relative to Assets Held (Dollars in Billions)

Breakdown of financial instruments held	31-May-08 MS	31-May-08 GS	31-May-08 LEH	27-Jun-08 ML	29-Feb-08 BSC	2Q Sum
CP / deposits	15,451	16,949	4,757			37,157
Government & agency	58,965	62,583	26,988	18,253	23,704	190,493
Mortgage & asset-backed		37,523	72,461	34,454	38,186	182,624
Loans		35,949				35,949
Corp debt	130,943	35,197	49,999	35,524	23,511	275,174
Equities	89,075	101,295	47,549	48,948	26,975	313,842
Commodities	3,654	1,248		5,451		10,353
Derivative contracts	92,305	120,450	46,991	89,453	28,728	377,927
Repo financing calculations						
Total own assets financed on repo	194,492	158,363	123,031	80,537	76,903	633,326
Minus CP / deposits / govies (from above)	74,416	79,532	31,745	18,253	23,704	227,650
Equals minimum repo financing equities / credit	120,076	78,831	91,286	62,284	53,199	405,676
cf cash on balance sheet	23,782	13,781	6,513	31,211	20,786	96,073
Surplus of equities / credit potentially to be sold	96,294	65,050	84,773	31,073	32,413	309,603

Source: Company 10-Qs, Citi calculations.

It is important to understand that there is no great surprise here. If asked specifically, all the brokers would probably happily state that they do finance a portion of their credit and equity assets through repo. Many even cite the average maturity of their repo excluding government bonds and agencies, and hence refer implicitly to the repo of illiquid collateral in credit and equities. Yet what seemed perfectly acceptable a few short months ago is now often being reconsidered in the light of the credit crunch. And – large though these numbers are – it turns out that, as far as brokers' gross usage of repo is concerned, this is just the tip of the iceberg.

Understanding the footnotes

So far we have concentrated on the use of repo to finance brokers' own assets, since it is this which is of greatest concern when considering a possible loss of funding. Yet brokers also make use of repo to finance client assets. Although in principle this is much less risky – since such client funding is frequently run on a 'matched-book' basis – the totals are nevertheless much, much larger than we think most investors realise. While some of the client financing is shown on balance sheet, it turns out that the majority features only in the footnotes.

Figure 4 shows the on-balance-sheet numbers for collateralised financing provided by brokers, i.e. how much they have lent, primarily to hedge funds, against which they have received collateral. These on-balance-sheet numbers consist of securities purchased under agreements to resell (reverse repo) and securities borrowed (an economically similar but legally distinct transaction). Repo and reverse repo are usually used in fixed income, and securities lending and borrowing in equities – hence the large "securities borrowed" numbers for the traditionally large equity houses, Morgan Stanley and Goldman Sachs – though this distinction has become a little blurred of late.

Figure 4. Collateralised Financing/Repo Activities Reported on Balance Sheet (Dollars in Billions)

Broker dealer assets	31-May-08 Morgan Stanley	31-May-08 Goldman Sachs	31-May-08 Lehman Brothers	27-Jun-08 Merrill Lynch	29-Feb-08 Bear Stearns	2Q Sum
Collateralized agreements:						
Securities purchased under agreements to resell	165,928	130,897	169,684	224,958	26,888	718,355
Securities borrowed	257,796	298,424	124,842	129,426	87,143	897,631
Total	423,724	429,321	294,526	354,384	114,031	1,615,986

Source: Company 10-Qs.

Figure 5. Total Collateral Received and Repledged in Connection with Repo Activities (Dollars in Billions)

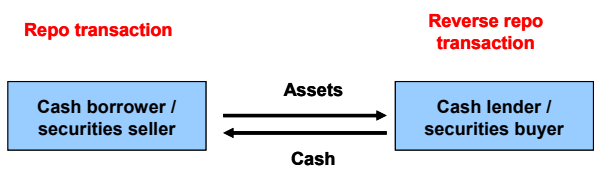
Client repos	31-May-08 Morgan Stanley	31-May-08 Goldman Sachs	31-May-08 Lehman Brothers	27-Jun-08 Merrill Lynch	29-Feb-08 Bear Stearns	2Q Sum
Collateral received (permitted to be repledged)	953,000	868,190	518,000	833,000	303,000	3,475,190
Collateral received (and actually repledged)	711,000	730,100	427,000	661,000	211,000	2,740,100
Collateral received and not pledged	242,000	138,090	91,000	172,000	92,000	735,090

Source: Company 10-Qs.

Figure 5 then shows the full volume of such activity, revealed only in a 10-Q footnote. The terminology is a little different, but the principle is the same: collateral received (against secured lending to clients), of which a significant proportion is then repledged out. What is immediately striking is how much larger the volumes are. Morgan Stanley, for example, reports a total of $953 billion of collateral received – more than twice the $420 billion shown explicitly on the asset side of the balance sheet, and indeed two-thirds of the total size of their balance sheet just by itself. Even taking into account other reverse repo-type transactions included elsewhere[5], it would be impossible to account for the full scale of these transactions using only on-balance-sheet figures. Where does the extra amount come from?

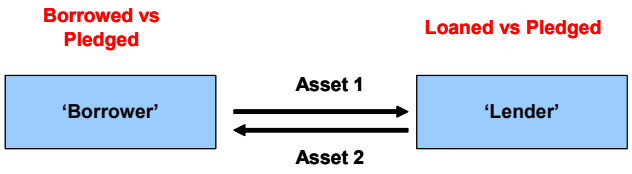
[5] For example, some reverse repo-type transactions, as part of which collateral is received, show up under "loans" (at banks) or "receivables" (at brokers), The full balance sheets are shown in the Appendix. Even the full addition of such line items does not account for the full amounts of collateral received recorded in the footnotes.

Figure 6. Mechanics of a Cash Repo Transaction



Source: Citi.

Figure 7. Mechanics of a Security-for-Security Repo Transaction



Source: Citi.

The explanation lies in the magic of the intricacies of repo accounting, and in the way that hedge funds run their books. Figures 6 and 7 contrast a normal repo transaction ("borrowed versus cash"), in which cash is lent against the reverse repoing in of collateral, with a "borrowed/loaned versus pledged" transaction. The latter works in exactly the same way, except that instead of cash being lent, securities are. Another way of thinking of it is as though a counterparty had collapsed together a simultaneous repo and reverse repo transaction into a single trade. One of the counterparties is said to have "loaned versus pledged". The other is said to have "borrowed versus pledged". The distinction between the two is supposed to be made on the basis of who is 'driving' the transaction, but is best described as confusing.[6] The magic occurs in that under FASB, borrowed versus pledged transactions do not feature on balance sheet; under IFRS, neither borrowed versus pledged nor loaned versus pledged transactions are consolidated.

How does this apply to the hedge funds? Well, hedge funds in particular have a tendency to run large long-short books. Under this same magic, brokers can provide them with financing for such long-short positions while recording very little of it on balance sheets.

We can think of this in three easy stages (Figure 8). First, suppose a hedge fund buys $100 million of Stock A. The broker will record a margin loan (receivable) to the client of $100 million, and debit $100 million in cash. The $100 million holding of stock A will feature in the client's account (from where it can be rehypothecated by the broker) and show on what the broker calls their "stock record"[7], but will not be on balance sheet; the margin loan will remain on balance sheet.

Figure 8. How to Make $200 Million into Nothing – Long-Short Accounting

	Flows			Balance sheet			Stock record (off balance sheet)		
Hedge fund buys $100m Stock A	Margin loan	100		Receivables	100		Stock A	100	
	Cash		-100	Cash		-100			
Hedge fund shorts $100m Stock B	Margin loan	-100		Receivables	0		Stock A	100	
	Cash		100	Cash		0	Stock B	-100	-100
Broker pledges Stock A to buy in Stock B	Borrowed vs pledged	0	0	Receivables	0		Stock A	0	
				Cash		0	Stock B	0	

Source: Citi.

[6] Quite apart from the fact that FAS 140 contradicts itself (with paragraph 15 (d) making borrowed versus pledged transactions off balance sheet, and paragraph 94 making them on balance sheet, a topic complained about by many broker-dealers immediately after its issue), there seems to be little consensus as to who is the borrower and who is the lender. As far as we can tell, terms like 'borrower' and 'lender' are used in exactly the opposite sense in the accounting regulations relative to standard market practice. The description above follows common market practice. The accounting documents seem to refer to this the other way around, a source of confusion commented upon in some of the accounting literature.

[7] Just as the balance sheet helps track levels of cash, so the stock record performs the same function for securities.

Second, the hedge fund shorts $100 million of Stock B. They will use the cash proceeds of the transaction to pay off the margin loan from the broker. So the broker now records no net change in cash, and no net receivable from the client, i.e. nothing on balance sheet. The stock record will continue to show both the $100 million long in Stock A, and now also the $100 million short in Stock B.

Finally, the broker needs to borrow in Stock B so that the client can deliver on their short. Now if they were to do this in a cash reverse repo transaction, it would have to show on balance sheet. But if, instead, they pledge out Stock A in order to buy in Stock B – or alternatively pledge out Treasuries or some other stock they happen to hold on inventory – it will count as borrowed versus pledged, and therefore be off balance sheet. At the end of the day, then, the client has gone long $100 million of Stock A, using $100 million in proceeds from the short sale of Stock B, the broker has effectively done a repo and a reverse repo of $100 million each, and yet nothing whatsoever is recorded on the broker's balance sheet.

In practice, the situation is slightly more complicated than this, but the principle does not change. The broker will demand a haircut on both the long and the short side of the transaction, and hence receive net cash from the hedge fund recorded as a payable to the client. Variation margin payments will add to this. But such haircuts are a fraction of the total value of the securities (and hence of the repo transactions): 10 or 20 percent would be fairly typical. And many hedge funds have further portfolio margin arrangements that can reduce this figure further still. The net effect, then, is for brokers to build up billions of dollars in reverse repo or stock borrowing transactions, on behalf of clients, of which only a fraction is recorded on balance sheet.

This, then, looks like the explanation behind the footnotes.[8] If it seems surprising that so much should remain off balance sheet, we can arrive at the same conclusion another way. Hedge funds globally have around $2 trillion in assets under management (before leverage). After leverage, this probably equates to around $6 or $7 trillion in open positions. Although some of this leverage will be achieved synthetically, the bulk of transactions (especially in equities, which is where the bulk of hedge fund money is allocated) is likely to feature cash instruments. If these were funded simply through reverse repo versus cash, they would have to be recorded on broker-dealers' balance sheets. Yet the broker-dealers between them only have a total balance sheet size of around $5 trillion, and of course not all of the balance sheet is dedicated to client repo. And while the brokers are not the only banks to have prime brokerage businesses, they are commonly thought to have the lion's share of the business. It stands to reason, then, that somehow or other a significant fraction of this business must be being recorded off balance sheet.

[8] Some other significant contributing factors operate along the same lines. For example, FIN 41 permits institutions to net repos and reverse repos provided a number of conditions are met – notably, that they be with the same counterparty and for the same maturity.

Isn't this just client financing?

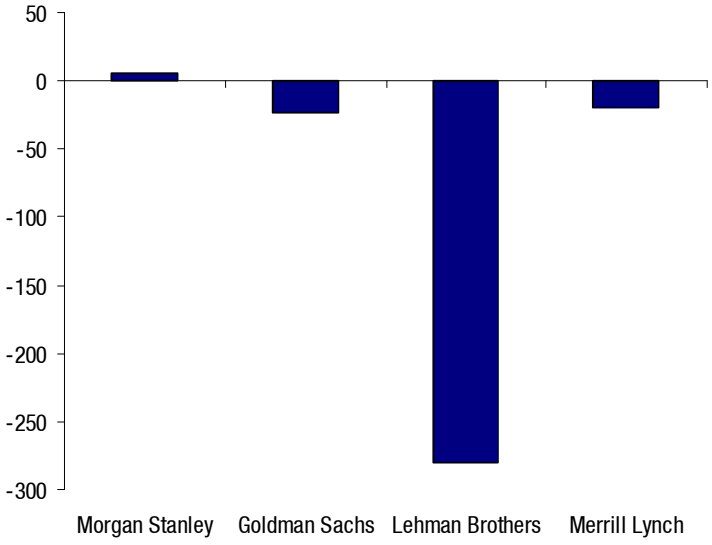
But why should investors care about all this? After all, if the maturities of the financing to the client and the actual reversing in of the securities are perfectly matched, then surely there is no reason to worry about the brokers' 'gross' usage of repo, and we should consider only their usage of it to finance their own assets, as we were doing earlier?

This argument has some merit, but nor do we think these off balance sheet numbers should be ignored altogether. First, the pledging of collateral to brokers in such large sizes – and the fungibility of pledged collateral with their own positions – significantly improves their own ability to take short positions, make markets and provide liquidity in other markets generally. Second, these numbers imply a gross dependence on repo financing far larger than the on balance sheet numbers suggest. Suppose, for example, that counterparties were to become concerned about the stability of a broker, and became reluctant to execute trades with and place collateral with them. The broker would, of course, immediately pass on this difficulty in their refusal to provide financing to their clients. But that in turn might spark other changes in the clients' behaviour, such as an abrupt decision to withdraw their unencumbered cash balances and place them elsewhere, and/or to move their broader business to another counterparty. The broker would probably find their ability to conduct day-to-day business providing liquidity in markets somewhat hampered, and in extremis might even start to find themselves running short of cash. If this sounds extreme, it is worth remembering that it was just such a run on cash – as a result of hedge funds moving their money elsewhere – which is thought to have precipitated the problems at Bear Stearns.

Recent shifts in flow

Other than their sheer size, the second most striking thing about these numbers is the recent change in them. Figure 9 shows how the total volume of assets pledged to each broker has changed since November 2007. The numbers have fallen everywhere except Morgan Stanley (which was roughly flat), but the vast majority has occurred at Lehman. In percentage terms, the changes elsewhere are of the order of 1, 2 or 3 percent; at Lehman the change is 54%.

Figure 9. Change in Collateral Received (Dollars in Billions, Nov 2007 – May 2008)



Source: Company 10-Qs.

Some – or even all – of this shift could be being initiated by the brokers themselves. One of the most obvious effects of the credit crunch has been to reduce their willingness to provide leverage to hedge funds. This has been reflected in the increases in haircuts hedge funds have been required to pay on different asset classes that we have commented on elsewhere. Such a conscious decision to reduce financing would, of course, reduce these off balance sheet numbers.

In addition, lenders may simply have became reluctant to provide financing for ABS and other illiquid credit. That would mean that once positions in those assets had been cut, there would not necessarily be any further pressure on positions elsewhere.

That said, it still seems odd that so much of the reduction is concentrated at just one house. The shift could also be related to changes in willingness to lend *to* the brokers (as opposed to shifts in their own willingness to lend to others). Indeed, a recent Greenwich survey found that "55 per cent of respondents had stopped using one or more financial institutions, other than Bear Stearns, as a counterparty on credit trades due to concerns about solvency".[9]

Who's providing the financing?

Until now, we have not really considered the question who is providing all this financing, is prepared to lend such enormous volumes of collateral and indeed who would have them on hand to lend in the first place. It turns out that the vast majority comes from just a handful of counterparties, whose obscurity is matched only by their absolutely colossal size. To understand some of the shifts going on at present, we need to digress slightly to consider their role.

Securities lenders, to give them their full (and rather apt) title, are massive participants in both repo and reverse repo, and their role is crucial to understanding not only broker-dealers' current difficulties, but also much of the liquidity of markets in general. These are generally institutions like Bank of New York Mellon, or State Street, or JPMorgan, with custodial responsibility for the assets in end-investors' portfolios. Although they do not own the assets themselves (indeed, they are held off balance sheet), they are given the authority by the end-investors (pension funds, central banks, and so on) to repo out their assets (which are mostly government bonds and agencies) in return for cash. They can then reinvest that cash so as to provide some extra return for the end-investors' portfolios.

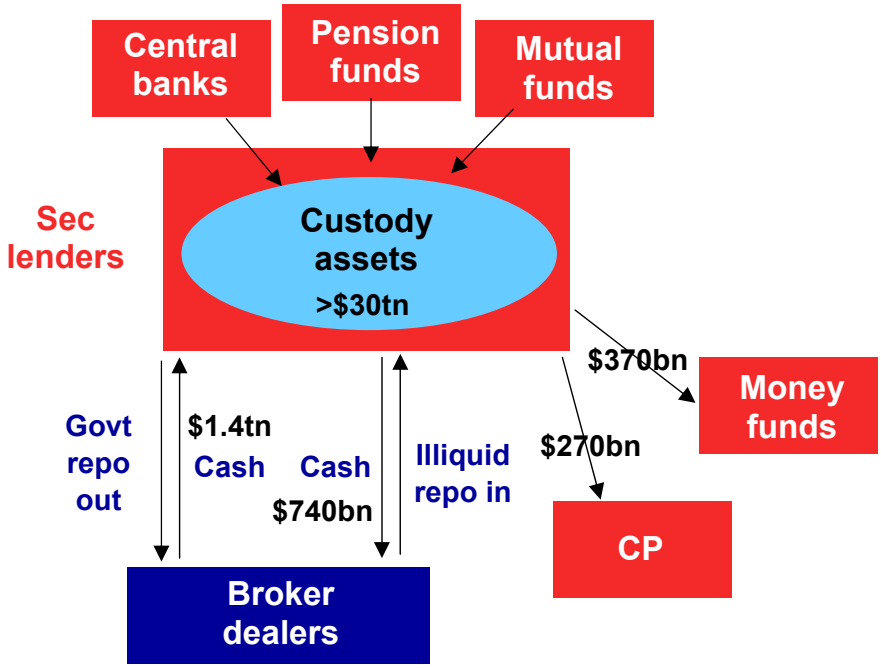
The reinvestments have an emphasis on security. Much consists of commercial paper (CP), or is deposited with externally managed money market funds. The bulk, though, consists of reverse repos, in which less liquid securities (such as corporate bonds, ABS, or equities) are accepted as collateral and the cash lent out in return for interest. Because these assets are generally of lower credit quality (and certainly lower liquidity) than are the original, mostly government or agency, assets, the interest rate received on this reverse repo is significantly higher than the rate paid on the original outbound repo.

[9] 'Investors fear another big financial firm failure', *Financial Times*, 11 August 2008.

In so participating in both repo and reverse repo, the sec lenders not only help to ensure a continuing pattern of liquidity and price discovery in government bonds, thanks to the ability of dealers to cover shorts in expensive bonds by borrowing them, but also permit the holding of positions in less liquid markets, like corporate bonds and ABS, by their willingness to finance them at much cheaper rates than dealers could achieve in unsecured markets.

The custody portfolios the sec lenders operate are simply enormous. State Street alone had $14.9 trillion under custody at end 2007, Bank of New York Mellon a further $23.1 trillion at end 1Q08. We can – with some difficulty – track shifts in their reinvestment portfolios using data from the Federal Reserve. In June 2007, they had at least $1.4 trillion of collateral (probably mostly Treasuries and agencies) actually lent out in repo, against which they reverse repoed in roughly $740 billion of lower quality collateral. The remaining $640 billion in cash received on the government repos was divided largely between money market funds and commercial paper, with a small amount in corporate and other bonds. Figure 10 shows these (rather convoluted) flows schematically.

Figure 10. Sec Lenders – Lending and Reinvestment Flows



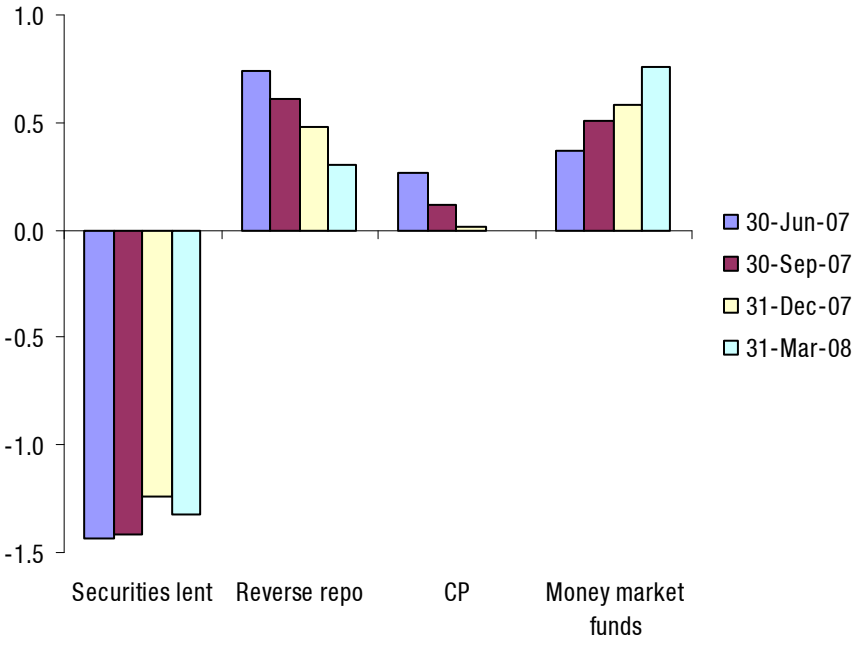
Source: Federal Reserve Flow of Funds (June 2007), Citi.

The great pullback

Of late, these flows have been shifting. Figure 11 returns to the Federal Reserve's numbers on repo and reverse repo by sec lenders, and shows how they have changed since the eruption of the credit crisis in June 2007.[10]

Over the past year, the volume of sec lenders' investments in commercial paper has collapsed, from nearly $270 billion basically to zero, with the money going into money market funds instead. In addition, while the volume of assets repoed out is little changed (down $100 billion, but against a $1.4 trillion base), the volume of assets reverse repoed in seems to have[11] more than halved, from around $740 billion to just over $300 billion.

Figure 11. Sec Lender Custody Portfolio Investments in Recent Quarters (Dollars in Trillions)



Source: Federal Reserve, Ctii.

What we think is driving this is an increased risk aversion by the sec lenders, and indeed by their own clients. As the credit crunch has unfolded, the owners of the custody portfolios, along with many other investors, have become increasingly nervous, and have started to place constraints on how their cash is reinvested. Fear that started with problems in subprime and CDOs of ABS rapidly infected many other asset classes.

[10] We have simplified a little insofar as the Fed's numbers technically refer not only to sec lenders but to "funding corporations", a category which includes also funding subsidiaries and non-bank financial holding companies. On the other hand, the Fed's numbers refer only to US domestic transactions, meaning the total for sec lenders globally will be considerably larger: Bank of New York Mellon's 10-Q filings show $676 billion in securities lending (repos out) from them alone in 1Q08. Another approximation is that some of the numbers are calculated as a residual in the context of the broader Flow of Funds, and may not therefore be perfectly reliable. Nevertheless, separate anecdotal evidence from brokers and from sec lenders themselves supports the shifts that show up in the official statistics.

[11] We say "seems to" just because the numbers are not reported as an explicit reverse repo in the Fed accounts, but rather in a category labelled "Other", which shows up as a negative liability (!). Questioning both the Fed and making comparison with the securities lenders' own balance sheets supports the idea that this consists largely of reverse repo, but the labelling is not actually explicit.

ABCP is a prime example: although only a tiny minority of CP investors have had actual losses, and even these have been on just a few of the SIVs and SIV-lites, many investors now refuse to invest in any type of ABCP whatsoever, regardless of the underlying assets and regardless of the presence of a full liquidity back-stop (as opposed to the partial back-stop on SIVs). In the case of the sec lenders, they have deemed it prudent to curtail investment in CP altogether, preferring to outsource the cash to money market funds instead.

Similarly, in many cases the original asset lenders have become much fussier about assets reverse repoed in. Sometimes this has taken the form of stricter rating constraints than previously. In the case of ABS, it has often been banned altogether. For example, BoNY Mellon reports that RMBS collateral grew from 20% to 30% of all tri-party repo between July 2006 and July 2007, but fell back to just 17% by July 2008. The use of Treasuries over the same period has climbed from 14% to 21%.[12] As was the case with SIVs, such constraints have often had less to do with a rational evaluation of credit risks than with the psychology of a flight from fear and negative headlines. That knowledge will have been of little solace to the borrowers.

It may just be a coincidence that the drop in the volume of sec lender reverse repo, $440 billion, is somewhat greater than the drop in the total collateral received by the four broker-dealers ($320 billion). But when we first started looking at these numbers, we were puzzled to find that the drop in reverse repo by the sec lenders was not mirrored by a drop in balance sheet size at the brokers – either on their own numbers, or on the appropriate section of the Federal Reserve Flow of Funds.[13] If the drop instead corresponds to these off balance sheet numbers, it might be a neat explanation. We would still have expected the drop to have affected the different dealers more equally, but since it was led by increased reluctance to take fixed income collateral in general, and ABS in particular, it could plausibly have affected fixed income houses more than equity ones.

Why the regulators are worried

At this point, it should be apparent that there are numerous reasons why the regulators are worried. The scale of the flows, their concentration, the size of the shifts, the sheer extent to which most people are unfamiliar with all this – all these argue for increased unease in a post-Bear Stearns world.

And there is plenty of evidence of just such unease. In addition to the more widely reported generic statements about needing to consider creating tools to ensure "an orderly liquidation of a systemically important securities firm"[14] – such as the need to create a CDS clearing house, and above all to create a legal mechanism for the rescue of non-bank financial – there have been many more explicit references to repo. In the same testimony, Bernanke referred to the Fed's focus on "enhancing the resilience of the markets for tri-party repurchase agreements, in which the primary dealers and other large banks and broker-dealers obtain very large amounts of secured financing from money funds and other short-term, risk-averse investors."

---

12 'Third-party intermediaries become part of repo solution', *Financial Times*, 29 August 2008.

13 Table F129.

14 Bernanke and Paulson testimony before the House Committee on Financial Services, 10 July 2008.

The more recent the quotation, the louder and more specific is the drumbeat. In Jackson Hole last month, Bernanke stated that "We are encouraging firms to improve their management of liquidity risk and reduce over time their reliance on tri-party repos for overnight financing of less-liquid forms of collateral. In the longer term, we need to ensure that there are robust contingency plans for managing, in an orderly manner, the default of a major participant."[15] The *Financial Times* has talked about a 'battery' of new, different and stringent liquidity tests which the Fed has imposed upon 'all big Wall Street firms', 'focused on sources of funding seen as particularly volatile such as the balances held in their prime brokerage business.'[16]

Taking all these together, our strong suspicion is that the Fed and other regulators will put pressure on all financial firms to reduce their dependence on repo, and in particular short-term repo of illiquid assets. The ECB's recent haircut increases for ABS and ordinary unsecured financials are a step undoubtedly designed to do just that, but they seem unlikely to be the only one. The failure of Bear Stearns shows all too clearly the fragility of such funding, and that the regulators are the ones ultimately on the line if it does. For investment banks in general, this is a severe blow. But for the broker-dealers, it strikes at the heart of their very business model.

What happens next?

If financial institutions want to reduce their funding risk in repo, they have several options. They can raise equity. They can sell assets. They can try to increase the term of their repo. They can increase issuance of unsecured term debt. And they can try to find a source of deposits. All of these are already under way, but we expect much more to come.

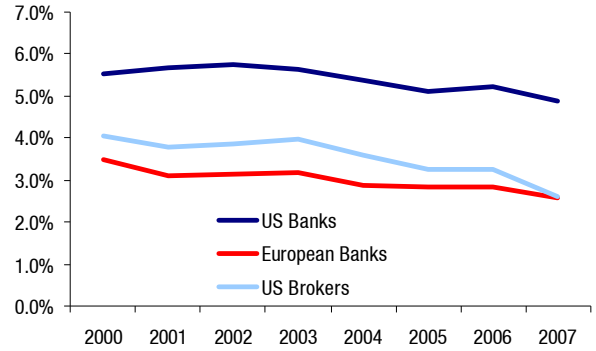
The trouble with leverage

The brokers' particular problem lies with their leverage and with their lack of a source of deposits. Figure 12 shows traditional leverage (tangible equity to non-risk-weighted asset) ratios for the major broker-dealers and a variety of banks. The downward trend in ratios (and hence upward trend in leverage) in recent years is all too obvious. Worse, Figure 13 (borrowed from our equity analysts) demonstrates the way in which such increased leverage has been a major driver of banks' improved return on equity. The other component of the equation – their return on assets – has often not changed, or has even deteriorated slightly. While Figure 13 shows the statistics only for European banks, it seems quite likely that there has been a similar effect elsewhere.

[15] 'Reducing Systemic Risk', B. Bernanke, at the Federal Reserve Bank of Kansas City's Annual Economic Symposium, 22 August 2008.

[16] 'Fed presses Wall Street banks on liquidity', 10 August 2008.

Figure 12. Tangible Equity/Asset Ratios



Source: Citi Investment Research. Excludes beneficial deleveraging shown during the first two quarters of 2008.

Figure 13. Decomposing Returns in the European Bank Sector

	1996	2007	Change
Return on Average Assets	0.60%	0.58%	-3%
x Leverage	21.3x	36.6x	72%
= Return on Equity	13%	21%	68%

Source: *European Banks – A Crisis of Confidence*, S. Samuels, June 2008

Going forward, we find it hard to see why either the brokers or the European banks should be allowed to have different leverage ratios from the US banks, and expect some sort of convergence. (Why should the rules for JPMorgan be different from those for, say, UBS?) There are, of course, some good historical explanations for these differences. European banks have always been regulated not in terms of tangible equity/asset ratios, but instead in terms of Tier 1 ratios driven by risk-weighted assets. Broker-dealers were not deemed to be of systemic importance to the economy, and hence were not subject to such stringent regulation as banks. Now, though, these differences are eroding, and we expect regulators to work consciously to remove them in future. Indeed, if wholesale funding is now deemed to be significantly more risky than deposits, one could even construct an argument that brokers should be less levered than banks, not more so.

This leverage is also an obstacle to rescue situations. When institutions are highly levered, small changes in assumptions about the value of their assets can have massive implications for the valuation of their equity. When Bank of America bought Countrywide, for example, it paid $4 billion for $8 billion of tangible book value. By the time they had fair-valued its balance sheet, though, the tangible book value was reduced to just $100 million. JPMorgan faced similar issues on the acquisition of Bear Stearns. Not only do you have to take writedowns on any previous mark-ups due to the widening out of liability spreads, but an acquisition forces you to mark-to-market previously modelled items such as Level 3 assets, too. The more levered the institution, the more serious the potential impact on the equity valuation.

Evaluating the options

Equity raising is perhaps the most obvious way to reduce leverage. In terms of the size of capital raising required, if the US brokers were to reduce their leverage to the levels of five years ago just by raising equity, they would need to raise over $50 billion (over and above the volume of any writedowns). This would probably be feasible, but would of course tend to depress stock prices still further. It is the conclusion that management teams will inevitably find such volumes unpalatable – and hence cut back on balance sheet growth instead – which was the principal inspiration behind two of our recent pieces, [17] and which is indeed showing up at the broker-dealers.[18]

[17] See our presentation *Why the banks aren't lending – and why you haven't noticed yet*, and research note *Funding in a crunch*.

[18] See *Analysis of Broker 10-Qs*, P. Bhatia, 14 July 2008, for both extra detail on the brokers' recent deleveraging from our equity analysts and indeed an alternative, more reassuring, assessment of their position overall.

The other alternatives – terming out of debt financing and a search for alternatives to repo – are unfortunately nearly as painful. On the repo side, its maturity is not only a matter of cost (with longer-term financing being more expensive than overnight), but also of achievability and availability. For illiquid assets in particular, lenders may simply refuse to extend terms for periods much longer than overnight because they themselves really do not want to end up with the collateral, regardless of the protection of overcollateralisation.

As for unsecured term financing, the main issue is cost. Increasing term debt from, say, 20% of the balance sheet to 30% of the balance sheet would be extremely expensive in terms of lost earnings. Very roughly, assuming repo costs of on average Libor flat and senior bond spreads for brokers currently well north of 200bp over Libor, terming out the implied $400 billion of financing from the four main brokers' balance sheets would cost an estimated $8 billion a year in interest. That represents almost 40% of their likely underlying earnings. Admittedly long-term average spread levels (when we eventually return to them, which we do not anticipate soon) would probably be somewhat tighter than this. But on the other hand, that is assuming that the rating agencies would not penalise such an increase in unsecured debt issuance, and above all that bond investors are actually prepared to double their exposure to institutions which already feature heavily in their benchmarks.

The last option for the brokers is to seek out deposits. Yet while this is perfectly permissible for the European broker-banks, such as Barclays and UBS, it is expressly prohibited by US legislation[19]. Brokers could in theory set up a holding company and parallel banking arm (as at JPMorgan and other universal banks), and then that banking arm could go out and take deposits. This would bring a greater stability to the parent organisation, but is not nearly as beneficial as one might think, due to an associated prohibition known as Rule 23A, which prevents the transfer of cash from deposits from banks to sister-company broker-dealers. Although there is speculation that this whole regime may be reviewed following the bailout of Bear Stearns, until any of that is enacted it still reduces the attraction of this route for the brokers. That leaves some combination of the unpalatable alternatives presented above.

Conclusion

In sum, we think a wholesale change in the financial system is in store. Transactions like repo have grown and grown to the point where they are far more significant for the system as a whole than their traditional, 'net', on-balance-sheet sizes had suggested. However safe they are from a lenders' perspective, the potential for those lenders to pull back – if only for reasons of psychology, but the same psychology which has affected ABCP and some other asset classes – now leaves regulators worried, given the scale of repo's importance.

[19] The Glass-Steagall Act of 1933. Although this was partially repealed by the Gramm-Leach-Billey Act of 1999, the prohibitions on deposit taking remained.

This is why regulators are taking increasing measures to reduce banks' reliance on short-term repo markets for funding. At brokers, in particular, repo is not only the means of funding a sizeable proportion of their inventory, but is also integral to their client business. If their access to the repo market were to be reduced, it would have very significant implications not only for their earnings, but also for their stability.

Unfortunately none of the potential solutions to this problem are painless. Increasing the term of the repo transactions themselves is problematic, and has already been done to a large extent. Increasing funding through unsecured short-term debt does not really help. Increased issuance of term debt is extremely expensive, especially in the current environment. Asset sales are difficult to achieve at attractive prices. And while raising equity does help reduce risk, it is obviously both dilutive and once again likely to prove difficult during a period of financial instability.

At this point, it is hard to see exactly how all this plays out. Even if the transition is achieved smoothly, markets in future seem likely to be significantly less liquid than they were until recently, with both hedge funds and brokers unable to play the same role in a world of reduced leverage. Returns on equity will almost inevitably be lower, though higher bid-offer and greater power in asset pricing may help compensate somewhat. In general, it feels like the world of tomorrow will look more like the world of yesteryear – before leverage and liquidity embarked on their dizzy climb in the late 1990s. The brokers may not be broken, but in future we expect the financial system in general – and the brokers in particular – to become shadows of their recent selves.

Appendix – Understanding broker balance sheets

While the body of this note has focused on what we think are those entries in brokers' balance sheets and 10-Qs most important to understanding the broader pattern of their repo financing, repo in fact crops up in several other line items as well. We thought it might be helpful as background to set out our interpretation of some of these other line items, and to explain what they do and do not include.

Figure 14 sets out the complete balance sheets of the main brokers as of their latest 10-Q filing. We have made some minor simplifications so as to present them on a common basis.

Figure 14. Broker-Dealer Balance Sheets (Dollars in Billions)

	31-May-08 Morgan Stanley	31-May-08 Goldman Sachs	31-May-08 Lehman Brothers	27-Jun-08 Merrill Lynch	29-Feb-08 Bear Stearns	2Q Sum
Assets						
Cash	23,782	13,781	6,513	31,211	20,786	96,073
Segregated cash	53,393	84,880	13,031	26,228	14,910	192,442
Financial instruments owned	390,393	411,194	269,409	288,925	141,104	1,501,025
of which pledged (and can be repledged)	140,000	37,383	43,031	27,512	22,903	270,829
of which pledged (and can not be repledged)	54,492	120,980	80,000	53,025	54,000	362,497
of which not pledged at all	195,901	252,831	146,378	208,388	64,201	867,699
Securities received as collateral	25,528			51,505	15,371	92,404
Collateralized agreements:						
Securities purchased under agreements to resell	165,928	130,897	169,684	224,958	26,888	718,355
Securities borrowed	257,796	298,424	124,842	129,426	87,143	897,631
Receivables	85,604	123,057	41,721	120,782	53,332	424,496
Other investments	5,886			79,170	29,991	115,047
Premises	4,856		4,278	3,142	608	12,884
Goodwill	2,988		4,101	-	-	7,089
Intangible assets	902			5,058	-	5,960
Other assets	14,172	25,912	5,853	5,805	8,862	60,604
Total	1,421,621	1,499,339	908,841	1255135	475,898	5,560,834
Liabilities						
Short-term borrowings	23,816	7,176	35,302	19,139	8,538	93,971
Deposits	35,227	29,518	29,355	100,458	-	194,558
Financial instruments sold, not yet purchased	161,748	182,869	141,507	105,976	51,544	643,644
Obligation to return securities received as collateral	25,528			51,505	15,371	92,404
Collateralized financings:						
Securities sold under agreements to repurchase	136,998	115,733	127,846	197,881	98,272	676,730
Securities loaned	45,981	34,439	55,420	65,691	4,874	206,405
Other secured financings	29,878	53,090	24,656	-	7,778	115,402
Payables	303,546	346,375	61,086	115,153	98,127	924,287
of which to customers (and counterparties)	293,344	335,481	57,251	65,633	91,632	843,341
Other liabilities	23,289	28,076	9,802	5,193	30,842	97,202
Long-term borrowings	210,724	182,051	128,182	270,436	71,753	863,146

Source: Company 10-Qs.

Reverse repo and repo appear in several places, on both the asset and the liability side. Let us consider reverse repo– in which cash is lent against the receipt of securities – first:

- "Financial instruments sold but not yet purchased" (liabilities): these are effectively short positions taken on trading desks, which may have been financed by collateral reverse repoed in against cash (and hence reported under "collateralised agreements" on the asset side), or using collateral received from hedge funds or other clients (which would not appear on balance sheet), or through collateral received as a result of a borrowed or lent versus pledged transaction. While in principle some of these short positions could be difficult or expensive to close quickly if repo financing were to evaporate, and the business' ability to take them must certainly be helped by the receipt of large volumes of collateral, in general we are relatively unconcerned about these numbers. Short positions in government bonds ought not to be too difficult to cover; short positions in risky assets would, if anything, probably be making money in the event of repo lines being withdrawn, given the significant systemic risk that implies.
- "obligation to return securities received as collateral" (liabilities): these correspond to "loaned versus pledged" transactions, and are normally paired off against an identical asset, "securities received as collateral".
- "securities purchased under agreements to resell" and "securities borrowed" (assets): this comprises a mixture of securities reversed in to cover trading desk short positions ("financial instruments sold, not yet purchased", on the liabilities side), and also to cover short positions taken by clients (for example, hedge funds in the prime brokerage business). "Securities borrowed" transactions are not legally reverse repos but are economically very similar; they are traditionally more common in equities. Once again, these numbers do not reflect the full volume of collateral received due to FIN 41 netting and the omission of borrowed versus pledged securities-for-securities financing transactions.

Returning to the liabilities side, we have the most obvious place in which securities are clearly stated as being funded on repo:

- "securities sold under agreements to repurchase" and "securities loaned": these are traditionally the repo funding book, consisting of assets the bank wants to finance as cheaply as possible by lending them out. Again, "securities loaned" consists of transactions economically similar to repo, yet legally distinct from it. The trouble with these numbers from an analyst's perspective is that, here too, they tend to comprise both repo financing the broker's own inventory and a portion of repo used to finance client inventory. These numbers will all be "loaned versus cash", since loaned versus pledged transactions are accounted for separately, as described above.
- "other secured financings": these vary, and are often of longer maturity than the standard repo financing book. They might contain, for example, leasing on property the brokers own, or secured financing for other non-marketable assets.

Finally, margin loans are again legally distinct from repo but have some similarities. When a hedge fund goes out and takes a long position in a security, that will typically be financed by a margin loan from the broker. The instrument is still pledged as security for the loan, but the transaction is not technically a repo. This loan would then be recorded as an asset under "receivables". Even here, though, receivables are reported net of any cash deposits the hedge fund leaves with the broker. If the size of the cash balance exceeds the total size of their margin loans (as might be the case for some funds engaged predominantly in synthetic transactions), then the net balance would instead be recorded as a liability under "payables".

Disclosure Appendix A1

ANALYST CERTIFICATION

I, Matt King, hereby certify that all of the views expressed in this report accurately reflect my personal views about any and all of the subject securities, issuers, currencies, commodities, futures, options, economies or strategies. I also certify that no part of my compensation was, is, or will be directly or indirectly related to the specific recommendation(s) or view(s) expressed in this report.

Other Disclosures

ADDITIONAL INFORMATION AVAILABLE UPON REQUEST

Citigroup research analysts receive compensation based on a variety of factors. Like all Citigroup employees, analysts receive compensation that is impacted by Citigroup's overall profitability, which includes revenues from, among other things, investment banking activities. Analyst compensation is determined by Citigroup research management and other senior management (not including investment banking personnel).

ISSUER-SPECIFIC DISCLOSURE

For issuer specific disclosures, please visit https://www.citigroupgeo.com/geopublic/Disclosures/index_a.html. Otherwise please contact Citigroup Global Markets Inc., 388 Greenwich Street, 11th Floor, NY, NY 10013, Attention: Fixed Income Publishing for additional assistance.

LIQUIDITY PROVIDER DISCLOSURE

Citi is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. Citi regularly trades in the securities of the subject company(ies) discussed in this report. Citi may engage in securities transactions in a manner inconsistent with this report and, with respect to securities covered by this report, will buy or sell from customers on a principal basis. For securities recommended in this report, in which Citi is not a market maker, Citi is a liquidity provider in the issuer's financial instruments and may act as principal in connection with such transactions.

VALUATION METHODOLOGY AND OTHER DISCLOSURES

"Relative Value"-based recommendations is the principal approach used by Citi's Fixed Income Strategy and Analysis ("FISA") and Economic & Market Analysis ("EMA") divisions' strategists/analysts when they make "Buy" and "Sell" recommendations to clients. These recommendations use a valuation methodology that is principally driven by opportunistic spread differences between the appropriate benchmark security and the security being discussed: (1) that have different maturities within a unique capital structure, (2) that have different collateral classes within a unique capital structure, or (3) that reflect a unique opportunity associated with a debt security. In addition, it is also not uncommon for a strategist/analyst to make an "Asset Swap" recommendation, such as a "Buy" and "Sell" recommendation between two securities from the same issuer/tranche/sector.

OTHER GENERAL DISCLOSURES

This research report was prepared by Citigroup Global Markets Inc. ("CGMI") and/or one or more of its affiliates (collectively, "Citi"), as further detailed in the report, and is provided for information and discussion purposes only. It does not constitute an offer or solicitation to purchase or sell any securities or other financial products.

This report does not take into account the investment objectives, financial situation, or particular needs of any particular person. Investing in securities and other financial products entails certain risks, including the possible loss of the entire principal amount invested. Certain investments in particular, including those involving structured products, futures, options, and other derivatives, are complex, may entail substantial risk, and are not suitable for all investors. The price and value of, and income produced by, securities and other financial products may fluctuate and may be adversely impacted by exchange rates, interest rates, or other factors. Prior to effecting any transaction in options or options-related products, investors should read and understand the current Options Clearing Corporation Disclosure Document, a copy of which may be obtained on request from your Citi representative. Certain securities may not be registered with, or subject to the reporting requirements of, the US Securities and Exchange Commission or any comparable regulatory authority. Information available on such securities may be limited. Investors should obtain advice from their own tax, financial, legal, and other advisors and only make investment decisions on the basis of the investor's own objectives, experience, and resources.

The information contained in this report is based on generally available information and, although obtained from sources believed to be reliable, its accuracy and completeness is not guaranteed. The analysis contained in this report is based on a number of assumptions. Changes in such assumptions could produce materially different results. This communication is not intended to forecast or predict future events. Past performance is not a guarantee or indication of future results.

Citi research analysts may communicate with sales and trading personnel and other Citi personnel for the purposes of gathering and analyzing market information and may discuss with such personnel information regarding, among other things, market trends, economic trends, the market for bonds of a specific issuer, and other market information (such as current prices, spreads, and liquidity), as long as such communications do not impair the analyst's independent ability to express accurately his or her personal views about any and all of the subject securities or issuers. Other Citi personnel who do not function as research analysts, including sales and trading personnel, may provide oral or written market commentary or trade ideas to Citi's customers or proprietary trading desks that differ from the views expressed in this report. Citi's proprietary trading and asset management businesses may make investment decisions that are different from the recommendations contained in this report.

Citi has no duty to update this report, and the opinions, estimates, and other views expressed in this report may change without notice. No liability whatsoever is accepted for any loss (whether direct, indirect, or consequential) that may arise from any use of the information contained in or derived from this report.

Securities recommended, offered, or sold by Citi (unless expressly stated otherwise): (1) are not insured by the Federal Deposit Insurance Corporation or any other body; and (2) are not deposits or other obligations of Citibank, N.A. or any other insured depository institution.

Citi does not provide tax advice and nothing contained herein is intended to be, or should be construed as, tax advice. Any discussion of US tax matters contained in this report was written to support the promotion or marketing of the transactions or other matters addressed herein and is not intended to be used, and must not be used by any recipient, for the purpose of avoiding US federal tax penalties. Recipients of this report should seek tax advice based on the recipient's own particular circumstances from an independent tax adviser.

This report is intended for distribution solely to customers of Citi in those jurisdictions where such distribution is permitted. No part of this report may be copied or redistributed by any recipient for any purpose without Citi's prior written consent.

Local law requirements may prohibit certain investors from effecting a transaction in the security or securities covered in this report. US persons wishing further information or to effect a transaction should contact a registered representative of CGMI in the United States. Non-US persons wishing further information or to effect a transaction should contact a Citi entity located in their own jurisdiction unless applicable governing law permits otherwise.