

Liquidity in global markets

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The latest episode of turbulence has been marked by an extended period of illiquidity in a large number of markets –ranging from traditionally highly liquid interbank money markets to the less-liquid structured credit markets. The event began with what was widely perceived as a credit deterioration in the US subprime mortgage market. However, this quickly raised uncertainty about the valuation of securities related to this market, thus affecting their liquidity. The rapidity with which this market illiquidity has been transmitted into funding illiquidity has been both striking and unprecedented.

The event has raised questions about how market liquidity in a variety of instruments is determined in both primary and secondary markets and how mechanisms act to transmit illiquidity across markets during a period of stress. The article seeks to identify how standard concepts of liquidity can be applied to various types of markets across the globe with a view to interpreting how liquidity deteriorated so quickly. Several attributes of liquidity –types of market structures (including existence of formal intermediaries and trading venues), the construction of the instruments, and the types of investors– are used to guide the analysis. One feature that appears to be important for liquidity is the degree to which information about the risks underlying the financial instrument are well understood by both buyers and sellers. Another insight is that the expectations of market participants about liquidity and their ability to monitor it also have an impact on liquidity itself. These attributes suggest that the growth in securitization and complex structured credit products –new developments in the transfer of credit risk– may carry with them a predilection to adverse liquidity events that will require further examination.

In light of the analysis, the article identifies ways of mitigating some of the problems that arose in this latest bout of illiquidity. Because liquidity is created and maintained by the market participants themselves, most of the room for improvement rests with the private sector. It is already clear that some market practices and policies will need to change and in this context some suggestions for enhancements to financial institutions' liquidity risk management are outlined. However, given that both market and funding liquidity are intimately related to financial stability, a public good, there is also a potential role for the public sector. Hence, the tools used by central banks to maintain their role in efficient monetary policy transmission together with financial stability will need to be reviewed.

The latest episode of financial turbulence has highlighted the crucial role of liquidity in global markets. While the turmoil originated in the US subprime mortgage market –initially a credit, not a liquidity event– it quickly brought into question the value of a number of asset-backed securities (ABS) and their related structured credit products that are held by financial institutions across the globe. This uncertainty gave rise to market illiquidity in these instruments and then, given the way that they were being financed, to funding illiquidity. The speed at which the disturbance in market liquidity has been transmitted to persistent dislocations in the interbank market is remarkable and hence requires more thorough analysis. It is already clear that some market practices and policies will need to change. Further, the tools used by central banks, may also require modification in order to strengthen the financial system from shocks of this nature. In light of the relation to the growth in securitization and complex structured credit products, it is an open question whether these types of liquidity events will be more likely in the future –an area that will require further study.

The event was precipitated by a recognition of the extent to which credit standards in the US subprime mortgage market had deteriorated, but quickly transformed itself into funding difficulties for financial institutions that had taken on related securities. In July, rapid declines in traded ABS indices (ABX) and credit rating agencies' downgrades of a number of the underlying ABSs, in some cases by multiple notches, contributed to uncertainty about the extent of credit deterioration and associated valuations. Following these downgrades, the inherent illiquidity of what had been assumed by some holders to be tradable securities became apparent. In particular, those investors that funded the securities held in conduits and structured investment vehicles (SIVs) with short-term asset-backed commercial paper (ABCP) began to question the validity of the underlying business model. As ABCP investors decided not to reinvest their proceeds as the paper matured, the liquidity of the ABCP market dried up, which in turn led to liquidity difficulties for the banks that had agreed to supply back-up contingent credit lines to these entities. The resulting liquidity squeeze in

interbank markets then prompted central banks to inject significant liquidity into short-term markets.

This article examines how, in the light of recent events, market illiquidity can quickly become funding illiquidity.¹ It shows how the use of alternative assumptions about the liquidity of particular assets can have important implications for bank's funding plans. The article attempts to document how, in normal times, liquidity (or the perception of it) appears to be abundant or at least sufficient for markets to function, but in stressful times, markets and products that are not designed with liquidity in mind become unstable and illiquid, precluding normal functioning. A large part of the existing literature tends to emphasize that episodes of extreme illiquidity and liquidity contagion are characterized by mechanisms largely absent during normal times. This article observes how illiquidity in one market can be transmitted to other markets in stressful conditions. Since our knowledge about drivers of liquidity during normal times is much more developed, the analysis provides a promising first start for improving our understanding and management of extreme illiquidity events.

After describing the main drivers of market liquidity, some important global markets are examined for their liquidity characteristics, both before and during the 2007 episode. It is relevant, and not surprising, that the markets for which only imprecise or little data are available on which to assess liquidity are the ones in which uncertainty has been most pronounced. Often, these assets are traded over-the-counter (OTC) rather than on an organized exchange, and the investors that hold these illiquid assets tend to have different time horizons and strategic goals than those that trade in the more liquid, exchange-traded assets.

Lastly, the article provides some guidance for how market structures for various assets may need to be considered in conjunction with their liquidity for markets that are important for financial stability. Information and disclosures are also important elements for determining and tracking market liquidity and anticipating funding liquidity difficulties. Some possible policy suggestions for both the private and public sectors are considered in this context.

¹ A number of recent contributions have studied the relevant transmission channels, both theoretically and empirically. See for example, Acharya (Viral V.) and Schaefer (S.) (2006): "Liquidity risk and correlation risk: implications for risk management," Working Paper, London Business School, and Brunnermeier (Markus K.) and Pedersen (Lasse H.) (2007): "Market liquidity and funding liquidity," NBER Working Papers 12939.

1 | TRADITIONAL CONCEPTS AND DEFINITIONS OF MARKET LIQUIDITY

A market is traditionally considered liquid if an investor has the ability to buy or sell a reasonably sized amount of an asset without appreciably affecting the price. Several characteristics about the structure of the market enhance its liquidity. First, liquidity is likely to be enhanced if information about the asset's value is distributed symmetrically between intermediaries and potential buyers and sellers.² Wide bid/ask spreads set by intermediaries can often be interpreted as reflecting asymmetric information. Second, liquidity is enhanced if the overall amount of the asset available to be purchased or sold is large relative to each investors' desired trading amount. For instance, in equity markets, a higher "free float" available for any buyer or seller to potentially acquire or put on the market increases available liquidity. Third, the price increment between quoted prices is relevant. If trades can only occur at round units, for example, one dollar, as opposed to a cent, then trades will only take place when a threshold half way between the units is achieved by the parties wanting to trade.³ Although at relatively narrow tick sizes, results are ambiguous, under most circumstances, the smaller the price increment, the higher the liquidity.⁴

Another important feature of the market's structure that influences liquidity is how the asset is traded. One element is the existence or absence of a party designated to act as an intermediary –such as a broker, specialist, local, or market-maker– which is typically also expected to provide ongoing price quotes and, sometimes, to hold an inventory of the securities. Another element is how buyers and sellers congregate, either physically or electronically. Exchange trading environments, where buyers and sellers can meet and where well-established methods of recording and publishing prices exist, tend to make it easier for transaction to occur than in OTC markets where pairs of buyers and sellers must find one another to trade.⁵ Many OTC markets have

used technology to improve the ability of buyers and sellers to find each other, but OTC markets still typically lack a formal clearing house that records trades and guarantees the performance of the opposing parties, reducing counterparty uncertainty. Another element of liquidity, immediacy –that is, the ability to find a willing buyer or seller within a short period of time– is also influenced by the existence or absence of an intermediary and the trading venue.

In addition to the characteristics of the markets in which assets trade, the characteristics of the asset itself are also relevant. The more homogeneous or standardized the asset's characteristics, the more likely multiple buyers and sellers will be found. For instance, futures contracts attempt to standardize various features of the underlying asset or commodity in order to attract heterogeneous buyers and sellers. Often the maturity date, a par or notional amount, a specified deliverable item with transparent characteristics, and an established trading unit or "tick size" are all relevant standard features of such a contract. At the other end of the spectrum, a "bespoke" OTC transaction is designed so that the contract is specifically suited for the buyer and seller in a way that personalizes the transaction, in some cases to hedge a specific risk. These transactions are often not intended to be traded in a broader market, but are meant to be held until maturity by the original buyer.

Often, the characteristics of an asset that influence the degree of liquidity are determined at the outset. Hence, the primary issuance of securities is an important determinant of likely liquidity in the future. However, it is important to distinguish between primary and secondary market liquidity because high volumes in primary markets do not necessarily imply liquidity in the secondary market. Particularly, the markets for customized credit derivatives and collateralized debt obligations are highly tailored to meet specific investor needs, which make them rather illiquid in the secondary market. The lack of secondary market liquidity may not be a major problem if the users, often long-term investors, desire the credit exposure and do not engage in active trading. However, an

2 *Glosten (L.) and Milgrom (P.) (1985): "Bid, ask and transaction prices in a specialist market with heterogeneously informed traders", Journal of Financial Economics, Vol. 14 (1), pp. 71-100, and, Glosten (L.) and Harris (L.) (1988): "Estimation of the components of the bid/ask spread," Journal of Financial Economics, Vol 21, Issue 1, pp. 123-142.*

3 *See for example Harris (L.) (1994): "Minimum price variations, discrete bid-ask spreads, and quotation sizes," Review of Financial Studies 7, pp. 149-178.*

4 *Bourghelle (D.) and Declerck (F.) (2003): "Why markets should not necessarily reduce the tick size," Journal of Banking and Finance, 28, pp. 373-398.*

5 *An prominent exception is foreign exchange markets, where OTC spot, forwards and option trades exceed their exchange-traded equivalents.*

investor wishing to unwind or modify a position may have to rely on the initial arranger of the transaction, who may not be willing or able to provide liquidity under stressed market conditions, or may do so only at a significantly depressed price.

In principle, an asset should have embedded in its price a discount that factors in the liquidity risk of holding that asset –the value of liquidity. For very liquid securities this discount is probably so small that it would be difficult to measure it precisely. For other securities, it might be difficult to measure a liquidity risk premium because the security itself is tailored to a particular group of investors making a separate calculation of the discount for liquidity hard to quantify. Most securities are between these two cases, but formal measures of a liquidity premia are still elusive. In the US Treasury market, the yield to maturity of an "on-the-run" issue, relative to bonds of similar, but slightly shorter, "off-the-run" maturity, provides a guide to the degree of liquidity in the Treasury market. In fact, this differential can sometimes be viewed as the "price of liquidity."

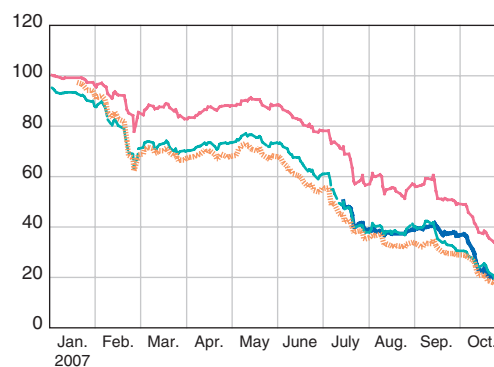
Thus, liquidity is described by a number of elements—the type of asset, the market structure, including the trading venue, and the diversity of the investor base. The value of the various components should be embedded in the price of the asset itself, but it is difficult to separate out this component, either theoretically or empirically.

2 | REVIEW OF LIQUIDITY IN GLOBAL MARKETS BEFORE AND DURING THE STRESS PERIOD IN 2007

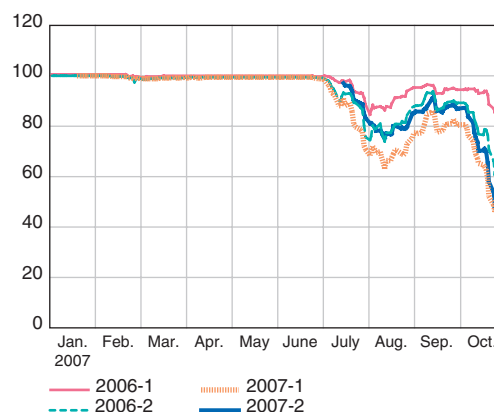
Based on the events that began in July of 2007 and the documented transmission of liquidity across markets, the liquidity characteristics of various markets are now explored. The sequence of events provides important clues regarding how and why the liquidity characteristics of markets matter for financial stability. The concepts presented above are also used to help interpret the changes in liquidity in certain markets.

As explained in the introduction, the first market to be affected by the events was the US asset-backed mortgage market, and specifically those securities backed by subprime loans. Trades in ABS occur in an OTC setting and thus volumes and prices are difficult to observe. In fact, often investors in such securities do not anticipate that they will trade them actively and neither do the arrangers of these assets. Thus, the asset is designed with low future liquidity in mind. Actual transactions in these securities are reportedly low, particularly in the more complex varieties. Such trading was undertaken primarily to make marginal adjustments to portfolios of the more active participants. A proxy market such as the tradable index market linked to credit default swaps in ABS (the "ABX") provides some clues. The volatile and declining prices in these traded indices suggest that they were used instead of the actual illiquid securities to embed the new (negative) information (Chart 1) as it arrived.

Chart 1
ABX price performance
BBB-rated



AA-rated



Source: Bloomberg

As it became evident that the same ABS securities and the structured credit products referencing those securities were likely to perform less well than anticipated, valuations became more uncertain. At first, there were declines in the ABX index and subsequently funding problems of various sorts. Following an admission by BNP Paribas that it was unable to value such securities in its money market funds and rumored difficulties in two banks in Germany, it became clear that a very geographically diverse set of institutions might themselves be holding concentrated exposures to losses on subprime ABS, including in off-balance sheet conduits and SIVs. These entities were being funded by short-term ABCP –another OTC market in which specific types of investors are targeted to purchase buy-and-hold commercial paper for the maturity of the paper.

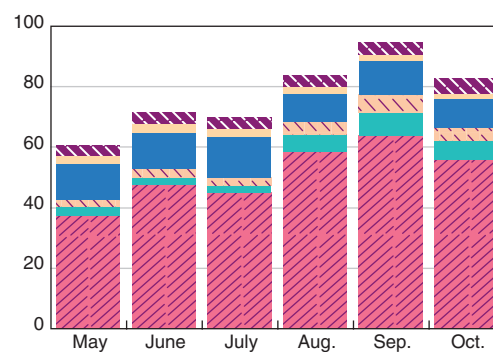
As with the ABS and structured credit market, liquidity of the ABCP market is also difficult to measure. However, one symptom of illiquidity and investor risk aversion was the degree to which the average maturity of the paper issued shortened from August onwards. Maturities of US ABCP range from 1-4 days to over 181 days, with an average maturity of 24 days in May, with some 66 percent held less than 9 days. In the month of August, the average maturity dropped to 18 days and the proportion with less than 9 days to maturity rose to 79 percent. Some normalization has occurred, but, as of October, the average maturity was still lower than prior to the disruption. The following chart shows the issuance at various maturities before, during and as of this writing (Chart 2). It is also notable that the amounts outstanding of the ABCP, where uncertainty about what backs the commercial paper is still present, have declined steadily (Chart 3) indicating funding liquidity using ABCP is still impaired.

Following the reluctance of ABCP holders to roll over their paper, or the requirement of higher yields and shorter maturities to do so, SIVs and conduits met their funding shortfalls by calling on contingent bank credit lines. Simultaneously, banks were warehousing more mortgage and leveraged loans than anticipated, due to the suspension of most transactions in the mortgage-related ABS markets and collateralized loan obligations (CLOs), while respecting liquidity commitments that had been made to other entities also under liquidity strain –hedge funds, CDOs, and other banks. This unexpected system-wide call on funds tightened the interbank market and caused a funding liquidity squeeze.

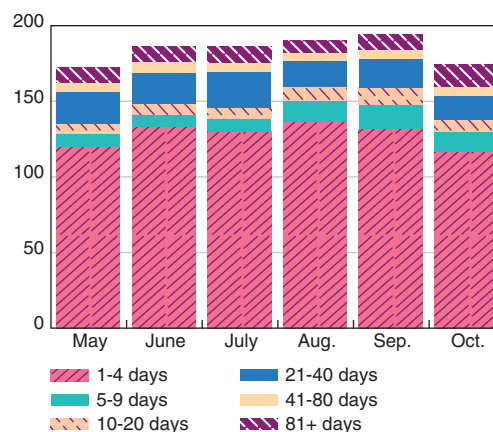
Chart 2
New issuance of asset-backed commercial paper in May-October 2007

(USD billions)

AA-rated



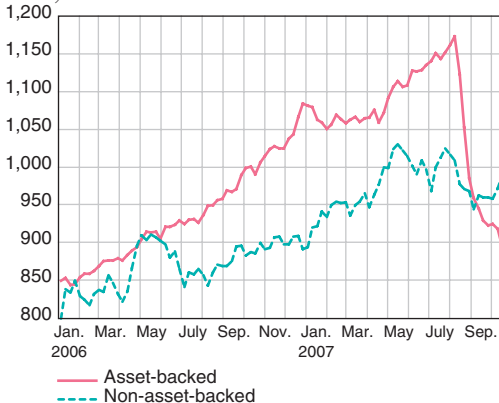
Total market



Source: Board of Governors of the Federal Reserve System

Chart 3
US commercial paper outstanding

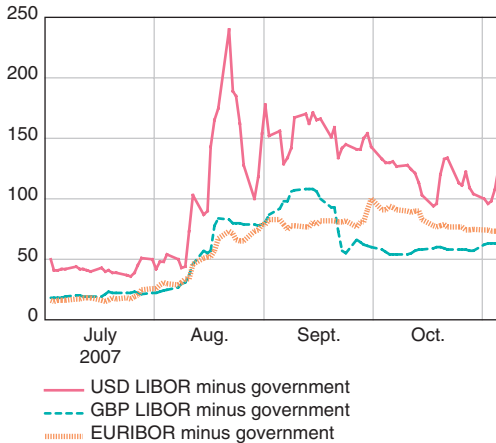
(USD billions)



Source: Board of Governors of the Federal Reserve System

Chart 4
Flight to quality

(in basis points on 3-month term)

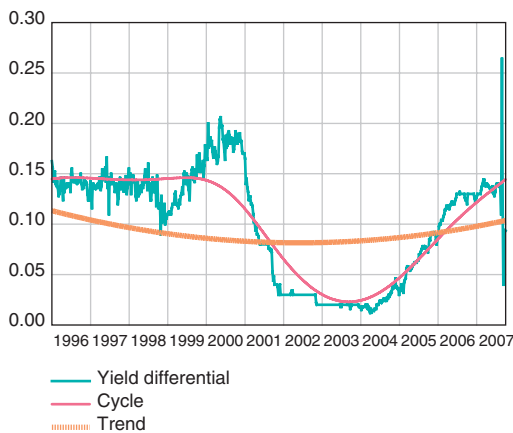


Source: Bloomberg

The illiquidity in the interbank markets can be measured in a number of ways. The most dramatic indications of difficulties were in the widening of various spreads –the spread between T-bills and Eurodollars –the TED spread– widened to extreme levels. Similar spreads in other currency markets also widened dramatically (Chart 4). While such widening can be an indicator of both credit and liquidity risk, the extreme nature of the observed moves suggests that liquidity in interbank markets was impaired. The flight to quality, and to more liquid markets, is also demonstrated by the wild gyrations in the differential

Chart 5
Yield differential of off-the-run/on-the-run US three-month Treasury bonds

(%)

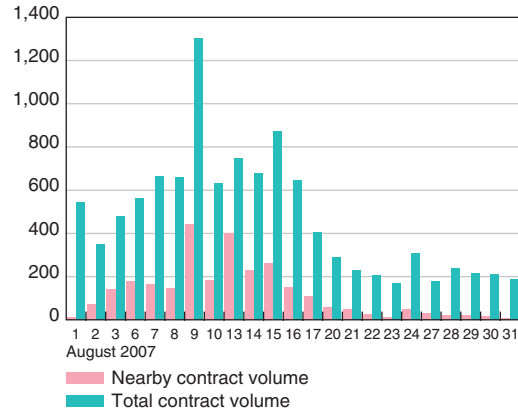


Sources: Bloomberg and IMF staff estimates

6 See Hegde (S.P.) and Paliwal (R.) (2005): "Financial contagion and market liquidity –evidence from the Asian crisis", February 23. The authors show that market liquidity dries up for both exposed and unexposed firms, but more forcefully for those entities that were more liquid and less risky during the pre-crisis period, suggesting that forced margin sales are at play.
7 See Khadani (A.E.) and Lo (A.W.) (2007): "What happened to the Quants in August 2007?", September, Working Paper, Massachusetts Institute of Technology Sloan School of Management, Cambridge, MA 02142.

Chart 6
30-day Fed Funds futures volume

(thousands of contracts)

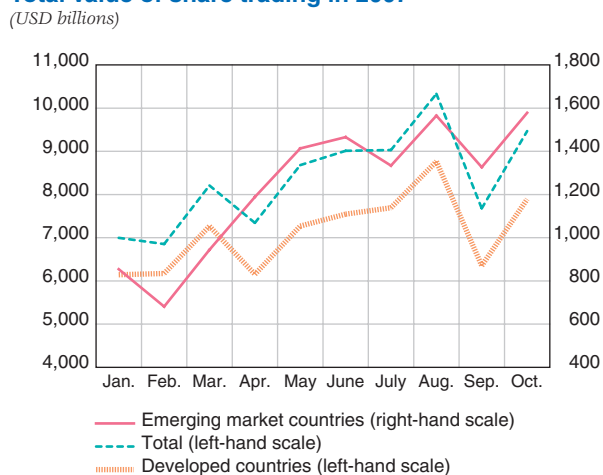


Source: Chicago Board of Trade

between less frequently traded (off-the-run) and more frequently traded (on-the-run) 3-month US Treasury bills (Chart 5). The US Fed Funds futures contract also witnessed a rise in volume as this market was easily accessible and liquid. Daily average volume doubled in the Fed Funds futures contract during mid-August when markets were most in distress (Chart 6). The OTC nature of the interbank market makes the level of activity difficult to analyze, but participants in the market expressed concern about whether quotes for term interbank lending (1- and 3-month maturities) on electronic screens could be relied upon as valid given the lack of trading activity.

The squeeze in interbank markets added to tight market liquidity conditions that had already been developing in July. Following the spike up in volatility of many markets, rising margin requirements meant that hedge funds and others subject to margining agreements –especially those that held ABS and structured credit products– attempted to offload some of these specialized securities. When they found this to be difficult, they began to sell other, more liquid, parts of their portfolios to meet margin calls and redemption requirements. In many cases, these more liquid instruments were exchange-traded equities in developed economies. In this way, liquidity spillovers were then witnessed first in the most liquid markets.⁶ Early analysis suggests there were fire sale liquidations of similar hedge fund portfolios that had been quantitatively constructed.⁷ Overall, nearly all

Chart 7
Total value of share trading in 2007
(USD billions)

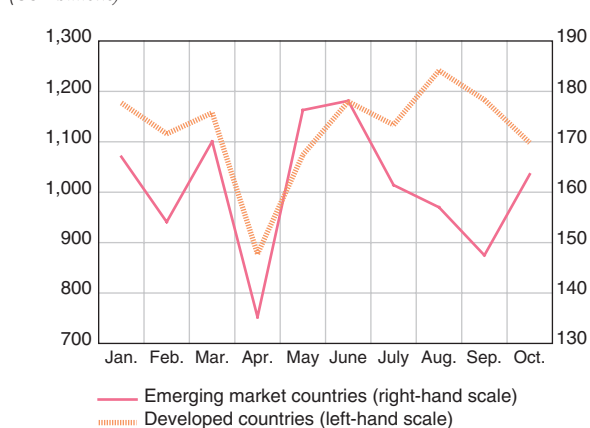


Source: World Federation of Exchanges

developed and emerging market equity markets saw their volumes reach their peaks in August (Chart 7). The United States experienced both high volumes and numbers of trades.

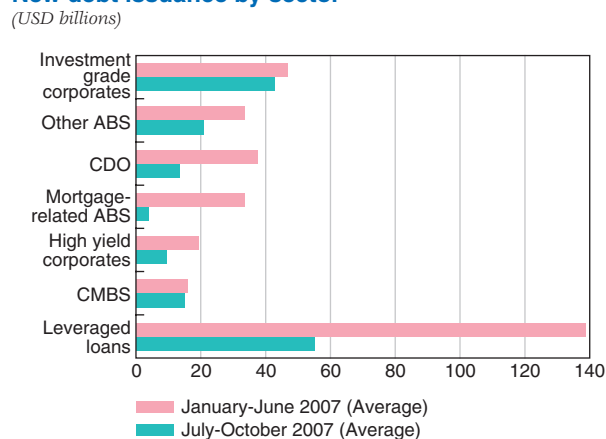
In bond markets, known for somewhat lower liquidity than equities, there was a move toward safe assets but the movements in volumes were more subdued. Volumes in the associated futures contracts, where they exist, increased, but, overall, the value of developed countries' bonds that traded increased only 9 percent from July to August. Anecdotal evidence suggests that securities viewed as risky, complex, or illiquid became more illiquid, while those with highly standardized features were traded more frequently. Measures of emerging market bonds activity show a gradual decline from June through September (Chart 8).

Chart 8
Total value of bond trading in 2007
(USD billions)



Source: World Federation of Exchanges

Chart 9
New debt issuance by sector
(USD billions)



Sources: Lehman Brothers, JPMorgan, and Bloomberg

When secondary markets experience reduced liquidity, issuance in the primary market invariably shows signs of stress, particularly, but not exclusively, those related to short-term funding markets. In the most affected markets, the decline in issues was striking (Chart 9). In the ABCP market, for instance, the decline in issuance has not yet abated. Even non-asset backed CP suffered a temporary drop in issues outstanding. Issuance of equity has also slowed in mature markets even though the price dips were relatively mild and short-lived (Table 1). Uncertainty regarding pricing and the higher cost of capital have made raising equity capital less attractive. Uncertain future prospects led investors to apply a higher discount to future cashflows, resulting in a decline in the fair value of equities. Equity issuance in emerging markets, where prices remained generally buoyant, took a hit in August and September, but appear to have recovered quickly.

In mature economy corporate bond markets, where issuance had been quite robust during the first half of 2007, issuance virtually stalled in July and August. However, since then, both US high grade and high-yield corporate issuance has recovered (Chart 9). Leveraged buyout (LBO) activity is strongly influenced by the willingness of lenders and investors to finance leveraged corporate acquisitions –willingness which is quite sensitive to the deal's characteristics and current market conditions. Hence, LBO activity also froze in July and August as investors became more conservative. Prior to July, the issuance of borrower-friendly "covenant-lite" leveraged loans had reached new highs (Chart 10). Issuance of leveraged and syndicated loans then

Table 1
Capital raised by shares (IPOs) in 2007

(USD millions)

	January	February	March	April	May	June	July	August	September	October
Developed countries										
United States	5,682.9	11,151.2	5,087.2	6,201.4	8,787.0	11,060.8	7,757.0	4,985.0	876.0	5,094.4
United Kingdom	295.9	3,311.8	7,830.5	2,809.7	11,313.4	...	8,504.6	2,339.1	205.7	1,793.2
Emerging market countries										
Brazil	1,116.6	878.3	1,456.6	2,079.3	620.8	2,833.5	6,379.3	584.1	280.8	12,322.9
Colombia	...	30.5	4,210.0	30.9	33,762.8
India	1,917.5	1,124.2	203.9	296.4	342.8	5,505.1	3,387.2	1,445.4	188.9	1,055.3
Hong Kong	31.9	1,030.2	1,497.8	7,485.9	1,882.0	615.8	4,776.7	489.1	2,539.7	5,779.6
Korea	278.4	211.6	...	468.1	97.6	765.2	543.3	256.9	328.0	85.0
China	4,200.2	2,464.9	5,332.9	2,874.1	3,433.8	2,099.9	2,387.3	1,018.2	10,968.0	8,978.7
Singapore	24.1	261.6	296.1	926.5	268.4	152.9	393.3	738.4	96.2	...
Poland	163.5	52.7	55.9	55.9	3,984.4	...	392.4	60.2	66.7	100.6

Source: World Federation of Exchanges.

fell sharply from their Q2 highs. Existing leveraged loans subsequently suffered price declines, typically trading 5-7 percent below previous highs, inhibiting further issuance.

Issuance of structured credit products associated with US mortgages suffered the most. Following robust growth from 2002 to mid-2007, the construction and distribution of complex structured credit products has all but come to a halt. Some collateralized debt obligations (CDOs) have been issued, but mortgage-related asset-backed security issuance has not recovered. Demand for more complex structures, such as CDO-squared and similar products, has disappeared. The tradability of existing structured securities was never meant to be a valued characteristic. Thus, the amount outstanding was mostly reflecting strong final demand for the

product. Now that their valuation is far from certain, the ability to trade ABS and associated products is even further impaired. The lack of liquidity has proved problematic for various financial firms to value them, or to remove them from their balance sheets following ratings downgrades.

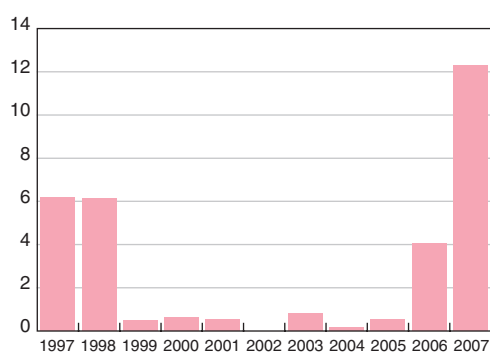
3 | INTERPRETATION AND DISCUSSION

From the data at hand, it is evident that an important feature leading to market illiquidity in this event has been asymmetric information and a lack of transparency regarding the securities that have been suspected of losing value. While much of the evidence is provided by volumes and spread data, which are indirect measures of liquidity, it is evident that markets that have the most informational uncertainty have been the most illiquid in this event. For instance, bank exposures to their SIVs and conduits, and the degree to which they may be required to take on assets from these entities, has disrupted interbank markets. For a time, banks were unwilling to lend to each other at anything but very short-term maturities, overnight to one-week, without knowing more about the risks involved and their own imminent liquidity needs. Questions about counterparty insolvency have also kept interbank markets illiquid.

While the interbank market is probably the most obvious case where a lack of information impeded market and funding liquidity, the absence of fundamental

Chart 10
Number of covenant-lite loans to total number of institutional term loans

(%)



Note: In 2007, data refers to the first half of 2007.

Source: Standard & Poor's, *Leveraged Commentary & Data*

information about how to price various structured credit products was also responsible. While traditional mortgage-backed securities, such as those issued by Freddie Mac and Fannie Mae are highly liquid, other structured credit products are very illiquid –how they are constructed shows that information and security design (matching the security to the ultimate holder) together influence market liquidity. For instance, the more bespoke the transaction, regardless of the transparency of the underlying information used to price it, the more illiquid it is likely to be. Securities based on well-established indices or reference securities are more liquid than those that are not. Similarly, the easier the structure is to understand the more likely it will be to be traded or valued without large bid-ask spreads. For most structured credit products, the high uncertainty surrounding their current value has many holders attempting to keep the securities, hoping uncertainty will be resolved, prices will stabilize at higher levels, and the ability to sell these instruments will improve, as funding liquidity returns to the system.⁸

Another factor leading to the lack of market liquidity is the trading venue. OTC markets allow buyers and sellers to satisfy very specific demands for the types of products they desire, but this positive aspect becomes disadvantageous if the investor wants to hedge or remove the asset from the balance sheet. In this event, some market participants moved to exchange-traded or more liquid index products to hedge the risks of the OTC structured products that they could not exit. Exchange-traded assets did not experience the large dip in liquidity that OTC markets appeared to have sustained and some, in fact, saw large increases in volume, though lack of OTC data makes the claim of differential liquidity difficult to verify.

The fact that historic information about trade size and frequency is so difficult to obtain for OTC markets, inhibits researchers and risk officers from developing realistic liquidity management contingencies. This need not be the case. The electronic trading systems accompanying trading in many securities, such as US Treasuries and exchange rates where brokers are present, provides the wholesale market participants with sufficient information to judge liquidity in real-time. Hence, in today's electronic trading environment, the information could be made available from OTC markets to study liquidity more rigorously.

Before examining policies that could influence market liquidity, it is important to assess the benefits and costs of developing the liquidity of a market. Many market participants and policymakers start from the position that policies should strive to make financial markets as liquid as possible. However, the needs of market participants, including their desires for product specificity, and the public "good" of liquidity need to be weighed in any policy actions.

Generally, liquidity develops in markets as more participants with differing views take part in them, demanding immediacy and finer pricing, suggesting private markets will produce the amount of liquidity demanded by the participants. That is, liquidity demands are endogenous to the development of markets themselves. For instance, when market participants decide more standardized financial products are desirable, collaborative associations are formed to move in this direction. The International Swaps Dealers Association (ISDA) is an obvious example –when the swaps market was immature, contracts were negotiated in pairs, but after a period of time, ISDA was established to standardize contracts and make swaps more tradable. If securities are used as collateral, liquidity aids assigning prices and supports the liquidation of collateral if performance of the counterparty is impaired.

However, in addition to these private sector considerations, there is also a public component to liquidity that benefits the broader objective of financial stability. Markets may be less likely to become unstable if they are liquid –price changes may be less abrupt or large and thus less likely to overshoot or display non-linear reactions. If systemic events do take place, liquid markets can allow a smoother unwinding of securities of bankrupt entities than if the securities are illiquid, thus permitting a financial system to recover more quickly.

There are several ways to increase liquidity that can be explored. Encouraging standardization by promoting working groups to provide benchmark characteristics or standardized financial instruments is one way. Making sure that regulations do not penalize exchange trading environments in relation to OTC environments would help level the playing field and make exchange trading more likely to develop. Allowing less liquid securities, or those denominated in other currencies, to be used as

⁸ The M-LEC structure promoted by Citigroup, Bank of America, and JPMorgan Chase has been designed with this notion in mind.

collateral at central bank lending facilities or in other contexts could also improve liquidity conditions.

As is clear in this episode, complexity, inadequate information and disclosure can make markets more illiquid than they would be otherwise. Thus, policies that improve transparency –reducing asymmetric information between potential buyers, sellers and intermediaries, such as brokers, market-makers, and specialists, can improve market functioning. Information can be improved at several levels: first, underlying information about the risks of the securities being traded would allow more granular pricing and lower bid-ask spreads; second, information about the market functioning itself, including recent traded prices, volumes, and trade sizes, could reduce uncertainties about the trading environment; and third, information about counterparty financial health could help in OTC environments where trading illiquidity is exacerbated by uncertainty over counterparty creditworthiness. It is notable that recently many institutions have attempted to disclose more about their exposures and businesses, knowing that uncertainty can raise their funding costs. On the other hand, too much disclosure at a time when markets are jittery can be counterproductive. Thus, if more disclosure is to be introduced, careful consideration as to its timing is warranted.

Each of these elements was in some way impaired during the latest crisis. Risks underlying complex structured credit products were difficult to grasp and price, in part due to insufficient information provided by structurers and rating agencies. For instance, the chances of multiple notch ratings downgrades were not well documented or understood. It was also clear that some markets did not function well because market participants themselves did not know whether quoted prices represented a true willingness to trade or just a place-holder designed to elicit others' agreement to a trade. Without some measure of trade size, price quotes are always difficult to interpret. Information contained in post-trade reporting requirements should allow for a reasonable delay, since real-time data on trades can sometimes alter the price dynamics through

strategic behavior to the detriment of participants initiating the trade. Financial institutions continue to be very cautious in lending funds to each other. Further information about the size of counterparty exposures, losses, and future prospects are needed to reduce concern over hidden exposures and so facilitate the resumption of trading.

Although work is still ongoing, a set of policies for better liquidity risk management within financial institutions is needed. A few obvious points can be made already. The first is that institutions should have a better understanding of the potential illiquidity of their assets in a crisis. Some did not appreciate how illiquid some of their assets were relative to their liabilities, nor did they adequately anticipate that they may need to take illiquid assets back on their balance sheets. After observing various kinds of asset liquidity, stress tests that anticipate either wider bid-ask spreads or longer potential holding periods should be considered. One solution to the liquidity squeeze is to hold more liquid assets and better match the liquidity characteristics of their assets and liabilities. In part, matching maturities of various assets would help, but this may be insufficient since maturity is not synonymous with liquidity –some short-term assets are illiquid while some long-term assets are liquid. Diversifying sources of liquidity is also advisable. As Northern Rock illustrated, relying predominantly on wholesale markets for marginal funding can be problematic at times of systemic stress. While capital is not a panacea for liquidity difficulties, having more capital can help to slow down a process whereby illiquidity leads to solvency difficulties. Counterparties may be more tolerant of providing liquidity to institutions they know to have sufficient capital.

Another line of inquiry for policymakers would focus on how central banks interact with those to whom they provide emergency liquidity support and inject liquidity. Issues of the market liquidity of the collateral, the composition of the collateral, and the types of counterparties through which central banks provide emergency liquidity support can all be usefully reexamined.

In sum, a predominant feature of this latest episode is the degree to which market illiquidity was transformed into funding illiquidity. Further analysis of the aspects of market illiquidity that were most problematic and the ways in which it links to funding illiquidity will be needed to form concrete policy recommendations. Surely, some of solutions to liquidity difficulties are in the hands of the private sector. Given the systemic nature of possible liquidity disruptions, an ongoing dialogue between the private and public sectors on how best to balance private interests with those of financial stability will be important.