Bank for International Settlements

Implications of repo markets for central banks

Report of a Working Group established by the
Committee on the Global Financial System
of the central banks of the Group of Ten countries

Basle
9 March 1999

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1. Executive summary

The purpose of this report is to enhance central banks' understanding of the economic and monetary policy role of repo markets and the policy issues surrounding the development of sound and efficient repo markets. The report is divided into three chapters. The first chapter, on the economics of repo markets, explains how they are used by private market participants for such activities as hedging and leverage. The second chapter focuses on the use of repos by central banks, both as a monetary policy instrument and as a source of information on market participants' near-term monetary policy expectations. In light of the benefits and the risks inherent in repo markets, the third chapter identifies those structural features (such as the legal framework and settlement systems) and market practices (such as adequate margining) that support sound and efficient repo markets.

In repo transactions, securities are exchanged for cash with an agreement to repurchase the securities at a future date. The securities serve as collateral for what is effectively a cash loan and, conversely, the cash serves as collateral for a securities loan. There are several types of transactions with essentially equivalent economic functions – standard repurchase agreements, sell/buy-backs and securities lending – that are defined as repos for the purposes of the report. A key distinguishing feature of repos is that they can be used either to obtain funds or to obtain securities. This latter feature is valuable to market participants because it allows them to obtain the securities they need to meet other contractual obligations, such as to make delivery for a futures contract. In addition, repos can be used for leverage, to fund long positions in securities and to fund short positions for hedging interest rate risks. As repos are short-maturity collateralised instruments, repo markets have strong linkages with securities markets, derivatives markets and other short-term markets such as interbank and money markets.

Repos are useful to central banks both as a monetary policy instrument and as a source of information on market expectations. Repos are attractive as a monetary policy instrument because they carry a low credit risk while serving as a flexible instrument for liquidity management. In addition, they can serve as an effective mechanism for signalling the stance of monetary policy. Repos have been widely used as a monetary policy instrument among European central banks and with the start of EMU in January 1999, the Eurosystem adopted repos as a key instrument. Repo markets can also provide central banks with information on very short-term interest rate expectations that is relatively accurate since the credit risk premium in repo rates is typically small. In this respect, they complement information on expectations over a longer horizon derived from securities with longer maturities.

An assessment of the risks faced by repo market participants can help identify the conditions necessary for sound repo markets. Like other financial markets, repo markets are subject to some credit risk, operational risk and liquidity risk. However, what distinguishes the credit risk on repos from that associated with uncollateralised instruments is that repo credit exposures arise from volatility (or market risk) in the value of collateral. For example, a decline in the price of securities serving as collateral can result in an under-collateralisation of the repo. Liquidity risk arises from the possibility that a loss of liquidity in collateral markets will force liquidation of collateral at a discount in the event of a counterparty default. Leverage that is built up using repos can increase these risks.

While leverage facilitates the efficient operation of financial markets, rigorous risk management by market participants using leverage is important to maintain these risks at prudent levels.

Repo markets have offsetting effects on systemic risk. They are likely to be more resilient than uncollateralised markets to shocks that increase uncertainty about the credit standing of counterparties, limiting the transmission of shocks. However, this benefit could be somewhat reduced by the fact that the use of collateral in repos withdraws securities from the pool of assets that would be available to unsecured creditors in the event of a bankruptcy. Another concern is that the close linkage of repo markets to securities markets means they may help transmit shocks originating from this source. Finally, repos allow institutions to use leverage to take larger positions in financial markets, which could add to systemic risk.

There are a number of structural features and market practices that support sound and efficient repo markets. Some, such as an adequate legal framework and settlement system and good margining practices, are essential to limit risks and to ensure the efficient and sound operation of markets, while others are probably less crucial. In addition to promoting these features and practices, authorities may want to conduct market surveillance of repo markets to help ensure that such practices are respected and to help detect instances of market manipulation or abuse. A number of features and market practices are especially important for sound and efficient repo markets:

- *An adequate and efficient legal framework*. There should be a clear legal definition of the repo contract (including buy/sell-back and securities lending agreements), an essential feature being unambiguous certainty as to legal rights vis-à-vis the counterparty in the event of a default. The legal framework should be complemented by well-structured legal documentation, such as master agreements.

- *Secure and efficient settlement systems*. Since the securities leg of a repo serves as collateral for the cash leg, the failure to settle simultaneously opens up a credit exposure. This risk can be contained using safe settlement procedures based on delivery-versus-payment (DVP) arrangements.

- *Appropriate haircuts and margin call practices*. While the use of collateral reduces credit risk, market participants remain exposed to credit risk arising from volatility in the value of collateral, counterparty default and liquidity risk. Haircuts and margin call practices limit these risks provided they are set at levels commensurate with risks and adjustments are implemented promptly when appropriate.

- *Adequate transparency*. To effectively manage their risk in repo markets, creditors need to have sufficient comprehensive and relevant information to assess the risks they face on an ongoing basis. However, provision of such information need not compromise proprietary information.

The work on this report was initiated in December 1997 when the Euro-currency Standing Committee decided that interested member central banks should form a working group on repo markets based on a proposal in a pilot study by the National Bank of Belgium. The working group, under the chairmanship of the National Bank of Belgium, included the Bank of Canada, Bank of England, Bank of France, Bank of Italy, Bank of Japan, Deutsche Bundesbank, European Central Bank, Federal Reserve Bank of New York, Netherlands Bank and the Bank of Sweden. In preparing its report, the working group obtained information from repo market participants using a questionnaire (in cooperation with IOSCO and the CPSS), through bilateral contacts and as a group during meetings in London and New York.

2. The economic role of repo markets

2.1 Introduction

An understanding of the economic role of repo markets is necessary to appreciate the benefits repos provide to market participants and their usefulness as a monetary policy instrument. This chapter provides a brief definition of repo markets and then turns to the economic role of repo markets and the linkages between repo markets and other financial markets. The analysis in this chapter draws on the results of interviews with market participants, summarised in Annex 1.

2.2 Definition and characteristics of repo markets

Repo markets are markets in which securities are exchanged for cash with an agreement to repurchase the securities at a future date. In the transaction, securities serve as collateral for what is effectively a cash loan. Repo markets are generally separated into markets for "general" and "specific" collateral. In the latter case, a piece of specific collateral is identified in the repo contract making it possible to obtain specified securities (for example, to make delivery in a forward contract). Other transactions such as buy/sell-back agreements and securities lending versus cash transactions have somewhat different legal and accounting treatments but an equivalent economic function and will also be referred to as repo market transactions. Annex 2 provides definitions of these different contractual forms.

The securities most commonly used as collateral in repos are sovereign debt instruments, followed by private sector debt instruments such as commercial paper and, in the United States, mortgage-backed securities. Equity is also used as collateral. It is increasingly common for repos to contain substitution clauses that provide for the possibility of substituting alternative securities as collateral over the life of the repo.

Repo transactions may be of any maturity, but are generally of a short maturity, between overnight and one year. The maturity of repo agreements can fall into at least three descriptive categories: overnight, open and term. Overnight refers to repos with a single-day maturity. Term maturity refers to repos that have a fixed maturity longer than one day. Open maturity repos are repos where both parties have the option to terminate the repo each day. The open maturity structure allows participants to reduce daily settlement costs if they wish to continuously roll over overnight repos.

Risk in repo markets arises mainly from volatility in the value of the collateral, which can open up a credit exposure and the risk of counterparty default. To mitigate this risk, cash lenders typically require margin. Accordingly, risk is controlled through margin practices, which involve the setting of initial margins ("haircuts"), and implementation of margin calls based on an ongoing revaluation of collateral. While margining practices can vary significantly, they always involve a credit judgement.

2.3 The economics of repo markets

The economic significance of a repo transaction derives from the fact that they allow one party to temporarily exchange cash for securities and the other to temporarily exchange securities for cash. From a legal point of view, a key feature that makes the repo contract attractive is that the legal transfer of securities for the duration of the contract provides protection against credit risk.

A useful starting point for analysing repo markets is to distinguish between participants according to their motivations for engaging in repo transactions. Repo transactions are used to obtain cash or to obtain securities. Depending on their uses, either the securities or the cash serve as collateral for a particular transaction. In the case of specific collateral repos, the transaction enables participants to obtain particular securities issues.

In addition to participants supplying cash or securities to repo market borrowers, a third group, repo market intermediaries, plays a key role in addition to that of administering transactions. Their arbitrage and speculative activity is important in facilitating price discovery, especially for those seeking specific securities, and in providing liquidity.

2.3.1 Use of repos to obtain funds, for leverage and to take long positions

The use of repurchase operations to obtain funds is perhaps the most straightforward use of this transaction, as it can be compared to a collateralised loan. From this point of view, the principal merit of repos is the generally lower cost of financing relative to the uncollateralised market. For the lender of cash, the advantage is the provision of collateral to limit credit risk.

Another fundamental use of repo transactions is to fund "long" positions in securities. Specifically, repos can be used to build up leveraged long positions in securities markets since securities lenders maintain their exposures to the securities they have repoed out. To build leveraged positions, market participants use cash raised through an initial repo transaction to buy securities which, in turn, are repoed out to raise more cash to buy more securities and so on. With each transaction the leverage ratio is increased. The maximum extent of leverage that can be built up through this process is determined by the margin or "haircut".

The haircut is the difference between the market value of the collateral and the cash lent and provides protection against the risk of a change in the market value of the collateral, which can open up a credit exposure. It is set according to the credit standing of the borrower of funds and the price volatility of the collateral (policy issues associated with margining practices are addressed in Chapter 4). At each stage of this leveraging process the amount of funds raised through the repo transaction (that can be used to purchase additional securities) is reduced by the haircut. Haircuts for low-risk borrowers using less-volatile collateral can be very low. Repo market participants regard repo markets as probably the lowest-cost source of leverage.

2.3.2 Use of repos to obtain securities and to take short positions

When repo transactions are motivated by the need to borrow securities, the funds exchanged for securities act as collateral in the transaction. In addition, specific repo transactions can be used to obtain specific securities, for example, to make delivery on a futures contract or to cover a short position.

A valuable feature of repo markets is that they can be used to facilitate the taking of "short" positions in securities markets. Using repos, participants can borrow securities for delivery in exchange for cash using the proceeds from the cash sale as collateral in the transaction. This allows participants to sell a security they do not own by borrowing it from another party in the repo market. Without a repo market (or an analogous collateral market transaction), securities market participants would be unable to establish short positions. One key reason for taking short securities positions is to hedge interest rate risk. In this way, repo transactions serve a very important function – they facilitate the establishment of interest rate hedges and thus play an essential role in risk management.

2.3.3 Pricing of repo transactions

Pricing in repo markets depends on whether the transaction involves general or specific collateral. In general repo transactions, the repo rate is roughly comparable to other short-term market interest rates. In a specific repo transaction, the repo rate reflects the value of the collateral in the securities loan.

The repo rate for specific collateral is generally below the repo rate for general collateral, as the borrower of securities willingly accepts a lower return in order to obtain specific collateral. The spread between the general repo rate and the specific repo rate can be thought of as a borrowing fee for specific securities and is sometimes referred to as the specialness spread. The setting of the repo rate for those seeking to obtain specific collateral is more specialised than for those seeking funds, as there is no ready benchmark, such as the uncollateralised money market rate, to facilitate pricing. In this regard, the price discovery process for specific repos facilitated by the arbitrage and speculative activity described below is important.

In rare circumstances, participants sometimes transact at negative specific repo rates (the lender of money receives less money at maturity than the amount loaned). Negative repo rates arise simply because the fee for borrowing a particular security has risen above prevailing interest rates. Such

strong demand to borrow collateral may result if failure to deliver to a counterparty results in other penalties (either fines or loss of reputation). For instance, penalties for failing to deliver an obligated security to some futures exchanges can easily exceed the interest rate.

2.3.4 Role of arbitrage and speculative activity in repo markets

Repo market intermediaries play an important role by facilitating price discovery and providing liquidity through their arbitrage, market-making and speculative activity. This often takes the form of direct trading of the repo rate itself, a practice called matched-book trading. It involves the borrowing of securities or cash through the repo markets with the intention of re-lending the cash or securities at more favourable rates in the same market. An example of the relative size of this arbitrage trading is given in Table 1 for the United States. This trading earns market-makers or dealers a small spread (usually a few basis points) and facilitates price discovery, enabling customers to obtain funding or securities on more favourable terms. Since this type of trading is usually conducted in high volume, it can have a large balance-sheet impact and thus tends to be sensitive to features of the regulatory regime (such as capital requirements).

Table 1

Volume of matched-book trading in the United States[1]

(7 January 1998, in billions of US dollars)

	Overnight	**Term**
Total collateral delivered (Repo, securities loan, securities pledged and collateralised loan)	$764	$590
of which reported matched	$409	$506
Percentage matched	***54%***	***86%***
Total collateral received (Reverse repos, securities borrowed and securities received)	$545	$758
of which reported matched	$306	$643
Percentage matched	***56%***	***85%***

Speculative trading involves taking a position based on a forecast of the direction of rates. It can take the form of mismatching the maturity of repos and reverse repos, which is equivalent to speculating on the future direction of repo rates. This might also be viewed as taking a position with respect to movements in the shape of the repo yield curve. For example, if one expects rates to rise, one could borrow money for term (say for several weeks) and lend money overnight. Conversely, one could reverse the maturity mismatch if rates were expected to decline in the near future. The market risk associated with this activity is determined by the extent of the maturity mismatch.

Although hard to quantify, the information gained by large repo traders and dealers trading on behalf of their customers may indirectly increase profitability for their speculative proprietary trading operations. Firms with large matched-book arbitrage trading operations may gain a better understanding of the various trading strategies of larger market participants or of which securities issues are likely to go on special (and thus command a scarcity premium) in the repo market.

One consequence of this arbitrage and speculative activity is high levels of "velocity" in repo markets. This occurs when a single piece of collateral is used to effect settlement in a number of contracts on the same day. It allows the daily repo trading volume of a particular note issue to exceed the outstanding amount of the issue, as participants are able to borrow and lend a single piece of collateral

[1] Source: Federal Reserve Bulletin, Table 1.43, 7 January 1998.

repeatedly over the course of a day. A positive consequence of velocity is that it facilitates the discovery of the price (repo rate) for each piece of specific collateral in the market.

2.4 Relations between repo markets and other financial markets

2.4.1 Relation of repo markets to the uncollateralised markets

Repos are typically carried out between participants that are also active in uncollateralised money and interbank markets, reflecting the functional similarity between the instruments traded in these markets. There may be a tendency to substitute repos for unsecured credits because repos perform the same cash borrowing or lending functions as these credits but are collateralised and thus carry lower credit risk. In addition, repos can be used to borrow securities, a function not provided by the uncollateralised money market. The lower credit risk associated with repos is illustrated in Table 2 for Japan, the United Kingdom, the United States and France, which shows that repo rates tend to be below unsecured rates on average.[2]

In practice, this substitution effect can be quite limited if the uncollateralised markets function well and the banking system is perceived as stable with a very low risk of default. In addition, repos can have a complementary impact on uncollateralised markets. Repos are used to finance the purchase of money market instruments and thus can contribute to the demand for these instruments. Also, the different risk-return profiles of collateralised and uncollateralised instruments may lead market participants to hold both, depending on their risk preferences. In countries where data are available, there is little sign of a decline in volumes in interbank or money markets as repo markets expanded.

2.4.2 Impact of repos on securities markets

The existence of a repo market supports liquidity in securities markets, according to market participants, as repos facilitate position-taking in securities markets. Repo markets can also be a source of demand for securities that serve as collateral. This can lead participants to look for alternative securities to serve as collateral, including corporate bonds, mortgage-backed securities and equity. Of course, this expansion in the types of securities that serves as collateral can also reflect market participants' efforts to develop new financing vehicles.

In some instances, the supply of securities in repo markets can be increased by stock-lending agreements. Such agreements enable an institution to lend its securities to a repo market participant, and receive in exchange either a fee or another security not used in repo contracts, or both. They allow institutions that hold securities but do not want to (or are not allowed to) participate directly in the repo markets to earn a higher return. These types of arrangements are common in several countries (especially in the United Kingdom). Since repo markets support securities markets, securities issuers sometimes take steps to promote them (for example, in the United States).[3]

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2 Price data are readily available for these countries but not for some others (see Annex 4). Three recent periods where market conditions were quite different are shown: March to June 1997 (before the Asian financial crisis); the final week of November 1997 (when the crisis worsened); and the first three months of 1998.

3 Efforts by non-government debt issuers to stimulate the development of repo markets for their securities are rare as issue size needs to be quite large. In a number of cases, issuers have created their own repo market infrastructure in order to stimulate the repo and cash market in their securities. The United States saw the establishment in 1998 of benchmark issuance programmes for two government-sponsored entities – Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac). These two entities began to issue large bullet issues across the yield curve coincident with the United States Treasury lessening its issuance in the benchmark issues.

Table 2

Uncollateralised money rate and repo rate

		overnight	1 week	1 month	3 months
Japan	**Average of final week in Nov. 97**				
	Uncollateralised money rate	0.528	0.743	0.818	0.727
	Repo rate	0.598	0.563	0.484	0.376
	Spread	-0.071	0.179	0.354	0.350
	Average of Jan. 98 – Mar. 98				
	Uncollateralised money rate	0.433	0.639	0.862	1.054
	Repo rate	0.555	0.549	0.533	0.474
	Spread	-0.122	0.090	0.329	0.581
United Kingdom	**Average Mar. - Jun. 97**				
	Uncollateralised money rate	6.12	6.18	6.27	6.45
	Repo rate	6.08	6.10	6.15	6.27
	Spread	0.04	0.08	0.12	0.18
	Average 24 - 28 Nov. 97				
	Uncollateralised money rate	7.23	7.25	7.42	7.63
	Repo rate	7.13	7.17	7.23	7.33
	Spread	0.10	0.08	0.19	0.30
	Average Jan. - Mar. 1998				
	Uncollateralised money rate	7.36	7.38	7.43	7.49
	Repo rate	7.24	7.22	7.24	7.28
	Spread	0.12	0.16	0.19	0.21
United States	**Average Mar. - Jun. 97**				
	Uncollateralised money rate	5.597	5.555	5.601	5.715
	Repo rate	5.512	5.460	5.527	5.638
	Spread	0.085	0.095	0.074	0.077
	Average 24 - 28 Nov. 97				
	Uncollateralised money rate	5.609	5.549	5.600	5.830
	Repo rate	5.682	5.716	5.659	5.730
	Spread	-0.072	-0.167	-0.059	0.100
	Average Jan. - Mar. 1998				
	Uncollateralised money rate	5.596	5.565	5.592	5.603
	Repo rate	5.589	5.568	5.553	5.547
	Spread	0.008	0.003	-0.039	0.056
France	**Average Mar. – Jun. 97**				
	Uncollateralised money rate	3.187	3.187	3.282	3.348
	Repo rate	3.21	3.20	3.280	3.335
	Spread	-0.02	-0.01	0.002	0.013
	Average 24–28 Nov. 97				
	Uncollateralised money rate	3.47	3.47	3.524	3.664
	Repo rate	3.44	3.44	3.46	3.58
	Spread	0.03	0.03	0.06	0.08
	Average Jan. – Mar. 98				
	Uncollateralised money rate	3.489	3.489	3.523	3.572
	Repo rate	3.444	3.443	3.443	3.489
	Spread	0.04	0.05	0.08	0.08

Repos can influence securities prices in the case of specific (but not general) collateral since specific repo transactions can affect the availability of particular securities. Since specific repos facilitate arbitrage along the securities yield curve, they sometimes help smooth the yield curve. This would be reflected in a narrowing of the average gap between yields on outstanding coupon securities and fitted yield curves.[4] In other cases, the use of collateral in specific repos contributes to a scarcity of certain securities (such as the cheapest-to-deliver issues in futures contracts), resulting in a temporary widening of this gap.

2.4.3 Relations with the derivatives markets

The relationship between repo and derivatives markets arises from the arbitrage opportunities between general repo rates and rates on derivatives contracts, especially for short-term interest rate derivatives such as interest rate futures. For specific repo markets, a relationship arises because they are used to obtain securities to deliver at the maturity dates of securities futures contacts. Normally, market participants will use cheapest-to-deliver issues and can obtain them on the specific securities market. It has been observed that there is a tight link between the yield of the cheapest-to-deliver issue and the specific repo rate for the issue as the delivery date approaches.

2.4.4 Relations with foreign exchange markets

The direct linkage between repo and foreign exchange markets may be less evident than for money and interbank markets (where repos have a similar function), securities markets (which are the source of collateral) and derivatives markets (where repo markets are used to obtain securities for delivery). Nevertheless, linkages exist as a result of the arbitrage between repo markets in different currencies (using the forward exchange rate curve) and the use of cross-currency repos. However, information on the latter is limited by a lack of data.

[4] There is some evidence that this occurred with the introduction of repo markets in the United Kingdom.

3. Monetary policy role of repos

3.1 Introduction

This chapter explores the ways in which repos are useful to central banks both as a monetary policy instrument and as a source of information on market expectations. As a monetary policy instrument, repos (broadly defined to include collateralised loans) are a flexible instrument for liquidity management and in some cases, for signalling the stance of monetary policy. Repos are also used for the provision of intraday credit to support the operation of Real Time Gross Settlement (RTGS) payment systems. Repos have been widely used as a monetary policy instrument by European central banks and have been adopted by the Eurosystemas its fundamental monetary policy instrument. [5]

Repo markets can also serve as a valuable source of information for central banks on market participants' near-term expectations regarding monetary policy. They largely complement other interest-rate-based measures of market expectations because they provide information on expectations at very short horizons. Since credit risk is typically low for repos, they give a relatively precise indication of expectations regarding future official rates (especially when the central bank's target rate is a repo rate). Moreover, repos can be used to estimate credit spreads on other instruments. This is illustrated using the example of UK repo markets.

3.2 The use of repos as a monetary policy instrument

Tables 3 and 4 provide information on the use of repos as a monetary policy instrument by G-10 central banks (as of June 1998). Table 3 shows that the Federal Reserve introduced a type of repo as far back as the 1920s and that the Bank of Canada has used repos since 1953. In a number of other G-10 countries, central bank repo operations started in the 1970s, while some have adopted repos quite recently (the United Kingdom started using repos with government securities as collateral on a daily basis in 1997, and Japan and Switzerland started using repos in 1997 and 1998, respectively). The purpose of this table is to give an overview of the wide diversity in the characteristics of central banks' uses of repos and, thus, includes information on practices in the Euro-area prior to the introduction of the euro.

Standard repurchase agreements are used by the majority of countries in the tables. However, Canada, Italy and Sweden use buy/sell-backs while Japan uses securities borrowing with cash collateral. The Netherlands uses a system of so-called special loans, loans collateralised via pledge on a pool of collateral, which are similar to repos in their economic role. These choices do not seem to be influenced by monetary policy considerations, but rather by the legal and institutional framework that prevails in each country. For the central banks that use them, repos have often become the most important monetary policy instrument. In a number of G-10 central banks, the proportion of repos used in the refinancing of the domestic financial sector is over 70% (as measured by outstanding amounts in Table 3).

The attractiveness of repos as a monetary policy instrument derives from the fact that the features of repo contracts are well suited to influence the interest rate level through two of the main channels used to implement monetary policy. Repos are both a flexible instrument for controlling liquidity in money markets and an effective mechanism for signalling to markets the desired level of interest rates.

3.2.1 The use of repos for liquidity management

Repos have the advantage that they give central banks relatively precise control over liquidity. The fact that injections of liquidity are reversed when repos mature means central banks can absorb

[5] They take the form of collateralised loans or standard repurchase agreement, which are defined as reverse transactions by the ECB.

liquidity simply by not renewing some fraction of repos falling due. Obviously, to use this technique to control liquidity, the maturity structure has to be tailored to ensure that sufficient stocks of repos mature on the appropriate days. Central banks can also withdraw liquidity directly using reverse repos. Table 3 shows that some G-10 countries use repos for liquidity supply, whereas others use repos and reverse repos for both liquidity supply and absorption.

A key determinant of the frequency of central bank repo operations is the existence of minimum reserve requirements. For central banks in countries with reserve requirements and averaging arrangements, daily liquidity fine-tuning is sometimes not necessary and repos are used for the long-term provision of liquidity at less frequent intervals. For central banks in countries without reserve and averaging requirements, where the demand for central bank money can be quite volatile, repos are conducted on a daily basis to fine-tune liquidity.

3.2.2 The use of repos for monetary policy signalling

Repo operations conducted by central banks sometimes have a signalling function. The type of signal and the manner in which operations are used to convey any message vary across countries according to the institutional arrangements in place. Use of repos for signalling will also depend on the value that central banks place on this form of communication rather than other methods. At one extreme, in recent years, the Federal Reserve has eschewed any use of repos or other types of market operations for communicating policy intentions, preferring to rely on explicit statements of policy. In other countries where a repo rate is the key policy rate, a change in the repo rate signals a shift in monetary policy. In countries where another rate (e.g. a discount rate or overnight interbank rate) plays this role, repos can still be used to provide a signal as to the stance of monetary policy and or the likely direction of the key official rate.

Central banks can vary the auction technique they use in repo markets depending on the signal they want to send. In some cases a central bank might use a variable (or multiple) rate auction (where the repo rates associated with the repo transactions used to manage liquidity are not revealed to the market) if it is satisfied with the level of market rates, but might prefer a fixed rate auction when it wants to indicate the desired level of rates or signal a change in policy. An example of an operating framework that combines these approaches is to use repo and reverse repo rates to define an upper and lower limit for short-term market interest rates. Central banks influence the level of market rates within this band by adjusting liquidity using repos (without necessarily revealing the repo rate). A shift in monetary policy can be signalled by adjusting the limits of the band.

3.2.3 Other reasons for central banks to use repos in monetary policy

Repos (and other types of collateralised loans) are also useful to central banks for monetary policy because they have a number of features:

- They carry a low credit risk as they are collateralised;
- They are relatively flexible, as their features (amount, maturity, frequency, interest rate and tender system) can be tailored according to liquidity conditions;
- They do not affect securities prices (since central banks only use general collateral repos);
- In contrast to some other instruments (e.g. discount rate), they utilise established markets accessible to a broader range of institutions.

3.2.4 Features of repo contracts relevant to central banks

Central banks can design repo contracts with features most consistent with their monetary policy framework, depending upon whether repos play a liquidity management or signalling role (or both). It is possible to identify four main dimensions over which the choice of features of repo contracts can vary:

- *Frequency*. The frequency of repo operations is higher in those countries that use repos for daily liquidity control. Frequency can be lower when central banks use repos mainly as a long-term liquidity provision mechanism or for interest rate signalling.
- *Maturity*. The maturity of repos determines the proportion falling due in a given period. Since this facilitates the absorption of liquidity through the non-renewal of these repos, central banks using repos for daily liquidity management tend to have a greater reliance on shorter-maturity repos.
- *Disclosure*. The disclosure of central bank repo rates before the tender depends on whether repos are used for signalling as well as liquidity management.
- *Tender system*. Tender or auction systems can be chosen depending on the signal (if any) central banks want to communicate as to the stance of monetary policy. Systems range from a multiple rate auction (low capacity to transmit interest rate signals) to a fixed rate tender (high capacity to transmit interest rate signals).

3.2.5 Role of repos in the monetary policy framework of the Eurosystem[6]

European central banks used repos extensively with a wide diversity of practices, as Tables 3 and 4 suggest. With the advent of EMU in January 1999, monetary policy in the euro area started to be conducted on the basis of a new, uniform set of monetary policy instruments, which replaces the national instruments in force before the start of Stage Three of EMU.[7] Since repos are a fundemental instrument within this framework, it is desirable to examine in detail how they are used in the monetary policy operations of the Eurosystem.

The set of monetary policy instruments of the Eurosystem comprises standing facilities, open market operations and reserve requirements on credit institutions in the euro area. The framework has been designed with a view to limiting the need for fine-tuning operations and to allow a decentralised implementation of the single monetary policy by national central banks in the Eurosystem . In order to stabilise money market interest rates, the Eurosystem applies a fully remunerated minimum reserve system with averaging provisions. The two standing facilities, which are available to the Eurosystem's counterparties on their own initiative, also serve as a means to limit the volatility of money market interest rates. The interest rate on the marginal lending facility provides the ceiling, while the interest rate on the deposit facility marks the floor for the overnight market interest rate.

Within this corridor, interest rates are steered by the ECB through open market operations. The so-called main refinancing operations play a pivotal role in pursuing the aims of steering interest rates, managing liquidity in markets and signalling the stance of the single monetary policy. They are liquidity-providing since the financial sector in the euro area is in structural deficit vis-à-vis the Eurosystem. They take the form of repurchase agreements or collateralised loans, and are executed regularly each week, with a maturity of two weeks.

In parallel with these main refinancing operations, the Eurosystem regularly conducts longer-term refinancing transactions, which are normally renewed at monthly intervals and have a maturity of three months. These operations represent only a limited part of the total refinancing volume. In these operations, the Eurosystem does not want to send interest rate signals to the market.

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6 The Eurosystem comprises the ECB and the National Central Banks (NCBs) of the Member States which have adopted the euro in Stage Three of Economic and Monetary Union. there are currently 11 NCBs in the Eurosystem. By contrast, the term "Eurosystem of Central Banks" is composed of the ECB and the NCBs of all 15 Member States, ie. including the NCBs of the Member States which have not adopted the euro from the start of Stage Three of EMU.

7 The operational framework for the single monetary policy is presented in "The Single Monetary Policy in Stage Three – General documentation on ESCB monetary policy instruments and procedures", September 1998.

The Eurosystem may also carry out fine-tuning operations. Fine-tuning operations are primarily executed as reverse repo transactions, but can also take the form of outright transactions, foreign exchange swaps and the collection of fixed-term deposits. Since credit institutions can make use of their reserve requirements to cushion liquidity shocks, the need for Eurosystem fine-tuning operations should only arise infrequently.

Furthermore, the ECB has the option of conducting "structural operations" to adjust the structural positions of the financial sector vis-à-vis the Eurosystem through reverse transactions, outright transactions and the issuance of debt certificates. The need for such operations would arise if the structural deficit of the financial sector either became too large or if it turned into a liquidity surplus.

As regards the settlement conditions for monetary policy operations in the euro area, the TARGET system, an EU-wide real-time gross settlement (RTGS) system, takes care of the money transfer aspect of the repo trade. TARGET facilitates rapid settlement of cross-border payments with immediate finality, thereby fulfilling the precondition for an integrated money market in the euro area. The other side of the repo trade, the securities transfer, is less well developed. The securities leg of monetary policy operations in the euro area is normally settled through the domestic procedures in Securities Settlement Systems (SSSs), which meet the ESCB standards.[8] In fact, most repo trades are carried out between Eurosystem counterparties and their local national central banks. Currently, at the domestic level, in countries where repo is used as the main refinancing instrument, intraday delivery versus payment (DVP) procedures are in place.[9] An interim procedure has been established for the cross-border use of collateral: the Correspondent Central Banking Model (CCBM)[10]. In order to promote the harmonisation of securities settlement practices within the euro area, the Eurosystem has formulated "Standards as preconditions for the use of SSSs by the Eurosystem in Stage Three of EMU".

3.2.6 Impact of central bank repo activity on repo markets

The expansion of private repo market activity has been supported by the introduction and widespread use of repos in monetary policy. In several countries, central banks have acted as key players in the promotion and development of repo markets. Repo operations by a central bank can attract new institutions into the market and can have a beneficial effect on repo market liquidity. Liquidity in the underlying markets for the collateral may also be positively affected. It can be expected that the use of repos to implement the ECB's monetary policy will also encourage the use of repos in Europe, in particular in the medium to longer term when securities settlement conditions have been harmonised and market facilities have been developed in the whole euro area.

3.2.7 Other uses of repos by central banks

Repos can be useful to central banks in a number of domains in addition to monetary policy:

- *Management of foreign currency reserves*. Most G-10 central banks use repos in their foreign currency reserve management, because repos widen the range of investment possibilities while reducing risk and providing some extra return on securities portfolios;

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8 In order to promote the harmonisation of securities settlement practices within the euro area, the Eurosystem has formulated standards as preconditions for the use of SSSs by the Eurosystem in Stage Three of EMU. See the ECB publication "Standards for use of EU Securities Settlement Systems in ESCB credit operations", January 1998.

9 In some countries, where pledge of pool of collateral is used they are settled with free of payment procedures. In these countries the link between the securities delivery and the settlement of cash is ensured by the local central bank According to the ESCB rules no credit is granted before collateral has been delivered with finality. Therefore, in countries where pledge is used, Eurosystem monetary policy operations (as well as intraday credit operations for providing liquidity to EU TARGET participants) are carried out with delivery before payment procedures.

10 For futher detail, see the ECB publication "Correspondent Central Banking Model", December 1998

- *Repos are used to provide intraday credit* to support the functioning of RTGS payment system.[11]

3.3 Repos as a source of information on monetary policy expectations

Expectations regarding future monetary policy are embodied to some degree in prices in a wide range of financial instruments. This section examines how information on these expectations obtained from repos can be useful to central banks and how it can be used in combination with information from other instruments.

3.3.1 Uses of information on market expectations

The short end of the yield curve reflects market expectations regarding when, and by how much, the central bank will adjust official rates in the near term. Long-term interest rates also embody monetary policy expectations, of course, but these are conditioned on expectations concerning inflation and other macroeconomic fundamentals and the perceived credibility of the central bank, which are relevant over a longer time horizon. Thus, an understanding of the expectations embodied in short-term interest rates is important in assessing the impact of monetary policy. Central banks need to know to what extent market participants expect a change in official rates in order to assess the likely impact of a policy adjustment on market rates and other variables.[12] Moreover, central banks need to be aware to what extent they are validating expectations about future monetary policy embodied in financial market prices. (Of course, central banks should not automatically seek to fulfil market expectations of policy, but they need to be aware of whether they are doing so.)

3.3.2 Financial market instruments that can be used to derive expectations

Expectations of the future levels of official interest rates are implicit (to some degree) in all financial asset prices. This wide choice of financial assets raises the question of which ones central banks should use to obtain the most useful measure of market expectations. In this regard, it is useful to assess the relative advantages of different instruments.

- *Government securities.* The cash market in government bonds is useful for deriving the term structure of interest rates at longer maturities and hence for assessing policy expectations over longer horizons as well as the credibility of the policy regime. However, computing implied forward interest rate curves for government bonds near to maturity (when there is less than two years to maturity) is difficult and can, at times, yield inaccurate measures of short-term policy expectations.
- *Private sector debt instruments.* These include interest rate swaps, interbank credits and certificates of deposit. It may be difficult to extract precise information on interest rate expectations from these instruments since they contain credit spreads, which cannot be fully distinguished from information on monetary policy expectations.
- *Interest rate futures.* Interest rate futures typically involve the right (obligation) to receive (pay) the unsecured interbank rate (usually the three-month rate) prevailing at the expiry of the contract. They are short maturity instruments that are highly liquid (in the United Kingdom, for example, they are liquid out to about three years), but involve some credit risk that arises from the unsecured nature of interbank deposit. Their usefulness as a measure of short-term expectations regarding the official ("risk-free") interest rate is reduced by a credit

[11] Some G-10 central banks provide intraday credit via a pledge system, some provide uncollateralised intraday credit, and some do not provide intraday credit.

[12] Specifically, only unanticipated adjustments in official rates that constitute "innovations" in policy can be expected to have a significant impact on interest rates (since in an efficient market, interest rates should already incorporate anticipated adjustments).

risk premium. Moreover, their usefulness as a measure for very short horizons is limited by the fact that futures contracts are settled infrequently, typically every three months. As a result, they cannot provide a direct measure of expectations for official rates over time horizons between the present and the next settlement date.

- *Repos*. Repo markets in most countries are typically liquid out to about three months (the US market has reasonable liquidity out to 12 months), so expectations extracted from the term structure of repo rates are unlikely to be accurate beyond the very short term. At very short maturities, however, repos are likely to be the best source of such information for many countries. Moreover, credit risk is small for repos since they are collateralised transactions and depends largely on the credit risk of the underlying securities (negligible for government securities).

As a result of these advantages, the rate in the general collateral repo market may be the best proxy for a risk-free short-term rate of interest (in countries were liquid repo markets exist). In principle, it should provide a relatively precise measure of market expectations regarding the level of central banks' official (intervention) interest rate, especially when the target rate is a repo rate. However, in practice, official rates and market repo rates can (and do) differ. Thus, for central banks to be able to use repo rates as a tool for assessing monetary policy expectations it is desirable to establish why, and to what extent, the two rates differ. Some reasons are presented below in the context of an example from the United Kingdom.

Another use for repos arises from the fact that credit risk is relatively low. This means that the spread between interest rates on repos and other short-term instruments at comparable maturities should provide a measure of the credit spread for each instrument. Estimation of credit spreads can facilitate the interpretation of interest rate expectations embedded in these other instruments because it is possible to adjust for credit risk premia. To assess this role for repos, it is worth examining these credit spreads, which is done using the example of the United Kingdom below.

3.3.3 Using repo rates to estimate credit spreads: the UK example

Chart 1 shows that the two-week unsecured interbank rate moves broadly in line with the official repo rate. Since the instruments are of the same maturity, the prime determinant of the spread between the market repo rate and the unsecured market rate should be the credit risk in the unsecured market. Chart 2 shows that in the United Kingdom the spread between the general collateral (GC) rate and the unsecured interbank rate at two weeks averaged 15 basis points in the 18 months to September 1998. The chart shows that this credit spread is not constant. Credit concerns associated with events in Asia probably caused the spread to widen to an average of 20 basis points for the month of November 1997. Credit spreads between secured and unsecured lending are likely to rise with the term of the loan. All other things being equal, a three-month bank deposit is likely to be judged by the market to contain more credit risk than an overnight deposit. Chart 3 sets out the spread at three months in the United Kingdom. As Chart 3 shows, the spread at three months is both significant – averaging 21 basis points – and fluctuating. Credit spreads of this magnitude are also seen in markets in a number of other countries, although differences in the structure and liquidity of markets make comparisons difficult. This is shown in Table 2, which reports spreads between the repo and unsecured markets in different countries.

3.3.4 Differential between the market repo rate and central bank intervention rate

To assess the extent to which the market repo rates reflect official rates it is useful to compare them, as is done in Chart 4 for market and official repo rates at a two-week maturity for the United Kingdom.[13]

[13] In interpreting Charts 4 and 5, it is useful to be aware of some terminology. The official and market repo rates are **bid** rates (i.e. the Bank is "bidding" for assets to be repoed to it). The market offer rate for repo is below the bid rate. In the

The chart shows that the market repo rate closely tracks the official rate. On average, the market GC rate in the United Kingdom was 6 basis points below the official rate between March 1997 and March 1998. The daily difference between the two rates is set out in Chart 5.

A number of factors – of varying importance in different countries – may cause the repo market rate to be systematically or temporarily below (or above) the official rate.

- *Rights of substitution.* Market practice on rights of substitution may differ from that adopted by the central bank in its own operations. Where central bank operations permit substitution but the private repo market does not, the market repo rate will tend to be systematically below the intervention rate. Since the possibility of substitution is a valuable option, the lender of securities is willing to accept a lower interest rate.
- *Margining in central bank operations.* Where a central bank is more conservative than the private market with respect to the margining of repos – requiring higher margin –Market rates may be pushed up relative to official rates.
- *Direction of official operations.* Where repos are used by central banks only as a means of lending cash into the market, the official repo rate could be expected to act more or less as a ceiling on the private repo rate: when the private repo rate rises above the official rate, counterparties of the central bank have an incentive to borrow from the central bank rather than the market. If the central bank also makes a reverse repo facility available to the market, this rate could act as a floor to the private market.

Since the two-week market GC rate tracks the official two-week repo rate reasonably well, the implied forward market repo rate is likely to be a good near-term guide to market expectations regarding monetary policy decisions in the future.

Chart 6 shows the example of the situation in the United Kingdom on 4 November 1998. The two-week, two-week ahead, implied forward repo rate (the diamond on Chart 6) is derived directly from the observed two-week and one-month rates. This chart is created just before the Bank of England Monetary Policy Committee meeting so the forward rate serves as an indicator of expectations for rates following the meeting. Between one and three months, the future two-week rates – and hence official rates – are estimated from a curve fitted to the market rates (details are given in Annex 3). The downward slope in Chart 6 demonstrates the market's expectation that official rates would fall in the coming months (indeed, rates were cut at the November meeting).

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unsecured interbank cash market, the terminology is the other way round, so that the higher rate is the London interbank **offer** rate, i.e. the rate at which cash is offered.

Table 3

General information on the use and importance of repos in monetary policy in G-10 countries (June 1998)[a]

	BE	CA	FR	DE	IT	JP	NL	SE	CH	UK	US
General information on monetary policy											
Intermediate monetary policy target	exch	inflation	exch, M	M3	diverse	diverse	exch	inflation	M	inflation	none
Operating target: market interest rates	short-term	O/N			O/N	O/N	short-term	short-term		short-term	short-term
General information on the use of repos											
Instrument used	repo	buy/sell	repo	repo	buy/sell	sec. borr.	coll. loan[d]	buy/sell	repo	repo	repo
In use since	1991	1953	1988[b]-93[c]	1973	1979	1997[f]	1976	1994	1998	1997[e]	1920s
Objective of the use of repos											
Liquid. manag:											
supply (S), absorption	S & A	S & A	S & A	S	S & A	S	S	S & A	S & A	S	S & A
Interest rate signalling	–	signal	signal[c]	signal	–	–	signal	signal	–	signal	–
Importance of repos:											
Outstanding amounts as a percentage of total refinancing of financial sector (year-end or yearly average)											
1992	52%				84%		20%	–	–		
1993	63%			72%	96%		43%	–	–		
1994	63%			67%	95%		43%	98%	–	28%	
1995	73%			68%	83%		57%	95%	–	23%	
1996	70%			71%	98%	0%	81%	74%	–	45%	
1997	73%			72%	93%	14%	58%	86%	–	66%	
1998 (June)	n/a			n/a	n/a	43%	–	95% (2)	50%	70% (3)	100%

[a] In some euro area countries, the situation is changing considerably due to the introduction of the euro. [b] For repos on a tender basis. [c] For repos at market prices. [d] The Netherlands Bank does not use repos but collateralised loans called "special loans". [e] The United Kingdom used fortnightly repos from 1992. [f] Japan started buy/sell-back operation using JGBs in 1987.

Table 4

Characteristics of central bank repos (June 1998)

	BE	CA	FR	DE	IT	JP	NL	SE	CH	UK	US
Frequency of repos [between brackets: average]	daily	as needed	2×/week [a], as needed[b]	weekly	as needed [weekly]	as needed	as needed [weekly]	weekly	as needed	upto 4×/day	as needed [daily]
Maturity of repos (days)	3	1	7[a], short[b]	14	2 - >30	typical 1 week to 4 months	usually 7	7	O/N-some months	14 and O/N	O/N - 15
Underlying securities											
Government debt securities	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓[g]
Other securities			✓	✓			✓	✓	✓	✓	
Counterparties											
Categories (***B***anks, ***S***ecurities ***H***ouses, ***M***oney ***M***arket dealers)	B	B, SH	B	B	B,SH	B,SH,MM	B	B,SH	B	B,SH,MM	B,SH
Number (approximate)	15	14	n/a	600 – 800 [f]	40 [h]	35	variable	9	increasing	around 20	35
Other criteria than activity in repo market?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tender system	multiple rate	fixed rate		mult. or fixed rate	multiple rate	multiple rate	volume tender	fixed rate[e]	bilateral trans.	fixed rate	multiple rate
Disclosure											
Before tender: amount	No	No	No	No	Yes	Yes	No	No	No	Yes	No
Before tender: information on rate(s)	No	Yes	Yes	Yes [c]	No	No	Yes	Yes	No	Yes	No
Tender result: bid and/or allotted amount	No	No		Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Tender result: information on rate(s)	No	– [d]		Yes	Yes	Yes	– [d]	– [d]	No	– [d]	No
Margining practices											
Mark to market	No	No	No	No	No	Daily	Weekly	Daily	Daily	Daily	Daily
Margin call	No	Yes	No	No	No	Yes	Rare	Yes	Yes	Yes	Yes
Initial haircut	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes

[a] For repos on a tender basis. [b] For repos at market prices. [c] For fixed rate tender. [d] Information on rates after tender irrelevant in case of fixed rate tender. [e] The Bank of Sweden also has the possibility to use variable rate tenders (very rare). [f] Depends on type of lender. [g] Includes some agency securities (issued by government-sponsored entities). [h] Average number, potential number of counterparties is over 900.

Chart 1: UK two-week unsecured interbank and repo rates

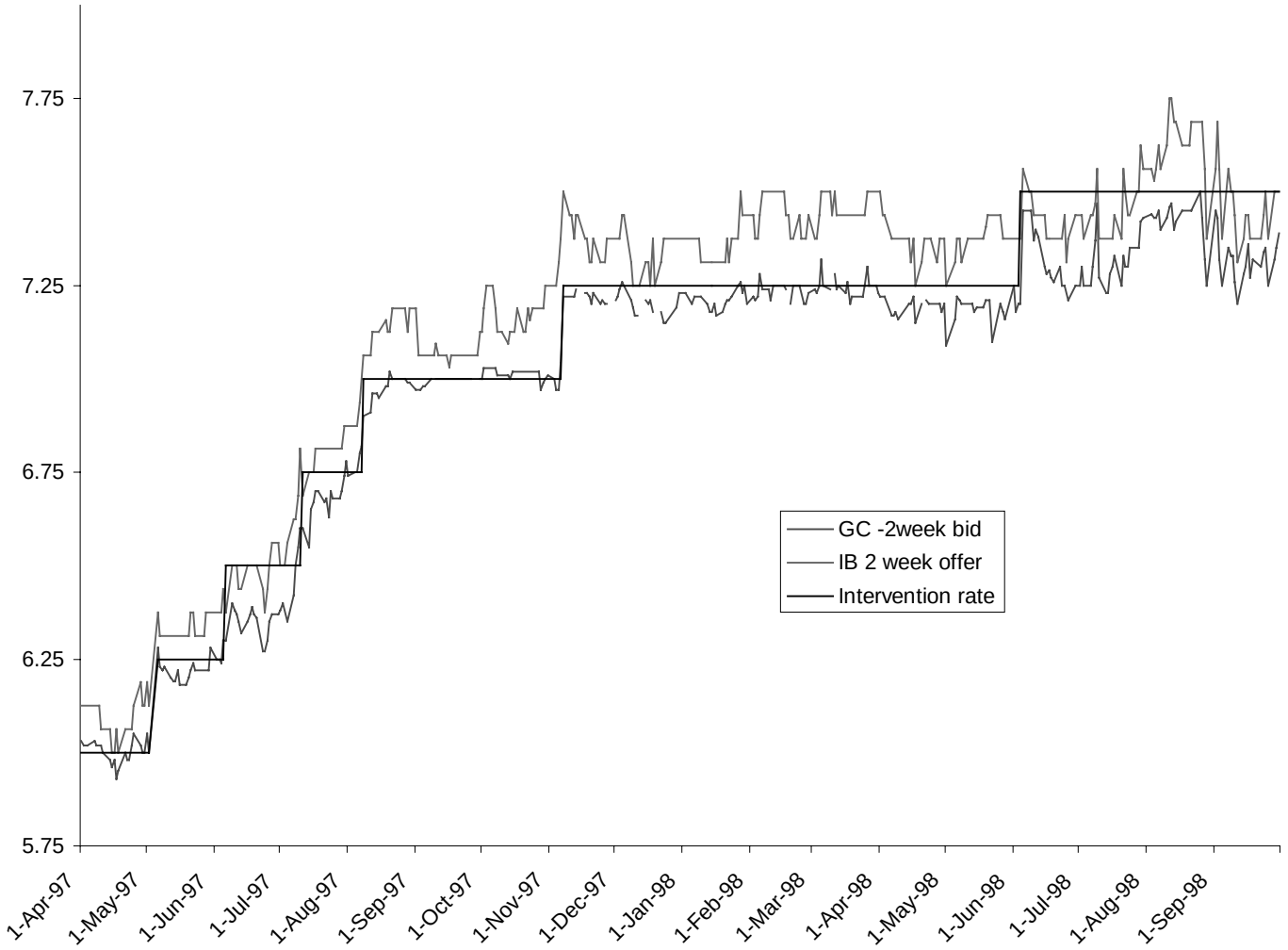


Chart 2: UK two-week unsecured interbank rate minus two-week GC repo rate

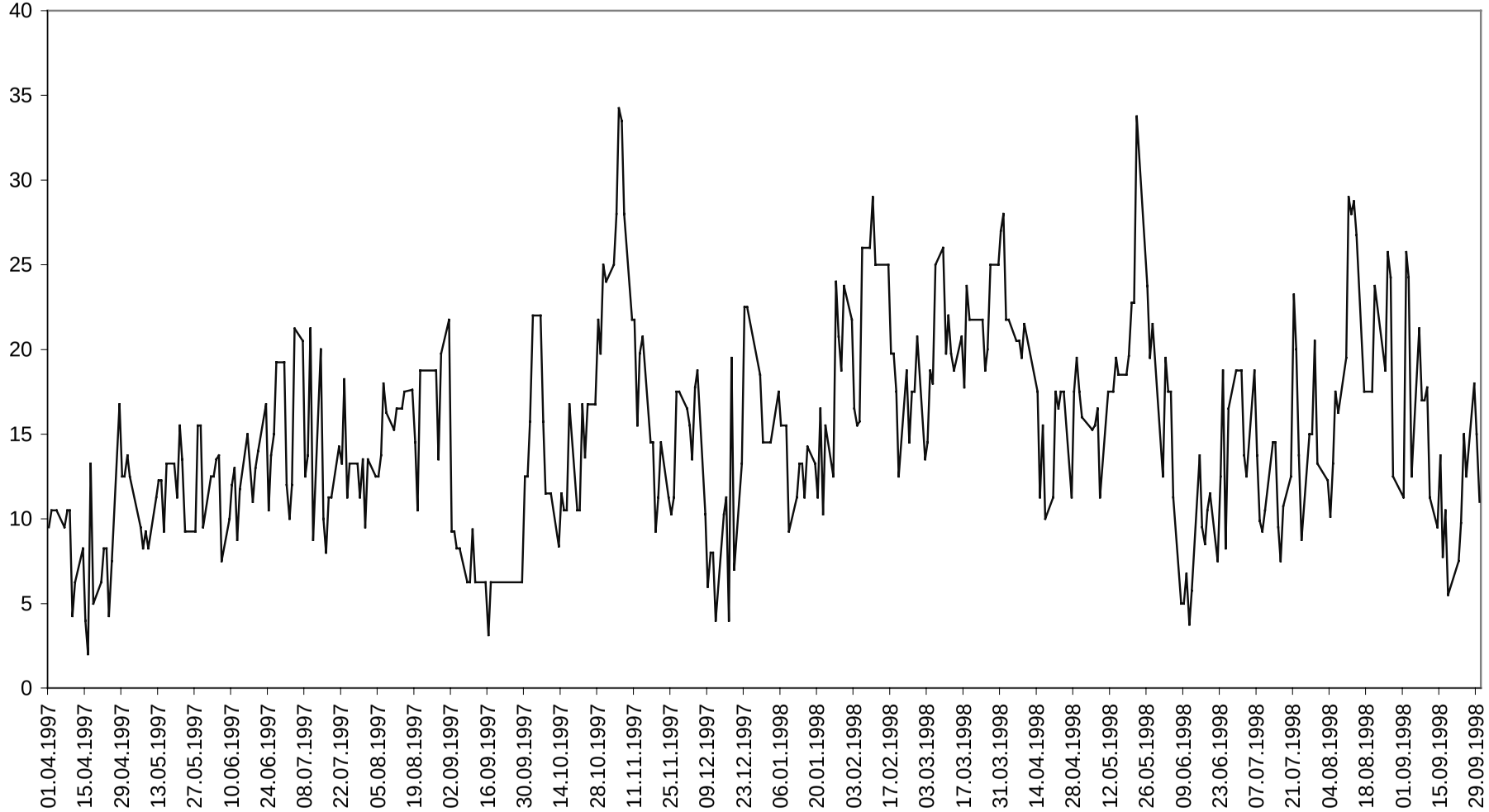


Chart 3: UK three-month interbank rates minus three-month GC repo rates

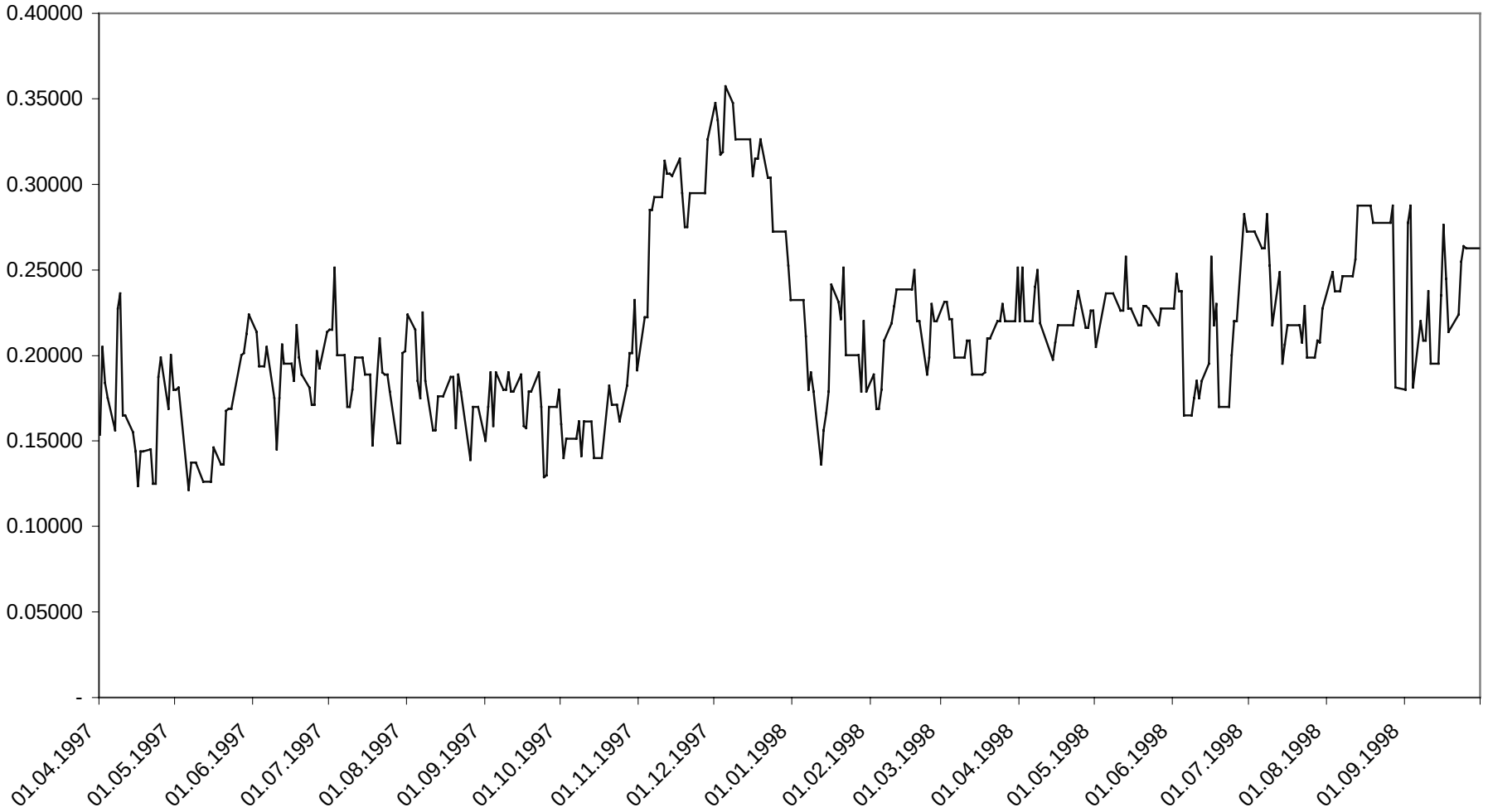


Chart 4: UK official intervention rate and two-week GC rate

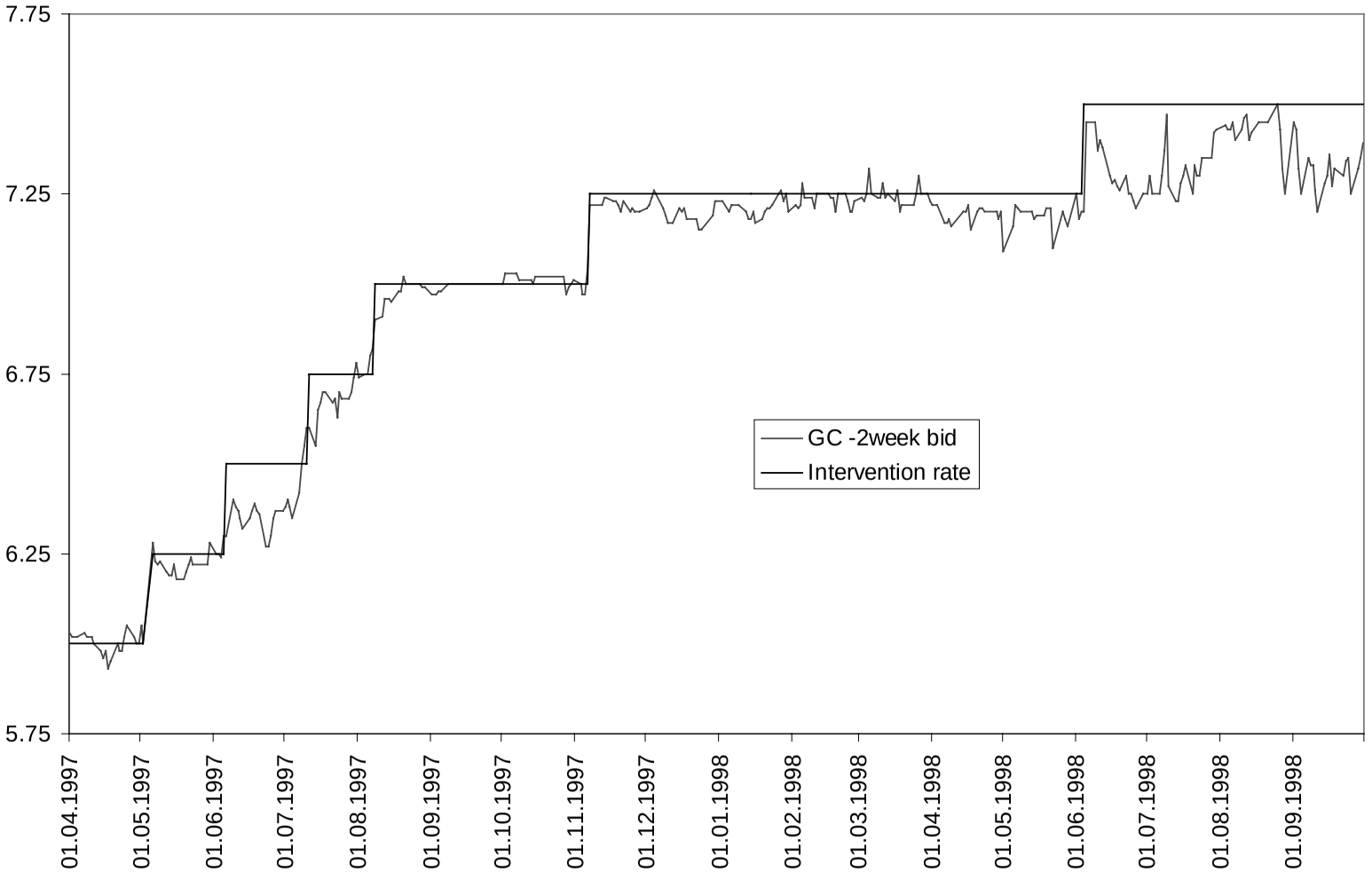


Chart 5: UK official repo rate minus two-week GC rate

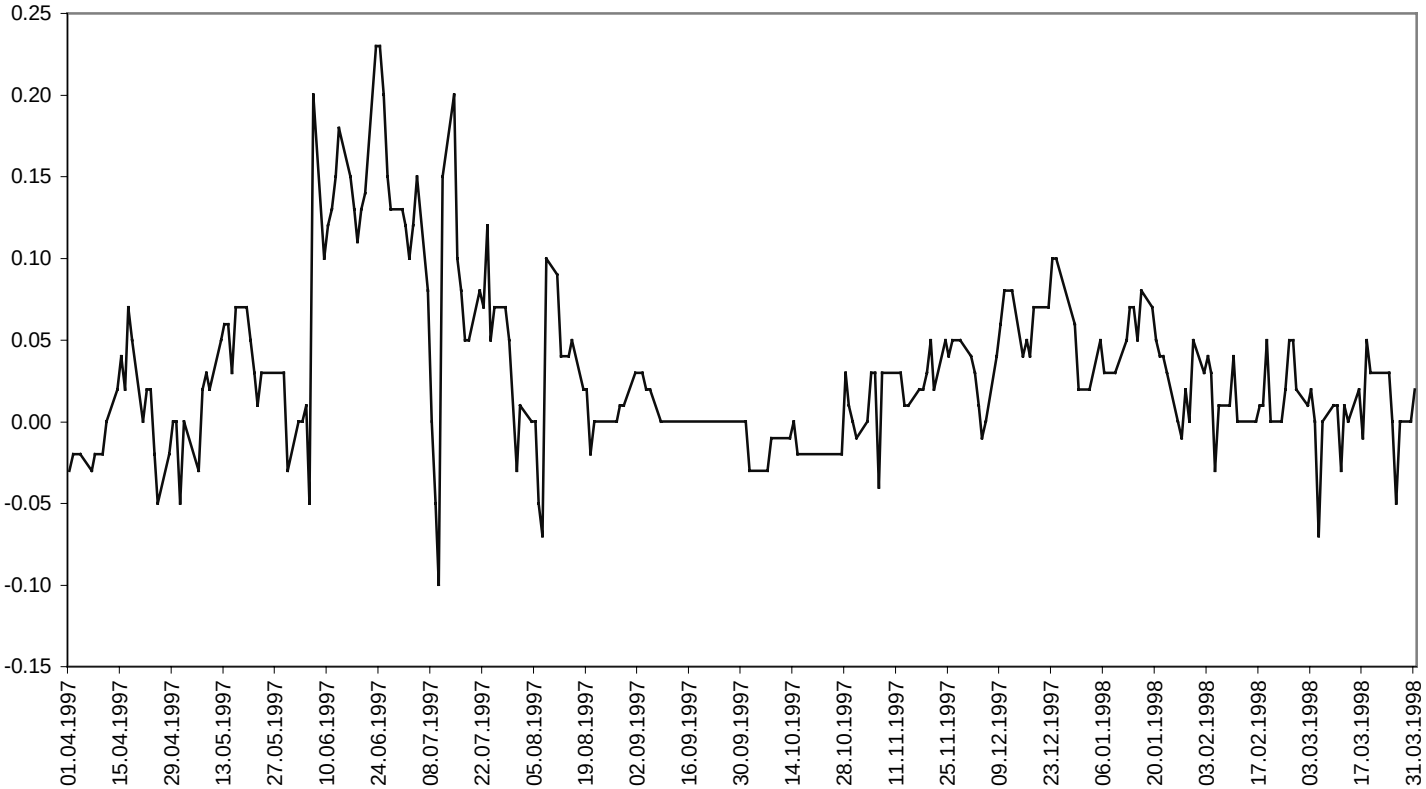
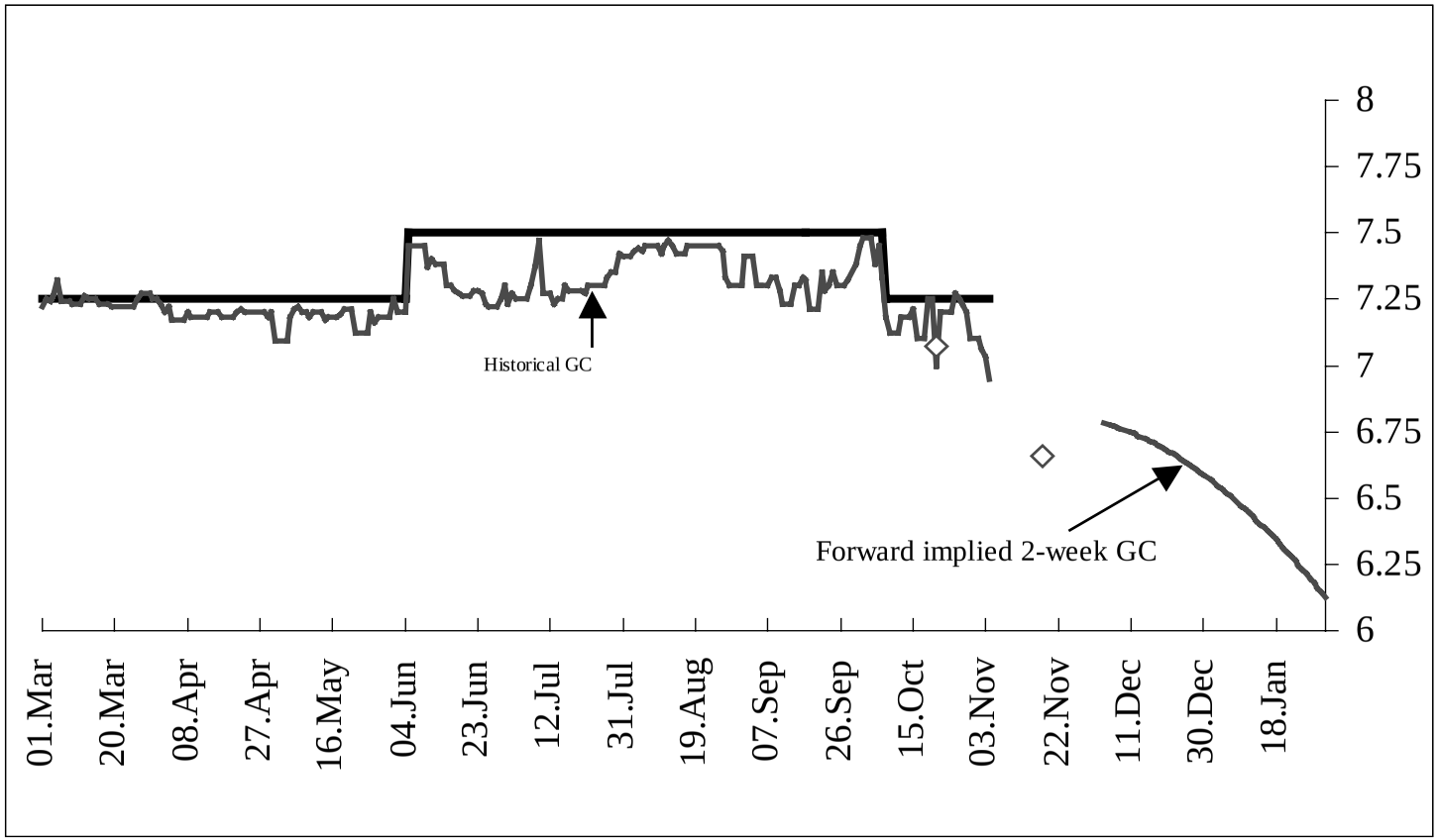


Chart 6: Historical and implied two-week repo rate



4. Policy issues raised by repo markets

4.1 Introduction

In view of the uses of repos for private market participants (for risk management and as a source of funding and securities) and for central banks (for monetary policy implementation), described in the two previous chapters, it is appropriate to consider how the authorities can support sound and efficient repo markets. To facilitate identification of those structural features and market practices consistent with sound and efficient repo markets, it is first necessary to assess the risks faced by market participants and the potential for repo markets to contribute to systemic risk. Another function of the authorities in supporting sound and efficient repo markets is market surveillance.

4.2 Risks faced by participants in repo markets

4.2.1 Credit risk

Although repo transactions are collateralised, certain embedded credit risks remain. The potential for a credit exposure to develop depends on the volatility of the price of collateral. A decline in the market value of the securities held as collateral creates a credit exposure as the cash loan is now only partially collateralised since, in the event of counterparty failure, the collateral will have to be liquidated at the prevailing (lower) market price. Conversely, if prices move in the other direction, the cash lender will be over-collateralised, which implies that the securities lender runs a credit risk for the difference between the market value of the collateral and the cash leg. Exposures can also develop if securities are not properly segregated or transferred and from inadequate margin call practices, such as the failure to re-establish haircuts after a change in collateral values.

Highly creditworthy borrowers in the repo market sometimes borrow money with a low haircut using more volatile securities as collateral. In doing so, they are using their strong credit standing to borrow funds more cheaply. Those lending to them must recognise that (uncollateralised) credit has been extended and manage the risk accordingly.

4.2.2 Operational risk

Just as for any other financial product, activity in repo markets entails operational risks. Although repos involve a bundle of relatively simple transactions, some of the associated transaction structures, such as cash and securities settlement systems and legal procedures, may be quite complex and can give rise to increased operational risk.

4.2.3 Liquidity risk

There are two types of liquidity risk associated with refinancing difficulties and with counterparty default. The first can arise from over-reliance on very short-term funding sources, where an institution experiencing unexpected financial distress may find it difficult to roll over maturing repos. This risk could arise in countries where only the short-term segment of the repo market has been developed, leading to a very short maturity structure for debt at institutions that rely heavily on repos for funding.[14] Another source of liquidity risk is associated with the liquidation of collateral, for example in the event of default of a counterparty. Clearly, if securities markets are rather illiquid (or become illiquid at times of market stress), the exposure may be under-collateralised if the collateral can only be liquidated at a discount. To limit this risk, market participants need to carefully consider the liquidity of the markets for the securities used as collateral when setting haircuts and credit lines.

[14] For example, after the Drexel bankruptcy in 1990, many US securities firms studied their funding mix and added a layer of medium-term funding to act as a liquidity buffer and reduced their overall reliance on repos as a source of funds.

4.2.4 Risks associated with the use of leverage

The use of leverage can increase credit and liquidity risk. This is likely to be of particular concern to repo market participants, since repos are regarded as an especially cost-effective source of leverage. Leverage is necessary to the financial market activities of market participants and, at appropriate levels, facilitates the efficient use of a scarce resource – capital. However, it also entails risks and needs to be set at a level so as to maintain these risks at acceptable levels. Institutions that use significant leverage need to have especially rigorous risk management systems to avoid situations where these risks inadvertently rise to excessive levels as a result of the use of leverage. In addition, policies on initial haircuts and margin practices that are well formulated and consistently applied help to limit leverage.

Identifying the appropriate level of leverage for an institution in repo markets is difficult. It will depend on a number of factors, including the institution's overall risk profile (involving credit, liquidity and other risks) and diversification of revenue sources. As a result, there can be no simple definition or rule regarding what constitutes excessive leverage across participants. In the financial system, credit allocation functions more effectively if providers of credit are not rigidly constrained by such rules. Rather, efficiency is likely to be enhanced if they are able to respond to market developments and changes in the financial condition of borrowers so as to limit the build-up of excessive leverage through effective risk management. This requires that those providing funds develop and follow sound credit practices and apply them consistently and that any deviations from those policies emanate from an appropriately senior level and be clearly documented.

4.3 Effects of repo markets on systemic risk

Repo markets can have implications for systemic risk through the linkages of repo markets with other short-term financial markets and securities markets, as outlined in Chapter 2. To assess their potential effect, it is useful to consider the three components of systemic risk:

- The probability of a shock occurring;
- The channels through which shocks are transmitted;
- The impact these shocks, once transmitted, are likely to have.

The first component, the source of a shock, was partially addressed in the last section, which identified risks arising in repo markets (of course similar risks could originate in other markets). For example, shocks are more likely when there are shortcomings in risk management. The effects of repo markets on the second component, the transmission of a shock, arise from their linkages with other markets and in case of interbank and money markets from their functional similarity to repo markets and in securities markets because securities are used as collateral in repo transactions. The impact of a shock, since it depends partly on its size at its source, can be increased by leverage, which allows institutions to take larger positions in markets.

There are two ways in which repo markets tend to reduce the systemic risk associated with shocks transmitted from uncollateralised interbank and money markets. The first arises from the fact that repos are collateralised. The substitution of repos for interbank loans/deposits should reduce the transmission of shocks between banks since, when a bank fails to pay, the creditor bank has the collateral to compensate for this loss. Second, repo markets can reduce systemic risk, because when a shock occurs, the existence of a repo market can help maintain institutions' access to liquidity. Since it is a collateralised market, liquidity may be less likely to dry up in emergency situations relative to an uncollateralised market. Specifically, uncertainty about the credit quality of the counterparties, which

can adversely affect the availability of funds for certain institutions on the uncollateralised interbank markets, is much less of a concern in repo markets as credit exposures are largely collateralised.[15]

However, repo markets may also contribute to systemic risk. To the extent that banks are using their securities portfolios as collateral for repos, these securities are withdrawn from the pool of assets that would be available for unsecured creditors in the event of bankruptcy. (This argument applies to all types of collateralised funding).

Shocks originating in securities markets can be transmitted through repo markets and give rise to systemic risk. Large price shocks in securities markets can result in an under-collateralisation of exposures in the repo market. The need to meet margin calls to cover such exposures may lead to financial distress at an institution using repos as a source of financing. Failure in securities settlement systems is another securities market shock that may be transmitted through the repo market.

Finally, leveraging through repo markets can contribute to systemic risk by allowing market participants to take bigger positions in markets. Excessive leverage resulting from inadequate risk management and inadequate counterparty discipline can also add to systemic risk by increasing the probability of failure of a large institution.

4.4 Structural features that support sound and efficient repo markets

Shortcomings in the structural underpinnings of repo markets represent obstacles to the development of sound and efficient repo markets. These include: inadequate market infrastructure; lack of an adequate legal framework; inadequate settlement systems; and transaction costs, including tax law impediments. To some extent, these obstacles may be related to the relatively complex tasks repo markets have to perform, which requires a fairly comprehensive legal framework. For example, repo transactions can simultaneously involve credit risk management, cash lending and securities lending.

4.4.1 Legal framework

The main concern from a legal point of view involves the enforcing of repo agreements. In this respect, difficulties may come about if bankruptcy law does not explicitly allow the offsetting of the cash leg and the securities leg in repo transactions. The legal treatment of the collateral is crucial. An essential feature of legal agreements is certainty with respect to rights when a counterparty in a repo transaction defaults. When this occurs, there should be unambiguous legal grounds for exercising rights on the securities (or cash) used as collateral. The legal arrangements should be such that a market participant whose counterparty in a repo transaction defaults has a legally perfected interest in the cash or securities received as collateral (in the sense of being the only claimant). The lack of such a legal basis would prevent the credit risk reduction benefit of a repo from being realised since it could not be considered a collateralised instrument. It is also important that the legal framework be supported by adequate legal documentation, for example by a master agreement that spells out detailed aspects of the repo contract.[16]

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[15] Of course, this does not imply that activity should move from uncollateralised markets to repo markets, since participants' choice of markets depends on their risk preferences and on the depth and liquidity of markets.

[16] The regulatory framework for repos is composed of standard legal documentation for cross-border repo transactions (e.g. the PSA/ISMA General Master Repurchase Agreement (GMRA) for Europe) as well as of National Master Agreements in some countries. While these national Master Agreements are currently used for domestic repo transactions, they may also be used in some cases – depending upon bilateral agreement between the parties involved in the transaction – for cross-border repo transactions. The European Banking Federation is about to launch a European Master Agreement (known as the Euro Master Agreement or EMA), for both domestic and cross-border transactions. The EMA should initially cover repurchase agreements as well as securities lending transactions.

4.4.2 Settlement systems

The soundness of securities settlement systems is a prerequisite for sound repo markets. Since the securities leg of a repo serves as collateral for the cash leg, settlement failures, where for instance the cash leg is executed without the securities leg being transferred (or vice versa), would imply that exposures are created that are not collateralised. This could have negative effects on repo markets, since it means a violation of one of the basic features of repos, i.e. the collateralisation of exposures. These requirements should be met by well-designed and well-managed DVP systems.[17] Also, market participants' systems should be adequately developed to manage settlement-related risks and problems.

Limitations of settlement systems can also inhibit repo market efficiency. In some countries, same-day settlement of repos (especially on a DVP basis) is limited or not available, which can inhibit the development of overnight and same-day repos. To support the full range of hedging and funding activities that repo markets are able to provide, authorities responsible for securities settlement systems may want to investigate whether such same-day settlement systems could be supported.[18] Finally, some settlement and clearing systems do not have separate identification of repos to facilitate payments of intermediate coupons. Since this may limit the use of collateral in repos, authorities may want to assess whether it could be supported.[19]

4.4.3 Transaction costs

Transaction costs can adversely affect the development of repo markets by reducing the attractiveness of collateralised markets relative to uncollateralised markets. These can be tax related or be associated with the cost of accessing the market (commissions, order handling charges and the cost of drawing up contracts and monitoring compliance, etc.). Taxes can add to costs directly (in the form of transaction taxes, stamp duties and withholding taxes), or indirectly to the extent that they contribute to uncertainty as to the tax regime. Also, a lack of tax harmonisation for cross-border repos can contribute to market segmentation and reduced market participation.

4.4.4 Accounting treatment of repos

Lack of transparency in the accounting treatment of repos in some countries can limit the development of repo markets. In some countries repos are reported as an outright sale of securities (meaning that securities that have been repoed out are no longer on the balance sheet). In others they are accounted for as collateralised loans (securities that have been repoed out remain on the balance sheet). The information contained in balance sheets constitutes an important basis for the assessment of

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[17] The characteristics and the feasibility of standards with respect to DVP systems are analysed in the September 1992 CPSS report "Delivery versus payment in securities settlement systems".

[18] The netting systems adopted in some countries can also support repo market efficiency. In the United States, the Government Securities Clearing Corporation (GSCC) has expanded its role in providing "netting" services to include repo transactions (including those for general collateral). In these arrangements, only the net amounts of cash and securities are delivered between participants in the netting arrangement. Netting has some advantages in terms of reducing gross flows of cash and securities, which helps reduce operating costs and credit risk. In Europe, Clearnet, the clearing house subsidiary of the French Société des Bourses Françaises, provides similar services. This clearer of repo trading in French Treasury bonds is to extend its services to other European bonds and repo markets.

[19] If a coupon payment falls due before the repurchase date, the securities lender's cash account at the Central Securities Depository System is automatically credited. If the Central Securities Depository System does not distinguish between transfers of different origin (outright transactions or repos), income payments usually must be taken into account in the repurchase price calculation. In other words, it might be necessary to resort to a buy/sell-back legal framework. Obviously, the possibility still remains of dealing with this intermediate payment on a bilateral basis.

counterparty creditworthiness, so that a lack of transparency with respect to such information can limit the capacity to make clear judgements about, and comparison of, counterparties.[20]

4.5 Market practices that support sound and efficient repo markets

In addition to these structural features, there are a number of market practices that the authorities could encourage to support the development of sound and efficient repo markets. These practices vary in both their effect and their importance. Good practices relating to haircuts and margin calls are essential to limiting risks that arise in repo markets. Other practices, such as those relating to timely delivery and fail rules, contribute to efficiency and help to reduce the scope for market manipulation and abuse. Finally, practices such as the use of substitution rules contribute to market liquidity and hence efficiency.

4.5.1 Mark-to-market pricing of collateral

The practice of pricing collateral to market, both when initiating the repo and during the life of the repo, is important to the sound and efficient operation of repo markets. Without such pricing, it is difficult to manage repo market risk effectively because exposure arising from movements in the price of collateral may not be immediately recognised. The lack of mark-to-market pricing is of particular concern in some repo markets in emerging market economies, where it can arise from a lack of secondary market liquidity.

4.5.2 Repo haircuts or margins

In repo transactions, sound credit practices by lenders involve haircut and margining policies and limits on unsecured exposures. These limits and policies should reflect the risk inherent in the repo contract, such as the price volatility of the underlying security, liquidity risk and the creditworthiness of the repo borrower. Sound practices with respect to haircuts and margin practices can help participants maintain more effective control of collateral. Without the proper margin and safekeeping practices, repo transactions can become under-collateralised exposures. Repo participants need to pay close attention to the risks associated with collateral and monitor changes in its value.[21]

Practices with respect to haircuts can fall short in a number of respects that may need to be addressed. First, in some cases repo haircuts are largely based on volatility in the value of the collateral and the credit standing of the counterparty and tend to ignore other risks such as liquidity risk, which are harder to measure.

Second, haircuts may also be subject to competitive pressures, which may lead to their being pushed below the level needed to compensate for the risks faced by lenders.

Third, there is a tendency to rely on collateral as the principal means of controlling risk and not to adequately take into account the risk of the overall position of borrowers in financial markets, partly because the relevant information is not available. Reliance on collateral cannot substitute for comprehensive credit analysis as a means of controlling risk.

Fourth, haircuts, once set, are sometimes not adjusted over the life of longer-maturity repo when conditions are more volatile. For short-maturity repos, which are usually rolled over, the haircuts are fixed when the Master Agreement setting up the trading relationship is negotiated and can be difficult to adjust when conditions become more volatile.

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[20] For a detailed discussion of the implications of different accounting treatment of repos, see the BIS quarterly review of International Banking and Financial Market Developments, November 1996, pages 21-22.

[21] Valuation of some types of collateral may be highly sensitive to rate movements. The August 1998 sovereign debt rescheduling by Russia dramatically illustrates the potential for "safe collateral" (i.e. sovereign debt) to become less valuable quickly.

Application of initial haircuts and prompt margin calls help control risk in repo markets by providing some protection for lenders from future changes in the value of collateral; and, by placing a limit on leverage. The failure to set initial haircuts can increase liquidity risk and entails risks for creditors individually and, if widespread, as a group. When lenders rely exclusively on margin calls for protection, steps to contain risk are implemented only after exposures become uncollateralised. An aggressive, ongoing assessment of credit risks inherent in repo transactions should be based on a measure potential future exposure that takes into account the risk of counterparty default. An approach based on the application of haircuts and margin calls based on such assessments is preferable to reacting to events.

Application of appropriate initial haircuts can be useful in situations where market conditions turn adverse, since reliance on margin calls sometimes does not allow creditors to adequately reduce their credit exposure with a borrower or counterparty that is experiencing distress. This is more likely to occur in cases where the borrower negotiated similar lax credit standards with other counterparties that will also be simultaneously imposing margin calls to try to reduce their exposures in this situation. With all creditors scrambling for margin, the borrower may experience a liquidity crisis which can quickly convert into a solvency crisis and force default. If this occurs against the backdrop of already distressed markets, or when creditors need to sell collateral at fire sale prices, the potential losses to creditors and the borrower can be even greater. To assess this risk and the appropriate level for initial margins that would help contain it, lenders need to run simulations or stress scenarios to assess the likely impact of adverse market conditions on borrowers, and the resulting impact on themselves.

Recent experiences with convergence trades that rely on leverage in repo markets provide a good example of how collateral-based risk mitigation strategies, intended to limit credit exposures of repos, break down in certain market conditions. In a convergence trade, investors take positions to profit from an expected convergence in the yields on two securities. When convergence trades work as expected, as on most occasions, the related repo and reverse repo credit exposures and consequent margin calls tend to be offsetting. However, in an extreme event like the credit market dislocation beginning in August 1998, credit exposures on repos and reverse repos moved in the same direction. That is, both legs of the borrowers' convergence trade moved against investors, causing margin calls on both repos and reverse repos to occur at the same time. The breakdown of the convergence trade shows how what initially might not appear to be excessive leverage (based on historical experience) can become excessive, with margin calls contributing to a rapid deterioration in the viability of the institutions.

It is important to keep in mind that borrowers have incentives for limiting leverage and ensuring sufficient liquidity as well as creditors since, in general, they are managing shareholder capital or investor funds. From this perspective, the sound credit safeguards applied by lenders reinforce those of borrowers.

4.5.3 Transparency

An adequate level of transparency is essential if the risks inherent in repo markets are to be properly assessed. Participants need to have sufficient, comprehensive financial information to understand the financial capacity, risk profile and risk management strategy of their counterparties before entering into credit relationships. The risk profile should include measures of the market, liquidity and credit risk, so that the creditor can understand the borrower's capacity to meet margin calls and absorb losses. In cases where there is a high degree of leverage, frequent information updates on the condition of the borrower are especially important as high leverage may quickly become excessive in response to unforeseen market developments.

Counterparties have legitimate concerns about maintaining the confidentiality of their trading strategy. However, an overly secretive approach that leads to an inadequate level of disclosure to creditors could be regarded as an unsound practice. Examples of quantitative information borrowers could provide without revealing proprietary information are daily net asset values, resources available to meet margin calls and aggregate risk information such as the VaR for the whole portfolio and, possibly, with respect to specific risk factors or concentrations, and stress test results. It is important

that VaR and stress test results be accompanied by information on the parameters and assumptions used in order to allow creditors to check their plausibility. In general, transparency should be sufficient to adequately inform lenders' without revealing sensitive information on borrowers' investment strategies.

4.5.4 Timely delivery

The timely delivery of collateral facilitates the smooth clearing and settlement of transactions. Participants should have time to implement any additional transactions using the collateral to which they may be committed. Authorities may want to discourage repo market participants from delivering collateral at the last possible moment in the hope that it generates fails to deliver by other counterparties which are scheduled to receive these same securities.

4.5.5 Provision of actively traded collateral to the market

The provision of actively traded collateral to the repo market by market-makers and active participants can be regarded as a sound market practice as it helps to maintain liquid and efficient trading conditions in specific issues. Repo market participants sometimes deliver collateral that is special in the repo market to participants that might not actively re-lend the collateral in the hope that this will generate higher borrowing fees by restricting the supply available to other borrowers of the collateral.[22] A similar practice is to withhold collateral from the repo market that is "cheapest to deliver" or is needed for specific delivery obligations on a futures contract. Such practices tend to reduce liquidity in the repo market.

4.5.6 Appropriate setting of rules for delivery fail

Lack of fail rules may discourage repo market usage and adversely affect market liquidity. Fail clauses ensure that the technical inability to deliver securities does not give rise to a formal default. To see how fail rules support market functioning, consider the example of cross-market trading involving three market participants where participant B plans to use a security received from participant A to make delivery to participant C. If all markets have fail rules, in a situation where participant A fails deliver to B, it is easy for B to put off his delivery to C, but without such rules, B might have to default. To avoid this risk, traders might refrain from getting involved in cross-market dealing, which would impair the development of cross-market repos. However, it is also important that fails carry an appropriate penalty. A penalty that is too low gives participants an incentive to fail deliberately, which can undermine market efficiency by creating uncertainty. In setting the penalty, a balance needs to be struck between the improvement in market functioning and the need to avoid disruptions associated with deliberate fails.

4.5.7 Substitution rules

Rights of substitution, the right of the party that has repoed out a security to repossess it and substitute another security in its place, can contribute to market liquidity. Substitution clauses enable securities lenders to retain control of securities lent. They encourage the participation of more lenders in repo markets by allowing them to repossess a specific security if the need arises (for example, to meet unexpected delivery obligations). While substitution can improve liquidity, it affects repo pricing because it gives the lender an option to repossess securities, for instance, when they have gone on special. The lender willingly accepts a lower rate to have this option.[23] While the use of substitution

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[22] Some participants might even attempt to park (deliver) blocks of special collateral to the central bank.

[23] It is also possible to craft substitution clauses such that the party substituting collateral compensates the borrower of the collateral only in the event of an actual substitution.

clauses varies across countries depending on legal arrangements, it is becoming more common for repo master agreements to contain substitution provisions or clauses.

4.6 Market surveillance

Sound market practices are often based on national or international market conventions, master agreements and laws. To help ensure that these are respected and effective, some market surveillance is needed. In this regard, surveillance can be seen as a complement to national or international market conventions, agreements or laws.

The structural features and market practices identified above should help limit the risks and sources of inefficiency in repo markets. However, it is not certain that these will be sufficient by themselves to enhance the development of sound repo markets and to secure financial stability, in part because the repo markets are still growing and changing in many countries. For this reason, authorities need to continue to monitor developments in repo markets.

Like other markets, repo markets might be subject to abusive practices on occasion. For example, in some cases episodes of squeezes on cheapest-to-deliver issues in futures contracts, which involved the use of repos, have been observed. Market manipulation cannot be easily detected by observing repo rates or prices alone. Moreover, there is not even a consensus regarding the definition of what constitutes market manipulation. This naturally leads the authorities to adopt something of a case-by-case approach for market monitoring and for handling particular cases of manipulation.

Market surveillance should take into account the fact that repos span different markets where there may be a strong presence of non-banking institutions and where responsibility for regulation and supervision may involve a number of different bodies. For this reason, surveillance should focus on the market rather than on institutions. When a market situation develops with the potential to adversely affect market functioning where various types of institution are involved, there should be coordination among authorities. Hence, when central banks conduct market surveillance, they will need to cooperate with other entities such as exchange authorities and private associations such as ISDA, BMA and ISMA. Another concern is that authorities should have adequate data on repo markets to conduct surveillance. In this regard, statistical information is relatively limited, as Annex 4 indicates.

Annex 1

Relative size of repo markets
(G-10 countries for which data are available)

(in percentage)

Country	Year	Outstanding amount as % of		
		nominal GDP	M3	government debt
Belgium[a]	1995	18.4	22.5	23.5
	1997	25.0	28.9	31.0
France	1995	14.5	20.4	34.7
	1997	21.7	32.8	47.3
Italy[b]	1995	8.1	9.0	6.5
	1997	9.9	11.1	7.3
Japan[c]	1995	n.a.	n.a.	n.a.
	1997	5.7	2.8	9.0
United Kingdom[d]	1995	0.0	0.0	0.0
	1997	9.5	10.0	17.4
United States	1995	12.0	18.3	17.8
	1997	14.9	22.9	22.4

[a] only repos in Belgian francs on government securities. [b] Repos reported by banks, including interbank and customer repos. [c] Securities lending against cash allowance. [d] outstanding amounts are computed as a share of M4.

Comparison of features of repo markets in G-10 countries

	BE	CA	FR	DE	IT	JP	NL	SE	UK	US
Types of repos										
a. Repurchase agreement	Yes (most dominant)	Yes (most dominant)	Yes (most dominant)	Yes	Not usual	No	Not usual	No	Yes (most dominant)	Yes (most dominant)
b. Sell/buy-back	Yes	Yes	Yes	Yes	Yes (most dominant)	Yes	Yes	Yes	Not usual	Yes
c. Securities lending	Yes	Yes	Yes	Yes	Yes	Yes (most dominant)	Yes	No	Yes	Yes
Characteristics of repo transactions										
– *Underlying securities*										
Government securities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank or corporate-issued notes	Yes	Yes	Not usual	No	Yes	Not usual		No		Yes
Mortgage securities	No	Yes	Not usual	Yes	No	No	No	Yes	No	Yes
Equity securities	No	Yes	Not usual (but growing)	Yes	yes (only for securities lending)	Not usual	Yes	Yes	Yes	Yes
– *Maturity structure*										
Overnight	Yes	Yes	Yes	Yes	Not usual	Yes	Yes	Yes	Yes	Yes
Term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Open	Yes	Yes	Yes (decreasing)	Yes	Not usual	Not usual		No	Yes	Yes
– *Minimum/average size*										
Minimum size	No	No	No	No	No	No	No	No	No	No
Approximate average size	EUR 40 mil	CAD 85 mil	EUR 100 mil	EUR 25 mil	EUR 3 mil	—	EUR 10 mil	SEK 300 mil	GBP 50 mil	—
– *Deliverability*										
Make or take delivery	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Hold in custody	Not usual	Limited	Not usual	Not usual	Yes	No		No	Not usual	Not usual
Tri-party agreements	*Yes*	*No*	*Not usual*	*Yes*	*Yes*	*Not usual*		*No*	*Yes*	*Yes*
– *Market for specific collateral*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
– *Substitutability*										
Legal basis for substitution	Exists	Exists by prior agreement	Exists	Exists	Exists	No	Exists	Exists	Exists	Exists
Use of substitution rights	Not frequently used	Not frequently used	Not frequently used	Frequently used	Not frequently used	Not used	Not frequently used	Not frequently used	Not frequently used	Frequently used

Comparison of features of repo markets in G-10 countries (cont)

	BE	CA	FR	DE	IT	JP	NL	SE	UK	US
– *Margining and marking-to-market*										
Use of initial margin	Yes	Not usual	Not usual	Yes	Not usual	Not usual		No	Not usual	Yes
Usual frequency of marking-to-market	Not or weekly	Daily	Daily	Daily	Daily for securities lending	Daily		Low frequency	Daily	At least daily
Major participants										
Banks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Securities firms	Few	Yes	Yes	Yes	Yes	Yes	Yes	Few	Yes	Yes
Institutional investors[a]	Few	Few	Yes	Yes	Yes	Few	Yes	Few	Yes	Yes
Insurance companies	Few	Few	Yes	Yes		Yes	Yes	Few	Yes	Yes
Non-financial companies	Few	Very few	Yes	Few		Few		Few	Few	Yes
Settlement										
Typical settlement lag	Same day	Same day, T+1	Same day, T+1	Same day, T+1, T+2, T+3	T+1,T+2	T+2	T+1, T+2	Same day, T+1, T+2,T+3	Same day, forward	Same day, forward
Failures to deliver	Allowed	Allowed	Allowed	Allowed	Not widely accepted	Not widely accepted		Allowed	Allowed	Allowed
Penalties for failure	specified in GMRA	specified in GMRA	specified in GMA	specified in master agreement					specified in GMRA	specified in master agreement
Transaction methods										
Market type	Off exchange	Off exchange	Off exchange	Off exchange	On and off exchange	Off exchange	Off exchange	Off exchange	On and off exchange[b]	Off exchange
Direct dealing or brokers	Both (mostly direct)		Both	Both	Both	Both	Both	Both (mostly direct)	Both	Both
Tools used for transactions	Phone, screens	Phone, fax, screens	Phone, screens	Phone, fax, screens	Phone, screens	Phone, fax	Phone, fax	Phone, screens	Phone	Phone, fax
Pre-trade transparency										
Prices available on screens	Yes	Yes for dealers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prices on screens firm or indicative	Indicative	Indicative	Indicative	Indicative	Indicative	Indicative	Indicative	Indicative	Indicative	Both
Order size information	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No

Comparison of features of repo markets in G-10 countries (cont)

	BE	CA	FR	DE	IT	JP	NL	SE	UK	US
Post-trade transparency: historic price information										
Tick by tick price information	No	No	No	No	Yes (since January 98)	No	No	No	No	No
Indicative daily information	No	Yes	Yes	No	Yes (since January 98)	Yes	No	No	No	Yes

[a] Mutual funds, pension funds, hedge funds, etc. [b] Off exchange for gilt repos, on exchange for equity repos.

Annex 2

Transactions included in the definition of repos

1. Repurchase agreement

A repurchase agreement involves the sale of an asset under an agreement to repurchase the asset from the same counterparty.[24] Interest is paid on the repurchase agreement by adjusting the sale and repurchase prices. A reverse repo is the purchase of an asset with an agreement to re-sell the same or a similar asset.

The settlement and custodial arrangements associated with a repurchase agreement are an integral element of the transaction. Depending on the form the transaction takes, the party lending cash could have a small or a large credit exposure to the borrower. There are several types of custodial arrangements:

- A *hold-in-custody repurchase agreement* refers to a trade in which the repoer receives cash from the lender but continues to hold the collateralising securities in custody for the lender of cash. The cash lender is thus potentially exposed to fraud or failure on the part of the borrower, although in certain jurisdictions (for example the United States, but potentially also the United Kingdom), the lender might take precedence over unsecured creditors in the event of the borrower failing.
- A *deliver-out repurchase agreement* is where securities are delivered to the cash lender's custodian in exchange for funds. So long as the securities are correctly valued and delivery is made versus payment an intraday credit exposure is eliminated.
- A *tri-party repurchase agreement* is similar to a deliver-out repurchase agreement, where the securities serving as collateral are held by an entity other than the securities borrower, except that a third-party custodian is typically used. The third party ensures that the collateral meets the cash lender's requirements, and provides valuation and margining services. Since a tri-party repurchase agreement offers a convenient and efficient means of taking and delivering collateral, and since fees are generally low, this form has become the primary form of repurchase agreement for securities dealers in the United States.

2. Sell/buy-back agreements

A sell/buy-back is two distinct outright cash market trades, one for forward settlement. The forward price is set relative to the spot price to yield a market rate of return. This structure is relatively simple in operational and legal terms, and so is more common in emerging markets. Typically, however, sell/buy-backs do not allow for marking to market and margin calls, which can result in larger counterparty risks than those of securities lending or repurchase agreements.

[24] Another important type of collateralised market transaction that is not referred to as a repo is borrowing against a pledged securities loan, where securities are borrowed and other securities, instead of cash, are used as collateral.

3. Securities lending

In a typical lending transaction, the owner of securities lends them to another person in return for a fee. The borrower becomes contractually obliged to redeliver *a like quantity* of the same securities, or to return *precisely the same* securities. If securities lending is combined with a cash lending of the equivalent amount (the cash being lent by the borrower of securities to the lender of the securities), the economic features of a repurchase agreement can be reproduced.

Annex 3

Deriving the expected official repo curve from market repo rates

Bank of England dealers ring a number of repo market participants each day to obtain quotes (a number of wire services carry repo quotes put out by brokers but these are only indicative). This is done at 9.00 a.m., prior to the release of official data (which occurs at 9.30 a.m.) and before the first round of official intervention, at 9.45 a.m.

The quotes are obtained for the ***bid*** rate, i.e. the quote given by the counterparty offering cash to obtain repo collateral. (The rate on the bid side is consequently higher than on the offer side for repo.)

Rates are obtained for overnight, tomorrow overnight, one week, two weeks and one, two, three, four, five and six months.

A cubic spline is then fitted to the data for one through six months rates and two, three or four parameters are estimated on an adjusted R^2 criteria. Usually the three-parameter model generates the best fit.

Fitting only takes place from one month out, since the fluctuations in the shorter data are more problematic. The fitted "par" rates for each period are then used to calculate the implied forward two week-rate for each day. The two-week ahead two-week forward rate is calculated separately, and indicated on the chart by the diamond. This is derived mechanically from two-week actual and the one-month actual.

Annex 4

Repo market statistics: availability and needs

1. Availability of statistics on repo markets

Most central banks have set up statistical reporting on their domestic repo markets. Table 1 presents an overview of the actual situation in G-10 countries. It appears from that table that among G-10 countries the reporting schemes on repo markets have only a very few characteristics in common: all of them ask for outstanding amounts, most of them have a monthly frequency. In a number of countries, these reporting schemes include information on turnover and market shares. All other characteristics of the statistical reporting vary widely across the G-10 countries: some reporting schemes only contain repos in domestic currency, others also contain foreign currencies, counterparty breakdowns seem to be different in each scheme, and a wide variety can also be observed in the maturity breakdown. Some of these schemes are also limited to a certain type of underlying securities (mostly government paper), others include all types. Also, the reporting population differs among the G-10 countries: some reporting schemes include only banks, others also include non-banks.

Information on repo rates is rather limited: market rates are collected and compiled only in a few countries.

Currently, there are no international statistics on repo markets. It is clear that the structure and content of the different national reporting schemes are such that they cannot be aggregated into comprehensive international statistics in any way.

2. Need for statistics

The survey that was conducted by the working group investigated whether there was a need among market participants for repo market statistics. From the reactions, it appeared that in repo markets that are more mature, most market participants do not feel any major need for statistics. In some countries where repo markets are still in their infancy, market participants seem to feel there is a greater need for statistics.

The survey having been conducted with major repo market players, the answers may not necessarily be representative for all (potential) repo market participants. For instance, for relatively small institutions, or for institutions that have only recently become active in repo markets, statistical data might be of more use than is indicated by large market players.

Central banks may feel the need for repo market statistics – just as for any other statistics on financial markets – from the monetary policy perspective and from the viewpoint of analysing flows and risks involved in the financial system.

Summary table on the availability of statistical data on repo markets

Belgium, France, Germany, Italy, Japan, Netherlands, Sweden,United Kingdom and United States

Type of data	Availability
Sources of data	*Central banks*: *daily and monthly data* in SE, *monthly statistical reporting by banks* in BE, IT and NL. For JP, monthly reporting for banks and non-banks. In addition, *data from own clearing system* in BE and *quarterly reporting* in UK as well as monthly reporting for banks in the monetary statistics, *weekly and quarterly reports from banks* and non-banks in the US, *one-off survey of banks for monetary policy purposes* in DE
	Other sources: *national securities clearing house and Treasury* in FR, very detailed *data feed from on-screen market* in IT, *securities dealers association and a repo broker* in JP
Types of transaction	*Repos* in BE, DE, FR, UK, NL, US; *sell/buy-backs* in BE, DE, IT, UK, NL and SE; *securities lending* in DE, FR, UK, JP, US
Measured data	*Outstanding amounts*: all countries; *turnover*: all countries except NL; *number of transactions*: BE, FR, UK
Currency breakdowns	*domestic and total foreign currencies* in BE, DE and IT; *domestic currency only* in JP, SE and US; *detailed individual breakdown* in FR, UK
Maturity breakdowns	*Various day and month brackets* in BE, DE, FR, UK and JP
Counterparty breakdowns	*Banks and non-banks* in BE, *domestic and foreign banks and non-banks* in DE, IT, *market-makers, domestic and foreign banks* in FR, *detailed sectoral breakdown* in UK, *specified holders, primary brokers and banks* in US, *public and private sector* in NL, *domestic banks and non-banks and foreign counterparties for turnover data (daily data), foreign counterparties for outstanding amounts (monthly data)* in SE
Underlying instruments	*Treasury bills, notes and bonds* in BE and SE, *plus commercial paper and notes* in FR, *plus corporate bonds and shares* in IT, *domestic and foreign bonds and shares* in DE, *government and other paper* in UK primarily, *US government and federal agency securities* in US
Market shares	*Individual shares* in BE, IT, JP, NL and SE *plus shares of banking groups* in DE, *by type of participants* in UK
Size of transaction	*Lowest, highest and most frequent amount* in DE, *medium size* in FR
Frequency	*Daily and monthly* in SE, *monthly* in IT, JP and NL *and on demand* in BE, *monthly and quarterly* in UK, FR, *weekly, quarterly and annual data* in US, *only once in 1996* in DE
Starting date	*1991 and 1993* respectively in BE, *1990 and 1998* respectively in IT, *1993 and 1995* respectively in SE, *1994* in FR, *1996* in JP and UK, *1998* in NL
Publications	*Daily and monthly turnover* in BE, *partial data* in DE, *monthly data* in IT and NL, *monthly net changes in positions* in SE, *data from non-central bank sources* in JP, *monthly data on amounts outstanding by sector, quarterly data on amounts outstanding by type of deal and maturity* in UK, *various publications of the Federal Reserve* in US

Summary table on the availability of repo rate data*

France, Japan and the United Kingdom only

Type of data	Availability
Source	*Reporting of counterparties of central bank repo operations* in JP, *market-brokers and principals by phone* in FR and UK
Measured data	*General collateralised repo rate* in FR, JP, UK
Frequency	*Daily* in FR, JP, *three times per day* in UK
Starting date	*1994* in FR, *January 1996* in UK, *November 1997* in JP
Breakdown bid/offer	*Available* in FR, UK and JP
Breakdown maturity	*Overnight, various weekly and monthly rates* in FR, UK and JP

* In the United States, data on repo rates and transactions are available from private vendors.

Committee on the Global Financial System

Secretariat

Members of the Working Group on Implications of Repo Markets for Central Banks

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