Bank of Russia Financial Stability Department

INTER-DEALER REPO MARKET REPORT, II QUARTER 2012

Moscow 2012

TABLE OF CONTENTS

Purpose of the Bank of Russia Inter-Dealer Repo Market Report 5

Summary conclusions 7

1. Key features of the inter-dealer repo market 8

2. Inter-dealer repo market structure 10

Box: Refinancing non-bank financial intermediaries 12

3. Foreign-exchange market developments in May 2012, and their impact on the inter-dealer repo market 13

4. Liquidity transmission in the overnight segment of the inter-dealer repo market, including Bank of Russia operations 15

5. Liquidity transmission in the overnight segment of the inter-dealer repo market, excluding Bank of Russia operations 19

Box: Modified liquidity transmission analysis 19

6. Banking sector capacity for Bank of Russia refinancing against marketable assets 22

7. Bank of Russia resumes equity repos 24

Box: Terms of Bank of Russia equity repos 25

8. Margin calls 28

9. Systemic risk and systemic importance of the inter-dealer repo market participants 30

Box: Assessment of systemic funding liquidity risk in the Russian banking sector 31

10. Stress testing of the inter-dealer repo market 34

11. New legislative and infrastructural mechanisms for the repo market 35

Glossary 36

LIST OF ILLUSTRATIONS

Tables

Table 4.1. Average-weighted interest rates by maturity, % 15

Table 4.2. Average-weighted overnight interest rates by tier 17

Table 4.3. Average-weighted intermediation ratio for tiers one and two 18

Table 6.1. Some value indicators of collateral available to banks, as of June 2012, trillion roubles 23

Table 7.1. Types of haircuts for Bank of Russia equity repos, as of June 26, 2012 25

Table 8.1. Repo haircuts for various types of collateral (average for the second quarter of 2012, for transactions with specified minimum haircuts) 29

Table 10.1. Comparative results of the inter-dealer repo stress tests in the first and the second quarters of 2012 34

Charts

Chart 1.1. Open positions in the repo market, billion roubles 8

Chart 1.2. Average-weighted rate in the inter-dealer repo market, and volume of repo trade with the Bank of Russia, % 8

Chart 1.3. Open positions in the inter-dealer repo market by direction of trade (quarterly average), billion roubles 8

Chart 1.4. Money market and policy rates, % 9

Chart 1.5. Number of inter-dealer repo market participants, units of organisations 9

Chart 1.6. Policy rates versus inter-dealer market rates, % 9

Chart 1.7. Banking sector debt to the Bank of Russia by maturity, billion roubles 9

Chart 2.1. Open positions in the inter-dealer repo market by collateral, billion roubles 10

Chart 2.2. Haircuts in the inter-dealer repo market by collateral, % 10

Chart 2.3. Open positions in the inter-dealer repo market by collateral issuer (quarterly average), % 10

Chart 2.4. Market capitalisation of Lombard List securities to inter-dealer repo market size (by type of counterparty), % 10

Chart 2.5. Shares of interbank repo transactions by rating of participating banks, % 11

Chart 2.6. Open positions in the inter-dealer repo market by maturity, billion roubles 11

Chart 2.7. Banks' trade in the inter-dealer repo market, billion roubles 11

Chart 2.8. Non-banks' trade in the inter-dealer repo market, billion roubles 11

Chart 3.1. Oil prices and rouble/dollar exchange rate 13

Chart 3.2. Inter-dealer repo market size and rouble/dollar exchange rate 13

Chart 3.3. Fundamentals driving money market developments in May 2012 13
Chart 4.1. Liquidity allocation in the overnight repo segment in the second quarter of 2012 16

Chart 4.2. Transmission chain length in the overnight bond segment 17

Chart 4.3. Multipliers for the overnight bond segment 18

Chart 5.1. Liquidity allocation in the overnight inter-dealer repo market (excluding the Bank of Russia) in the second quarter of 2012 19

Chart 5.2. Average-weighted length of the transmission chain in the overnight bond segment 20

Chart 5.3. Spread between the average and average-weighted length of the transmission chain in the overnight bond segment 20

Chart 5.4. Multipliers for the overnight bond segment 21

Chart 5.5. Average-weighted interest rate in the tier two overnight segment 21

Chart 6.1. Utilisation ratio dynamics in the second quarter of 2012 22

Chart 6.2. Utilisation ratio and overnight repo rate, second quarter of 2012 23

Chart 7.1. Equity repos in the second quarter of 2012, billion roubles 26

Chart 7.2. Collateral backing equity repos by issuer in the second quarter of 2012, % 26
Chart 8.1. MICEX stock indices and equity repo margin calls 28

Chart 8.2. Repo margin calls by issuer of collateral, % 28

Chart 9.1. Shapley Value weekly dynamics in the first half of 2012 (potential contributions of market participants to the total losses of the financial system if counterparties holding homogeneous portfolios default), billion roubles 32

Chart 9.2. Correlation between the concentration ratio (ratio of the top five aggregate contributions to top ten aggregate contributions to the total losses of the financial system) and the top ten aggregate contributions to the system's total losses as observed in the second quarter of 2012 33

Purpose of the Bank of Russia Inter-Dealer Repo Market Report

Article 3 of the Federal Law on the Central Bank of the Russian Federation (Bank of Russia) prescribes the following **purposes for the Bank of Russia**: to protect the rouble and ensure its stability; to develop and strengthen the banking system of the Russian Federation; and to ensure efficient and uninterrupted functioning of the payment system. **The money market is a proper venue to achieve all these three purposes.** The money market serves to support liquidity in the banking sector and rouble interest rates (stability of the banking system), to meet transaction money demand (efficient and uninterrupted functioning of the payment system), and to smooth rouble rate fluctuations, caused by enhanced volatility of the foreign exchange market (protection of the rouble and ensuring its stability). This may explain the Bank of Russia's focus on the money market, which is a mechanism for short-term liquidity redistribution in the financial system.

Sustainable development of the money market involves the following tasks:

- Stable conditions for liquidity reallocation, i.e. acceptable volatility of short-term interest rates and smoothed fluctuations in trading volumes;
- Minimised counterparty default risk by means of using high-quality collateral and adequate correction factors (haircuts);
- Well-balanced development of various market segments, specifically, fostering a robust segment beyond overnight maturities.

Within the money market, which includes the interbank loan market, currency swap market and **the inter-dealer repo market**, the latter commands most attention. **There are several factors contributing to its importance**:

- The repo market is a mechanism for liquidity redistribution in the financial system;
- As evidenced in the autumn of 2008, the repo market can create instability resulting in liquidity squeeze in the banking sector;
- The short-term segment of the inter-dealer repo market (overnight) is comparable in size to the short-term segment of the interbank loan market, adjusted for intra-group trade;
- Repo interest rates and haircuts emerge as macroprudential indicators, as they reflect links between the corporate and government bond market, the equity market and the interbank loan market;
- The repo market concentrates systemic risks of the financial sector, as it has not only large banks but also non-bank professional securities market players among its participants.
- With regard to the rising importance of the inter-dealer repo market for the interest rate policy of the monetary authorities, the Bank of Russia has launched **regular quarterly reports** to reflect its developments.
- **The ultimate goal of this publication** is to promote financial stability by enhancing transparency in the money market on the whole and in its repo segment. If participants are more aware of the repo market structure and trends, they would better understand and more appropriately assess their own risks. The Bank of Russia also seeks to communicate potential collective implications of their individual investment decisions in case of herd behavior and misjudgment of market risks.

The Report is not an official Bank of Russia document. It is more of an analytical and information paper focusing on the inter-dealer repo market in the second quarter of 2012. The latest reporting data are provided as of June 29, 2012, with any possible material events following the reporting date excluded from the analysis.

A data source for this study was the Moscow Exchange repo trade data and financial reporting on foreign exchange and money market transactions. The values quoted in the Report were calculated on the basis of open positions as of a date, unless otherwise specified.

SUMMARY CONCLUSIONS

- In the second quarter of 2012, the inter-dealer repo market contracted, primarily in its interbank segment. In contrast, repo trade with non-bank institutions, as well as the number of non-bank participants in the repo market, were steady throughout the latest two quarters.
- One factor that strengthened stability of the money market and improved current liquidity management in the banking sector was increased demand from market participants for one-week borrowings from the Bank of Russia. As of the end of the second quarter of 2012, one-week transactions accounted for 53% of the banking sector's repo debt to the Bank of Russia. Meanwhile, the inter-dealer repo market continued to be dominated by overnight repos (60-80% of the total trade).
- The composition of underlying repo collateral in the inter-dealer market and sizes of haircuts remained unchanged in the second quarter of 2012 compared to the previous quarter.
- Non-resident impact on the Russian repo market remains significant. Non-residents account for 58% of total market trade on average during the quarter. Most non-residents are affiliated with Russian residents.
- Large banks, including banks controlled by non-residents, were key suppliers of liquidity in the interbank repo market, while liquidity recipients were small and medium-sized banks.
- The bulk of repo trade was executed by banks on their behalf and for their account; they were key lenders.
- There are signs indicating declining intensity of liquidity redistribution among market participants in the second quarter of 2012. Thus, the maximum liquidity transmission chain shortened not to exceed three consecutive liquidity transmission links in the repo market, with multiplier values reflecting increased stress in the overnight market.
- Overall, the banking sector retains adequate collateral for Bank of Russia repo refinancing against marketable assets (estimated at 2.9–3.3 trillion roubles as of June 2012).
- Resumed Bank of Russia equity operations had a neutral effect on the inter-dealer market conditions and structure.
- In the second quarter of 2012, the total value of margin calls was under 1 billion roubles, which is a mere 0.25% of the total inter-dealer repo market size.
- The domino effect risk subsided due to contracted inter-dealer market size and lower mutual dependency of market participants.
- Contracted inter-dealer repo market led to higher market concentration and lower systemic importance of individual primary dealers.
- The results of the inter-dealer repo market stress testing revealed that haircuts are generally acceptable.
- Since the second quarter of 2012, close-out netting has been in place in Russia for exchange-traded repo transactions made in the Moscow Exchange Primary Market sector.
- It is expected that by the end of 2012, a trading repository for repo market participants will be established on the basis of the National Settlement Depository and will start functioning.

1. KEY FEATURES OF THE INTER-DEALER REPO MARKET

The second quarter of 2012 was marked by a persistent liquidity squeeze in the banking sector. The key drivers behind the developments in money market conditions included Russia's current fiscal surplus and external position. As a result, banks stepped up their demand for Bank of Russia repo funding (Chart 1.1). Starting from May, the debt of the banking sector to the Bank of Russia tended to increase, reaching 1.4 trillion roubles by mid-June. Similar to the previous quarter, the bulk of repo transactions with the Bank of Russia were auction-based, while being driven by liquidity shortfall in the market (Chart 1.2).

In the second quarter, conditions in the inter-dealer repo market became more dependent on Bank of Russia actions. While the size of the inter-dealer repo market stood at 400 billion roubles, the outstanding debt to the Bank of Russia was above 800 billion roubles most of the time.

Chart 1.1. Open positions in the repo market, billion roubles

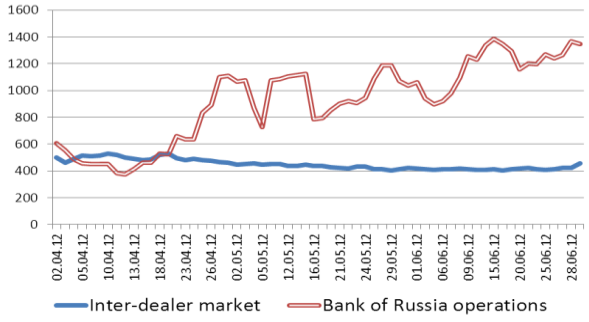
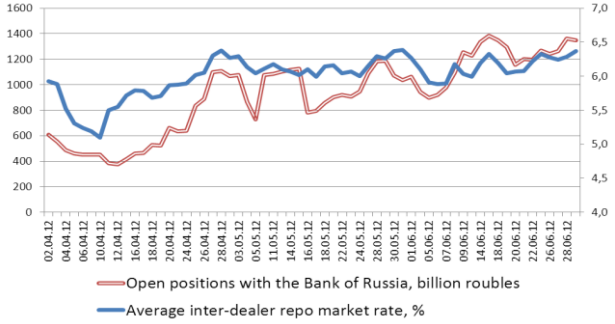
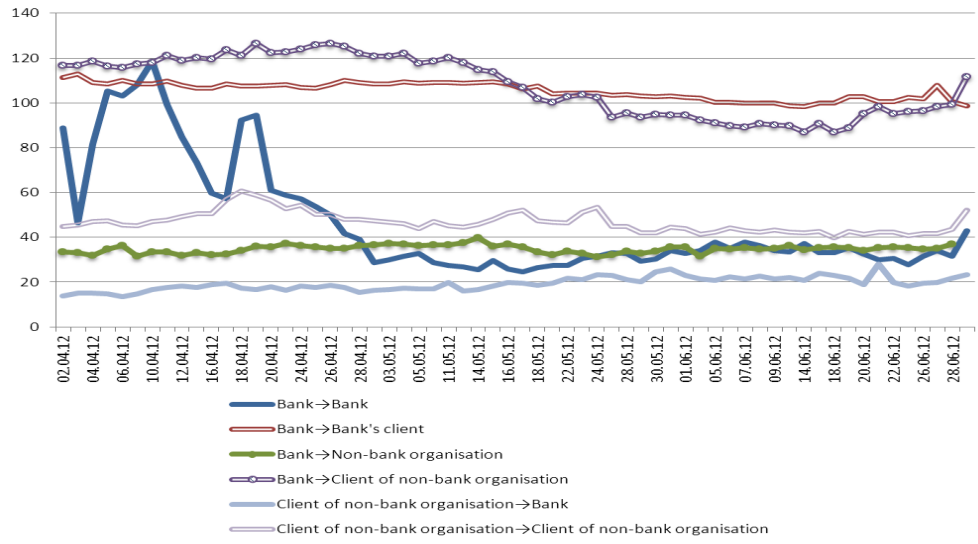


Chart 1.2. Average-weighted rate in the inter-dealer repo market, and volume of repo trade with the Bank of Russia, %



The rise in trade with the Bank of Russia was accompanied by some shrinking of the inter-dealer market. While at the beginning of the quarter open positions in the inter-dealer market exceeded 500 billion roubles, they dropped to 400 billion roubles by the end of the quarter. An important contributor to this contraction of the inter-dealer market size was the fact that interbank repo values more than halved during the period (Chart 1.3). Banks remained key lenders in the inter-dealer repo market, accounting for 65% of total lending at the end of the quarter. In contrast, there were not so many banks among borrowers, just about 15%. Key borrowers included clients of banking and non-bank institutions, accounting for 73% of total borrowings at the end of the quarter.

Chart 1.3. Open positions in the inter-dealer repo market by direction of trade (quarterly average), billion roubles



This contraction of inter-bank repo trading was caused by a number of reasons, including some participants switching to borrowing from the Bank of Russia rather than from the inter-dealer market (substitution effect), while some participants also reduced lending in the inter-dealer repo market due to their own liquidity constraints.

The inter-bank repo market shrinkage reflects not only lower trading volumes, but also a smaller number of banks participating in the repo market (both as lenders and borrowers) (Chart 1.5). In contrast, the trading volumes and the number of non-bank organisations in the inter-dealer repo market were stable over the last two quarters.

As the liquidity squeeze further worsened, the Bank of Russia supplied large volumes of funds at rates determined by the current operational procedure of refinancing (between the auction-based rate of 5.25% and the fixed rate of 6.25%). Persistent liquidity shortages and high inter-dealer market rates made the Bank of Russia the primary funding source for market participants to meet their current liquidity needs. Rising counterparty risks in the money market, including the repo market, the pattern of collateral allocation, and other reasons increased the volatility of the RUONIA interbank market rate (Chart 1.4) and kept inter-dealer market rates persistently high.

Chart 1.4. Money market and policy rates, %

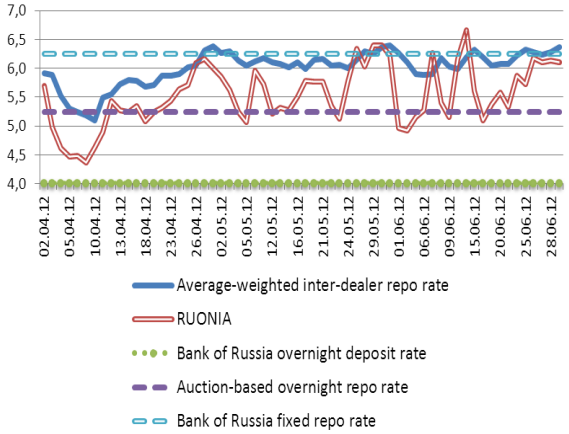
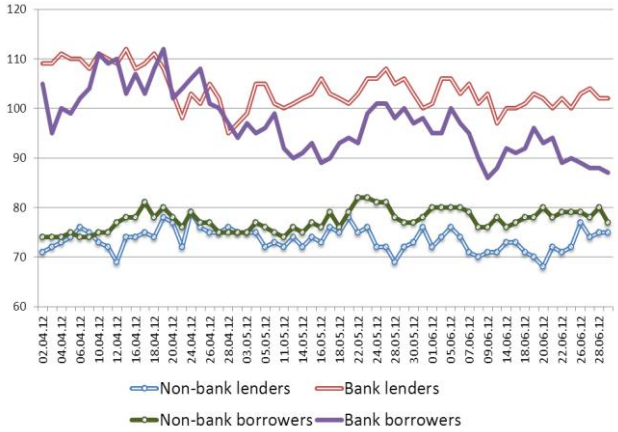


Chart 1.5. Number of inter-dealer repo market participants, units of organisations



One important contributor to enhanced stability of the money market and improved current liquidity management in the banking sector was increased volumes of Bank of Russia one-week transactions. As of the end of the second quarter, 53% of the Bank of Russia's repo exposure fell on one-week transactions (with 27% taken by overnight repos and 20% by three-month repos, Chart 1.7). However, the inter-dealer market continued to be dominated by overnight transactions, with their share flat at 60-80% like in the first quarter.

Chart 1.6. Policy rates versus inter-dealer market rates, %

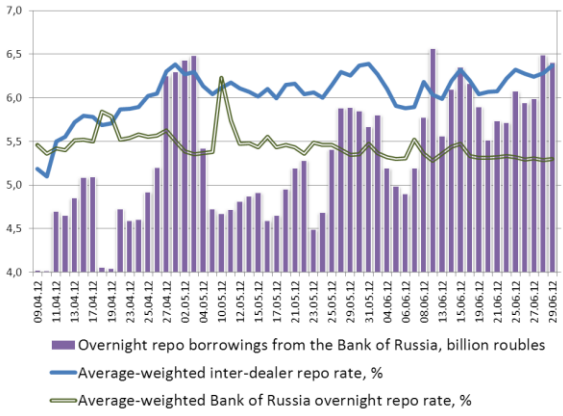
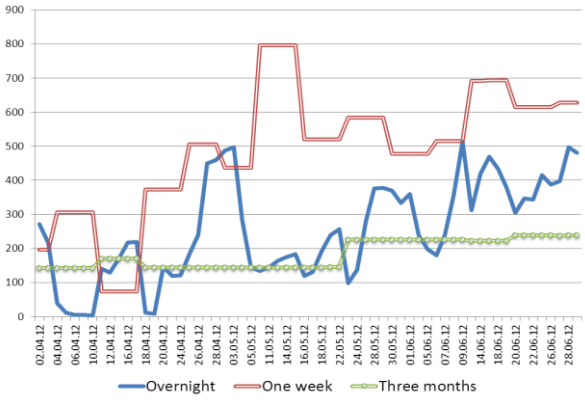


Chart 1.7. Banking sector debt to the Bank of Russia by maturity, billion roubles



2. INTER-DEALER REPO MARKET STRUCTURE

The composition of collateral (by type of collateral) and haircuts stayed virtually unchanged in the second quarter compared to the first quarter. (Chart 2.1, Chart 2.2). A decline in OFZ-secured trading during the quarter was accompanied by a faded share of interbank transactions in the repo market. The large volume of equity repos resulted from a rise in reverse repo trade (securities lending) and intra-broker transactions (when one participant acted as a broker for both the lender and the borrower). Equity repo haircuts were highly volatile.

Chart 2.1. Open positions in the inter-dealer repo market by collateral, billion roubles

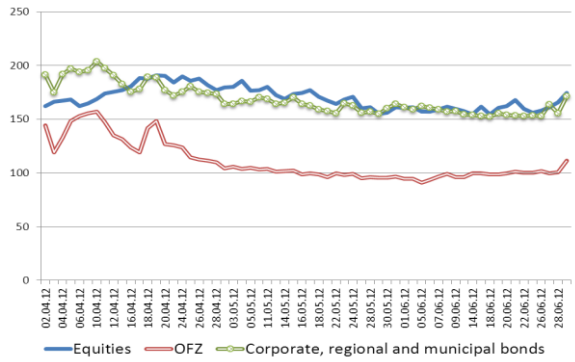
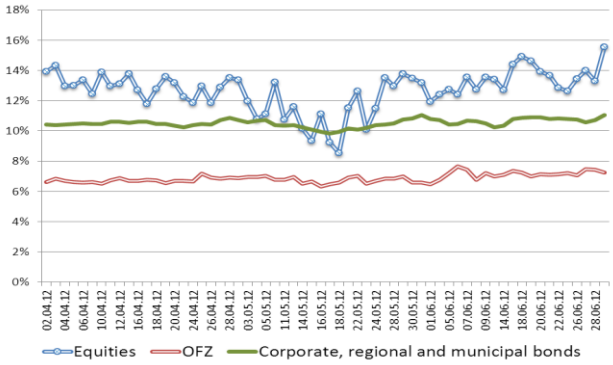


Chart 2.2. Haircuts in the inter-dealer repo market by collateral, %



Apart from the mentioned contraction in repo transactions secured by OFZs and Government of Moscow bonds, otherwise, the structure of collateral by issuer remained largely unchanged (Chart 2.3). Similar to the first quarter, repo transactions backed by government securities or corporate bonds/bonds issued by banks with government stakes (OFZs, shares and bonds issued by Gazprom, Sberbank, VTB, Rosneft, and bonds by the Government of Moscow) accounted for over 50% of the total market size.

To further ensure regular access of credit institutions to liquidity provided via Bank of Russia refinancing operations, the range of eligible collateral for repo operations was extended to include equities of leading Russian companies. As a result, the share of repo transactions backed by securities from the Bank of Russia eligible collateral list (Lombard List) exceeded 80% of the total inter-dealer repo market (Chart 2.4).

Generally, the Russian repo market predominately uses reasonably good collateral. However, given the specifics of the Russian stock market (high volatility and a large proportion of foreign investors), and a sizeable share of equities in the pool of all collateral, the probability of margin calls remains high.

Chart 2.3. Open positions in the inter-dealer repo market by collateral issuer (quarterly average), %

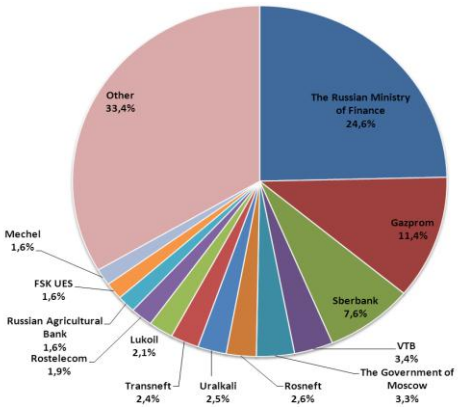
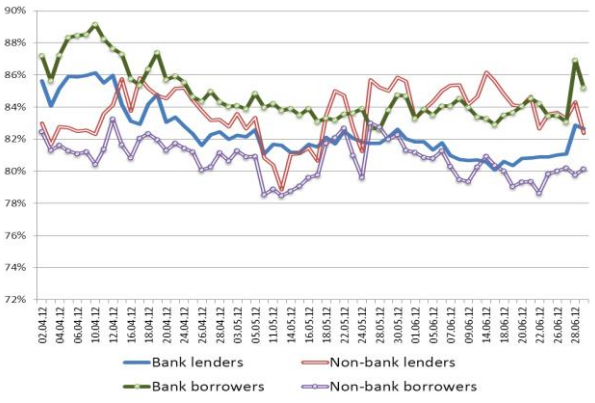


Chart 2.4. Market capitalisation of Lombard List securities to inter-dealer repo market size (by type of counterparty), %



In the second quarter, the inter-dealer market remained an overnight market (73% of total trade), while transactions with maturities up to one week (inclusive) accounted for 18%, those with maturities up to two weeks (inclusive) took 5%, and with maturities beyond two weeks – 4% (Chart 2.6).

Concentration increased in the inter-dealer repo market. Meanwhile, like in the previous quarter, the market was strongly concentrated on the lender side and moderately concentrated on the borrower side. The share of top 20 lenders averaged 65% of the total market size in the second quarter, with borrowers at 48%.

Non-residents, who are predominantly borrowers, continued to impact the Russian repo market significantly, with 58% of repo transactions involving non-residents (quarterly average). Most non-residents were residents' affiliated companies.

The share of transactions brokered by one agent for both the lender and the borrower increased from 13.5% in the first quarter to 14.2% in the second quarter of 2012, largely due to lower trade in the shrinking inter-dealer repo market, including the interbank repo market.

Chart 2.5. Shares of interbank repo transactions by rating[1] of participating banks, %

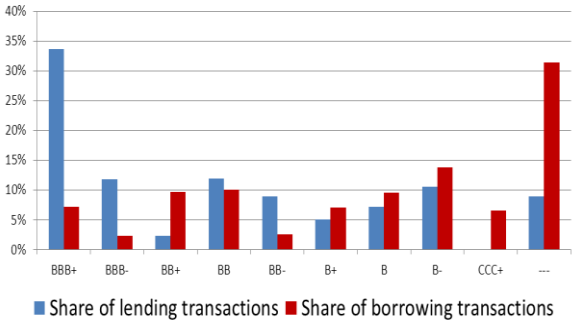
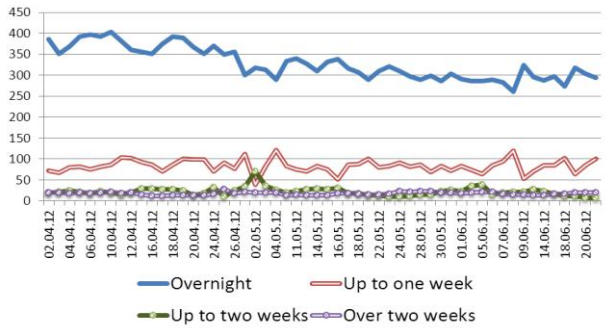


Chart 2.6. Open positions in inter-dealer repo market by maturity, billion roubles



The interbank repo market featured large banks, including foreign bank subsidiaries, as key suppliers of liquidity, while small and medium-sized banks were liquidity recipients. If banks found it difficult to get required funds in the interbank market (due to their low or absent international credit rating), they would turn to the inter-dealer repo market (Chart 2.5).

Most repo trade was executed by banks on their own behalf and for their own account. They emerged as primary lenders in the market accounting for 300 billion roubles of the total 450 billion lent on average during the quarter (Chart 2.7, Chart 2.8). Non-banks, in contrast, acted more as intermediaries, with half of all the borrowings in the inter-dealer market brokered by financial companies (for further detail see the section on Refinancing Non-bank Financial Intermediaries below).

Chart 2.7. Banks' trade in the inter-dealer repo market, billion roubles

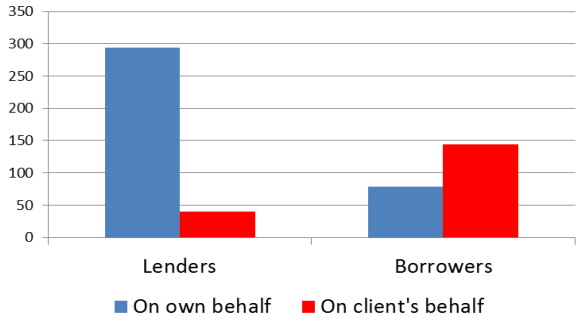
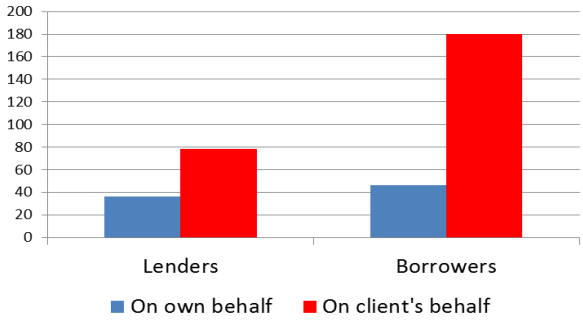


Chart 2.8. Non-banks' trade in the inter-dealer repo market, billion roubles



[1] We used the highest of Moody's, S&P and Fitch ratings; subsidiaries of leading foreign banking groups were awarded with BBB+.

Refinancing Non-bank Financial Intermediaries

In June 2012, public debate picked up the issue of possible central bank refinancing of professional non-bank stock market participants, primarily, investment companies (hereinafter professional participants). Article 4 of the Federal Law on the Central Bank of the Russian Federation (Bank of Russia) states that the Bank of Russia shall be the lender of last resort to credit institutions and shall organise their refinancing. The refinancing of professional participants is not listed as a central bank function, either in Russia or internationally.

Meanwhile, there is a need to address funding liquidity risks of professional participants. If such risks materialize, they may trigger panic sales of financial assets leading to stock revaluation and market losses of banks, pension funds, insurance companies and other financial market participants. Refinancing facilities for professional participants may be designed so as to exclude outright central bank lending.

- International practice suggests (e.g., the USA) that to get access to central bank refinancing professional participants may get licensed as credit institutions or join banking groups. This solution has been used by some large Russian investment companies – either by joining a banking group (Troika Dialog) or by establishing a banking subsidiary (e.g., BD OTKRYTIE).
- A central counterparty (CCP) may be established in the inter-dealer repo market to intermediate repo trade on a blind basis and in this way eliminate counterparty risks that market participants may be exposed to, and the related systemic liquidity deficit. To successfully implement this solution, the FFMS's regulatory framework should be completed.

For the period before the central counterparty is launched and becomes fully operational, Vnesheconombank (VEB) was discussed as a temporary solution to provide refinancing for professional participants in times of turbulent financial markets. At present, VEB, on the one hand, has access to Bank of Russia refinancing, and, on the other, it participates in the inter-dealer repo market. In the exchange-traded inter-dealer repo market, VEB emerges as a net lender consistently sustaining dozens of billion roubles in daily trade. Therefore, acting as a stabiliser via the inter-dealer repo market (market-maker role) will not be a new activity for VEB.

3. FOREIGN-EXCHANGE MARKET DEVELOPMENTS IN MAY 2012, AND THEIR IMPACT ON THE INTER-DEALER REPO MARKET

The second quarter of 2012 saw increased turbulence in global financial markets against the backdrop of uncertain parliamentary election outcome in Greece and fiscal problems in Spain and Italy. Negative expectations of global market participants translated into declines in global stock market indices and in resource prices, oil in particular. This had a strong impact on emerging market currencies, including the rouble (Chart 3.1). The rouble's depreciation against the US dollar was accompanied by a contraction of the inter-dealer repo market (from 460 billion roubles as of the end of April to 410 billion roubles as of June 5, Chart 3.2).

Chart 3.1. Oil prices and rouble/dollar exchange rate

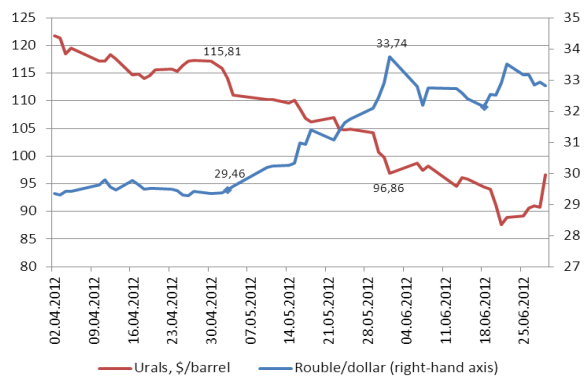
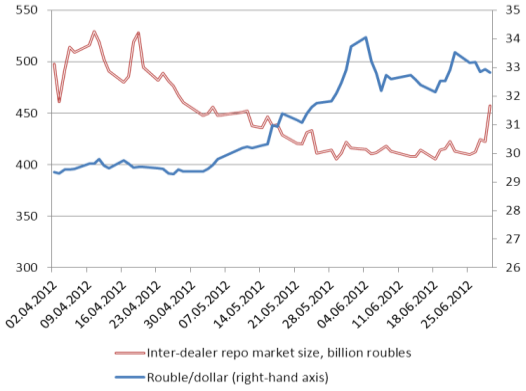


Chart 3.2. Inter-dealer repo market size and rouble/dollar exchange rate



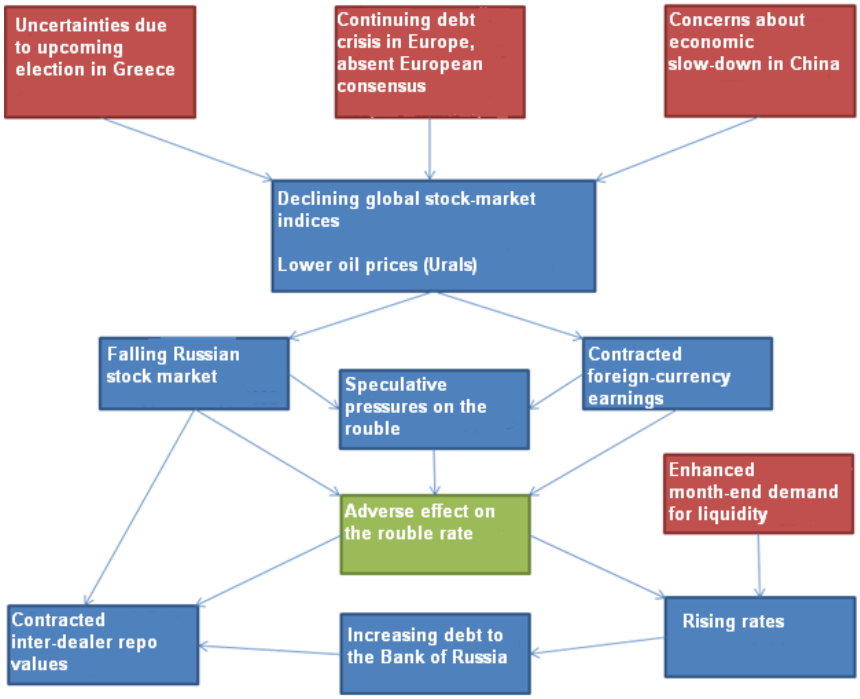
The inter-dealer repo market contracted due to, first, the declining value of securities collateralising repo transactions, and, second, high money market uncertainty, pushing banks and their clients to build up their long positions in foreign exchange. Moreover, banks substituted borrowings in the inter-dealer repo market with borrowings from the Bank of Russia. During the period under review, the Bank of Russia provided abundant liquidity at rates acceptable to participants.

Money-market developments came as a result of complex interaction of both exogenous and endogenous factors (Chart 3.3). To explore market expectations and behaviour of market participants the Bank of Russia conducted a series of working meetings with banks–money market makers in May 2012. During these meetings, heads of banks' treasury divisions indicated several factors influencing the exchange rate and interest rates:

- Declining oil prices and absent visible support to the rouble from the Bank of Russia in the foreign-exchange market enhanced depreciation expectations, thus generating expectations of high interest rates in the rouble market;
- Increased long positions in foreign exchange resulted in reduced rouble liquidity and higher rouble interest rates;
- Large corporate clients turned from medium-term rouble deposits to short-term deposits (in the range of overnight–one week), thus adding to uncertainties as regards banks' current liquidity needs;
- Corporate clients converted some of their disposable rouble liquidity to foreign-exchange deposits;
- Exporters delayed selling their foreign-exchange proceeds in anticipation of a more favourable rouble rate;
- Uncertain expectations of money market dealers as regards the Bank of Russia refinancing policies increased demand for repo transactions with the Bank of Russia;

- Some money market participants exhausted their counterparty limits.

Chart 3.3. Fundamentals driving money-market developments in May 2012



When the rouble was weakening, the Bank of Russia, being the lender of last resort, stepped up its repo operations seeking to stabilise the rouble interest rates and to manage current liquidity effectively. As a result, the debt of the banking sector to the Bank of Russia secured by marketable collateral increased to 1,400 billion roubles as of June 4, 2012. However, the continued turmoil in Europe and oil price swings led to increased volatility of the RUONIA rate observable in June.

4. LIQUIDITY TRANSMISSION IN THE OVERNIGHT SEGMENT OF THE INTER-DEALER REPO MARKET, INCLUDING BANK OF RUSSIA OPERATIONS

This section presents the results of the transmission mechanism analysis as applied to liquidity distribution in the inter-dealer repo market from April 2 through June 29, 2012 (62 trading days). The focus was on bond-secured transactions, as they are a key instrument to support liquidity in the banking sector. During the period under review, outstanding repo values, excluding repo futures (T+N) and reverse repos, averaged 1,195.3 billion roubles (including Bank of Russia operations), which is 67.5% more than in the first quarter of 2012. The analytical framework designed to study liquidity transmission in the repo market allows a detailed examination of market distribution by group of participants (tiers, see Glossary), classified by their distance from key funding sources[2].

For each of the trading days, we calculate values of all the bond-secured transactions. The number of open positions under such transactions (number of linkages between various dealers across different maturities) averaged 851 a day (+7.7% quarter on quarter) for 234 dealers (+16.4% quarter on quarter), including both banks and non-bank financial organisations.

In March-April 2012, the trade was dominated by overnight transactions with a daily average at 424.2 billion roubles (+46.6% quarter on quarter), and by 7-day repos of 430.3 billion roubles (+454.3% quarter on quarter) in absolute terms. Meanwhile, the relative share of the overnight segment in the total trade decreased from 40.9% in the first quarter to 35.9% in the second quarter of 2012, while the share of the one-week segment more than doubled from 13% to 35.5% respectively. These developments resulted from the Bank of Russia's one-week repo facility, actively used by the largest banks. Table 4.1 presents interest rates by maturity for a sequence of months.

Table 4.1. Average-weighted interest rates by maturity, %

Period	Overnight	O/N-6 days	7 days	8-29 days	30 days	Over 30 days
January 2012	5.65%	5.69%	5.66%	6.20%	6.78%	6.87%
February 2012	4.92%	5.17%	5.42%	6.20%	6.95%	6.88%
March 2012	5.33%	5.57%	5.44%	6.18%	6.66%	6.90%
April 2012	5.57%	5.86%	5.40%	6.27%	5.85%	6.98%
May 2012	5.76%	6.09%	5.80%	6.22%	6.12%	6.97%
June 2012	5.58%	6.44%	5.34%	6.59%	10.72%	6.95%

Over a half of overnight trade (65.8% in value terms) is conducted between tier zero (includes the Bank of Russia and primary lenders) and tier one, incorporating the largest banks with easy access to the refinancing system. ***An overall distribution of liquidity flows among the tiers***[3] is given in Chart 4.1, showing shares of tier-to-tier trading volumes of the total overnight market turnover. The average number of tier zero participants is 34 (including 22 banks), of tier one – 130 (110 banks), and of tier two – 24 (10 banks).

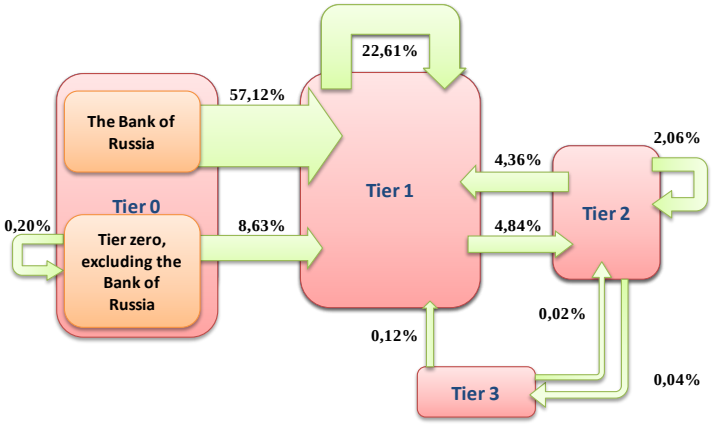
The directed graph below suggests that most liquidity is used in tier one. This tier captures most funds from tier zero and funds collected from the other tiers. The last tier, tier four, observable in the previous quarter, is no longer existent. In May-June 2012, the share of Bank of Russia presence

[2] See Conceptual Framework for Liquidity Transmission Analysis in the Inter-Dealer Repo Market Report for the First Quarter of 2012, p. 26. For a detailed description of the analytical system and its indicators please see in Моисеев С.Р., Пантина И.В., Сосюрко В.В. Анализ трансмиссии ликвидности на рынке междилерского РЕПО // Деньги и кредит, 2012. - № 7. – с. 65-71.

[3] Calculated using average values for tier-to-tier transactions during the period under review.

in the repo market increased significantly compared to the February-April 2012 period. Specifically, while the Bank of Russia share in the overnight segment averaged 41.1% of the total market in April, it rose to 58.4% in May to exceed 68.1% in June. During the span of short liquidity, overnight repo lending by tier zero banks contracted noticeably, as well as by dealers belonging to the other tiers.

Chart 4.1. Liquidity allocation in the overnight repo segment in the second quarter of 2012



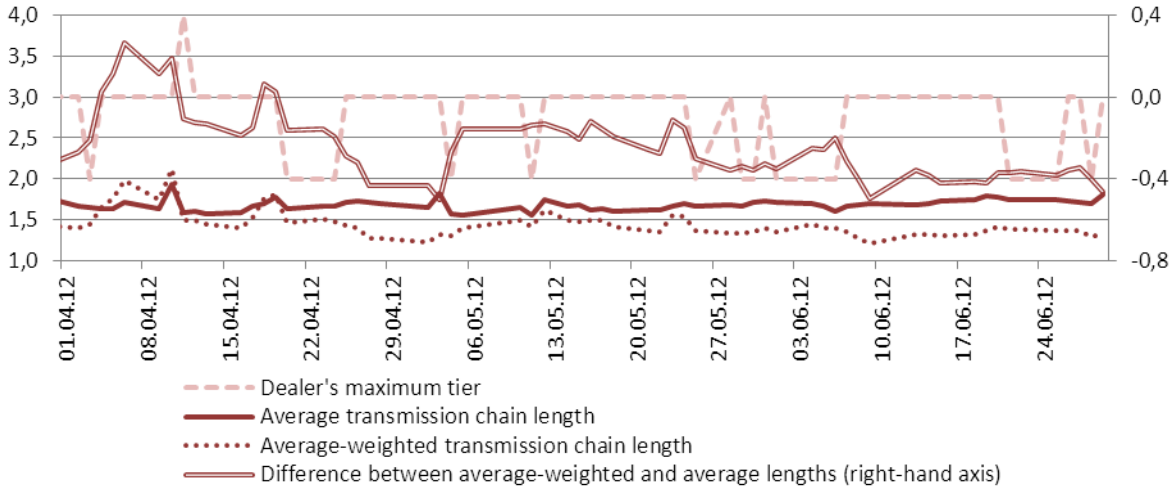
Note. The scheme presents a directed graph illustrating cash flows in the repo market. The pointed arrows (graphs) show liquidity provision operations (i.e. repo transactions), while the blocks represent tiers of market participants. The directed graph shows cash flows in the overnight bond segment, totalling about 424.2 billion roubles. The percentage values reflect shares of these cash flows in the total bond segment of the overnight market. The closed graph means that the trade is transacted between dealers (clients) from the same tier.

The average ***maximum length of the transmission chain*** (see Glossary) declined in the second quarter of 2012 to 2.74 (-13.3% compared with the first quarter 2012). In a number of cases, the transmission chain was as short as two liquidity transmissions, i.e. when liquid funds were transferred from tier zero to tier 2 at maximum. In most cases, the chain was three links long. During financial stress episodes, for example, on certain days in October–November 2011, the market shrank to three tiers (from tier zero to tier 2), while in normal conditions the market operated across five tiers (February 2012).

In May-June 2012, the ***average-weighted length of the transmission chain*** was below the average length of the chain, driven by high trading volumes in lower tiers (in this case, between tier zero and tier one). A similar situation was observed in the fourth quarter of 2011, when the difference between the transmission chain lengths (Chart 4.2, right-hand axis) took low values (lower than a median value of -0.2). This implies that lower tier trade dominates the market, and the transmission mechanism performs weaker, signalling short liquidity in the money market.

Contributors to this decline in the transmission chain length were diverse, i.e.: reduced available collateral for potential borrowers, liquidity hoarding by lenders who needed liquidity for themselves and wanted to build liquidity buffers, revised counterparty limits, dislodgement of pledged collateral from the inter-dealer market toward the Bank of Russia (substitution effect), risk management constraints imposed on treasury departments of banks, etc. In combination with other developments, the transmission chain shortening may suggest aggravating liquidity shortages and shrinking space for liquidity redistribution among market participants.

Chart 4.2. Transmission chain length in the overnight bond segment



Average-weighted interest rates at each tier of liquidity distribution show the average rate (with regard to volumes of transactions) of borrowing for this tier. In May 2012, liquidity conditions changed, triggering significant hikes in rates for transactions, excluding the Bank of Russia. The situation was further aggravated by the fact that some banks for a number of reasons did not have direct access to the lender of last resort, in particular, due to their lack of adequate collateral from the Lombard List. Therefore, to support their liquidity, some banks had to borrow at elevated rates, higher than the central bank fixed repo rate (6.25%). In addition, one reason behind the liquidity squeeze in May 2012 was the rouble's temporary depreciation, leading to conversions of rouble liquidity into foreign exchange and rising rouble interest rates.

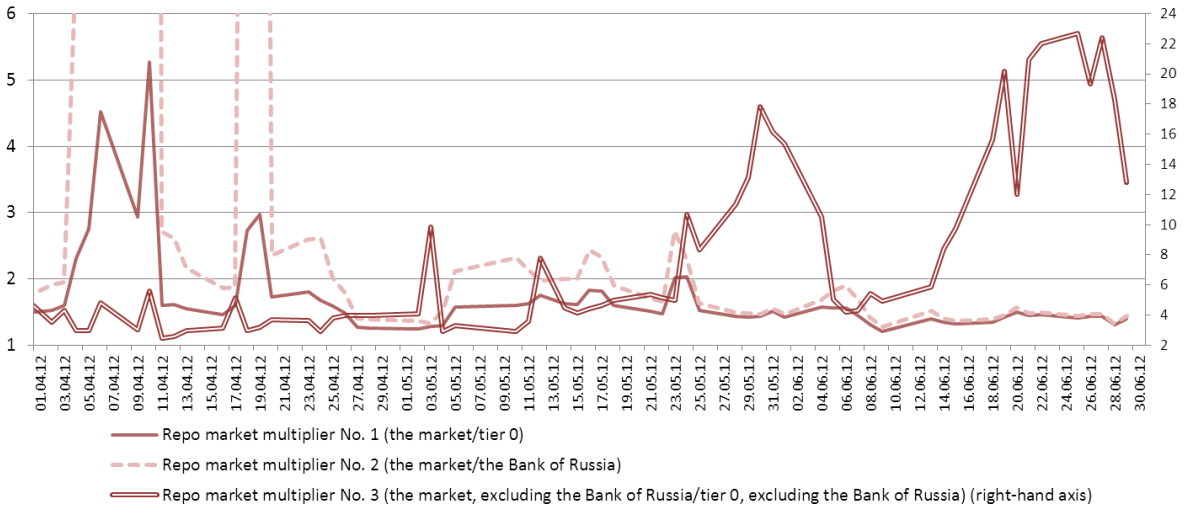
Table 4.2. Average-weighted overnight interest rates by tier

Period	1 tier		2 tier	3 tier	Total
	Bank of Russia operations, separately	excluding Bank of Russia operations		and above	for the overnight segment
January 2012	6.00%	5.51%	5.13%	4.86%	5.65%
February 2012	5.44%	4.92%	4.64%	4.18%	4.92%
March 2012	5.32%	5.44%	4.97%	4.19%	5.33%
April 2012	5.55%	5.74%	5.72%	5.55%	5.57%
May 2012	5.48%	6.10%	6.35%	6.40%	5.76%
June 2012	5.34%	6.04%	6.25%	5.28%	5.58%

In May-April 2012, as the Bank of Russia was building up its overnight repo liquidity provision, the values of ***repo market multiplier No. 1*** (ratio of the total market size to tier zero total trade) and ***repo market multiplier No. 2*** (ratio of the total market size to liquidity provided by the Bank of Russia), disregarding outliers, gradually converged by the end of the period under review. Their values did not exceed 1.5 as of June 29, 2012, which is explained by the overall market contraction and concentration of total trade between the Bank of Russia and tier one banks. Accordingly, as the number of tier zero banks and their trade declined, ***repo market multiplier No. 3*** (ratio of the total market size, excluding the Bank of Russia, to tier zero size, excluding the Bank of Russia) increased to reach its all-time high[4] of 22.7.

[4] Period of observation since September 2011 to the present day.

Chart 4.3. Multipliers for the overnight bond segment



Following a decline, the ***intermediation ratio*** (net liquidity borrowings by a tier to its total trade) started rising again in the second quarter 2012, indicating that tier one resumed liquidity accumulation. Tier two banks were borrowing more than lending in the overnight market in May 2012, while showing an overall net outflow of funds, except for periods of tight liquidity.

Table 4.3. Average-weighted intermediation ratio for tiers one and two

Period	Tier 1		Tier 2	
	banks	non-banks	banks	non-banks
January 2012	0.72	0.66	-0.78	0.51
February 2012	0.61	0.73	-0.88	-0.06
March 2012	0.59	0.79	-0.86	0.05
April 2012	0.51	0.82	-0.83	0.54
May 2012	0.57	0.85	0.26	0.60
June 2012	0.69	0.78	-0.38	0.55

5. LIQUIDITY TRANSMISSION IN THE OVERNIGHT SEGMENT OF THE INTER-DEALER REPO MARKET, EXCLUDING BANK OF RUSSIA OPERATIONS

This section presents the results of the liquidity transmission analysis as applied to the overnight segment of the inter-dealer bond repo market, ***excluding Bank of Russia operations***. This approach features a revised tiering of dealers and revised financial linkages between market participants.

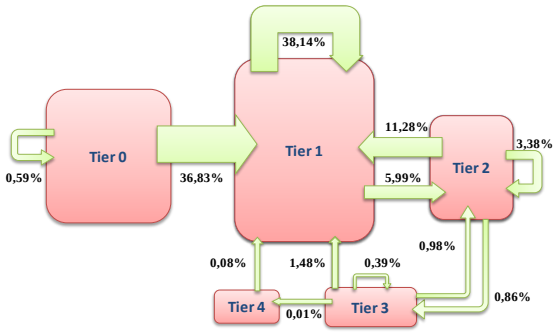
Modified liquidity transmission analysis

To produce a more detailed and profound analysis of intra-market linkages, we excluded the impact of the creditor of last resort on repo market performance. Thus, we excluded all transactions with the Bank of Russia from our analysis, while tiering the market on the basis of the remaining inter-dealer repo transactions. Therefore, according to this approach, tier zero will include all the market lenders (buyers of securities), excluding the Bank of Russia, who never act as borrowers (sellers of securities). If one broker acts on behalf of the lender and the borrower in one transaction, this broker will be classified in tier zero. Tier one includes borrowers (sellers) engaged in repos with tier zero participants. Market participants' affiliation to further tiers is determined by iteration: any successive tier will accommodate borrowers engaging in repo transactions with lenders from the preceding tier. If a borrower engages in repo trade with lenders from various tiers, this borrower will be classified into the tier of the lowest possible number.

The general picture of the inter-dealer market liquidity allocation in the second quarter 2012 is presented in Chart 5.1. While the number of tiers increases to 4, but, similar to the previous approach (including Bank of Russia operations), the bulk of liquidity accumulates in tier 1 (49.67% come from other tiers and 38.14% are redistributed among tier 1 participants). The average maximum dealer's tier is 3.05, which is higher than when the Bank of Russia is involved, suggesting that the Bank of Russia is the only tier 1 lender for many market participants.

The average daily value of inter-dealer repo market open positions was 178.1 billion roubles. The market activity peaked[5] in February 2012 at 250.0 billion roubles, while in the second quarter of 2012 the inter-dealer market trade contracted to 215.4 billion roubles in April, 156.0 billion roubles in May and 162.0 billion roubles in June.

Chart 5.1. Liquidity allocation in the overnight inter-dealer repo market (excluding the Bank of Russia) in the second quarter 2012



Note. The directed graph shows cash flows in the overnight bond segment, excluding Bank of Russia operations. The average daily trade stands at about 178.1 billion roubles. Percentages reflect the share of a cash flow in the total value of the overnight bond segment trade. The closed graph indicates that the trade is transacted between dealers (clients) from the same tier.

[5] Period of observation since September 2011 to June 2012.

The difference in estimated values of the ***transmission chain length*** under the two frameworks described above is a direct function of market conditions and volumes of Bank of Russia operations. In February 2012, when central bank involvement was minimal, both approaches showed a largely coinciding distribution of participants by tiers. As the liquidity strain intensified, the length of the chain, including Bank of Russia operations, shortened abruptly. The Chart below shows that in most cases, the chain, excluding Bank of Russia operations, is shorter than the chain, including those, as the latter case involves a massive shift of trade toward tier zero (Chart 5.2). The values of the spread between the average and average-weighted lengths of the chains follow a similar pattern. A noticeable difference between the two values is observed in late December 2011, in early and in late May 2012, and in the second half of June 2012 (Chart 5.3).

Chart 5.2. Average-weighted length of the transmission chain in the overnight bond segment

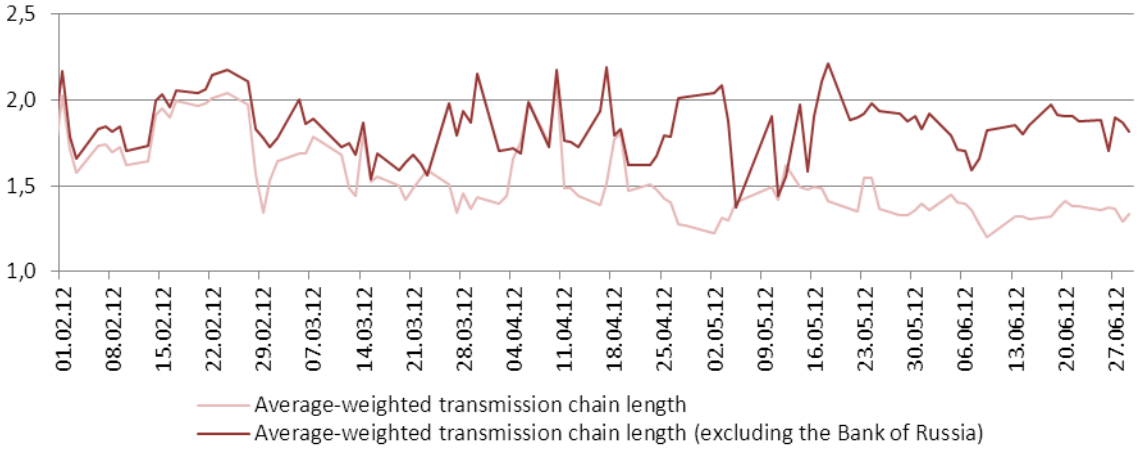
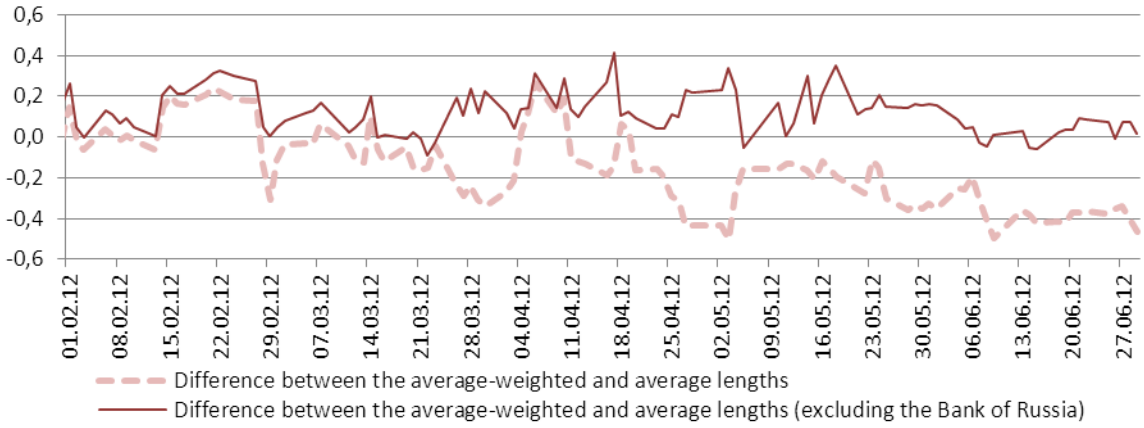
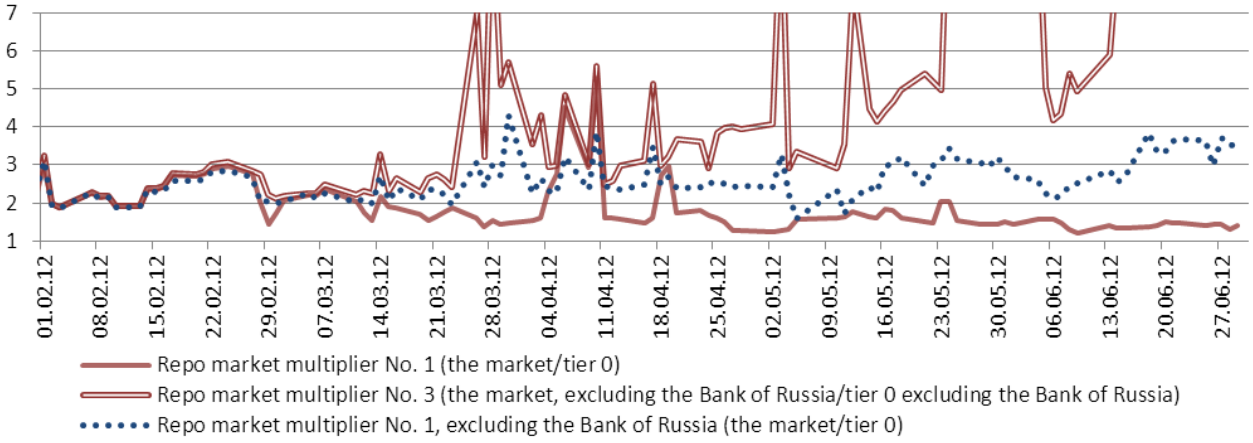


Chart 5.3. Spread between the average and average-weighted length of the transmission chain in the overnight bond segment



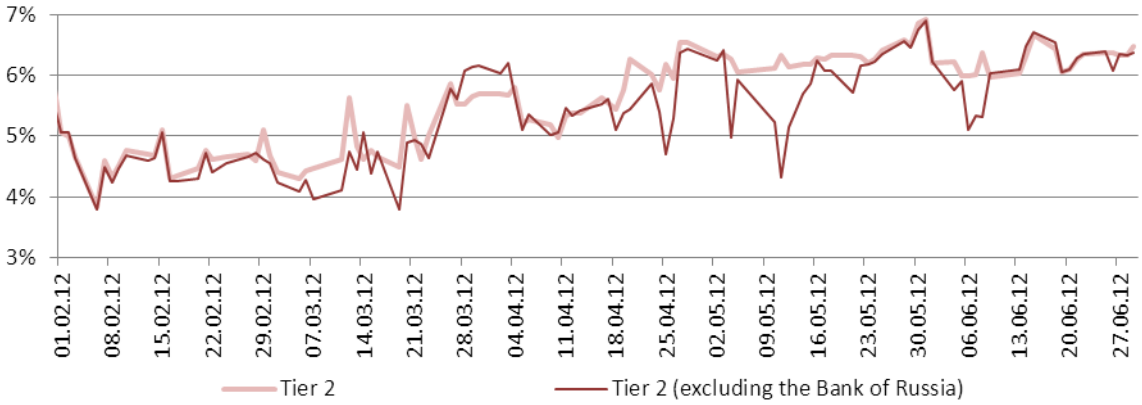
In both frameworks, the multipliers for the ratio of the market size to tier zero trade behaved similarly in February 2012, due to small volumes of operations with the Bank of Russia. In the following months, however, the multipliers showed widely different values due to the Bank of Russia's active presence in the market. However, the rise and fall of the ***repo market multiplier No. 1*** (ratio of the total market size to tier zero trade) in the framework "excluding the Bank of Russia" coincide with the changes in the ***repo market multiplier No. 3*** (ratio of the market size, excluding the Bank of Russia, to tier zero, trade excluding the Bank of Russia) in the framework "including the Bank of Russia", while varying in amplitude. Multiplier No. 1 "excluding the Bank of Russia" showed a marginal increase in inter-dealer repo market activity in the second half of May and June 2012 (Chart 5.4).

Chart 5.4. Multipliers for the overnight bond segment



The borrowing rates at tier one virtually coincide with tier one interest rates under the first approach (Chart 5.5, interest rates at tier one, excluding Bank of Russia operations) throughout the period under review. For tier two, the interest rates differ, and their values were lower in a number of cases than under the first framework (for the market, including the Bank of Russia). In most cases, this was due to some tier one banks moving to tier two as a result of the changed approach.

Chart 5.5. Average-weighted interest rate in the tier two overnight segment

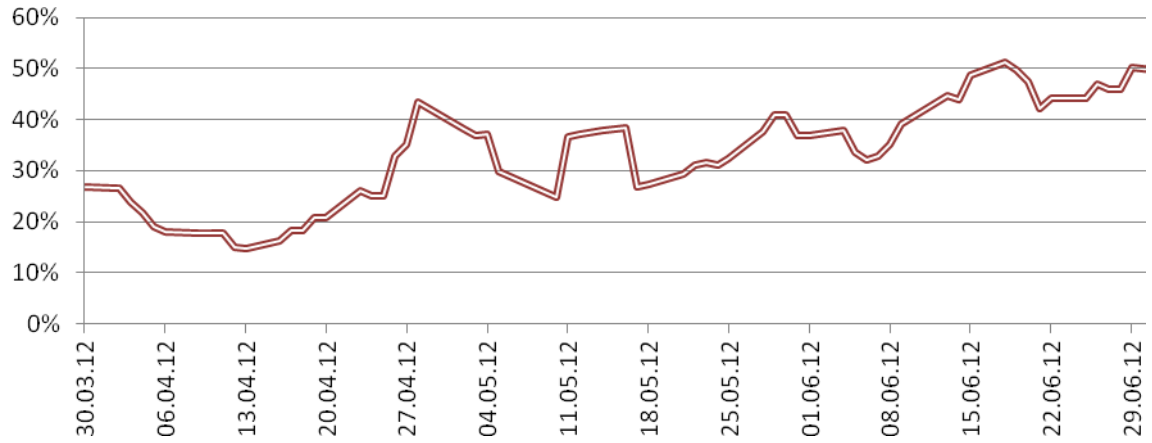


6. BANKING SECTOR CAPACITY FOR BANK OF RUSSIA REFINANCING AGAINST MARKETABLE ASSETS

As refinancing volumes increased in the second quarter of 2012, the Financial Stability Department embarked on regular evaluations of funding capacity of credit institutions using marketable assets as collateral. For this purpose, we use the so called «marketable collateral utilisation ratio» for repo transactions (hereinafter utilisation ratio). This rate reflects a ratio of the credit institutions' total repo debt to the Bank of Russia across all maturities to the total collateral available to credit institutions. A rise in the utilisation ratio indicates that the share of securities not utilized in Bank of Russia repo operations is declining in the total pool of available collateral. A high value of the utilisation ratio suggests a shortage of collateral in the banking sector, potentially leading to higher money market rates and current liquidity management problems. In fact, some participants may face liquidity problems even when the utilisation ratio is significantly lower than one, due to uneven allocation of collateral.

As suggested by the utilisation ratio approach, its value is determined by two key factors, i.e. the size and composition of securities portfolios held by credit institutions, and the size of their repo debt to the Bank of Russia (both exchange-traded and OTC). During the period under review, the repo debt of credit institutions to the Bank of Russia showed quite strong intra-month cyclical fluctuations (from 0.4 to 1.5 trillion roubles). Compared to the value of debt, the value of available collateral showed much smoother dynamics.

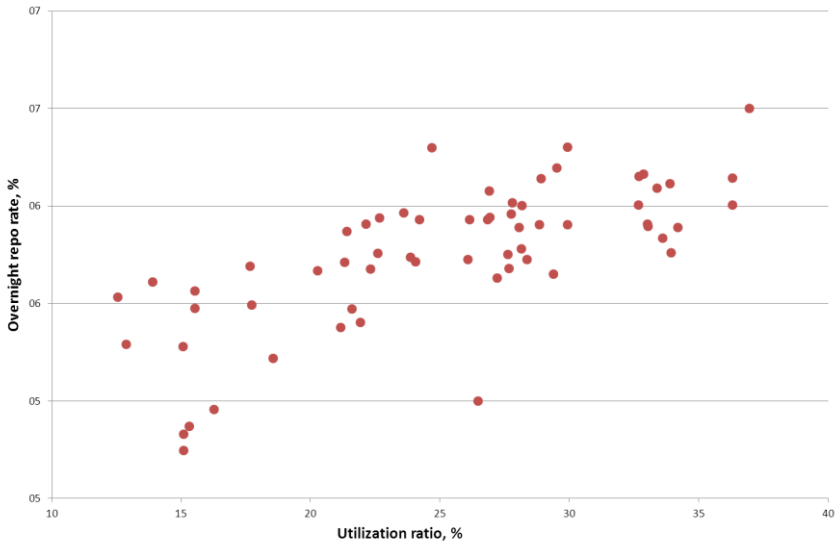
Chart 6.1. Utilisation ratio dynamics in the second quarter of 2012



Throughout the second quarter, the utilisation ratio followed a rising trend, because the repo debt of credit institutions to the Bank of Russia grew faster than their available collateral. The utilisation ratio peaked on June 18, 2012, marginally exceeding 50%. Therefore, notwithstanding the strong expansion of repo debt to the Bank of Russia, overall, looking across all the refinancing instruments, the banking sector retains adequate collateral to sustain normal operation of the money market.

Overall, the second quarter of 2012 saw a positive relationship between the utilisation ratio and the overnight repo rate (Chart 6.2). Therefore, a higher value of the utilisation ratio signals tighter money market conditions.

Chart 6.2. Utilisation ratio and overnight repo rate, second quarter of 2012



According to preliminary estimates, the value of eligible collateral held by credit institutions (adjusted by Bank of Russia repo haircuts) increased by 14% in the second quarter of 2012. This was largely due to the expansion of the range of securities accepted by the Bank of Russia as eligible collateral for its repo transactions. Specifically, on May 22, 2012, the Bank of Russia resumed its repo operations collateralised by equities of Russian non-financial companies. Adjusting for equity repo haircuts, this facility will allow credit institutions to borrow an additional 0.24 trillion roubles (net of transfers of equity stakes on the banks' books from other professional participants of the securities market).

Table 6.1. Some value indicators of collateral available to banks, as of June 2012, trillion roubles

Collateral	Free float	On the books of the banking sector	On the books of the banking sector (conservative estimate)
Debt securities	6.0	3.1	2.7
Equity securities	4.2	0.24	0.2
TOTAL	**9.2**	**3.34**	**2.9**

Note: the above values have been calculated with regard to the Bank of Russia repo haircuts; the conservative estimate recognises that some collateral is held by banks not engaged in repo transactions with the Bank of Russia (the observation period covers the second quarter of 2012).

7. BANK OF RUSSIA RESUMES EQUITY REPOS

Starting from May 22, 2012, the Bank of Russia resumed its repo operations using equities of Russian non-financial corporations. Before the financial crisis of 2008-2009, the Bank of Russia accepted only government securities, regional and municipal government bonds, Bank of Russia bonds, mortgage bonds and rouble-denominated corporate bonds as eligible collateral for its repo operations. Eligible securities were selected with regard to credit quality, high liquidity and low volatility of interest rates, striking a balance between reliable and smooth refinancing against financially sound assets and minimising Bank of Russia credit risk. Further on, as this instrument evolved, the Bank of Russia gradually extended the list of eligible collateral.

In 2008, in response to banking community initiatives, and as a temporary anti-crisis measure, the Bank of Russia started regular OTC repo operations secured by corporate Eurobonds. Then, in 2009-2010, as part of its crisis support to the banking sector, it recognised equities as collateral for repo transactions. On February 26, 2009, MICEX launched Bank of Russia repo transactions secured by Lombard List equities. However, throughout the whole period when this liquidity support instrument was available, the banking sector did not show any non-trivial demand for it. As the financial markets improved, the Bank of Russia suspended its repo transactions collateralised by Russian equities.

In May 2012, the Bank of Russia resumed its exchange-traded equity repos driven by the need to expand marketable collateral for the banking sector to use. The instrument is seen as a temporary stabilising measure.

The current parameters of equity repos provide ample funding opportunities for the banking sector. The Bank of Russia list of eligible collateral included 104 issues by 43 corporations as of the end of June 2012. Selection criteria were mixed, guided by both the crisis response experience with regard to the Russian Government's recommendations in 2008-2009, and the current composition of the MICEX and RTS stock indices, which include equities by issuers having the largest market capitalisation (see Terms of Bank of Russia's Equity Repos). According to Financial Stability Department's estimates, the total free float value of equities on the Lombard List stood at 7.6 trillion roubles in June 2012. The current market value of equity portfolios (from the Lombard List) on the books of banks is estimated at 440 billion roubles. Adjusting for haircuts, the banks will be able to borrow about 240 billion roubles against these equities. Currently, this amount is perceived as a realistic estimate of the maximum possible equity-secured refinancing. The actual value of provided liquidity may be lower (as supported by equity repo statistics, see below). In case of a systemic liquidity crisis, banks, on top of pledging their own equity portfolios, may resort to asset swaps and raise collateral from affiliated investment companies and other non-bank financial intermediaries with sizeable equity stocks.

Terms of Bank of Russia's Equity Repos

List of issuers recognised as eligible collateral originators for Bank of Russia repo operations, as of June 26, 2012:

Acron (OAO)
ANK Bashneft (OAO)
AFK Sistema (OAO)
Aeroflot (OAO)
Gazprom (OAO)
Gazprom Neft (OAO)
GMK Norilsk Nickel (OAO)
PIK Group (OAO)
LSR Group (OAO)
DIXI Group (OAO)
INTER RAO UES (OAO)
Irkutskenergo (OAO)
KAMAZ (OAO)
M.Video (OAO)
VSMPO-AVISMA Corporation (OAO)
Lukoil (OAO)
Magnit (OAO)
Mechel (OAO)
MMK (OAO)
Mostotrest (OAO)
Mosenergo (OAO)
MOESK (OAO)
MTS (OAO)
NLMK (OAO)
NOVATEK (OAO)
Novorossiysk commercial sea port (OAO)
OGK-1 (OAO)
OGK-2 (OAO)
Raspadskaya (OAO)
Rosneft (OAO)
Rostelecom (OAO)
RusHydro (OAO)
Severstal (OAO)
Surgutneftegaz (OAO)
Tatneft (OAO)
TNK-BP Holding (OAO)
Transneft (OAO)
Uralkali (OAO)
Pharmstandard (OAO)
FSK UES (OAO)
MRSK Holding (OAO)
E.ON Russia (OAO)

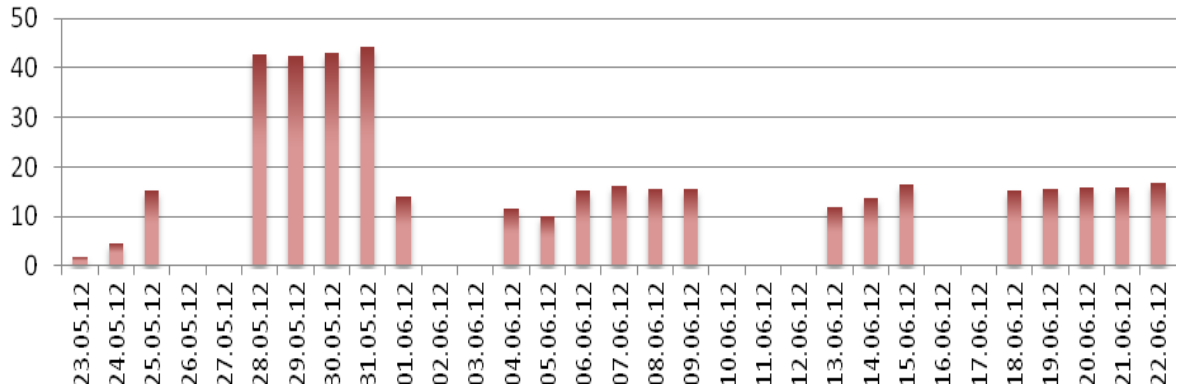
Table 7.1. Types of haircuts for Bank of Russia equity repos, as of June 26, 2012

Repo maturity	Type of haircut	Haircut, %
Up to 6 days	initial	45
	minimum	—
	maximum	—
From 7 to 14 days	initial	45
	minimum	35
	maximum	55
From 15 to 120 days	initial	45
	minimum	35
	maximum	55
From 121 to 200 days	initial	45
	minimum	35
	maximum	55
From 201 to 365 days	initial	45
	minimum	35
	maximum	55

Given that the Bank of Russia is willing to eventually view its one-week repos as a key repo instrument and is trying to provide maximum liquidity via this facility, equity haircuts were set on the basis of projected potential weekly volatility of equity prices. The maximum drop in value of pledged equities is estimated at 45% (see Terms of Bank of Russia Equity Repos). The above haircut seems quite a conservative estimate, to insure the Bank of Russia against potential losses given that the average-weighted haircut for inter-dealer equity repos with maturities up to one week is at about 20% (though in February 2012 it was as high as 33%). We did not differentiate haircuts by issuer because any information about regulator assessment of stock market risk may distort market pricing of equities.

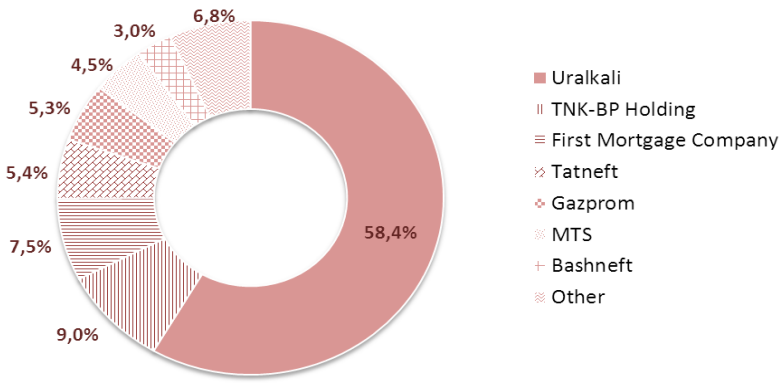
In contrast to 2009-11, banks showed strong demand for equity repos in the second quarter of 2012. On the very first day after the Bank of Russia announced the launch of this facility, the total trade amounted to 1.7 billion roubles. On some peak days (month ends – time for tax payments), open positions were as high as 44 billion roubles, while normally they would be in the range of 16 to 19 billion roubles (Chart 7.1).

Chart 7.1. Equity repos in the second quarter of 2012, billion roubles



At present, equity repos remain no more than an auxiliary instrument for a small group of credit institutions. A structural analysis of borrowers shows that two banks benefited from this new facility, taking up 72% of the total liquidity injection via equity repos in the second quarter of 2012. These two banks come from the top 30 by assets. Consequently, this new instrument can hardly be classified as conventional. It is likely to be in more demand in times of financial trouble. All in all, only 24 credit institutions resorted to equity repos.

Chart 7.2. Collateral backing equity repos by issuer in the second quarter of 2012, %



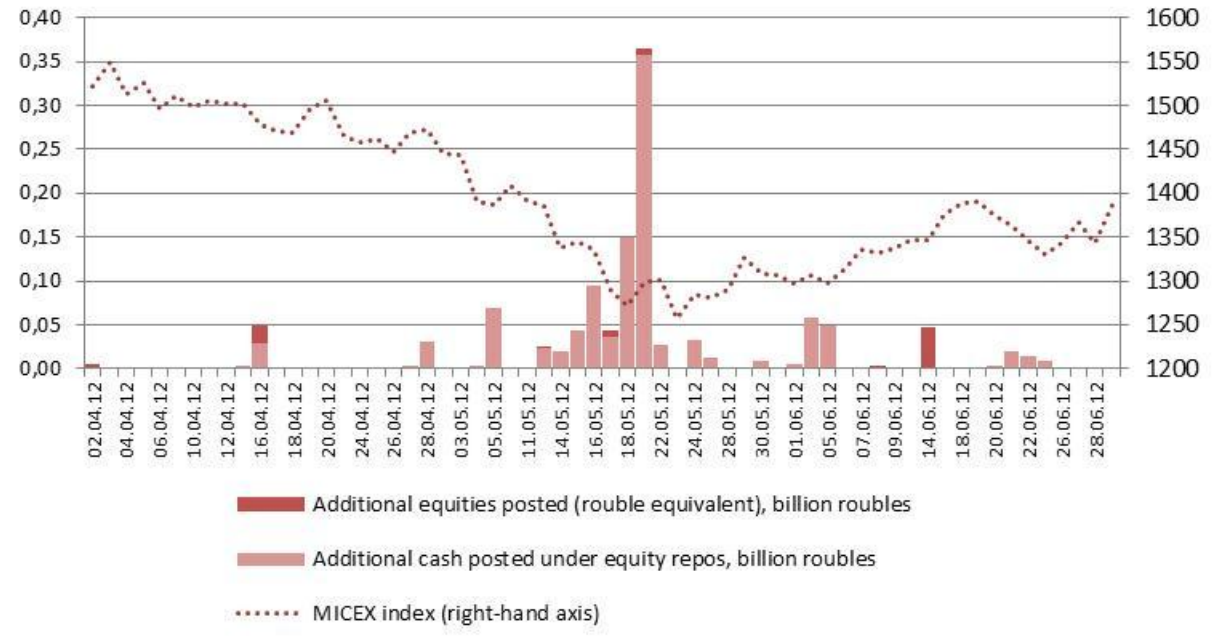
The renewal of equity-backed transactions by the Bank of Russia during the reporting period had a neutral effect on the inter-dealer repo market. The primary reason is insignificant volume of trade. The inter-dealer equity repo segment maintains a relatively steady outstanding value, fluctuating in the range of 130-135 billion roubles. Therefore, Bank of Russia equity repos took up no more than 15% of the inter-dealer market. They partially offset the contraction of the inter-dealer equity repo segment caused by the tumbling stock indices in the spring of 2012. Despite a relatively low interest of banks in equity repos, they remain attractive as a price arbitrage opportunity. While the Bank of Russia repo fixed rate is 6.25%, the inter-dealer equity repo rate was hovering around 6.9% in the second quarter of 2012.

8. MARGIN CALL

If the value of the repo collateral declines, the borrower will be required to deposit additional funds to offset a potential or actual collateral shortage (margin call, see Glossary). The total value of such margin calls in the inter-dealer repo market was under 1 billion roubles in the second quarter of 2012 versus the total market size of about 400 billion roubles.

When the stock index and the bond index are declining borrowers are forced to offset their pledged securities' devaluation by placing funds to the margin account. And, vice-versa, when the value of the collateral rises, the lender will refund some securities to the borrower (Chart 8.1).

Chart 8.1. MICEX stock indces and equity repo margin calls



Margin calls are not used for overnight transactions in the inter-dealer repo market. Given that overnight repos dominate the market, margin call risks in the repo market are perceived as limited. Moreover, the underlying collateral for the transactions subject to margin calls included highly liquid securities of sound issuers (Chart 8.2). Should the borrower fail to meet the margin call such securities may be easily sold by the lender in the stock market.

Chart 8.2. Repo margin calls by issuer of collateral, %

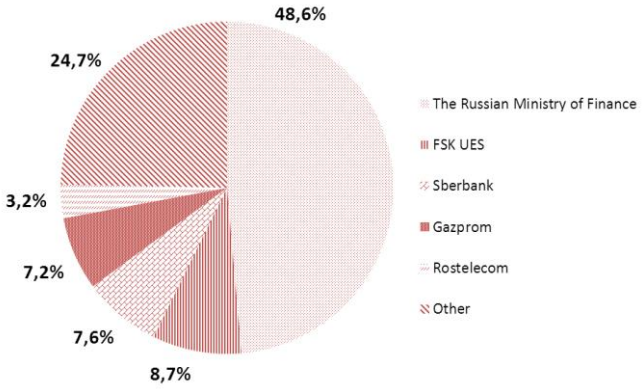


Table 8.1 presents haircuts (margins) by type of collateral, for the repo transactions that triggered margin calls, and had the minimum haircut (margin) requirement determined. Since this sample does not include overnight transactions (not subject to margin calls), the haircuts given in the table are higher than the average market haircuts for respective types of securities.

Given that in the second quarter of 2012 margin calls happened in a relatively stable inter-dealer repo market, market participants may find it reasonable to revise repo haircuts to make sure that the market risk is fully covered. The average haircut and the minimum haircut may be adjusted to widen the gap between them. In the second half of the quarter, the haircuts increased reflecting elevated risks in the period under review.

Table 8.1. Repo haircuts for various types of collateral (average for the second quarter of 2012, for transactions with specified minimum haircuts).

Type of securities	Value of margin call, billion roubles	Average haircut, %	Average minimum haircut, %
Preferred equities	0.002	27.193	19.434
Common equities	0.015	26.335	19.501
Government bonds	0.021	9.524	5.782
Regional government bonds	0.002	9.138	5.476
Corporate bonds	0.012	14.196	11.270
Exchange bonds	0.002	15.295	12.471

9. SYSTEMIC RISK AND SYSTEMIC IMPORTANCE OF THE INTER-DEALER REPO MARKET PARTICIPANTS

Systemic risk can be measured by a variety of methods. For example, in June 2012, Bank of Finland's Institute for Economies in Transition published a paper by I. Andrievskaya (an economist of Russian origin working at the Verona University, Italy), which measures individual banks' contribution to variation of the aggregate liquidity surplus in the banking system using Independent Component Analysis. The author's methodology allows indirect measurement of systemic liquidity risk (see box below: Assessment of Systemic Funding liquidity Risk in the Russian Banking Sector). This approach assumes unobservable linkages among market participants, creating potential risks for other participants in case of individual liquidity shocks. However, it remains unknown how an individual liquidity shock ripples through the banking sector evolving into a systemic shock. And still, this approach, coupled with other indicators and models, may be useful for systemic analysis.

While assessing systemic liquidity risk, the Financial Stability Department (FSD) relies on several alternative methods allowing both indirect and direct evaluation of systemic risks. These methods include financial soundness indicators (liquidity ratios), systemic liquidity risk index (arbitrage relationships), the N2 liquidity ratio, stress testing for liquidity risk and the network analysis of shocks in the money market. This inter-dealer repo market report presents results of FSD analysis using the Shapley Value approach. This approach allows to measure systemic importance of each market participant for the overall financial system[6]. The Shapley Value helps to directly assess systemic liquidity risk via counterparty intra-market linkages as an amount in roubles that market players are set to lose in case of each financial institution's default.

The analysis suggests that in the second quarter of 2012, the maximum contribution to total losses of the financial system (including both banks and non-banks) from the leading systemically important market participant was in the range of 4.8 to 13.2 billion roubles. As of the end of the second quarter of 2012, it stood at 5.2 billion roubles. Thus, the total losses of the financial system caused by a default of its leading systemically important participant may amount to about 5.2 billion roubles within one month. The value of 'top three contributions to the total losses of the financial system' indicator was in the range between 9.4 and 23.2 billion roubles, reaching 10.7 billion roubles by the end of the second quarter. The value of 'top ten contributions to the total losses of the financial system' indicator was in the range of 14.3 to 46.7 billion roubles, reaching 17.2 billion roubles by the end of the quarter. All the three indicators peaked during the last week of April. Following that, they declined to the second-quarter lows by the last week of May to pick up marginally afterwards.

[6] See a brief description of the approach in the Inter-dealer Repo Market Report for First Quarter, 2012, p. 33. For a complete description please see Моисеев С.Р., Снегова Е.А. Системная значимость участников денежного рынка // Банковское дело, 2012. - №3. – с. 24-29.

Assessment of Systemic Funding Liquidity Risk in the Russian Banking Sector

In June 2012, the Bank of Finland Institute for Economies in Transition published a study on measuring systemic funding liquidity risk and identifying systemically important banks in the Russian banking sector[7]. To identify liquidity risk and systemically relevant institutions, the author suggests deriving the relative and the absolute liquidity balances. The first measure is a ratio of highly liquid assets to short-term liabilities (up to 30 days), while the second indicator is derived as their difference.

Systemic funding liquidity risk is understood as the banking system's potential to fall below its critical level of the relative liquidity balance (this critical level is assumed to equal one). Identification of systemically important banks is based on their contribution to the variation of the aggregate liquidity level of the banking system.

The author applies this methodology to analysing liquidity in the Russian banking system, which was marked by a high level of risk in late 2011. The analysis is based on the monthly financial statements of the 268 largest commercial banks for the period January 2007–December 2011, with assets accounting for 90% of banking sector total assets.

The results reveal that during the period since January 2007 through November 2011 the systemic liquidity risk was at its highest in August 2008 (1.009). It may be noteworthy that in the last month of the period analysed the relative liquidity balance was close to the level observed in August 2008. Then, the author turns to the analysis of the systemic funding liquidity risk in the banking system. In December 2011, the conditional probability that the liquidity balance could fall to the critical level equalled 28%. According to the author, this suggests a high level of risk in the banking sector.

Proceeding from each bank's contribution to the variation of the system's liquidity balance, the author identifies ten systemically important banks. Six of them are directly or indirectly government-owned (Sberbank, VTB, Gazprombank, Bank of Moscow, Russian Agricultural Bank and VTB24), three banks are foreign-owned (Raiffeisenbank, Rosbank and UniCredit Bank), and one bank is private – Promsvyazbank. These banks are characterised by relatively small liquidity surpluses.

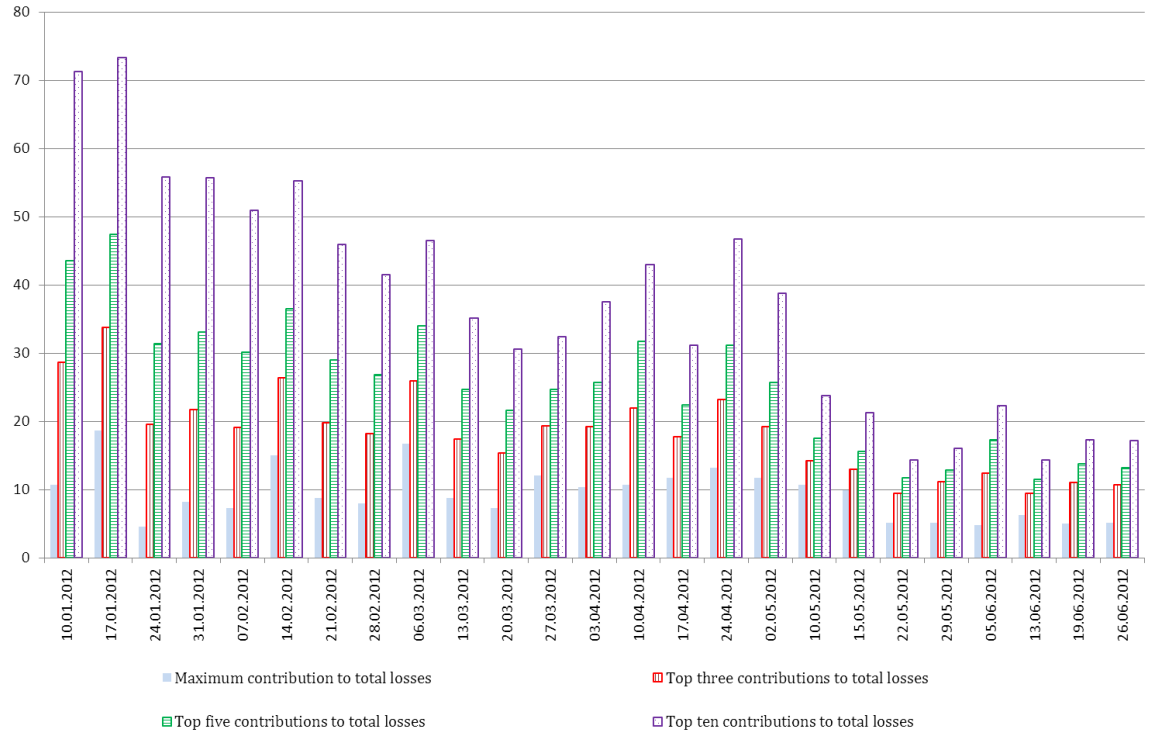
The author also notes that there are banks which have a countercyclical effect on the system's liquidity level. These banks are typically small domestic banks with relatively high values of their liquidity surplus (consistently above 1, and often in the range of 5-10). These banks cannot rely on a parent company or the government for liquidity support. The author argues that these banks retain excess liquidity as insurance against a crisis.

The author concludes that large government-owned and foreign banks were the major contributors to system liquidity conditions. During the recent financial crisis of 2008-2009, these banks (especially the banks with direct or indirect government stakes) received substantial liquidity support from the government. Therefore, the author recommends stricter requirements for these banks, including tighter capital and liquidity requirements, to reduce the impact of liquidity problems on the economy as a whole.

[7] Andrievskaya I. Measuring systemic funding liquidity risk in the Russian banking system. BOFIT Discussion Papers No. 12, 2012.

The second quarter declining trend for systemic risk may be accounted for by two reasons. First, repo trade contracted by 15% during the second quarter. In other words, the market size and the values of cross-positions contracted. Second, liquidity shortages resulted in shrinking inter-dealer linkages, suggesting weaker mutual counterparty dependence. Overall, the share of net lender operations (excluding the Bank of Russia) in the total repo market (excluding the Bank of Russia) decreased by 30%.[8] Meanwhile, the share of five market participants falling in the top ten player group (top ten contributors to the total loss of the financial system) increased.

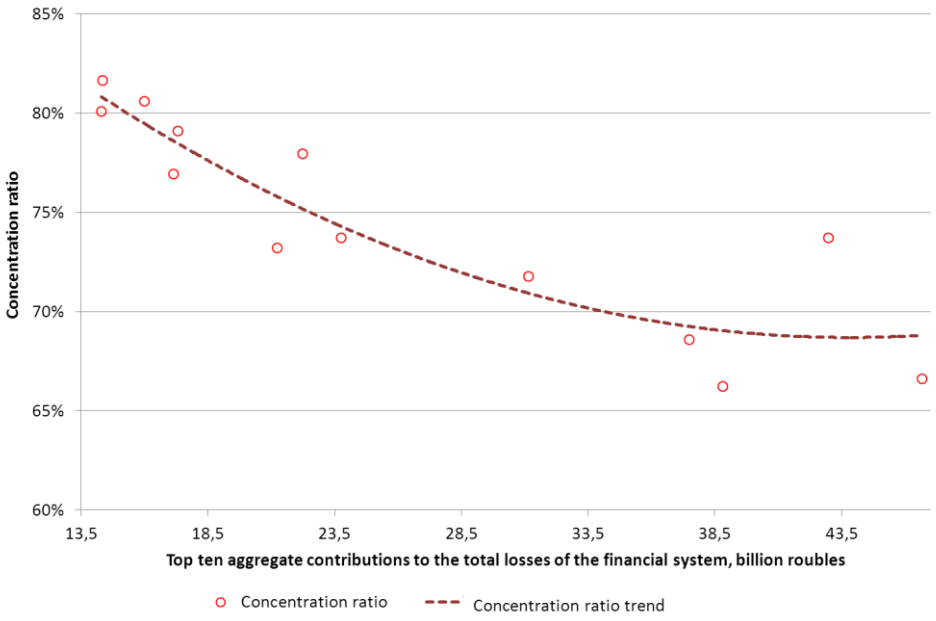
Chart 9.1. Shapley Value weekly dynamics in the first half of 2012 (potential contributions of market participants to the total losses of the financial system if counterparties holding homogeneous securities portfolios default), billion roubles



It should be noted that the average quarterly value of the top three contributions to the total losses of the financial system dropped by 33% in the second quarter compared to the first quarter, while the average quarterly value of the top ten contributions collapsed by 40%. As potential loss assessment declined within the quarter, risk concentration for the key repo players increased. Specifically, this may be illustrated by the concentration ratio movement (a ratio of the "top five contributions to the total losses of the financial system" to the "top ten contributions to the total losses of the financial system"). The correlation between the concentration ratio and the "top aggregate contributions to the system's losses" may be seen in Chart 9.2. It shows that the system risk decline in the second quarter of 2012 is accompanied by risk concentration of the top five contributors to system risks. The top ten systemically important players are quite stable. If we look at two consecutive banking days, 7.2 group members will coincide on average (looking at the total period of observation, at least 4 systemically important participants will coincide). Therefore, we may identify two related trends, impacted by market structure developments, i.e.: reduced systemic risk and enhanced systemic importance of individual primary dealers.

[8] The share of net lending operations (excluding the Bank of Russia) in total repo market trade (excluding the Bank of Russia) equals the repo market multiplier No. 3 (see Box Conceptual Framework for Liquidity Transmission Analysis in the Inter-Dealer Repo Market Report for the First Quarter 2012, pp. 26-27).

Chart 9.2. Correlation between the concentration ratio (ratio of the top five aggregate contributions to top ten aggregate contributions to the total losses of the financial system) and the top ten aggregate contributions to the system's total losses as observed in the second quarter of 2012



10. STRESS TESTING OF THE INTER-DEALER REPO MARKET

Stress testing of the repo market is an aggregated stress test measuring the impact of stock market shocks on each market participant, to be further aggregated to get an estimate of a total impact of the financial turbulence on the entire sector. The shock is assumed as a collapse in prices of financial assets used as collateral for inter-dealer repo transactions[9]. Declining collateral value leads to increased probability of default under the second leg of the repo transaction (repurchase of securities and repayment of cash). If the price of the collateral drops lower than the monetary liabilities as a result of the price shock, at the microlevel, the borrower will be facing two problems: loss of liquidity preventing him from meeting margin calls and loss of capital resulting from negative revaluation of the stock market portfolio. Moreover, at the macrolevel, if stock market indices collapse, this may trigger mass defaults in the inter-dealer repo market[10].

The inter-dealer repo market stress test used data as of the end of the second quarter 2012. The test covered 6,214 transactions (of 7,367) for a total value of 314.8 billion roubles (of 418.7 billion roubles). Some transactions were excluded because of their illiquid collateral (for these transactions, any appropriate valuation of the underlying collateral seemed impracticable). The total value of defaulted transactions (when the value of the collateral fell below the size of the debt as a result of the shock, as of the date of stress testing) amounted to 102.9 billion roubles (1/3 of the registered market size), with the number of such transactions at 3,928, and the inadequacy of collateral (difference between the value of the collateral and the value of the second leg of the transaction, total for all the defaulted transactions) at 6.9 billion roubles. The stress testing did not take into account Bank of Russia repo operations.

The large value and number of defaulted transactions reflect the strength of the simulated shock (looking ahead, shock simulation algorithms will be further elaborated and enhanced[11]), while the relatively small shortage of collateral suggests the market haircuts are largely adequate. This value is insignificant for the banking sector, given that its 2012 profits are projected by the Financial Stability Department at 1 trillion roubles. The stress-test results have marginally improved from the previous quarter (Table 10.1), partly due to the inter-dealer repo market contraction. Indeed, the contraction of outstanding contract values entailed contraction of potential mutual non-payments.

Table 10.1. Comparative results of the inter-dealer repo market stress tests in the first and the second quarters of 2012

Parameter	first quarter	second quarter
Market size, billion roubles	519.1	418.7
Number of transactions	8,106	7,367
Registered value of transactions, billion roubles	361.5	314.8
Registered number of transactions	6,561	6,214
Value of defaulted transactions, billion roubles	114	102.9
Number of defaulted transactions	3,898	3,928
Collateral shortage, billion roubles	8.2	6.9

[9] In quantitative terms, the size of the shock is simulated by applying the 1 percent historical CVAR (conditional Value at Risk) to the asset price daily variance (in percent). The historical horizon of price behavior observation covers daily stock quotes from 2004 through 2011, which allows considering several periods of financial stress. From each asset's price series, one percent of least values is selected to be used as a basis to calculate their mean value (i.e., conditional VAR). The result is a measure of a potential extreme fall in the asset price within a trading day.

[10] The algorithm of the stress test is outlined in the Inter-Dealer Repo Market Report for First Quarter 2012, pp. 34-35.

[11] Further elaboration of the stress testing methodology is planned to better account for market and credit risk drivers that may potentially increase hypothetical losses of repo market participants.

11. NEW LEGISLATIVE AND INFRASTRUCTURAL MECHANISMS FOR THE REPO MARKET

In early 2011, Federal Law No. 8-FZ of February 7, 2011, "On Amending Some Russian Laws in Line with the Adoption of the Federal Law on Clearing and Clearing Activities" was passed. This law introduced the concepts of close-out netting and of reporting transactions to a trade repository. Close-out netting is a mechanism for determining the value of net liabilities under financial contracts in bankruptcy proceedings. The definition of financial contracts includes repo contracts.

Since 14 May 2012, close-out netting became enforceable to exchange traded repo contracts made in the Moscow Exchange Primary Market sector. For this purpose, an additional section 17 was included in the Clearing Rules for the National Clearing Centre Securities Market Operation, describing procedures of terminating liabilities under financial contracts and determining the size of net liabilities.

OTC repo contracts that are not covered by the clearing rules shall meet the following requirements to qualify for close-out netting:

- ✓ Their repo trade participants should comply with the bankruptcy legislation;
- ✓ They should have a general agreement as required by respective federal legislation;
- ✓ Repo transactions should be reported to a trading repository.

Internationally, a trading repository is normally a systemically important infrastructure entity of the financial market, which maintains a centralised database on transactions in financial instruments. In Russia, a trading repository is being established with a view of creating conditions for financial market participants to use close-out netting, and also for the regulators (FFMS and the Bank of Russia) to monitor systemic risks, analyse financial market conditions and oversee operations of its participants.

Pursuant to a FFMS order, repo market participants will be obliged to report entering into, termination or performance of their transactions within three business days[12]. Should repo market participants fail to report the above information to a trading repository, they would lose access to close-out netting and, moreover, can be made administratively liable for a breach of securities market legislation. The trade repository is expected to be established on the basis of the National Settlement Depository and to start operating since 2013.

[12] FFMS Order No. 11-68/pz-n of December 28, 2011, "On Approving the Order of Keeping of the Register of Agreements Entered into on the Basis of a Master Agreement (Single Agreement), Providing Information Necessary for the Keeping of such Register as well as Information from such Register, and Providing the Register of Agreements Entered into on the Basis of a Master Agreement (Single Agreement) to the Federal Executive Body for the Securities Market".

GLOSSARY

GENERAL CONCEPTS

Basic terms – framework conditions to conclude and execute repo transactions.

Intraday repo – repo transactions with both legs executed within a trading day. Repo maturity is assumed as one day.

Volatility – a quantitative measure of variation in economic variables.

Outstanding repo transaction – a repo transaction with the start leg of the transaction executed and the close leg unexecuted because the term for the close leg has not expired yet.

Dealer – a party (counterparty) to a repo transaction acting either on its own behalf and account or on behalf and for account of clients.

Haircut – a percentage variable reflecting the correlation between the value of the collateral and liabilities discounted by the repo rate.

Duration – the average-weighted time until the redemption of a financial asset (asset portfolio); calculated as a weighted sum total of the asset (asset portfolio) maturities, where the weights are the present values of the shares of the respective payments in the total present value of the asset (asset portfolio).

Margin call – a payment required by the counterparty (buyer) from the seller as a partial prepayment under the closing leg of the repo transaction if the market value of the collateral drops below the required level.

Credit rating – an expert assessment by a rating agency of the borrower's (issuer's) ability and willingness to meet their obligations fully and in time.

Yield curve – a graphic interpretation of the relationship between the yield and the term to maturity of a debt obligation.

Accumulated income under a repo transaction – an estimated value in roubles used to calculate liabilities under a repo transaction.

Collateral (for the purposes of this Report) – securities traded under a repo transaction. Underlying repo collateral shall not include bonds to be redeemed through the execution date of the second leg of the repo transaction, as well as bonds of different issues.

Residual liabilities – liabilities of repo counterparties incurred as a result of a non-executed or unduly executed close leg of a repo transaction. Residual liabilities shall be settled with regard to the basic terms.

Lender (for the purposes of this Report) – a party (counterparty), who is buying a financial asset under the first leg of a repo transaction and is selling the financial asset under its second leg.

Borrower (for the purposes of this Report) – a party (counterparty), who is selling a financial asset under the first leg of a repo transaction and is buying the financial asset under its second leg.

Bank of Russia interest rate band – a framework of short-term borrowing and lending interest rates of the central bank aimed at limiting the volatility in money market rates.

Repo - a two-way transaction to sell (buy) a financial asset (the opening leg of the repo) with a commitment to buy (sell) back the same issue and the same amount of the asset (the closing leg of the repo) on a date and for a price specified in the terms and conditions of the repo contract.

Repo maturity – a time period in calendar days between the dates of execution of the start and of the close legs of the repo transaction. The repo maturity is calculated starting from the date following the date of execution of the start leg through the date of execution of the close leg.

Repurchase price – an amount the seller has to pay to the buyer under the close leg of the repo transaction.

Refund under a repo transaction – an amount payable by the seller to the buyer as of the date of the reverse purchase (sale) of the financial asset under the close leg of the repo transaction.

GENERAL MARKET CHARACTERISTICS

Number of participants – number of counterparties (dealers and brokers) in the repo market; includes all the counterparties with open repo positions as of the reporting date. All counterparties engaged in repo and reverse repo transactions, secured by any type of collateral, are included.

Number of open positions – number of open positions between counterparties as of the reporting date. All the one-way transactions of the same maturity made by two participants are aggregated into one position. Then, the number of such positions in the system is derived.

Funds provided by the Bank of Russia – an amount of accumulated positions of market participants under their repo transactions with the Bank of Russia as of the reporting date.

REPO TRADE STRUCTURE BY COLLATERAL

Repo market size, total – total accumulated positions of the repo market participants (repo amount outstanding) as of the reporting date. The amount is calculated as a sum total of all the open positions as of the reporting date across all the instruments and all the maturities. The calculation includes short-sale transactions (securities lending).

Debt repo market size – total accumulated positions of the repo market participants (repo value outstanding) as of the reporting date. The amount is calculated as a sum total of all the open positions as of the reporting date under bond repo transactions of any maturity. The calculation excludes short-sale transactions (securities lending).

Sizes of repo markets secured by equities (shares) and *by other securities (depositary receipts)* are calculated in a similar way.

Debt repo market share – a percentage ratio of the bond repo market size to the total market.

Shares of the equities (shares) repo market and of *the other securities (depositary receipts) repo market* are calculated in a similar way.

Overnight segment size – total accumulated positions of the repo market participants (repo value outstanding) as of the reporting date. The amount is calculated as a sum total of all the open overnight (1 day) positions as of the reporting date. The calculation excludes securities lending trade (reverse repo) and repos secured by equities and depositary receipts.

Values of *2-to-6-day*, *one-week*, *8-to-29-day*, *one-month* and *over 30 days* repo segments are calculated in a similar way.

Overnight repo segment share in total market size, % – ratio of the overnight bond repo market size to the total market size, in %.

Shares of *2-to-6-day*, *one-week*, *8-to-29-day*, *one-month* and *over 30 days* segments are calculated in a similar way.

These indicators shall be derived for bond-secured transactions. The calculation excludes short-selling trade (securities lending). The overnight segment is estimated separately.

Maximum length of transmission chain – the maximum number of consecutive liquidity provision transactions from the zero to the last tier of liquidity distribution. It is identified as the highest number of liquidity distribution tiers.

Average length of transmission chain – an average number of consecutive liquidity provision transactions (liquidity transmission), including client transactions of one single broker. It is determined as an average value of the tier number weighted by the number of open positions of this tier's participants.

Average-weighted length of transmission chain – an average number of consecutive liquidity provision transactions (liquidity transmission) with regard to trade values. It is determined as an average value of the tier's number weighted by the outstanding volume of open positions of this tier's participants.

Repo market multiplier No. 1 (the market/tier zero) – a ratio of overnight positions to the total liquidity provided by tier zero of liquidity distribution; calculated for the "repo amount outstanding" field.

Repo market multiplier No. 2 (the market/the Bank of Russia) – a ratio of overnight positions to total liquidity borrowed from the Bank of Russia; calculated for the "repo amount outstanding" field.

Repo market multiplier No. 3 (the market, excluding the Bank of Russia/tier zero, excluding the Bank of Russia) – a ratio of overnight positions, excluding borrowings from the Bank of Russia, to total liquidity provided by tier zero, excluding borrowings from the Bank of Russia; calculated for the "repo amount outstanding" field.

Number of tier i participants (banks) – number of credit institutions (dealers and brokers) in the repo market, attributed to tier i.

Number of tier i participants (non-banks) – number of counterparties (dealers and brokers) attributed to tier i of the repo market, which are not credit institutions.

AVERAGE-WEIGHTED INTEREST RATES

Average-weighted interest rate for tier i – a ratio of the product of the repo amount outstanding and the interest rate to the repo amount outstanding, for lending transactions of tier i of liquidity distribution.

Average-weighted interest rate for tier zero (Bank of Russia operations separately) –a ratio of the product of the repo amount outstanding and the interest rate to the repo amount outstanding, for Bank of Russia lending operations.

Average-weighted interest rate for tier zero (excluding Bank of Russia operations) – a ratio of the product of the repo amount outstanding and the interest rate to the repo amount outstanding, for lending transactions by other than the Bank of Russia participants.

Average-weighted interest rate, total for the market – a ratio of the product of the repo amount outstanding and the interest rate to the repo amount outstanding, for all overnight transactions.

BORROWING AND LENDING VOLUMES ACROSS ALL THE LIQUIDITY DISTRIBUTION TIERS

Tier i borrowings (banks) – amount of funds borrowed under repo transactions by tier i credit institutions; determined for the "repo value outstanding" field.

Tier i borrowings (non-banks) – amount of funds borrowed under repo transactions by tier i financial organisations, which are not credit institutions (banks); determined for the "repo value outstanding" field.

Lending by tier i (banks) – amount of funds provided under repo transactions by tier i credit institutions; determined for the "repo value outstanding" field.

Lending by tier I (non-banks) – amount of funds provided under repo transactions by tier i financial institutions, which are not banks; determined for the "repo value outstanding" field.

Share of funds lingering at tier i (banks) – a ratio of the difference between borrowed and provided funds to total borrowings by tier i credit institutions.

Share of funds lingering at tier i (non-banks) – a ratio of the difference between borrowed and provided funds to total borrowings by tier i non-bank financial institutions.

Intermediation ratio (banks) – an absolute value of the ratio of the net position (difference between borrowings and loans) of the participants (credit institutions) to the total trade of credit institutions.

Intermediation ratio (non-banks) – an absolute value of the ratio of the net position (difference between borrowings and loans) of the participants (non-credit institutions) to the total trade of non-bank participants.

FORWARD TRANSACTIONS

Number of forward transactions – number of "future" transactions with the open leg to be settled after the reporting date.

Forward market size, billion roubles – a sum total of accumulated forward positions of repo market participants.

Average-weighted maturity of forward transactions, billion roubles – average maturity weighted by initial values for all forward transactions.