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WHY IS THE FURTHER DEVELOPMENT OF REPO MARKETS IN EMERGING MARKET COUNTRIES NECESSARY? – LESSONS FROM PAST EXPERIENCE

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Abstract: *The repo markets in many emerging market countries were established considerably later than in developed countries. Even though these markets have been growing steadily in some countries, they have not yet developed sufficiently to provide all the possible benefits to different entities, market segments and the financial market as a whole. In this article, the author intends to answer the question: Why is the further development of repo markets in emerging market countries necessary? To answer this question, the author will rely primarily on the experience of developed economies, and to a lesser degree on the experience of developing countries, because the research in which the experience associated with the functioning of the repo markets in emerging market countries is presented is scarce and thereby insufficient to draw a conclusion about the issue. According to the author's findings, the multiple benefits of repo agreements and the existence of insufficiently exploited potential advantages of repo agreements and repo transactions can explain the necessity of the further development of repo markets in emerging market countries.*

Key words: *repo market; repo transaction; repo agreement.*

JEL classification*: G15, G19.*

INTRODUCTION

"The origins of repo markets can be traced a century ago with the first developed domestic market created in the United States to facilitate the Federal Reserve's open market operations. Notwithstanding, the modern US repo market developed only sixty years later driven by securities firms that lacked access to funding from retail or interbank deposits. The 1980s signal also the start of the globalization of repo markets, with the importation of repos into Europe by US investment banks to support derivatives trading." (Ursu, 2013, p. 32) Although there are currently repo markets around the globe, the US repo market is the largest one in the world. Compared to the US repo market, other markets have much shorter histories and are much smaller in size. The largest repo market outside the United States is the European repo market. This market

dates back to the introduction of the euro in 1999. Repo markets in many emerging market countries were established in the early 1990s.

After the basic equity and bond products, repo, as one of the primary instruments in the money market, is perhaps the most important financial instrument in the global financial market. Hence, the repo market is at the heart of the global financial system, together with the equity and bond markets. Repos are very popular because they virtually eliminate credit problems. Repo markets in developed economies are characterised by huge transaction volumes. Precise statistics on the size of the whole US repo market over the past quarter of a century are not available. Notwithstanding, there is a feeling among the researchers and officials about the exponential growth of the repo market since the middle 1990s. Certainly, the US, as well as the European repo markets started growing from the early 2000s. Prior to the global financial crisis, the repo market observed the fastest growth among the wholesale funding markets in developed economies. "The size of the repo markets in the US had grown at a fast pace thanks to the securities such as MBSs, ABSs, CMOs (Collateralized Mortgage Obligations) and CDOs (Collateralized Debt Obligations) starting to be accepted as collateral for repo trades from 2000." (Yun & Heijmans, 2013, p. 4) However, the US and European repo market activities collapsed during the global financial crisis. This happened due to the declining of the market value of collateral and rapidly spreading fears over counterparty risks. The US repo markets responded more intensively to the shocks than the European ones. The US repo market activity remained at a low level for an extended period. The European repo markets, in contrast, recovered from the shocks relatively faster, due to provisioning ample liquidity by the ECB in response to the sovereign debt crisis. Since 2011 up to 2017, the European repo market activity declined again compared to the pre-crisis level, but the yearly decrease was continuously lower than the yearly decrease during the global financial crisis.

In some developing countries, for example India and Korea, the repo market has been growing steadily. In India, repo transactions account for a substantial part of the total short-term money market transactions. In Korea, the repo market has grown along with the development of the domestic bond market. The market growth can be ascribed to the enabling not only government bonds, but also corporate bonds to be pledged as collateral, the government's short-term financial market reforms, and the imposition of a maximum limit on borrowings by securities companies in the call market.

The research in which the experience associated with the functioning of the repo markets in emerging market countries is presented is scarce and thereby insufficient to draw the conclusion about the importance of the further development of repo markets in these countries. Therefore, in order to answer the question why is the further development of repo markets in emerging market countries necessary, we will primarily rely on the experience of developed economies, and to a lesser degree on the experience of developing countries. We will draw lessons for emerging market countries on the basis of the previous experience of developed economies. The results in this paper will be of use to the researchers and policy makers. The researchers could be motivated to find a model of the further development of repo markets which is appropriate for a specific country or a group of countries. The policy makers could be stimulated to create as favourable an environment as possible for the further development of repo markets.

The paper is divided into three sections. In the first section, we will give a general overview of the repurchase transaction and repo market. The analysis of benefits of the repo markets and repurchase transactions will be executed in the second section of the paper. Empirical evidence on implications of the repo markets and repurchase transactions will be presented in the third section. In the fourth section, we will regard the role of repo market in financial crisis. Finally, we will come to the conclusion.

BENEFITS OF THE REPO MARKETS AND REPURCHASE TRANSACTIONS: GENERAL OVERVIEW

There are a number of benefits in using repo markets. Repo agreements can be used for a variety of purposes, and, thus, meet a range of requirements of different entities, market segments and the financial market as a whole.

Repo agreement is basically a funding tool. It enables the cash borrower to obtain the cash necessary for funding positions, at a relatively low and very competitive interest rate. Therefore, a repo transaction presents a cost-efficient funding mechanism for the cash borrower. The interest on borrowed funds, paid by the cash borrower, is, in fact, the return on the lent collateral, earned by the collateral lender. Furthermore, a repo agreement is the means by which the collateral borrower can obtain specific securities. If a security trader has to deliver a specific instrument in order to, for example, close out his short sale position, he will enter into a reverse repo. Participation in a repo transaction provides for the cash investor an additional investment option when placing funds. Investment in repo agreement is secure and liquid. The returns on this investment are competitive with the returns of the same maturity, or even higher. Additional benefits for the cash investor are opportunities for the insurance of investment and the diversification from bank risk. Insurance potential in the repo market exists since the deposits at the so-called repo banks are secured by the securities used as collateral, while the large deposits at commercial banks are not insured.

The more efficient employment of capital and more efficient collateral management are enabled for banks and other financial institutions which actively participate in repo transactions. Through making the inventories of securities available for repo trading, these institutions obtain the opportunity to enhance their returns. Namely, the collateral lender may lend the securities from his portfolio at general repo rate and then re-invest the received cash at a higher rate and by bearing additional risk. In these transactions, the collateral lender's compensation is the difference between the market rate at which the cash is re-invested and the repo rate paid on the counterparty's cash. Alternatively, the security trader may borrow securities in the security lending market, then lend securities at general repo rate and re-invest the received cash at a higher rate and by bearing additional risk via repo market. In these transactions, the security trader's compensation is the difference between the return earned in the repo market and the cost paid in the security lending market. In the opposite case, the security trader may short sell securities in the short selling transaction and then, in the repo market, pledge the received cash and borrow the same assets for delivery purpose. In these transactions, the security trader's compensation is the difference between the returns earned in the short selling transaction and the cost paid in the reverse repo transaction. Further opportunity for the security trader to efficiently employ capital implies combining the reverse repo transaction with the intention to borrow some securities with

the outright sale of these securities in the market. In these transactions, the security trader's compensation is the difference between the return earned in the outright selling transaction and the cost paid in the reverse repo transaction.

The opportunities for the banks and other financial institutions to enhance their returns through the efficient employment of capital and efficient collateral management are often related to the existence of the arbitrage and speculative opportunities in the repo market. Thus, the institutions' participation in the repo transactions, particularly the participation of security holding institutions may be motivated by the arbitrage and speculative opportunities as well. Security holding institutions sometimes use securities from their portfolios to take advantage of favourable movements in repo rates. Hence, an institution which perceives that, at some moment, the repo rate on a specific security is different in one market compared to the other one and which owns this security is able to borrow cash at a rate significantly lower than the prevailing market rates and invest it at a higher rate. Likewise, an institution which expects the repo rate on a specific security to rise in the future and which owns this security is able to borrow cash at a current rate significantly lower than the future rate and invest it later at a future higher rate. By taking positions in the repo market in the direction of interest rates, the institutions increase potential profits.

Repo transactions are also used for funding leveraged position-taking in various securities. Namely, "repo transactions are typically used to fund "long" positions in securities - used to build up leveraged long positions in securities markets. A trader uses 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". […] Repo market is probably the lowest-cost source of leverage." (Nath, 2015, p. 289)

Moreover, banks and other financial institutions can use repo agreements for sourcing funds for financing both their own positions and counterparties' activities, increasing their intermediation capacity while maintaining an optimal risk-return portfolio performance, maximizing their market making ability, and managing short-term liquidity fluctuations, too. Besides all the previously mentioned reasons why the banks and other financial institutions participate in the repo market, an additional reason for them, and particularly for those institutions which act as primary dealers, is the financing of the risk management and market making activities.

For security dealers, e.g. bond dealers, participation in repo transactions may be useful in providing opportunity for short-term investors to avoid the so-called endogenous bond-liquidation cost which is associated with the bilateral bargaining in an over-the-counter market, as Tomura (Tomura, 2013) stated. Endogenous bond-liquidation cost presents the ex-post price discount in an OTC market, which emerges as a result of the greater bargaining power of bond buyer compared to short-term investor in situation when a short-term investor resells bonds because he needs cash soon. This cost discourages a short-term investor from simply buying and reselling bonds in a series of spot transactions. Likewise, this cost can explain short-term investors' need for repo agreements in a situation when the investors intend to buy long-term bonds. "Without repurchase agreements, short-term investors do not buy long-term bonds. In this case, the bond yield rises unless dealers have enough capital to buy and hold bonds. […] By

selling bonds with a future contract to repurchase bonds, a dealer can offer the initial ask price and the repurchase price simultaneously to an investor. Thus, a dealer can adjust the two prices to ensure a sufficiently high bond return for an investor to buy bonds." (Tomura, 2013, pp. 1-2)

Central banks participate in the repo market in order to implement their monetary policy. More specifically, they use repo transactions to facilitate their open market operations, to maintain the overall money market liquidity, to stabilise and broaden the money market, and to make monetary policy transmission easier and broader. If a central bank intends to increase liquidity in the money market, it can, for example, take a position in the reverse repo transaction. On the contrary, if a central bank wants to reduce liquidity in the money market, in can take a position of cash borrower in the repo market. Moreover, repo rate adjustment serves as an effective mechanism through which a central bank sends the signal on the stance of monetary policy. "The use of repos as a monetary policy instrument is more justified from the fact that repos are well suited to influence the interest rate level through two of the main channels used to implement monetary policy - for moderating or controlling liquidity in money markets and an effective mechanism for signalling to markets the desired level of interest rates. A central bank repo indicates the rate at which the central bank is willing to lend money against acceptable collaterals to banks – to infuse liquidity to the system where there is shortage of funds. Most central banks follow an interest rate corridor to set a rate below the repo rate at which the central bank is willing to absorb excess liquidity in the banking system if the need arises. So, the repo and reverse repo rates indicate both support and resistance level for money market funds. The market logically has to operate within the interest rate corridor as a trader having excess cash would demand the minimum rate from a borrower of funds which she can get from the central bank by pledging excess cash with her. If a bank has faced shortage of liquidity, then it can approach the central bank with acceptable collaterals to pledge and borrow funds at the repo rate. By changing repo rate, the central banks indicate the interest rate direction. A shift in monetary policy can be signalled by adjusting the interest rate corridor." (Nath, 2015, pp. 291-292) Repo agreements are a preferred monetary instrument "because they have a number of features: (a) it carries a low credit risk as they are collateralized; (b) they are relatively flexible and their features can be tailored by central bank according to liquidity conditions; (c) it does not affect securities prices or yield curve in general; and (d) central banks can reach out to a broader range of institutions in case of need" (Nath, 2015, p. 292). What follows from the above mentioned is that there is a close relationship between repo and money markets.

Repo agreements can also be used in the sterilised foreign currency interventions aimed at preventing the excessive weakening of national currencies which is caused by large capital outflows. Hence, to address the problem of currency market liquidity decrease, which arose as a response to the foreign currency outflows upon the imposition of the financial sanctions in 2014, the Bank of Russia launched foreign currency repo auctions, which Shulgin (Shulgin, 2018) wrote about. According to the author, the implementation of auction program helped banks to substitute the Bank of Russia loans for external borrowings. It also helped the Bank of Russia to expand foreign currency supply without affecting domestic money supply. By using repo agreements in the foreign currency repo auction program, the Bank of Russia

was able to avoid the direct selling of foreign currency from reserves. Because of this effect, the foreign currency interventions based on foreign currency repo auctions are deemed to be sterilized interventions. "Banks could be uncertain whether they would be able to obtain the entire amount of foreign currency they needed at one auction, which provoked them to buy foreign currency in advance. Banks could accumulate the amount of currency needed for their payments at several auctions, and, because of it, the response of the exchange rate to a foreign currency repo auction could be lagged." (Shulgin, 2018, p. 71) The main problem associated with the use of this monetary policy instrument is its relative weakness.

Repo transactions are essential for the well-functioning and efficiency of both bond and equity markets as well. In other words, the repo markets are considered to be crucial for the trading of fixed-income securities and equities, and, consequently, for greatly enhancing the liquidity of those instruments and their markets. Repo transactions are used by the bond and equity market participants to either initiate short positions or finance long positions. By increasing the liquidity of instruments, repo transactions lower the cost of raising funds for the issuers of capital. Additionally, repo transactions enable market makers to hedge positions with greater efficiency.

IMPLICATIONS OF THE REPO MARKETS AND REPURCHASE TRANSACTIONS: EMPIRICAL EVIDENCE

In their research covering Swiss market, Berentsen, Kraenzlin and Müller (Berentsen, Kraenzlin, & Müller, 2015) intended, among other objectives, to assess the impact and the effectiveness of the interest on reserves, term deposits, central bank bills, and reverse repos, i.e. the four instruments which a central bank can use to exit from unconventional monetary policy (that is, from situation in which there is a structural liquidity surplus, and which continued to exist after the global financial crisis and the subsequent sovereign debt crisis). The effectiveness of the observed exit instruments was assessed on the basis of the ability of the central bank to control the money market rate, the impact of instruments on the trading activity in the money market, and the operational costs of exit which arise when each instrument is implemented. The obtained results show that all four exit instruments allow central banks to achieve an interest rate target. However, central bank bills and reverse repos enable the money market trading activity to re-emerge more quickly than the other instruments do. Moreover, central bank bills and reverse repos are more cost-effective compared to the other exit instruments.

"The central bank repo is one of the oldest instruments of monetary policy. Federal Reserve started using a type of repo in 1920s while Bank of Canada used repos since 1953. Later, Bank of England, Bank of Japan and other central banks started using repos with government securities. Canada, Italy and Sweden use the buy-sell backs while Japan uses securities borrowing with cash collateral. The Netherlands uses a special loans system in which loans are collateralized via pledge on a pool of collateral (general). Most of the countries use the form of repo keeping in mind the legal and institutional framework that prevails in each country." (Nath, 2015, p. 291) The Reserve Bank of India uses repo as an instrument of monetary policy, by institutionalizing daily Liquidity Adjustment Facility (LAF). LAF system "has specific timing window (typically at the beginning of market hours) within which banks are required to ac-

cess funds or park funds in which RBI is the counter-party. The rates at which such transactions take place are fixed and are changed by RBI from time to time depending upon its monetary policy considerations" (Nath, 2015, p. 292). LAF system enables RBI to moderate liquidity situation in the domestic banking system. Simultaneously, it enables managing liquidity needs for the banks and primary dealers.

The People's Bank of China (PBC) participates in repo market transactions in order to manage domestic liquidity conditions through its open market operations. Via its open market operations, PBC plays a role of large funds supplier. The volume of PBC's lending activity in the interbank pledged repo market has increased since 2015. This increase is likely aimed at reducing repo rates volatility. Besides the PBC, small, medium-sized and large commercial banks, policy banks and asset managers act as the lenders in the China's repo market, too. Large commercial banks are the major suppliers of funds in the interbank pledged repo market. Although small and medium-sized banks are net borrowers in the repo market, a substantial share of lending in this market is provided by them. "Policy banks play a quasi-fiscal role in channelling government funding to infrastructure and development projects, and also play a significant role in the financial system." (Kendall & Lees, 2017, p. 349) Liquidity management is the primary motive for asset managers to participate in the repo market. The share of the outstanding lending of these institutions is small. Furthermore, for many financial institutions operating in China, repo market is an important medium for providing short-term funding. Most of the borrowing in the China's interbank pledged repo market relates to the borrowing of the small and medium-sized banks and asset managers. The rest of borrowing consists of the borrowing by other financial institutions such as the PBC, policy banks and joint-stock banks. Over time, repo market in China is likely to become a more important channel for monetary policy transmission as well.

In Mexico, banks practice short-term funding in the repo market to cover their needs for liquidity. From the viewpoint of mutual funds, repo market is an important place for investing their money. As Cañón, Florez-Acosta and Gomez (Cañón, Florez-Acosta, & Gomez, 2020) proved in the research which covered the period from January 2006 through February 2018, reciprocal lending between financial conglomerates (FCs) in the repo market has multiple benefits. The authors "define reciprocal lending as all of the repo transactions that happen between investment funds and banks owned by a given pair of rival FCs such that the funds of one FC provide some liquidity to the bank of the rival FC and, simultaneously (i.e., within the same time window), a similar transaction happens in the reverse direction." (Cañón, Florez-Acosta, & Gomez, 2020, p. 2) Reciprocal lending between financial conglomerates is a common trading strategy in Mexico because "the regulatory framework constraints funds to provide liquidity to banks if they belong to the same financial conglomerate" (Cañón, Florez-Acosta, & Gomez, 2020, p. 45). Given that reciprocal lending provides a regular source of funding for banks, these institutions are interested in executing reciprocal lending transactions. According to the authors' findings, reciprocal lending between financial conglomerates in the overnight repo market provides cheap and stable short-term funding, mitigates credit risk concerns for lenders, reduces search costs for borrowers, increases the market concentration of repo lending in a few powerful funds and, consequently, the market power of these funds, increases the importance of commercial banks compared to all other financial institutions, and, also, leads to

centrality within the financial network and increases the dependence between the parties involved. "Interestingly, a higher intensity of reciprocal lending can be harmful, but this does not necessarily deteriorate financial stability." (Cañón, Florez-Acosta, & Gomez, 2020, p. 1)

"A wide range of market participants use the gilt repo market. Money market funds, corporates and local authorities use the market to deposit cash securely. Meanwhile, hedge funds, asset managers, pension funds and insurance companies borrow cash via repo to finance leveraged investment strategies. GEMMs frequently use the gilt repo market to cover short gilt positions. Banks use reverse repo to borrow gilts for their liquid asset buffers. […] The gilt repo market also plays an important role in the Bank of England's monetary policy transmission and liquidity insurance operations" (Bicu, Chen, & Elliott, 2017, p. 6)

In New Zealand, the primary participants in the repo market are retail banks and the Reserve Bank. Both institutions use repo market predominantly for short-term liquidity management. Banks use repo market "for managing short-term fluctuations in their cash holdings, rather than for general balance sheet funding. However, in many offshore markets, there are entities that use repo markets to fund leveraged position-taking in securities." (Cook, 2012, p. 13)

Baklanova, Dalton and Tompaidis (Baklanova, Dalton, & Tompaidis, 2017) and Chircop, Kiosse and Peasnell (Chircop, Kiosse, & Peasnell, 2012) mentioned in their papers that the repo markets are the key source of funding for the operations of many financial institutions in the U.S. Hence, securities dealers and their clients obtain liquidity primarily through repo funding. Moreover, repo markets are "a provider of secondary market liquidity for a variety of U.S. securities, such as U.S. Treasuries and agency mortgage-backed securities. They also play an important role in the pricing and price discovery of cash and derivatives instruments." (Baklanova, Dalton, & Tompaidis, 2017, str. 1)

In the research covering the period from July 3rd, 2006 to September 30th, 2015, Mahmood (Mahmood, 2016) discovered the transmission of the volatility in money market overnight repo rate along the term structure, that is, yield curve in Pakistan. This research was the first one of this kind in developing countries. In line with the empirical evidence previously found in developed countries, the higher transmission of the volatility in overnight repo rate was proven at the shorter end than at the longer end of the yield curve. In other words, the observed transmission was "higher at the shorter maturities and tends to fall as move along the yield curve" (Mahmood, 2016, p. 4). Excessive volatility at the shorter end of the yield curve not only complicates the process of monetary policy implementation, due to creating disconnect between short and long-term interest rates in the economy, but may also provoke volatility in other important macroeconomic variables in the economy. The level of volatility transmission was found to have been reduced since August 2009, when the State Bank of Pakistan adopted the interest rate corridor framework. At that time, the State Bank of Pakistan also established an overnight deposit facility (besides the overnight lending facility which already existed there) for the money market and announced that overnight repo rate is its operational target. As a result of such changes, the volatility in money market overnight repo rate is now transmitted smoothly along the yield curve.

The relation between repo market and economy was discovered by Shin and Kim (Shin & Kim, 2013) as well. Namely, the housing repo market, or the so-called Jeonse system, was of great importance for the financial and economic development in South Korea. "The Jeonse contract is essentially a repurchase agreement (repo) in which the landlord borrows from the tenant, with the house as collateral. […] The landlord might be an urban small business owner, or an extended family member of a small business owner who needs business financing but is shut out of the formal banking sector. The tenant might be a young worker who has yet to save enough to buy a house outright or is a recent arrival in the city who is saving to get on the housing ladder." (Shin & Kim, 2013, pp. 3-4) Jeonse system implied direct, that is, by bypassing banking system, channelling of funds from savers to entrepreneurs. Within this system, the financing of investment projects was more extensive and more efficient and the cost of capital was lower, compared to those within banking system. Jeonse system helped better exploit Korean financial potential, establish competitive market for credit, and displace the impediments that slow down financial development and hence economic development in Korea. The authors emphasized that the relation between housing repo market and the financial and economic development became more sluggish as the financial system developed further. Therefore, the housing repo market may be especially important for the developing countries with financial systems that are at an early stage of development.

The effectiveness of the sterilized foreign currency interventions based on foreign currency repo auctions was revealed by Shulgin (Shulgin, 2018). Over the observed period from November 6th, 2014 to April 20th, 2017, those interventions generated a temporary effect on the ruble exchange rate. The effect was statistically significant within the second week and reached its maximum on the 9th business day after the repo auction was held. "Also, the exchange rate was found to respond asymmetrically to positive and negative interventions. Ruble/dollar exchange rate response to positive interventions (an expansion in commercial banks' foreign currency borrowings from the Bank of Russia) has the correct sign and is statistically significant while the response to negative intervention is not." (Shulgin, 2018, p. 69) The author finally mentioned that the dilemma about the effectiveness of the foreign currency repo auctions as an instrument for sterilized foreign currency interventions under normal conditions remains open.

Osterberg (Osterberg, 2011) considered the roles which the repo market and repo transactions can play in emerging market countries. From his standpoint, using repo agreements in market transactions to a higher degree substantially contributes to the development of financial markets. Specifically, repo agreements "can play important roles in both the primary and secondary treasury markets and the need for repos in these regards becomes painfully clear in markets that are not that far removed from the days when government financed itself through an overdraft facility at the central bank" (Osterberg, 2011, p. 197). Moreover, they can play an important role in the success of primary dealer systems, in increasing the amount of interbank lending in the case when limits which relate to interbank credits are very restrictive and make the transfer of excess liquidity from the surplus to deficit banks more difficult, as well as in mitigating counterparty risk. Finally, trading in the repo market enables a central bank to manage national liquidity, achieve interest rate targets, and avoid

holding a significant inventory of treasuries under the conditions of high interest rate volatility and market thinness.

THE ROLE OF REPO MARKET IN FINANCIAL CRISIS

Apart from the other segments of global financial system, the shadow banking was also affected by the global financial crisis of 2007–09. As shadow banks financed most of their leveraged positions in the repo market, a large part of disturbance spills over from shadow banking to repo market. Thus, during the global financial crisis, repo market experienced disturbance as well. "The run on the shadow banking system in the interdealer repo market occurred in two phases. Although Bear Stearns's hedge funds were the first victims, it was BNP Paribas's suspension of redemptions on its three SIVs that triggered the first phase in August 2007. The failure of Bear Stearns in mid-March 2008 was the next phase of the run in the repo markets." (Acharya & Öncü, 2013, pp. 320-321)

The vulnerability of repo market to the shocks could be explained by the nature of repo contract, that is, the pro-cyclical character of the haircut and collateral chain, the possibility of creating long collateral chains, collateral value variability, and the legal feature of safe harbour. The pro-cyclical nature of haircut is considered to be a major threat for financial stability in the repo market. It implies that haircuts tend to be low in the upswing of a cycle, and tend to become very high in a crisis. The higher the haircut on new repo-loans, the smaller is the amount of cash which a borrower can obtain by pledging the same amount of securities as collateral. Consequently, a large increase in haircuts puts pressure on the cash borrowers to reduce the level of leverage in their positions and even to sell their assets at fire-sale prices, and potentially exposes all entities relying on the repo market to satisfy financing needs to the liquidity shortfalls problem, and makes an emergence of the bankruptcy of repo transaction participants and the disturbance in the repo market more probable.

From a financial stability perspective, the possibility of creating long collateral chains in the repo transactions is associated with both positive and negative effects. Longer collateral chains contribute to an increase in the level of leverage in repo participants' positions, the reduction of overall funding costs and the efficient functioning of financial markets. However, they also increase the interconnectedness of the repo transaction participants and, consequently, enable easier and faster transfer of shock through the whole repo system and contribute to the appearance of the systemic risk and financial crisis. In a crisis, collateral chains tend to shorten, that is, express their pro-cyclical nature. Because of it, the efficiency of financial markets is reduced in the times of crisis. Counterparty risk is a key problem in long collateral chains. It may be solved by using different hedging instruments and techniques and by introducing penalties for the late settlement of liabilities. Additional danger for financial stability arises when one entity fails to return the collateral and therewith provokes the loss of confidence among the participants in the collateral chain. If distrust among the participants in the collateral chain initiates the belief in general deterioration of market conditions, the problem deepens. In this situation, repo transactions could not be rolled over, credit expansion could become limited, funding potential for many market participants might decline, and, in consequence, serious illiquidity problem might emerge. Therefore, a concern for counterparty risk

in a collateral chain, as well as for the level of the cost of failing is essential for preventing the spillover effects across the market.

In a crisis, in case of default, safe harbour clause may be detrimental to financial stability, as a large number of the cash lenders are not interested in holding the pledged securities in their portfolios and they sell these securities massively. Given that in times of crisis the repo transactions are executed with high haircuts, the cash lenders will be willing to sell collateral at high discounts. Such fire-sales will cause only limited or even no losses for the market participants who lend the cash in the repo transactions. However, those sales can be harmful for particular asset-classes and, consequently, for other market participants. Namely, the prices of the securities used as collateral in the repo transactions will decline because of the increased sales. Such a price movement will reduce the value of securities investment represented in the balance sheets of the other market participants. The worst effects are the spillover of fire-sale across the whole market, the creation of long loss spiral, the misallocation of credit, serious illiquidity problem, the disruption of price discovery mechanism, and the free fall of market prices. All the mentioned effects could be eliminated or at least mitigated if repo agreements were not exempted from bankruptcy proceedings. Therefore, it is understandable that academics and government authorities "share the estimation that an "orderly liquidation facility" (OFR Report 2013: 14) for securitized transactions is needed" (Thiemann & Birk, 2015, p. 9)

The concern of cash lenders about the quality of the collateral pledged in repo transactions, the decrease in value of the collateral, the rise of haircuts, the high and volatile repo rates, substantial de-leveraging of the positions of participants in the repo market, selling assets at fire-sale prices, a sharp rise of failed transactions, and the drawbacks of safe harbour clause marked a condition and caused disturbance in the repo market during the global financial crisis. Besides the above listed, window dressing, which non-US bank dealers have continuously practiced at the end of each quarter since the 2008 financial crisis, also destabilised repo market. In general, window dressing is the name for the practice in which an entity adjusts its "activity around an anticipated period of oversight or disclosure to appear safer or more profitable to outside monitors" (Munyan, 2017, p. 1). In the context of observed institutions, window dressing implies that dealers sell a large amount of, primarily, US Treasuries and agency securities in the last days of the quarter and buy those securities back again immediately after starting the new quarter. As Munyan (Munyan, 2017, p. 1) stated, „broker-dealer subsidiaries of non-US banks use repo to window-dress roughly $170 billion of assets each quarter". Repo window dressing transactions were aimed at reporting lower leverage. Therefore, the author's finding "that a non-US dealer's quarter-end window dressing is strongly predicted by its leverage the prior quarter" (Munyan, 2017, p. 3) was expected. Since repo window dressing leads to the understatement of bank dealer's leverage, what follows is that this practice causes the understatement of systemic risk in the market as well. Such a practice in the repo market during the financial crisis also negatively affected other markets, primarily agency securities market, and market participants, for example money market mutual funds.

The transmission of disruptions from the repo market to other markets was the topic which Hu, Pan and Wang (Hu, Pan, & Wang, 2015) and Düwel (Düwel, 2013) wrote about, too. Düwel (Düwel, 2013) used data on German parent banks and their

foreign branches and subsidiaries to investigate if repo funding shocks were transmitted via internal capital markets of multinational banks. According to the author's finding, "German parent banks which were more exposed to the run on repo markets during the financial crisis were more aggressive in reducing their liquidity provision to foreign affiliates, especially after the subprime market collapse and the Bear Stearns rescue. Hence, funding via repo markets is found to be one channel that transmitted shocks primarily related to the US financial system abroad" (Düwel, 2013, p. 4).

Chang (2015) examined the relation between the activities in the repo market and stability in the banking system and discovered that non-reverse repo transactions correlate with the disruptions in banking system. The key moment for the transfer of disturbance in the repo market to the banking system is the so-called due time of reverse, that is, the time when the repo transaction can no longer be rolled over. Therefore, bank market disruptions could be prevented by facilitating reverse repo transactions. The possibility for the repo transaction to be reversed depends on the repo rate and the repo size. The repo size is determined by three factors: the haircut rate, the market value of the assets used as collateral, and the liquidity shortfall. By controlling the factors affecting repo size, the emergence of the bank market disruptions caused by repo market disturbance may be prevented. More specifically, the repo size may be decreased and, in consequence, a repo transaction may be made easier to reverse and the instability in both repo and bank markets may be avoided through a decrease in haircut rate or an increase in the market value of the assets used as collateral. Furthermore, the author revealed "that repo runs would expose the banks which survive the repo runs to a higher probability of bank runs due to increasing liabilities, even in the absence of contagious panic. The contagious run led by the run on repo, should it occur, would be more likely one period after the due time of reverse" (Chang, 2015, p. 3). Turbulence in the repo market and/or banking system might also be triggered by banking regulations, such as capital and liquidity requirements, if those regulations negatively affect banks' leverage.

According to the findings obtained in the research which covered the period between January 2006 and February 2013 and which was implemented by Mancini, Ranaldo and Wrampelmeyer (Mancini, Ranaldo, & Wrampelmeyer, 2015), the resilience of repo market to the shocks could be ensured. The authors empirically proved that the central counterparty-based euro interbank repo market is resilient during crisis episodes. In this market, the aggregate volume of repo transactions did not decline, but it increased during the observed crisis periods. Such a movement in the aggregate volume of repo transactions differed from the one happening in the other parts of the euro interbank repo market and in the repo markets in the United States. Moreover, repo spreads and haircuts did not increase, and the maturities of repo transactions did not shorten as the risk increased. What follows from the abovementioned is that the central counterparty-based euro interbank repo market can even act as a shock absorber. The authors also discovered "that resilience of the CCP-based euro interbank repo market stems from the combination of three important characteristics: an anonymous CCP-based infrastructure, safe collateral, and the absence of the unwind mechanism" (Mancini, Ranaldo, & Wrampelmeyer, 2015, p. 1775). The importance of collateral quality for the resilience of the observed market was confirmed in a cross-sectional analysis in which the authors showed stronger resilience of repo transactions with the

safest collateral, such as German government bonds, compared to those secured by relatively riskier collateral, such as Italian government bonds.

CONCLUSION

Participation in the repo market is beneficial for banks and other financial institutions (e.g. pension funds, insurance companies, money market funds, hedge funds, security dealers, and asset managers), corporates, central banks, and local authorities. For banks and other financial institutions, contracting and implementing repo transactions enable sourcing funds for financing both their own positions and counterparties' activities, sourcing funds for financing risk management and market making activities, as well as funding leveraged position-taking in various securities. That also enables the increase of institutions intermediation capacity with the maintenance of an optimal risk-return portfolio performance, maximizing their market making ability, managing short-term liquidity fluctuations, more efficient employment of capital and more efficient collateral management, and making a profit within the arbitrage and speculative trading. Furthermore, the repo market allows corporates and local authorities to deposit cash securely. In the repo market, central banks implement their monetary policy, that is, carry out their open market operations, manage domestic liquidity conditions, tend to achieve an interest rate target, ensure an easier and broader transmission of monetary policy, and tend to stabilise and broaden the money market. Additionally, central banks might effectuate the sterilised foreign currency interventions aimed at preventing the excessive weakening of national currencies which is caused by large capital outflows. The repo markets are considered to be crucial for the well-functioning and efficiency of both bond and equity markets. They greatly enhance the liquidity of both bond and equity markets and their instruments, contribute to mitigating counterparty risk, lower the cost of raising funds for the issuers of capital, and increase the success of primary dealer systems. The role the repo markets play in the pricing and price discovery of cash and derivative instruments is also important. All in all, using repo agreements in market transactions to a higher degree substantially contributes to the development of financial markets. There is some empirical evidence on the relation between repo market development and economic development as well. As the repo markets in many emerging market countries were established substantially later (mostly in the early 1990s) than in developed countries, and even though they have been growing steadily in some countries, these markets have not yet developed sufficiently to provide all the possible benefits for different entities, market segments and the financial market as a whole. For all the possible benefits to be provided, the repo markets in emerging market countries need to be developed further. Therefore, the multiple benefits of repo agreements and the existence of insufficiently exploited potential advantages of the repo agreements and repo transactions can explain the necessity for the further development of repo markets in emerging market countries. Bearing in mind great importance of repo market for different entities and for financial and, potentially, economic development, disruptions in the repo market are very detrimental. Using different hedging instruments and techniques, introducing penalties for the late settlement of liabilities, increasing the level of the cost of failing, and not exempting repo agreements from bankruptcy proceedings are only some ways in which the disruptions in the repo market and their detrimental influence could be eliminated or at least

mitigated. There is some empirical evidence that the resilience of repo market to the shocks could be ensured. The fact that the repo market is resilient to the shocks would additionally strengthen our conclusion about the necessity of the further development of repo markets in emerging market countries. However, the proof of the resilience of repo market to the shocks is not sufficiently strong. The relation between repo market development and economic development is not sufficiently strong either. Therefore, the further research could be directed to the additional empirical investigation of subject-matter issues. The further research could also be directed to finding an appropriate model for developing repo market in individual emerging market countries or groups of countries.

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