Interbank Market Indicators

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1 Overview of Interbank Markets

1.1 Key Functions of the Interbank Market

Interbank markets are markets where banks borrow from and lend funds to one another for the sake of meeting their daily liquidity needs. Interbank markets are crucial to banks when fulfilling their intermediation role. This is because interbank markets provide one of the most important funding channels for banks, especially short-term funds. Although there are other alternative sources of liquidity, interbank markets remain a reliable source of liquidity for banks.

While interbank markets are seen to be associated with banks, the role played by interbank markets in the distribution of liquidity is crucial for the whole economy. It is documented in literature, for instance, that the failure of the interbank markets to redistribute liquidity was the key feature of the 2007-2008 Global Financial Crisis (GFC) (Heider et al. 2009). As observed during the GFC, banks stopped lending to one another in the interbank market due to precautionary reasons. Consequently, interest rates were driven up in most European money markets and volumes plummeted. This implies that the malfunctioning of interbank markets can endanger the stability of the whole financial system and the whole economy.

Further, the interbank market could be regarded to be one of the most important indicators of the functioning of the whole financial system. Problems in the efficiency of interbank markets can easily be transmitted to other financial markets. For instance, challenges in the interbank market can lead to inadequate allocation of capital and lack of risk sharing between banks. Moreover, the interbank market is the market that central banks use to assess the transmission of monetary policy. This is because it is in this market that the overnight rate, a rate that affects other rates in the money market quicker than any other rate, is determined. Consequently, the functioning of the interbank market affects the performance of the whole economy by influencing borrowing conditions for households and firms and therefore affecting economic growth and development.

The central bank may put in place facilities that enable, on the one hand, banks with surplus reserves to deposit their excess reserves and earn a return and, on the other, banks in deficit to borrow from the central bank. However, borrowing from the central bank is generally costly and banks must always pledge securities to do so. Additionally, there is the stigma to frequent borrowing from the central bank – a bank that borrows frequently from the central bank may be perceived to be riskier than others and be at risk of triggering a run (Acharya and Merrouche, 2012). In addition, the deposit rate offered to liquidity-surplus banks by the central bank is usually lower than the one obtained from the interbank market.

In many markets, the repurchase agreement (repo) markets offer an additional source of liquidity for banks. However, repo markets are still not very active or non-existent in most less developed markets. Moreover, sourcing funding from repo markets may be more costly compared to borrowing from the unsecured, largely O/N (very short-term) interbank market.

1.2 Peer Monitoring in Interbank Markets

Although banks respond to the perceived riskiness of other banks through credit limits, there is evidence in literature that interbank markets can provide an additional reliable indicator of riskiness of banks. This is because borrowing in these markets is typically O/N and unsecured and dependent on the trust that banks have in one another. As such, banks within the interbank market framework typical to Emerging Markets and Developing Countries (EMDCs), are motivated to invest in information about the riskiness of their peers. Using such information, banks can monitor and discipline each other in the interbank market. Among other things, interbank participants limit, or even deny altogether, lending to risky banks and price liquidity according to the perceived riskiness of the borrowing counterparty.

Interestingly, there is evidence that market discipline prevails even in the secured interbank market, where collateral is used when banks lend and borrow funds from each other. This evidence stems from developed markets, where following post-GFC reforms, interbank markets are largely secured. For the U.S. secured market for instance, King (2008) found that even secured borrowing costs display cross-sectional differences, reflecting differences in counterparty risk. Such findings were also supported by Gorton and Metrick (2012). Likewise, in the Colombian interbank market, Martínez and León (2016) found that different banks are charged different rates when borrowing from the interbank market despite offering the same low credit risk collateral.

It is therefore expected that a well-functioning interbank market, whether secured or unsecured, would be able to put in place strong disciplining mechanisms among its participants. It follows that the existence of an active interbank market can expose some of the hidden risks in the banking system and assist the central bank to take the necessary actions to avoid potential crises. It is precisely bank actions, relative to peers in the interbank market, which can be informative to financial market stakeholders given that banks are particularly good at identifying the risks of said peers.

Although central banks provide liquidity to liquidity-deficient banks and provide for a deposit facility for banks with excess liquidity (replacing the interbank market liquidity distribution role), there are limits to the extent that central banks can perform this function. For instance, while central banks can offer standing facilities, they may not provide liquidity at different maturities like interbank markets. Since the interbank market offers borrowings at different maturities, it provides flexibility to banks. Further, all banks are treated equally by the central bank when borrowing or placing liquidity – all banks are offered unlimited liquidity at uniform rates and can post the same collateral. In an interbank market however, banks lend and borrow at different rates, depending on the credit risk of the borrowers. Thus, the peer monitoring role of interbank market, which serves to find the appropriate valuation of liquidity, is lost when central banks are heavily relied upon as providers of liquidity.

For the cross-border interbank market, sovereign risk could also affect the creditworthiness of banks. This is because, in most cases, government securities are used as collateral in these markets. The risk of sovereign default on its obligations could affect the quality of collateral and hence affect the decision to lend and how to price interbank loans. Consequently, interbank market indicators contain important information about the riskiness of banks participating in the interbank market and the riskiness of the whole market. For example, as pointed out by Iori et al. (2012), distress in the interbank market can serve as an early warning indicator of sovereign risk. Furthermore, interbank indicators could have important implications for the transmission of the monetary policy and financial stability in a given country. Understanding interbank market indicators has been a growing concern among policymakers and other financial market stakeholders.

2 Rationale for Vibrant Interbank Markets

2.1 Financial Intermediation

A deep and liquid interbank market supports the main purpose of financial intermediation: channelling of funds from savers to investment (Smaghi, 2008). In the capacity of taking deposits to channel them to investments, banks are presented with the challenge of having to match demand for loans against deposits. Banks thus face unexpected liquidity needs in their everyday business. Without a vibrant interbank market, this role of fund reallocation would be difficult and lead to outcomes that can hinder economic growth and development. Further, the interbank market rate is important from the perspective of transmission of information along the yield curve.

2.2 Pricing Loans and Financial Products

The interbank market forms the shortest end of the yield curve; up to typically 12 months. Ideally, interest rates applied to many outstanding loans are indexed to, or at least priced against, the interbank rate. Changes to the interbank market rate are transmitted to other important rates in the market. Consequently, where interbank market rates are inefficiently determined, other rates throughout the yield curve are likely to be distorted. For instance, without the interbank market rate, other financial markets like repo, bond and some derivatives markets would become less liquid or dry-up. Additionally, without a price for short-term liquidity, the market for term lending stops functioning (Smaghi, 2008).

It is not just the pricing of loans that is affected by the absence of an active interbank market. Absence of an active interbank market can also affect the availability of bank credit. Among other sources, banks depend on interbank funds to manage their liquidity positions. Absence of an active interbank market could lead to conservative liquidity management and the build-up of liquidity buffers, which hinder the supply of loans. Of course, other factors can affect the hoarding of liquidity, such as ineffective monetary policy and in light of expected economic distress.

2.3 Monetary Policy Transmission

By using the interbank market, central banks can influence the longer-maturity rates that are relevant for bank loan rates. Through monetary policy operations, central banks can steer the interbank market rates, usually the overnight rate, to keep them close to the official rates. This is made possible because the interbank market rate responds quickly to central bank rates changes emanating from central bank operations.

It can be concluded that absence of an active interbank market hinders the smooth transmission of monetary policy and economic growth and development. As argued by Smaghi (2008), a financial market without a proper interbank market is unprecedented. It is against this background that Frontclear and its partners aim to develop the interbank markets in EMDCs.

3 Interbank Market Challenges in Developing Countries

3.1 Sub-optimal Structures and Systems

Interbank markets in EMDCs are different from those in developed countries. For example, the poorer quality institutional environment contributes to the small size of the formal financial sector and the existence of informal financial sector is evident (Mishra, 2010). Since financial intermediation is often carried-out outside the formal financial sector in many countries, the role played by interbank markets is limited. This is evidenced by the low level of interbank connectivity in such countries. For instance, besides having a small number of banks, the Malawi interbank network displays just a fair connectivity (68.9%)[1] and an average path length[2] 1.322 (Kanyumbu, 2020). Such an interbank market could be classified as less complete compared to the interbank payment flows of the United Kingdom where connectivity was found to be as high as 88%, and the average path length just 1.1 (Becher et al. 2008).

Due to absence of bank transparency, coupled with a weak regulatory and supervisory structure and inability to enforce contracts, banks are discouraged to trade liquidity among each other. As highlighted by Chipili et al. (2019), in many under-developed markets, there are no clearly defined and specific laws or regulations formulated to guide the interbank money market. Further, such markets lack a code of conduct to guide market participants' responsibilities, integrity, trust, honesty and faith in dealing with interbank market transactions. While the market may be indirectly regulated by some provisions of some Financial Institutions Acts, such provisions are often insufficient to address all the needs of a developing interbank market. Consequently, interbank markets in low-income countries are associated with high levels of risk.

3.2 Liquidity Surplus in the Financial System

For a variety of reasons such as ineffective monetary policy, macro-economic volatility, insufficient investment opportunities, and a lack of access to risk management options, banks often have chronic excess reserves which cannot be explained by the standard theories of liquidity management. The central bank's monetary policy transmission mechanism will be rendered less effective because banking system liquidity is trapped on banks' balance sheets, versus flowing as credit through the whole banking system.

These have implications for the conduct of monetary policy in such countries (Mishra, 2012). In Rwanda, for example, the interest rate pass-through to the lending rate was found to be very weak, limiting the impact of monetary policy actions on the cost of banking loans (Kigabo, 2018). The effectiveness of the interbank market on the transmission mechanism of monetary policy is limited in low-income countries. Unlike with developed countries, most central banks in low-income countries are not independent and government interventions are common. Consequently, central bank actions may deviate from the expected market practice and reactions may not always be according to market fundamentals, resulting in serious forecasting errors on the part of market participants. In addition, due to increased levels of government intervention, banks that do not meet central bank's minimum macro-prudential limits may not necessarily be closed. Such banks may be sustained by the government and continue to operate in the sector. Such actions will affect the ability for banks to effectively screen one another in the interbank market.

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[1] The degree of 'connectivity' in a market is the number of existing interbank trading relationships relative to the number of possible relationships given the number of banks. Where every bank trades with every other bank, the number is 1 or 100% connectivity.

[2] Average path length is the average number of banks to reach any other bank in the network. 'Path' measures the proximity of banks to one another at any given time. The more direct the connection – fewer or no intermediate banks – the shorter the path.

3.3 Features of Under-Developed Interbank Markets

Despite their cornerstone role, interbank markets remain under-developed in most emerging markets and developing countries. As pointed out by Raga and Tyson (2021), one particular aspect of banking system under-development in low-income countries is manifested in interbank markets. In many African countries for instance, interbank markets are still at their early stages of development[3] and the markets remain shallow (ibid). While some countries have managed to increase interbank activity up to 30% of GDP in the last decade[4], interbank transactions have remained small in other major economies[5].

3.3.1 Limited availability of credit

The under-development of the interbank markets in developing countries, could partly be attributed to the fact that they are dominated by unsecured credit lending. This makes counterparty risk high, motivating banks to resort to liquidity hoarding as an alternative way of managing their balance sheets risks and to charging high borrowing rates where they lend liquidity to counterparties. Since the interbank rate acts an anchor for the long-term structure of other interest rates in the financial system, the high interbank rates can spillover to rates charged by banks. This limits the amount of credit that banks extend to the economy and hence, the fundamental role played by the banking sector.

In Sub-Saharan Africa (SSA) for instance, credit, both relative to GDP and in absolute terms, is relatively lower compared to middle- and high-income regions. As at 2018, banks' domestic credit to the private sector as a percent of GDP in SSA stood at 28%. This figure is five times smaller than in East Asia Pacific countries at 140% and only around half of that in Middle East and North Africa, Latin America and South Asia (Raga and Tyson, 2021). Moreover, costs of credit are high. The margins between the lending and deposit rate are 10.6%; the highest globally. Consequently, the region's banking sector operates at a higher profit than elsewhere. For instance, the SSA region has the highest bank return on assets at 1.9% and return on equity of 16.8%.

3.3.2 Market segmentation

EMDC interbank markets are associated with segmentation, which is manifested in both differential interbank access and pricing. Relatively smaller banks are prevented from mobilizing funds at lower rates. Although the large banks that manage to borrow funds at lower rates are expected to drive down credit rates, such banks tend to favour large enterprises and government securities in order to minimize risk (Raga and Tyson, 2021). This makes the trickle-down effect of lowering credit rates in the financial system more difficult. In West African Economic Monetary Union (WAEMU) countries for instance, there is empirical evidence that the correlation between money markets rates (including interbank rates) is small, heterogeneous and negative in some instances (Iman and Kolerus, 2013). However, there is evidence that the interbank market can lower interest rate spreads in Zambia and that large banks charge the lowest premium compared to other bank categories (Chilipi et al. 2019).

Due to the shallowness of interbank markets in these countries, banks prefer to transact with the central bank and their own clients. As evidenced in some markets, market segmentation in the interbank market pushes banks to rely on central bank standing facilities for their liquidity adjustment despite existence of excess liquidity in the banking system (IMF, 2018). Such behaviour has been observed in some markets like the Malawian interbank market (Reserve Bank of Malawi, 2020) and Zambian interbank market (Chipili et

[3] Most which started in 1990s.
[4] Such countries include Kenya, Malawi, Uganda and Zambia.
[5] Nigeria (1.3%), Ghana (4.8%) and Tanzania (8.4%).

al. 2019). Further, trading of liquidity is limited to few counterparties in such markets. Consequently, such markets are associated with heightened vulnerability to systemic shocks due to concentration of transactions (Raga and Tyson, 2021). In addition, most interbank market transactions in these markets, are largely limited to overnight (O/N) (no flexibility).

3.3.3 Unconducive market and institutional regulations, rules and policies

Some banks, besides having material deposits, are not active in the interbank market due to internal policies and limited credit lines for smaller banks (ibid). In addition, banks in some EMDCs suffer from the insecurity emanating from the absence of specific laws, guidelines and codes of conduct for interbank markets. This further intensifies bank reluctance to lend to each other. Because of this, there is persistence in the deviation of the interbank rate from the monetary policy rate. In some countries like Uganda, even when interbank loans are secured, creditors do not have an automatic right to realize their loan authority (Bwire et al. 2019). This results in low volumes of liquidity being traded in the interbank market. For instance, although the Ugandan banking sector has at 44.4% higher liquidity relative to other African countries[6], interbank loans and other liabilities to financial institutions only comprise of 1.2% of total liabilities as of 2017 (ibid).

In Nigeria, the preference for the secured interbank market remains prominent. The share of the secured segment in total interbank transactions increased from 72% in 2013 to 96% in 2018. This could reflect relatively lower confidence for uncollateralized lending among the interbank participants, mirroring credit worthiness issues among the market players (Raga and Tyson, 2021). This could also be intensified by other factors like uncertainty in both the domestic and external economic environment as well as tight monetary policy stance. Consequently, the contribution of interbank cash market to the economy remains largely untapped and limited to only about 1.3% of GDP as of 2018 (ibid). Market participation and depth can also be hindered by costs related to legal enforcement and transaction costs.

A further challenge to the interbank market in low-income countries remains the limited financial and supervisory capacity. Since the interbank market is largely uncollateralized, management of risks rely on available financial soundness indicators of counterparties. Again, this increases the cost of lending, limiting investment and economic growth. This further limits the effectiveness of monetary policy since it reduces transmission through the interbank market.

3.4 Recent Remedial Developments

All these imply that most of the interbank markets in these regions do not operate to their full potential. Given the important role played by interbank markets, the current state of these markets in EMDCs makes intervention both necessary and interesting. There is a need to deepen interbank activity, increase efficiency and transparency in these financial markets.

Central banks have taken several steps to deepen interbank markets. Such initiatives include calibrating monetary policy tools and putting in place necessary infrastructure to increase the efficiency and transparency of transactions for market participants. Notable reforms in SSA include the establishment of real-time interbank transfers and payment and settlement systems in the early 2000s. The region has also registered improvements to the primary markets for government securities, boosting collateralised interbank trades.

[6] As indicated by the liquid assets to total deposits and short-term liabilities.

In addition, governments are transitioning towards an inflation targeting framework that typically sets the interbank rates as the central bank's operation target (Raga and Tyson, 2021). To encourage liquidity trading among banks through horizontal repurchase agreements, some central banks have adopted local Master Repurchase Agreements (MRAs). While such initiatives are welcome market changes, there continue to be barriers to local and cross-border access to liquidity that require continued attention. Additional remedial actions are needed to activate these markets.

4 Academic and Existing Evidence

Literature on interbank markets generally agrees that distribution of liquidity across banks matters (Bindseil et al. 2011). This is because a more imbalanced or dispersed distribution of liquidity leads to a tighter market in which banks with liquidity shortfalls risk being squeezed or rationed by banks that are long. Within this literature, the malfunctioning of interbank markets is generally attributed to risk and transparency (information asymmetry) issues. Applying such literature, we focus on existing direct and indirect measures of bank riskiness and their determinants based on both theoretical and empirical considerations. Indicators of the general riskiness of the interbank market could be less comprehensive because there is no consensus on measures of risk. However, several important studies provide deep insights to the building of the suggested indicators.

The theoretical literature on interbank markets proposes two main channels through which liquidity shock to individual banks (distributional shocks) can lead to market-wide reductions in liquidity (aggregate liquidity shocks) and pricing of such liquidity (Afonso et al. 2011). The two channels have been used extensively in empirical literature to explain different aspects of interbank markets. In particular, the role played by both counterparty risk and liquidity hoarding is manifested in the results of different empirical studies for different interbank markets around the world, both in normal times and during financial crisis.

4.1 Information Asymmetry and Counterparty Risk

The first channel proposes that the drying-up of liquidity in interbank markets is explained by an increase in counterparty risk. In Flannery (1996) and Freixas and Jorge (2008), such market disentanglement is explained as a result of adverse selection. It is argued that information asymmetry becomes worse during a crisis, when the number of risky banks increases such that lenders are unable to distinguish the credit risks of individual banks. Consequently, lenders of liquidity demand high rates for said banks to participate in the market. Under situations where uncertainty becomes unbearable, the fear of adverse selection becomes so great that interbank lending stops altogether.

In some instances, counterparty risk is modelled by assuming that lenders in the interbank market do not face information asymmetry, but rather counterparty risk for some of the market's banks has increased to the point where their cost of capital prevents them from accessing the interbank market. Under such situations, there is greater divergence in the cost of borrowing and in access to liquidity between weaker and stronger banks. This is also supported by the general finance literature, which suggests that holders of uninsured liabilities at financial institutions demand higher rates of return in response to higher probabilities of default.

4.2 Liquidity Hoarding

The second channel dwells on the importance of liquidity hoarding in interbank lending. Under this model, banks are not willing to lend liquidity even to high-quality counterparties, because they prefer to keep their liquidity for precautionary reasons. Such behaviour is observed in Allen et al. (2009), where banks hoard liquidity in anticipation of their own needs or in anticipation of high volatility in asset prices and correspondingly high aggregate demand for liquidity. Similarly, banks may also hoard liquidity when expecting high returns when banks in need of cash are forced to sell securities at fire sale prices (Diamond and Rajan, 2011). Under liquidity hoarding, borrowers' access to funds is reduced regardless of borrower quality.

4.3 Market Discipline – Relationship Bank Risk and Interbank Access and Pricing

For many markets, it has empirically been demonstrated that high-risk banks pay more than safe banks for interbank loans and are less likely to use interbank loans as a source of liquidity. This is in line with the existing literature on market discipline, which states that if a bank is taking too much risk and its lenders are aware of such behaviour, they will either deny that bank liquidity or request a higher return (risk premium) to be reflected in the market price. For the U.S. overnight federal funds market, King (2008) found that riskier banks consistently pay more than safe banks for both unsecured and secured interbank loans.

Further, it is observed that riskier banks are less likely to use interbank loans as a source of liquidity because such banks are rationed by their peers. These results are supported by Furfine (2001), who also provided evidence that the interbank market provides a good platform for banks to effectively monitor their peers. He found that banks with higher profitability, higher capitalization and lower non-performing loans (NPLs) ratio, tend to pay lower interest rates on federal funds loans. This is also confirmed by Cocco et al. (2009), who also added that apart from charging higher prices to counterparts that exhibit higher liquidity risk on unsecured interbank loans, imbalances in liquidity positions across banks are also associated with higher prices on interbank loans across the market.

Behaviour of the Colombian interbank market is also attributed to presence of market discipline among participants. Sarmiento (2016) showed that riskier banks pay higher prices and borrow less liquidity in the interbank market. On the other hand, more capitalized and liquid banks pay less for their funds and have greater access to the interbank market. Small banks were specifically found to suffer more as their credit risk and liquidity risk increased.

Authors like King (2008) and Furfine (2001) confirm that banks monitor their counterparts, including charging higher rates to riskier borrowers. However, in the U.S. overnight federal funds market, some studies have established that interbank market behaviour during periods of crisis is different from that in normal circumstances. In Italy, another instance, Angelini, Nobili and Picillo (2011) noted that, while the spread between the rate paid on the interbank market by a specific bank and the central bank's rate was broadly insensitive to key borrower characteristics prior to the GFC, the spread became more reactive to measures of creditworthiness afterwards. Such results broadly agree with the ones by Afonso, Kovner and Shoar (2011), who concluded that lenders in the overnight federal funds market began to pay attention to borrowers' creditworthiness only after the Lehman failure in September 2008. Poorly performing banks saw an increase in spreads of 25 basis points when borrowing from the federal funds market after the financial crisis. As a parallel, Andrievskaya and Semenova (2013) investigated the quantity-based discipline mechanisms of Russia's interbank market before, during and after the GFC. For the Russian interbank market, however, it was found that quantity-based market discipline existed only during the financial crisis and not prior to or after.

Although research on interbank markets for EMDCs remains scarce, the few studies confirm presence of market discipline. For Murinde et al. (2015), the peer monitoring role of the Kenya interbank market is evidenced by an inverse relationship between interbank activity (volume) and bank risk levels. The study underscored that the interbank market is effective as a peer-monitoring and market discipline device, thus complementing bank regulation. Based on the results, Murinde et al. (2015) argue that regulators can use the dynamic signals from interbank borrowing activity to identify banks perceived as risky.

For example, in Uganda, interest rate spreads around the average market rate in the interbank market were found to contain information about market perceptions of counterparty risk (Bwire et al. 2019). Bwire et al. (2019) concluded that monitoring of spreads paid by banks in the interbank market furnishes useful

information to guide risk-based supervision strategies. This is also supported by Tiriongo and Kanyumbu (2019), whose results showed that banks with improved asset quality face lower borrowing costs compared to counterparts with poor asset quality (higher ratios of NPLs to total loans). This was proven to be the case for both Malawi and Kenya. Further, banks with higher capital buffers were found to enjoy lower costs of borrowing in these two interbank markets – highly-capitalised banks are perceived to be less risky in these markets.

Although banks can have better information about the riskiness of peers compared to other economic agents, they may not always have complete information. While a bank may be party to the banking sector's distribution of risk and be well-informed about the risk of their own assets, they may not always be party to their counterparties' risks. With a high degree of asymmetric information about counterparty risk, trading is likely to be minimized. Such interbank market behaviour supports the work of Akerlof (1970), where asymmetric information can lead to reduced market activity with only the riskiest parties willing to trade.

Heider et al. (2009) explained interbank behaviour in relation to both level and dispersion of risk among banks. The authors argued that where the level and dispersion of risk are low, the unsecured interbank market functions smoothly despite counterparty risk and asymmetric information. In such cases, the interest rate for unsecured loans is low and all banks manage their liquidity using the interbank market. Under such cases, riskier banks exert an externality on safer banks, while the safer banks subsidize the liquidity of the riskier banks. Overall, the cost of obtaining liquidity from the interbank market is small compared to the cost of obtaining liquidity outside the interbank market.

For higher levels of risk however, there can be adverse selection in the interbank market. This could imply that the externality on safer banks is so costly that such banks could leave the interbank market to obtain short-term financing from other sources. Under such circumstances, liquidity could still be traded but the interest rate rises to reflect the presence of riskier banks. According to Heider et al. (2009), there are also cases where the interbank market would just break-down. This could be for instance, where the dispersion of risk is high. While banks prefer to lend out excess liquidity in the interbank market versus keeping idle funds that do not remunerate income in normal times, where the dispersion of risk is quite high, banks with liquidity could prefer to hoard liquidity instead of lending it out to an adverse selection of borrowers.

There could also be cases where even riskier borrowers could find the interbank rate to be too high and prefer to obtain liquidity elsewhere. For instance, although not very common, interbank rates could be above the central bank's lending facility and excess reserves could increase above the expected levels. Such a situation was observed following the extraordinary events surrounding the last weekend of September 2008, when the financial crisis spread outside the realm of investment banking and into the global financial system (Heider et al. 2009).

In summary, peer-monitoring and market discipline form part of interbank market behaviour. The peer-monitoring and discipline role of the interbank market manifests itself in several ways including the price of liquidity, the traded volumes of liquidity and participation of banks in this market. It is possible, therefore, to analyse some trading patterns in a given interbank market that could guide on the risk levels of individual banks as well as the whole market.

5 Regulatory Responses to Interbank Market Challenges

Improving the normal functioning of the banking system is, in general, believed to be more effective to economic growth than cutting the interest rate to zero (Heider, 2009). Given the aforementioned benefits of interbank markets, it is important to activate or increase the activity in interbank markets. The main task is therefore to encourage banks to participate in these markets. Given that functioning of the interbank market can be impaired by adverse selection, the first way to encourage interbank market participation is for central banks to limit adverse selection by increasing market transparency. However, even where adverse selection is eliminated, the lack of trust that loaned funds will be repaid remains the main factor behind the inactiveness of interbank markets (Smaghi, 2008).

5.1 Lessons from the GFC – Guarantee Schemes

Arguably, it is lack of trust that led to the drying-up of interbank markets in European countries after the GFC. For proper functioning of an interbank market, both information asymmetry and risks need to be reduced to minimum levels. The reduction of risks in markets needs special commitment because market forces are not sufficient to perform such a task. The need for such special commitment was noted even before the GFC. Dean and Giddy (1981), for instance, proposed that the international interbank market needed to establish formal guaranteed credit commitments among its participants. This was in support of Grubel (1979) and Franklin Edwards (cited in Dean and Giddy, 1981), who proposed the creation of an international deposit insurance corporation.

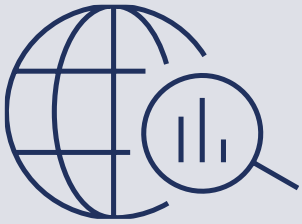
It is against this background that European governments took steps to address the problems that hindered banks from lending to one another after the GFC. To reduce credit risk in the banking sector, European governments put forward packages that aimed at alleviating risks associated with bank assets and improving banks' solvency. Such packages include capital injections, public buying of distressed assets and issuance of government bonds that are deposited with banks. In addition to such packages, there were interbank lending guarantees (usually through new debt issuance guarantees) that were being provided to banks. Such guarantees function as domestic deposit insurance. As argued by Bernard and Bisignano (2000), certain segments of the market might collapse without guarantees. Among other things, such packages restore confidence in banks and improve trading in interbank markets. To illustrate, a drop in rates[7] was evident in European interbank markets following the roll-out of said packages.

For Italy, the revival of the post-GFC frozen interbank market was done by the Bank of Italy guaranteeing the interbank lending market. The guarantees called the Mercato Interbancario Collateralizzato (MIC) were introduced in 2009 and targeted Italian banks to again start lending to one another more freely. Under arrangements like this, a central bank may create a collateralized interbank market and guarantee the collateral posted by banks when borrowing from each other. This aims to ensure that all transactions are completed even if any participating bank defaults on its obligations.

With such interbank market guarantees, counterparty risk is eliminated and all banks are able to participate in the market with the guarantor committed to covering all losses stemming from any illiquid investment. Thus, such loan guarantees reduce or even eliminate counterparty risk, lowering the interbank interest rate and inducing safer banks to borrow again. Although government guarantees can help to revive the interbank market by eliminating credit risk in unsecured lending transactions, government guarantees have been found to be problematic (Smaghi, 2008). Among other things, such guarantees would entail a wide re-nationalisation of money markets and thus reverse a long process of liberalisation.

[7] For example, the three-month EURIBOR dropped.

Moreover, such guarantees are often associated with substantial distortion of various segments of the money market that would weaken monetary policy. Further, government guarantees are often associated with moral hazard due to the inability of governments to control their provision.



6 The Interbank Market Impact Indicators

Alongside relevant factors[8] described earlier such as the monetary policy framework, legal and regulatory framework and market institutional infrastructure, counterparty credit risk remains of crucial influence to interbank market activity. The presence and perceived degree of both risk and information asymmetry can be reflected in both the interbank rates and interbank traded volumes. Taken together, prevailing problems in the interbank market are likely to be manifested in market participation, the level of collateralization, trade maturity and level of access to the central bank facilities and other sources of liquidity. Changes in interbank levels would therefore mirror changes to these factors. Against this backdrop, the proposed ten interbank market indicators are based on six market-based signals. The magnitude and speed with which the adjustment to these indicators will take place could be a key factor relevant to the impact that such development initiatives have directly had on the perceived risks of participating banks and the whole market.

Explanatory note: Application of the indicators per country depends on the specific country context, which will affect decisions such as the most suitable definition of parameters included in the indicator formulas and timing and frequency of measurement. Consequently, the indicators are best suited to track development of local markets over time and care should be applied in comparing markets against these indicators.

[8] Such as bank size, aggregated money market liquidity position and lending relationships.

Market signal 1

Impact indicators 1 to 3

6.1 Interbank Rate Spread

Shin (2013) argues that market prices are generally appropriate for obtaining indicators of concurrent market conditions. The interbank market literature underscores that banks perceived to have high levels of credit risk are penalized by their counterparties in the interbank market. Whenever such banks access liquidity in the interbank market, they pay higher borrowing rates than peers perceived to be less risky (King, 2008; Ashcraft et al. 2011; Flannery, 2001). Conclusively, the risk of lending to a bank is reflected in the premium it pays when borrowing from the interbank market. This is because risk disparity among banks still exists, even if the general riskiness of the market changes.

With this in mind, an interbank market spread at bank level is computed as the difference (in basis points) between an individual bank's weighted average interbank (borrowing) rate for a given maturity at a given time and the average interbank market rate for a given maturity at a given time. This is calculated as in Indicator 1.

$$spread_{it} = ibr_{it} - ibr_{mt} \quad (1)$$

Where $spread_{it}$ is the individual bank's (i) interbank rate spread in period t, ibr_{it} is the weighted average interbank (borrowing) rate of an individual bank in period t, ibr_{mt} is the average interbank market rate at a given time (t). In this case, a positive number implies that, on average, a bank is borrowing at a higher rate than the average rate prevailing in the market for given period. Therefore, the wider the spread, the riskier the bank. On the other hand, a negative number implies that, on average, a bank is borrowing at a lower rate than the average market rate for the period. Likewise, the wider the spread, the less risky the bank.

The interbank borrowing rate for a specific bank (i) for a given maturity at a given time, ibr_{it} is calculated as the volume-weighted average of the borrowing interest rate (r) of all loans (l_j) at a given time (t), computed as in Indicator 2.

$$ibr_{it} = \frac{\sum_{j=1}^{J}(1+ibr_{it})*l_{ijt}}{\sum_{j=1}^{J} l_{ijt}} \quad (2)$$

The average interbank market rate for a given maturity is calculated as the volume-weighted average interbank rate for all interbank loans (q) by all banks (i) that borrow liquidity from the interbank market for a given maturity at a given time (t), denoted as Indicator 3.

$$ibr_{mt} = \frac{\sum_{i=1}^{I} ibr_{it}*q_{it}}{\sum_{i=1}^{I} q_{it}} \quad (3)$$

It is important to note, however, that where banks manage to lend and borrow from one another in the interbank market, it does not necessarily improve the liquidity of the banking system as a whole. Changes in the riskiness of individual banks are reflected in both the rates to individual banks and the overall market rates. Given that interbank lenders may not distinguish between safer and riskier banks with precision, the presence of risky banks in the interbank market may impose an externality on safer banks (European Central Bank, 2009). As detailed above, the failure to distinguish between safer and riskier banks could drive-up interest rates for the whole market.

There is therefore a need to disentangle whether changes to prices of liquidity can be attributed to changes in riskiness for just a few institutions (counterparty risk) or changes to the overall market risk (aggregated risk). If the latter result is observed, we may suggest that changes to prices reflect market sentiment rather than credit rationing for individual counterparty risk. As such, another measure of spread that could be used to point the level of risk in the interbank market as a whole is warranted. This is presented as Indicator 4.

$$spread_{mt} = ibr_{mt} - mpr_t \qquad (4)$$

Where $spread_{mt}$ is the difference (in basis points) between the average interbank market rate for a given maturity and the policy rate[9] at a given time.

This spread is basically the premium from the policy rate at a given time. Theoretically, the policy rate is the highest rate at which banks borrow liquidity when unable to borrow from the interbank market. With reduced risk levels brought about by market development initiatives, interbank market rates across tenures are expected to go down. Hence the gap between the interbank market rate and the policy rate will be expected to widen where initiatives are effective.

[9] This is the rate at which banks borrow from the central bank.

Market signal 2

Impact indicators 5 to 6

6.2 Interbank Borrowed Volumes

Indicators of interbank market conditions would also be reflected in the ability of the market to accommodate the liquidity needs of its market participants without resorting to other sources. As highlighted earlier, the interbank market could be regarded as the best source of liquidity for banks. Seeking liquidity from other sources, while the interbank market has enough liquidity, would therefore signal underlying market challenges. Consider the heightened risk levels during the GFC for instance – while the unsecured euro interbank market was characterized by huge amounts of excess reserves with the ECB, the average daily traded volume in the overnight unsecured interbank market dropped significantly. Holding liquidity levels in the interbank market constant, interbank borrowed volumes can therefore be used to show riskiness of the market. Interbank borrowed volume, relative to other funding sources, could indicate the extent to which the interbank market is relied upon as a funding source[10]. We take this into consideration and express an interbank market indicator in terms of interbank borrowed volumes as in Indicator 5.

$$ibv_{it} = \frac{Interbank\ Borrowed\ Volume_{it}}{Total\ liabilities_{it}} \qquad (5)$$

At an individual bank level, this indicator measures the sum of interbank borrowings undertaken by a bank at a given time divided by the bank's total liabilities for the period. This will also be extended to measure changes in the whole market's reliance on the interbank market as in Indicator 6.

$$ibv_{mt} = \frac{Total\ Interbank\ Traded\ Volume_{t}}{Total\ banking\ sector\ liabilities_{t}} \qquad (6)$$

where ibv_{mt} is an interbank volume indicator for the market at a given time and $Interbank\ Traded\ Volume_t$ is the value of the total interbank traded volume (in local currency) at a given time.

This indicator could be compared to the total amount of liquidity provided by the central bank over a bank's total liabilities, to see differences in reliance on the two sources of liquidity. When the value of this indicator is bigger, it implies that the interbank market is more able to accommodate the liquidity needs of its participants before the central bank intervenes. On the other hand, where the value of this indicator is smaller, it implies that the liquidity distribution role of the interbank market is not complete. Holding all things constant, the value of this indicator will be expected to go up following the implementation of market development activities in the participating markets if such activities are effective.

[10] For the sake of meeting their daily liquidity needs, in addition to interbank borrowing, banks meet their liquidity needs by accessing the central bank facilities or by discounting their securities

Market signal 3

Impact indicator 7

6.3 Unsecured Versus Secured Rates

In typical credit markets, banks protect themselves from risks of NPLs by requiring collateral or placing restrictive covenants in loan contracts. While it is possible to borrow without collateral in interbank markets, lenders may demand some pristine form of collateral as a safeguard on interbank loans. This is especially where interbank lending is regarded with increased levels of uncertainty or suspicion. This implies that concerns about the riskiness of counterparties may induce a shift to collateralised lending. This has been common especially in the aftermath of the GFC. In most interbank markets, government securities such as repurchase agreements have been used as collateral for interbank borrowing (Bernard and Bisignano, 2000).

Given that unsecured interbank lending is riskier compared to secured lending, lenders are compensated by borrowers through their paying of a premium above the secured rate for funds obtained in the unsecured interbank market. Consequently, the rate at which banks borrow from the unsecured market is above the one they pay in the secured market. This implies that the spread between the unsecured and secured interbank rates could reflect the level of perceived risk in the interbank market. As highlighted by Heider and Hoerova (2009), the unsecured segment of the interbank market is particularly vulnerable to changes in the perceived creditworthiness of counterparties. For instance, one of the outstanding manifestations of tension in the interbank markets during the GFC was the decoupling of the interest rates in these two segments of the interbank market. Precisely while the rates obtained from the two segments of the market were closely tied together prior to the outbreak of the crisis, the rates moved in the opposite direction following the Lehman bankruptcy (ibid).[11]

The spread between the unsecured rate and the secured rate will therefore be used to track the impact of market development activities on the participating markets.

An indicator that will track the spread between the rates from the two segments of the market is created. This indicator, $CollateralSpread_t$ is expressed as in Indicator 7.

$$CollateralSpread_t = UncollateralizedRate_t - CollateralizedRate_t \quad (7)$$

Where $UncollateralizedRate_t$ is the weighted average interbank market rate obtained from the uncollateralized market segment at a given time and $CollateralizedRate_t$ is the weighted average interbank market rate obtained from the collateralized market segment at a given time. The reasoning follows, the value of this indicator will be expected to go down when reflecting the reduction in risk following the implementation of market development activities in the participating markets if such activities are effective.

[11] with the unsecured rate increasing and the secured rate decreasing.

Market signal 4

Impact indicator 8

6.4 Maturity Period of Interbank Loans

Where creditors lack certain information on borrowers, the perceived risk levels in the interbank market would also be reflected in maturity periods of interbank loans. Holding all things constant, restrictive covenants could be precluded by shortening the maturity period of interbank loans. An increase in both asymmetric information regarding the total indebtedness of interbank borrowers and the perceived risk can lead to shorter debt maturity structures. While risky banks are offered liquidity at higher rates than less risky banks, such behaviour would work where loan covenants are enforceable and bankruptcy procedures are transparent. In such cases, interest rates can adjust to clear the loan market.

However, with absence of enforceable constraints on debt dilution, lenders would cover themselves by shortening the maturity period of the interbank loans. By tracking the average maturity period of interbank transactions over time, an increase/decrease in the perceived risk in the interbank market can be traced. Holding all things constant, the longer the average maturity period of interbank loans, the more confident lenders are in the borrowers. From this perspective, an interbank market indicator that will track changes in the weighted average maturity period of interbank loans over time is relevant. The weighted average maturity period of interbank loans, at a given time, is computed by the summation of the product of the weight[12] of each maturity category and its maturity period. This is expressed in Equation 8.

$$AverageMaturity_t = \sum maturity_{lt} * weight_{lt} \quad (8)$$

Where *l* is a maturity category of interbank loans.[13]

This indicator can be used to track changes in perceived risk for both individual participating banks and the whole market. The increase in the value of this indicator is attributable to more factors but extended maturities may be a reflection of effective market development activities.

[12] The weight of each maturity category is obtained by dividing the value of all loans in a given maturity category at a given time by the value of all interbank loans in the period.

[13] This can be overnight, 7 day, 14 day, etc depending on the available maturity profiles of interbank loan in a given market.

Market signal 5

Impact indicator 9

6.5 Interbank Market Participation

Indicators of interbank market conditions would also be reflected in the ability of banks to participate in this market, both on the lending and borrowing side. Practically, when the interbank market is safe, all banks could be expected to participate in trading of liquidity as either lenders or borrowers. This is because it is uncommon for banks to have the exact amount of liquidity they need daily. With reduced levels of risk and information asymmetry, more banks are able to both lend and borrow liquidity from one another. The interbank market participation indicator, ibp_t, is expressed as in Equation 9.

$$ibp_t = \frac{Interbank\ participants_t}{Total\ number\ of\ banks_t} \quad (9)$$

Where $Interbank\ participants_t$ is the number of banks that participated in the interbank market (as borrowers or lenders) at a given time and $Total\ number\ of\ banks_t$ is the number of banks[14] that are allowed, by regulation, to participate in the interbank market. The value of this indicator will be expected to go up following the implementation of market development activities in the participating markets if such activities are effective.

[14] The word "banks" is used loosely to include all financial institutions that are allowed by regulations of a specific market to participate in the interbank market.

Market signal 6

Impact indicator 10

6.6 Excess Liquidity

As pointed out earlier, riskiness of an interbank market could result in liquidity hoarding. The inability to borrow[15] from the interbank market would motivate banks to keep significant amounts of liquidity as a precautionary measure. Such behaviour is usually reflected in the levels of systemic liquidity in the banking system. Under such circumstances, banks would keep liquidity over and above the level of reserves that are required to meet the liquidity reserves requirement (LRR) stipulated by the central bank. Banks do this to cover themselves from liquidity shocks. The excess liquidity indicator for a specific interbank market EL_t is expressed in Equation 10.

$$EL_t = \frac{ER_t}{RR_t} \tag{10}$$

Where ER_t is the total amount of reserves over and above the required reserves for the whole banking system at a given time and RR_t is the total amount of liquidity needed for banks to meet LRR. The value of this indicator will be expected to go down following the implementation of market development activities in the participating markets if such activities are effective, since banks will build confidence for the interbank market to provide their liquidity needs in times of liquidity shocks.

[15] Or borrowing at a very high rate.

7 Conclusion

Although interbank markets are the cornerstone to the growth and development of economies, these markets are still under-developed and are often characterized by information asymmetry and high levels of risk in most EMDCs. This discourages trading and limits the effectiveness of interbank market on the transmission mechanism of monetary policy, among other things. There is a need for deliberate efforts to support interbank markets in these regions.

Despite the unequivocal importance of interbank markets, literature on the subject remains scarce and precise interbank indicators remain non-existent. This paper seeks to fill this gap by, building from the existing literature on interbank markets, suggesting six market-based signals and ten corresponding interbank impact indicators, which could be used by financial market stakeholders to track the progress made by interbank market development initiatives.

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