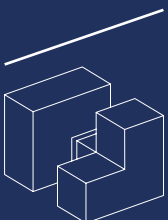




Interbank Market Impact Indicators

The analytical and academic foundation
for a comprehensive set of indicators to
baseline and track market development

Policy
Brief
#2



frontclear

A financial markets development company

November 2021

I Measuring interbank impact

The nucleus of the money market is interbank lending, where banks borrow and lend to each other using financial instruments such as repurchase agreements (repos) and hedge balance sheet risks through derivatives. Frontclear¹ is a development finance organisation that facilitates the achievement of stable and inclusive money markets. To date, Frontclear is active in over 20 frontier markets across all global regions with a two-part approach: 1) technical assistance (capacity and advisory) to improve interbank trading conditions, alongside 2) credit guarantees that cover transacting institutions' credit risk. This is especially important because counterparty risk is one of the factors that banks consider when lending liquidity to each other. Taken together, these interventions enable frontier market banks to connect to local and global interbank markets. Frontclear's activities are expected to reduce the risks and obstacles in interbank markets and result in a smoother distribution of liquidity through a financial system.

Frontclear would like to assess the impact of its initiatives in such countries, where collaboration has reached a minimum of 5 years. The aim is to determine if initiatives are resulting in the targeted changes to interbank markets. While Frontclear has impact indicators per its Theory of Change (TOC)², this project will improve on the robustness of such indicators and become a comprehensive source for any stakeholder – local or international – to track interbank market development with greater authority. This Policy Brief, the second in the Frontclear series, highlights the academic underpinnings of interbank markets in frontier economies. It goes on to use this basis to determine six interbank market signals on which nine interbank impact indicators have been identified.

Project objective

The project aims to develop an optimal set of interbank market indicators that when applied, would yield quantitative and qualitative information about the status of a country's interbank and money market. Such indicators will be applied to track changes that will occur in the interbank markets. Initially, the project will apply the indicators to a single country, develop a baseline and track developments on the interbank market for a period of two years. This is to test the set's robustness.



¹ Visit www.frontclear.com for more information.

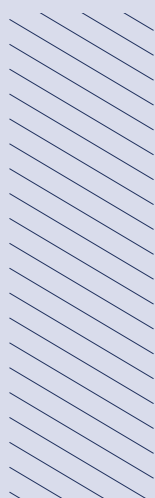
² In 2020, Frontclear put in place its Result Measurement Framework (RMF). A cornerstone piece in the RMF is the Theory of Change (TOC). The TOC is the practical framework by which Frontclear measures and reports on its performance relative to its Impact Strategy. In general terms, a TOC is a tool used to describe the need that is being addressed, the changes that are needed to achieve the targeted outcomes and what is planned to be done (activities) (Harries et al, 2014). The approach has been found to be useful for different organisations, including funders. Among other things, a TOC explains why activities are expected to lead to the intended outcomes. A TOC also helps to explore whether plans are supported by evidence and helps to understand the information that is needed in monitoring performance. This tool can therefore be used as the basis for claims about attribution.

II Cornerstone role

Interbank markets are markets where banks lend and borrow funds from each other for the sake of meeting their daily liquidity needs. A deep and liquid interbank market supports the main purpose of financial intermediation: channelling funds from savers to productive investment (Smaghi, 2008)³ in households and businesses. In doing so, banks are challenged by having to match the demand for loans against deposits. In this, banks regularly face unexpected liquidity needs in their everyday business, especially short-term funds. A vibrant interbank market ensures access to liquidity through a mechanism that reallocates funds through the financial system. Without it, economic growth and development can be hindered.

A central bank may put in place facilities to enable banks with surplus reserves to deposit their excess reserves and earn a return, and those in deficit to borrow from the central bank. But borrowing from the central bank is generally costly and even though in a balanced and effective monetary policy environment banks are expected to borrow from the central bank from time to time, a bank doing so frequently may be perceived to be in a riskier position⁴. While there are other alternative sources, interbank markets remain a reliable source of bank liquidity.

The interbank market should be regarded to be one of the most important indicators of the functioning of the entire financial system. Disruptions to the interbank market can easily be transmitted to other financial markets. For instance, challenges faced by 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 gauge monetary policy. It is in the interbank market where the overnight rate – a rate that directly affects other rates in the economy – is determined. Consequently, the functioning of the interbank market is linked to the performance of the economy by influencing borrowing conditions for households and firms, impacting wider economic growth and development.



Experience confirms

While interbank markets are seen to be associated with banks, the role played by interbank markets in the distribution of liquidity is crucial to the whole economy. Much literature documents that the failure of 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 each other in the interbank market due to precautionary reasons and as a result, interest rates were driven-up in most European money markets. Consequently, there was an evident reduction in transaction volume. This implies that the malfunctioning of interbank markets can endanger the stability of the entire financial system and the whole economy.

³ Smaghi, L.B. (2008), *"Restarting a Market-the Case of the Interbank Market"*, ECB Conference on Global Financial Linkages, Transmission of Shocks and Asset Prices, Frankfurt, 1 December 2008.

⁴ Acharya V. and O. Merrouche (2012), *"Precautionary Hoarding of Liquidity and Interbank Markets: Evidence from Subprime Crisis"*, Review of Finance, Vol 17, pp 107-160.

III Gauging financial system risk

Although banks set credit limits to respond to the perceived riskiness of other banks, there is literary evidence supporting that interbank markets can provide an additional reliable indicator of bank riskiness. In short, borrowing in frontier markets is often unsecured and depends on the level of trust among banks. Consequently, banks within the interbank market framework are motivated to invest in information about the riskiness of their peers. Through this peer mechanism, banks can monitor and discipline one another in the interbank market. For example, a bank may limit or 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. For the U.S. secured market as an example, King (2008)⁵ found that even secured borrowing costs display cross-banking tier variations, reflecting differences in counterparty risk. Such findings were also supported by Gorton and Metrick (2012)⁶. Likewise, as shown in a South American interbank market, Martínez and León (2016)⁷ found that different banks are charged different rates when borrowing from the interbank market despite offering the same quality collateral. 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. These results are supported by Furfine (2001)⁸, who also provided evidence that the interbank market provides a good platform for banks to effectively monitor their peers.

5 King, B.K. (2008), "*Discipline and Liquidity in the Interbank Market*", Journal of Money, Credit and Banking, Vol. 40, No. 2-3.

6 Gorton, G. and A. Metrick (2012), "*Securitized Banking and the Run on Repo*", Journal of Financial Economics, vol. 104, issue 3, pp425-451.

7 Martínez, C. and C. León (2016), "*The Cost of Collateralized Borrowing in the Colombian Money Market: Does Connectedness Matter?*", Journal of Financial Stability, Vol. 25, pp193-205.

8 Furfine, C.H. (2001) "*Banks as Monitors of Other Banks: Evidence from the Overnight Federal Funds Market*", Journal of Business, vol. 74, no. 1.

Although research on interbank markets for frontier markets remains scarce, the few studies confirm the presence of market discipline. For Murinde et al. (2015)⁹, the peer monitoring role of one Sub-Saharan Africa (SSA) interbank market is confirmed through an inverse relationship between interbank activity (interbank volume-based measure of interbank market discipline) and bank risk levels. The study confirmed that the interbank market is effective as a peer-monitoring and market discipline device and thus complements bank regulation. Based on the results, Murinde et al. argue that regulators can use the dynamic interbank borrowing activity signals to identify banks that are perceived as risky in the market. For a neighbouring SSA market, 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)¹⁰. Bwire et al. concluded that monitoring of the spreads paid by banks in the interbank market would guide in obtaining useful information to guide risk-based supervision strategies.

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 is precisely banks' actions relative to peers in the interbank market, which can be informative to financial market stakeholders. This given that interbank market indicators contain important information about the riskiness of banks participating in the interbank market and about the market in its totality. 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. As pointed out by Lori et al. (2012)¹¹, distress in the interbank market can serve as an early warning indicator of sovereign risk. As such, interbank indicators could have important implications for the transmission of the monetary policy and financial stability in a country. Understanding interbank market indicators has therefore been a growing concern among policymakers and other financial market stakeholders.

⁹ Murinde, V., Bai, Y., Green, C.J., Maana, I., Tiriongo, S. and K. Ngoka-Kisinguh, (2015), *"The Peer Monitoring Role of the Interbank Market in Kenya and Implications for Bank Regulation"*, European Financial Management Association (EFMA), Conference Paper 0323.

¹⁰ Bwire, T., Brownbridge M., Rubatsimbira, D. and G. Tinyinondi (2019), *"Do Interbank Interest Rates Reflect the Financial Soundness of Borrowing Banks?"*, SOAS Centre for Global Finance, Working Paper No. 14/2019.

¹¹ Lori, G., Kapar, B., and J. Olmo (2012), *"The Cross-Section of Interbank Rates: a Nonparametric Empirical Investigation"*, City University Report, No. 12/03, London.

IV Pricing credit and price transparency

Interbank market rates transmit pricing information along the yield curve and usually form the shortest end of the yield curve. Ideally, interest rates applied to many outstanding loans are indexed to, or at least priced against the interbank rate. This implies that changes to the interbank market rate are conveyed 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 – limiting price transparency. Without a price for short-term liquidity, the market for term lending stops functioning (Smaghi, 2008). Without the interbank market rate, for instance, other financial markets like repo, bond and some derivatives markets would become less liquid or dry-up.

Through the interbank market, central banks can influence the longer-maturity rates that are relevant to the setting of bank loan rates. Using their 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 possible because the interbank market rate responds quickly to changes in central bank rates, usually emanating from central bank operations. Although central banks provide liquidity to liquidity-deficient banks and provide for a deposit facility for banks with excess liquidity, there are limits to the extent that central banks can replace the interbank market liquidity distribution role. For instance, while central banks can offer standing facilities, they may not provide liquidity at different maturities like interbank markets.

Where central banks are heavily relied upon as providers of liquidity in the market, the peer monitoring role of the interbank market, which serves to find the appropriate valuation of liquidity, is lost. The interbank market is central to pricing credit. Absence of an active interbank market also affects the availability of bank credit. Among other sources, banks depend on interbank funds to manage their liquidity positions. Lack of an active interbank market could lead to, among other factors such as ineffective monetary policy, conservative liquidity management by banks and the build-up of liquidity buffers, thus hindering the supply of long-term loans which are key to economic growth. Therefore, the ability of a bank to grant new loans would depend to a degree on the possibility of using the interbank market as one of its sources of funding.

Case in point

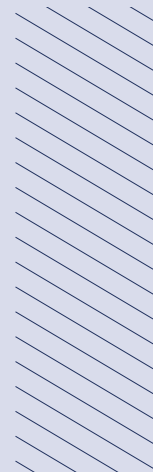
Since interbank rates act as anchors for the long-term structure of other interest rates in the financial system, higher interbank rates can spillover to rates charged by banks, limiting the amount of credit that banks extend to the economy and hence limiting the role played by the banking sector. In the SSA region for instance, credit, both relative to GDP and in absolute terms, is relatively low 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%, 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)¹². 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%.

¹² Raga, S. and J. Tyson (2021), "Sub-Saharan Africa's Interbank Markets: Progress, Barriers and Policy Implications", DEGRP Synthesis Report, March 2021.

v Challenges in frontier interbank markets

A common challenge to frontier interbank markets is structural market segmentation. In structurally shallow interbank markets, banks prefer to transact with the central bank and their own clients. Some banks, besides having material deposits, are not active in the interbank market due to internal policies and limited credit lines for smaller banks. As evidenced in some markets, market segmentation pushes banks to rely on central bank standing facilities for their liquidity adjustment despite often high levels of excess liquidity in the banking system (IMF, 2018). Where liquidity trading does occur, it is limited to few counterparties in such markets. Consequently, shallow markets are associated with heightened vulnerability to systemic shocks due to concentration risk – few transactions among few players (Raga and Tyson, 2021). In addition, most interbank market transactions in these markets are largely limited to an overnight basis (no flexibility). Segmentation thus prevents relatively smaller banks from mobilizing funds at lower rates, making the trickle-down effect of lowering credit rates in the financial system more difficult.

A further challenge to frontier interbank markets is limited financial and supervisory capacity. While secured interbank markets are the developed country norm post-GFC, the frontier country interbank market is largely uncollateralized, wherein counterparty credit risk management relies on available financial soundness indicators and data gathering. Again, this increases the costs behind the economics of actual lending, limiting investment and economic growth. In addition, banks in frontier markets suffer from the insecurity emanating from the absence of specific laws, guidelines and codes of conduct for interbank market transactions. This further intensifies the reluctance of banks 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 markets where 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.



VI A driving force: risk and information asymmetry

Interbank market literature generally confirms that the distribution of liquidity across banks matters (Bindseil et al, 2011)¹³. A more imbalanced or dispersed distribution of liquidity leads to a tighter, segmented market in which banks with liquidity shortfalls risk being squeezed or rationed by banks that are liquid. Literature supports that a malfunctioning interbank market, typified by a dispersed distribution of liquidity, is generally attributed to information asymmetry relative to risk. An effort to define robust impact indicators is dependent on disentangling the existing direct and indirect measures of bank riskiness.

In Flannery (1996)¹⁴ and Freixas and Jorge (2008)¹⁵, information asymmetry results in adverse selection. Although banks could have better information about the riskiness of peers compared to other economic agents, they may not always have such full information. While a bank could know the distribution of risk in the whole banking sector and be well-informed about the risk of their own assets, they may not always observe the risk of their counterparties. 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)¹⁶, where asymmetric information can lead to reduced market activity since it is only the worst parties that are willing to trade. In some instances, counterparty risk for some of the banks in the market has increased up to a 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.

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 to participate in the market. Under situations where uncertainty becomes unbearable, the fear of adverse selection becomes so great that interbank lending stops altogether. 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)¹⁷ for instance, 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. Under liquidity hoarding, therefore, borrowers' access to funds is reduced regardless of borrower quality.

¹³ Bindseil, U. and J. Jabłocki (2011), *"The Optimal Width of the Central Bank Standing Facilities Corridor and Banks' Day-to-Day Liquidity Management"*, European Central Bank, Working Paper Series No. 1350 / June 2011.

¹⁴ Flannery, M. (1996) *"Financial Crises, Payment System Problems and Discount Window Lending"*, Journal of Money, Credit and Banking, vol. 28, pp 804-824.

¹⁵ Freixas, X. and J. Jorge (2008), *"The Role of Interbank Markets in Monetary Policy: A Model with Rationing"*, Journal of Money, Credit and Banking, vol. 40, 1151-1176.

¹⁶ Akerlof, G. (1970), *"The Market for 'Lemons': Quality Uncertainty and the Market Mechanism"*, Quarterly Journal of Economics, Vol. 84, pp 488-500.

¹⁷ Allen, F., E. Carletti and D. Gale (2009), *"Interbank Market Liquidity and Central Bank Intervention"*, Journal of Monetary Economics, vol.56, pp 639-652.

VII Interbank market impact indicators

Alongside relevant factors¹⁸ 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 interbank market indicators are based on six market-based signals.

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.

Interbank Rate Spread

Market Signal 1

As argued by Shin (2013)¹⁹, market prices are generally appropriate for obtaining indicators of concurrent market conditions. As highlighted earlier, banks that are 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 less risky peers (King, 2008; Ashcraft et al. 2011; Flannery, 2001). Conclusively, the risk of lending to a bank is reflected in the premium that it pays when borrowing from the interbank market. This is because disparity in the riskiness of banks still exists even if the general riskiness of the market changes.

Along this line, 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.

$$Spread_{it} = ibr_{it} - ibr_{mt} \quad / \text{Indicator 1}$$

Where $spread_{it}$ is individual bank's interbank (i) rate spread at time (t), and ibr_{it} is the weighted average interbank (borrowing) rate of an individual bank at time (t), and ibr_{mt} is the average interbank market rate at time (t). A positive number implies that on average, a bank is borrowing at a higher rate than the average rate prevailing in the market at that time. 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 at that time. Likewise, the wider the spread, the less risky the bank.

¹⁸ Such as bank size, aggregated money market liquidity position and lending relationships.

¹⁹ Shin, H.S. (2013), "Procyclicality and the Search for Early Warning Indicators", IMF Working Paper, WP/13/258.

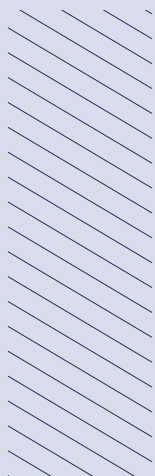
The interbank borrowing rate for a specific bank (i) for a given maturity at a given time ibr_{it} , is calculated as the volume-weighted average of the borrowing interest rate (r) of all loans (l_j) at a given time (t), computed as in Indicator 2.

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

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.

$$ibr_{mt} = \frac{\sum_{i=1}^I ibr_{it} * q_{it}}{\sum_{i=1}^I q_{it}} \quad / \text{Indicator 3}$$

It is important to note that where banks manage to lend and borrow from one another in the interbank market, it does not necessarily improve the liquidity of the entire banking system. 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.



Interbank Borrowed Volumes

Market Signal 2

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 (including that through swaps) 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 source²⁰. We take this into consideration and express an interbank market indicator in terms of interbank borrowed volumes as in Indicator 4.

$$ibv_{it} = \frac{\text{Interbank Borrowed Volume}_{it}}{\text{Total liabilities}_{it}} \quad / \text{Indicator 4}$$

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 at that time. This will also be extended to measure changes in the whole market's reliance on the interbank market as in Indicator 5.

$$ibv_{mt} = \frac{\text{Total Interbank Traded Volume}_t}{\text{Total banking sector liabilities}_t} \quad / \text{Indicator 5}$$

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, offering insight into the 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 take care of the liquidity needs of its participants before the central bank comes in. On the other hand, when 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 interbank development activities in the participating markets if such activities are effective.

²⁰ 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.

Collateralization of Interbank Trades

Market Signal 3

In typical credit markets, banks protect themselves from the risks of borrowers not repaying loans by requiring collateral or placing restrictive covenants in the loan contracts. While it is possible to borrow without collateral in interbank markets, lenders may demand some form of unencumbered collateral as a safeguard on interbank loans. This is especially the case where interbank lending is regarded with increased levels of uncertainty. This implies that concerns about the riskiness of counterparties may induce a shift to collateralized lending. In most interbank markets, government securities have been used as collateral for interbank borrowing via repurchase agreements (Bernard and Bisignano, 2000)²¹. Secured repo transactions are especially common in the aftermath of the GFC, increasingly required by regulation.

In some instances, the ratio of the volume of collateralized to uncollateralized borrowing relative to total traded volumes in the market could be used to trace movements in interbank market perceived risk. An increase in the value of collateralized trades at a given time, could signify that perceived risks in the interbank market are high and lenders prefer collateralized over uncollateralized lending. On the other hand, a decrease in the value of this indicator could imply that perceived risks are low. However, in the case of tracking the impact of market development activities on the participating markets, the spread between the unsecured rate and the secured rate will be used²².

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)²³.

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 6.

$$\text{CollateralSpread}_t = \text{UncollateralizedRate}_t - \text{CollateralizedRate}_t \quad / \text{Indicator 6}$$

Where *UncollateralizedRate_t* is the weighted average interbank market rate obtained from the uncollateralized segment of the market at a given time and *CollateralizedRate_t* is the weighted average interbank market rate obtained from the collateralized segment of the market at that same given time. The value of this indicator will be expected to go down to reflect a reduction in risk following the implementation of market development activities.

²¹ Bernard H. and J. Bisignano (2000), "Information, Liquidity and Risk in the International Interbank Market: Implicit Guarantees and Private Credit Market Failure", BIS Working Paper, No. 86. Bank for International Settlement Monetary and Economic Department, Basel, Switzerland.

²² This is because collateralized trading is encouraged with the introduction of Global Master Repurchase Agreement (GMRA) in most markets.

²³ With the unsecured rate increasing and the secured rate decreasing.

Maturity Period of Interbank Loans

Market Signal 4

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.

In the 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 and the effectiveness of the market environment. 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 weight²⁴ of each maturity category and its maturity period. This is expressed in Indicator 7.

$$\text{AverageMaturity}_t = \sum \text{maturity}_{it} \times \text{weight}_{it} \quad / \text{Indicator 7}$$

Where I is a maturity category of interbank loans²⁵.

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.



²⁴ 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 at the given time.

²⁵ This can be overnight, 7 day, 14 day, etc depending on the available maturity profiles of interbank loan in a given market.

Interbank Market Participation

Market Signal 5

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 and well-developed, 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 Indicator 8.

$$ibp_t = \frac{\text{Interbank participants}_t}{\text{Total number of banks}_t} \quad / \text{Indicator 8}$$

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 banks²⁶ 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.

Excess Liquidity

Market Signal 6

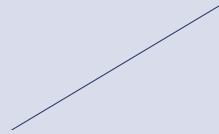
As pointed out earlier, riskiness of an interbank market could result in liquidity hoarding. The inability to borrow²⁷ from the interbank market would motivate banks to keep significant amounts of liquidity as a precautionary measure. Such behaviour is usually reflected in the levels of systemic liquidity 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 protect against potential liquidity shocks. The excess liquidity indicator for a specific interbank market EL_t , is expressed in Indicator 9.

$$EL_t = \frac{ER_t}{RR_t} \quad / \text{Indicator 9}$$

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.

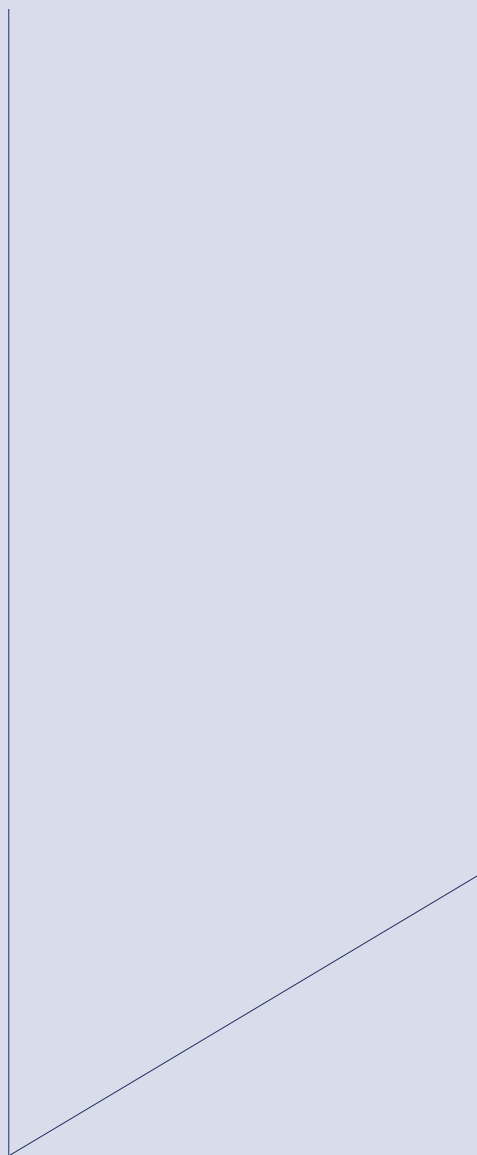
²⁶ The word "banks" is used loosely to include all financial institutions that are allowed by regulations of a specific market to participate in the interbank market.

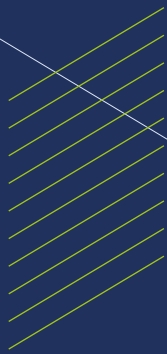
²⁷ Or borrowing at a very high rate.



VIII Conclusion

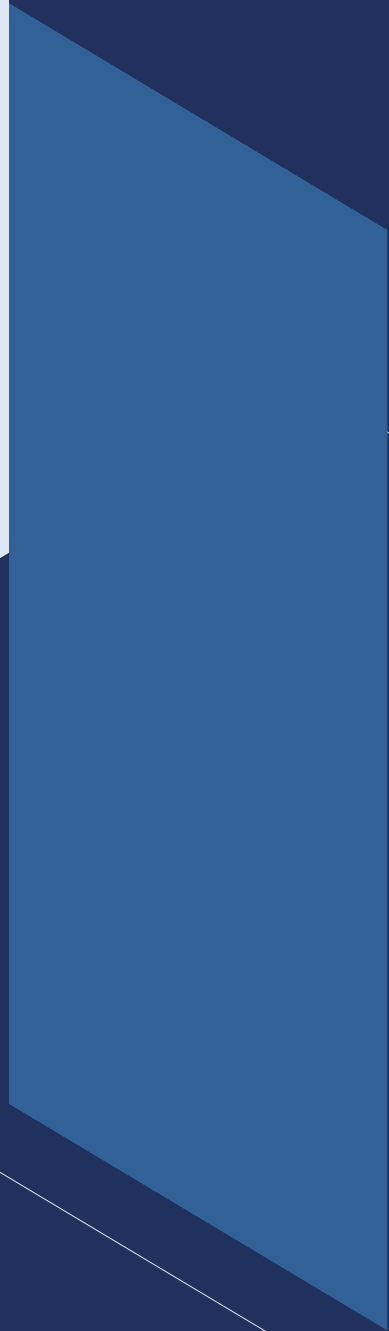
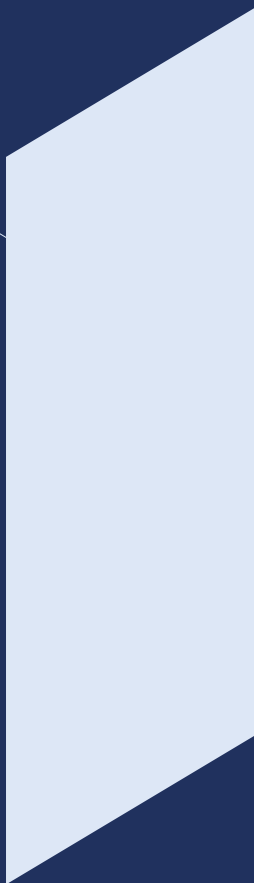
Interbank markets play a crucial role in the smooth functioning of the financial system by providing short-term funds to banks, enabling them to manage risks and free-up idle capital otherwise not put to best use for the economy. Interbank markets have a cornerstone role in the economy and the degree to which targeted initiatives contribute to their development can be baselined and reviewed over time using these proposed indicators.





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