BANK INDONESIA
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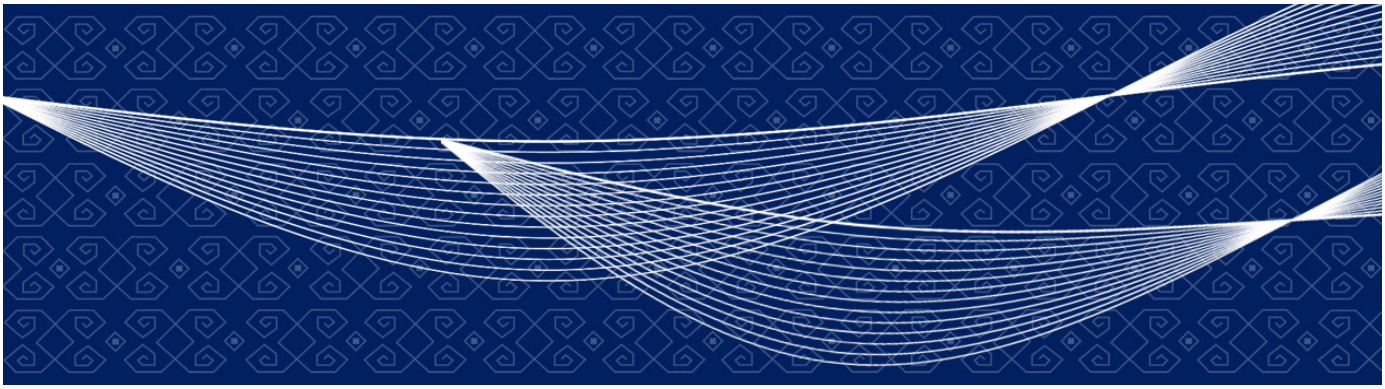

RP/MON/08/2024

WORKING PAPER

ANALYSIS OF PRIMARY DEALER IMPLEMENTATION IN PRO MARKET MONETARY OPERATION TRANSACTIONS

Aryo Sasongko, Cicilia A. Harun, Rahutomo Anugrah Dewanto, Wahyu Widianti, Geyana Ledy Fista, Kusfisiami Wima Mustika, Astrika Erlin, Ibrahmi Adrian Nugroho, Putra Prima Raka, Misbahol Yaqin

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Abstract

This study explores the impact of primary dealer system implementation on counterparty connections, prices, liquidity, and concentration risk in the Indonesian Money market. Using transaction data of interbank money market instruments, we find that the implementation of the primary dealer system increases the degree of centrality (number of counterparty connections) in the Indonesian Repo and time deposit markets. The implementation of primary dealers also leads to an increase in nominal transactions of Bank Indonesia Rupiah Securities (SRBI). The simulation results of primary dealer selection by clients show that the greater the demand of banks participating in monetary operations with limited primary dealer liquidity, the faster the orders are concentrated on primary dealers with large liquidity. Vice versa, the smaller the demand of banks participating in monetary operations with large liquidity, the orders tend to be scattered. The larger the order size of banks participating in monetary operations, the faster orders are concentrated in primary dealers with large liquidity. Vice versa, the smaller the order size of banks participating in monetary operations, the orders tend to be scattered.

Keywords: Primary dealer, concentration risk, liquidity, interest rate, counterparty connection

JEL Classifications: E43, G21, G28

1. Introduction

Primary dealers act as a link between the ministry of finance and the central bank and the financial markets. It started as a primary market intermediary for government bonds (Arnone & Iden, 2003) and then expanded to all other monetary operations instruments (Garbade, 2016). After growing for a while, primary dealers have an additional role, which is to become a communication facilitator between the central bank and commercial banks (Toporowski, 2022).

As a disseminator of central bank policy signals, primary dealers help the central bank obtain information (Preunkert, 2023) channel interest rate information to money market participants more effectively (Ehrmann, 2006; Rozkrut, 2008; Preunkert, 2023), and help predict monetary policy (Rafferty & Tomljanovich, 2002; Morris & Shin, 2005), so that the market becomes more efficient and the market for monetary operations instruments becomes more liquid. Correia-Golay et al.'s (2013) survey in New York found that the primary dealer market is more efficient than the central bank. (2013) in New York found that primary dealers assist the Federal Reserve's Bank in understanding market expectations for monetary policy. Martin (2023) explains that the dissemination of market information by primary dealers can increase liquidity, lower transaction costs, and support the implementation of monetary policy.

On 24 August 2023, Bank Indonesia announced to start a pro-market monetary policy program by involving primary dealers. Pro-market monetary operations are using monetary operations and their transmission supported by primary dealers to foster activity and liquidity in the money market and foreign exchange market. The target is for money market participants to activate market dynamics so that the mechanism of activities to determine product/security prices is more effective. Previously, the central bank interacted directly with market participants to determine the price of monetary operation (OM) instruments, so the central bank had a major role in directing prices. In place of Bank Indonesia, primary dealers interact directly with market participants/participants of monetary operations, so that market participants form the price of monetary operations products/securities naturally through their interactions. The program aims to establish a market structure between Bank Indonesia, primary dealers, and other monetary operations participants in order to determine the prices of money market instruments that affect market liquidity and stability (Garbade, 2016).

After the announcement of the implementation of the primary dealer structure system above, Bank Indonesia started the primary dealer system in money market and foreign exchange monetary operations on April 17, 2024 as stated in PADG No. 2 Year 2024 on primary dealers. In fact, since 2003, Arnone & Iden's study has recommended Indonesia to implement primary dealers to develop a secondary market for bonds and increase instrument liquidity. In addition, Ferdian & Dewi (2017) proposed the implementation of a primary dealer system for trading State Shariah Securities (SBSN) to increase liquidity, namely trading volume. Other studies on primary dealers also suggest that primary dealers can influence the supply and demand of money market instruments and move the market (Bisignano et al., 1996; Gray, 1997). Arnone & Iden (2003) survey results from 47 countries also show that the role of primary dealers can develop secondary market liquidity of government bonds.

However, Fecht et al. (2014) argue that the implementation of primary dealers' changes counterparty interconnection and market prices. In addition, primary dealers hold market power, which leads to discriminatory pricing when trading with entities such as the Federal Reserve Bank (An & Song, 2023). Whereas, Mishkin

(2007) says “the implementation of new policies takes time before their effects can be seen significantly in financial markets.” And, Adrian and Shin (2010) state that financial market stability is often affected by market participants' expectations and macroeconomic factors, which can slow down the response to new policies. This implies that the primary dealer effect has not had an impact in less than a year. Thus, the first research gap is that the implementation of the primary dealer system may lead to differences in the structure/flow of transactions and banking groupings as well as the transmission of price changes either through primary dealers or not through primary dealers.

Competition between primary dealers can lead to monopoly or oligopoly clients that cause systemic risk in the distribution of monetary operations or concentration risk. Primary dealers are financial institutions that aim to maximize operating profits (World Bank, 2010). Jensen & Meckling (1976) said that agent-dealership behavior can make primary dealers act opportunistically. Similarly, Grossman & Stiglitz (1980) say that it is impossible for the market to be perfectly efficient, and competition between primary dealers leads to no information exchange between them. Thus, primary dealers compete to have an information advantage to get clients (non-primary dealer Monetary Operations (OM) participating banks). Clients will choose primary dealers that have a large number of clients or Bandwagon Effect (Schmitt-Beck, 2015) or positive network externalities (Katz & Shapiro, 1985). The result is that the number of active primary dealers decreases (primary dealer concentration) due to competition. The risk of primary dealer concentration is the systemic risk of monetary operations and the reporting of market information to the central bank becomes less complete, making the central bank's price expectations less precise (Ueda, 2018). Thus, the second research gap is how likely it is that banks participating in Monetary Operations (OM)/non-primary dealers will concentrate on certain primary dealers.

After obtaining the above two research gaps, the researcher made two research objectives, namely: (1) to find the impact of the implementation of the primary dealer system on counterparty interconnection, prices and liquidity of the Money market in a pro-market monetary policy system; (2) to simulate how market concentration risk can occur in the implementation of the primary dealer system.

This research makes two contributions regarding the impact of primary dealers on pro-market monetary operations. First, we discuss the structure of the money market between primary dealers and their clients using network analysis. We find that the role of primary dealers affects market dynamics, including financial asset prices and market liquidity. Second, we simulate the competition between primary dealers for clients. When a group or a primary dealer wins the competition, primary dealer concentration occurs. We develop a primary dealer concentration mitigation strategy that can be implemented by the Central Bank.

The next section of this research is as follows. Section II contains the literature review and section III contains the methodology that explains the data and research model. Section IV presents the results and discussion. Conclusions and recommendations are presented at the end.

2. Literature Review

2.1 Primary Dealer di Indonesia

Strong interconnections between market participants strengthen the stability of the money market, although they may increase systemic risk (Acemoglu et al.,

2015; Diem et al., 2019). One interesting aspect of the money market structure is the presence of dominant players. Central banks often select these dominant banks as primary dealers to support money market development and enhance the effectiveness of monetary policy (Garbage, 2016).

In addition to the requirement of a dominant bank, Bank Indonesia requires primary dealers to comply with the regulations regarding primary dealers stipulated in PBI Number 9 of 2023 concerning Amendments to PBI No. 22/14/PBI/2020 concerning Monetary Operations and PADG Number 2 of 2024 concerning Primary dealers. Primary dealers are banks and/or other parties determined by Bank Indonesia by fulfilling the primary dealer criteria set and obtaining approval from Bank Indonesia.

In its formation, there are several criteria contained in the regulation. Banks and/or other parties determined by Bank Indonesia can become primary dealers by fulfilling the primary dealer criteria and obtaining approval from Bank Indonesia. Primary dealer criteria include aspects of contribution, capability, and collaboration and reputation assessed through general criteria, consisting of:

1. General criteria consisting of:
    a. Size, which is the size of the primary dealer's financial services to the financial system and real sector;
    b. Interconnectedness, which is the primary dealer's relationship with the financial system;
    c. Complexity, which includes the component of substitutability; and
2. Special criteria consisting of:
    a. Transactions measured through transactions with Bank Indonesia, transactions with the real sector, and cross-border transactions;
    b. Interconnection measured through interconnection with Bank Indonesia, interconnection with the real sector, and cross-border interconnection;
    c. Competence as measured through the fulfillment of human resource competency requirements;
    d. Risk management measured through market risk management, liquidity risk management, and/or operational risk management; and
    e. Infrastructure as measured by the readiness of technological infrastructure, infrastructure governance in the Money Market and Foreign Exchange Market, as well as cyber resilience and security.

Primary dealers perform the following activities:

1. Participate in OPT transactions with primary dealer participants according to a predetermined schedule;
2. Accessing facilities provided to primary dealers in the form of lending facilities and/or securities that will be implemented in stages;
3. Obtaining information related to the role as a primary dealer; and/or
4. Participate in Bank Indonesia activities,

2.2 Fulfillment of Primary Dealer Criteria and Supervision

In order to support the implementation of the monetary operations strategy and the development of a modern and advanced money market and foreign exchange market, Bank Indonesia needs to establish, implement and supervise primary dealer criteria. Effective establishment and supervision of primary dealers will improve market efficiency, resulting in a more liquid market for monetary operations instruments.

Primary dealers must fulfill the general criteria and specific criteria when the

bank applies as a primary dealer and after obtaining Bank Indonesia's approval. In order to ensure the fulfillment of these criteria, Bank Indonesia conducts continuous periodic supervision and evaluation every semester. The supervision and evaluation are based on, among others: work plan documents submitted by banks, self-assessment, onsite visit results, as well as further confirmation with primary dealers.

Supervision of compliance with the general criteria of primary dealers, namely: size, interconnectedness, and complexity, which includes a substitutability component, can be simultaneously monitored by considering the indicators of Global Systemically Important Banks according to the international standards of the Basel Committee on Banking Supervision - Bank for International Settlements. With such an important role in the financial system and real sector, it is expected that primary dealers will be able to maintain the fulfillment of the general criteria over time.

Specific criteria describe the development of transactions and interconnections of banks in carrying out the role of primary dealer, as well as the capabilities of primary dealers in meeting competency requirements, implementing risk management, and ensuring infrastructure readiness including cyber resilience. Supervision and evaluation of risk management aspects include assessment of inherent risk and quality of risk management implementation for market, liquidity, and operational risks. As for the technology infrastructure aspect, the supervision includes an assessment of inherent risk mitigation in the form of treasury minimum standard infrastructure, treasury Information Technology (IT) governance, and cyber resilience and security. The purpose of the evaluation is to ensure that primary dealers have a strong and reliable quality of risk management implementation and IT infrastructure, so that they can carry out the primary dealer role properly.

Bank Indonesia evaluates semesterly performance to ensure that primary dealers have implemented market, liquidity and operational risk management as reflected by: (i) clear authority of the bank regarding the implementation of risk management as well as the Board of Directors and the implementation of the duties of the Board of Commissioners in accordance with their authority and responsibilities, (ii) the adequacy of risk management policies and procedures and the establishment of risk limits, (iii) risk management framework and risk measurement models, (iv) the adequacy of the quantity and quality of human resources, and (v) the adequacy of the bank's internal control system. Similarly, for IT infrastructure, the evaluation ensures that the bank has performed functional suitability, performance efficiency, compatibility, and reliability of the infrastructure. In addition, the evaluation also ensures that the bank has implemented technology infrastructure governance and risk management and has policies, procedures, and cyber incident preparedness.

Based on Bank Indonesia's ongoing supervision and evaluation of primary dealers, in general, primary dealers have adequate risk management and IT infrastructure, so the expectation is that primary dealers can carry out their role in supporting monetary operations and deepening financial markets. We identified some risk management weaknesses in terms of policies and procedures, limit monitoring, and internal audit. For IT infrastructure, some weaknesses include the need to update the core treasury system to ensure continuous vendor support. The assessment results on the aspects of information system security and cyber resilience show that primary dealers still need to improve cyber prevention efforts in order to identify disruptions and respond to disruption recovery in a timely manner. To address some of the primary dealer weaknesses that are classified as significant, Bank Indonesia may submit a coaching letter in order to monitor the bank's follow-up, which may later result in revocation of approval as a primary dealer.

3. Methodology

3.1 Data

To analyze the interconnection between counterparties using network analysis, we utilize data on transactions in the interbank money market (PUAB or time deposit) and Repurchase Agreement (Repo) transactions both before the implementation of primary dealers (before April 17, 2024) and after. To analyze the impact on prices due to changes in policy rates, namely the increase on April 24, 2024 and the decrease on September 17, 2024 that occurred after the primary dealer implementation. We evaluated the price changes of time deposit, repo, and SRBI products. To analyze the liquidity aspect, we processed daily data of Repo and time deposit transactions, as well as monthly data of SRBI transactions both before and after primary dealer implementation. In addition, to research the primary dealer concentration risk simulation program, we use primary dealer cash opening balance data from the annual reports of banks in 2023 that have been listed on the stock exchange.

Tabel 3. 1 Statistic Descriptive

Nama	obs	mean	min	max	std
Interbank repo and time deposit transactions					
Repo Q1	5,329	514,459	0	30,700,000	7,387,905
Repo Q3	5,329	328,462	0	53,930,000	2,468,020
TD Q1	3,600	503,424	0	29,350,000	1,550,651
TD Q3	3,600	580,943	0	26,205,000	1,626,491
Data for Repo Transaction (Jan 2023 - Nov 2024) and TD (Daily)					
Vol Repo	444	35,810,364	4,132,000	95,100,000	16,684,485
Freq Repo	444	61	8	151	25.94
Vol TD	372	20,764,294	9,421,000	33,152,842	4,550,516
Freq TD	372	203.17	110	301	34.45
Primary Dealer Concentration Simulation					
Liquidity	18	5692.111	498	24380	7521.75
Sigma	18	0.165	0.15	0.18	0.009337

3.2 Method

3.1.1 Network Analysis

We use *network analysis* to map the interconnectedness of bank *counterparties* to compare before and after the implementation of *primary dealers*. The observations include several instruments, namely: repo transactions, SRBI, and time deposits. The results of the centralization analysis can be one of the evaluation materials for determining the *primary dealer* for Bank Indonesia.[1]

Our assumption is that more market participants will be able to price the products after the *primary dealer* implementation. Thus, we expect higher centralization results for more market participants than before the *primary dealer* implementation.

We construct the *network analysis* by incorporating data on interbank money market transactions (repo, SRBI, and *time deposit* transactions). Furthermore, we use the interbank transaction volume data to build a financial relationship matrix between banks. Kanno (2015) explains the relationship model between banks in the X (N x N) matrix is as follows:

[1] One of the requirements to become a *primary dealer* is that the Bank must have sufficient transaction size and interconnection (PADG No. 2 Year 2024).

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1j} & \cdots & x_{1N} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \cdots & x_{ij} & \cdots & x_{iN} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{N1} & \cdots & x_{Nj} & \cdots & x_{NN} \end{bmatrix} \begin{matrix} \sum_j \\ a_1 \\ \vdots \\ a_i \\ \vdots \\ a_N \end{matrix}$$

$$\begin{matrix} \sum_i & I_1 & \cdots & I_j & \cdots & I_N \end{matrix} \qquad (3.1)$$

where $x_{i,j}$ denotes the sale of interbank securities, provided by bank *i to* bank *j*. The sum of row *i represents the* total sales of interbank securities held by bank *i*, while the sum of column *j represents the* total purchases of interbank securities held by bank *j*, as per equation 3.1.

$$a_i = \sum_j x_{i,j},\ I_j = \sum_i x_{i,j}, \qquad (3.2)$$

Once the interbank matrix is established, the next step is to measure how banking institutions are interconnected. *Network analysis* produces statistical measurements to see the interconnection or *centrality* of a domestic network. Each bank sampled in this study will be given a *centrality score*. Banks with a high *centrality score* can be categorized as *systemic* impact banks or having an important role in the money market.

In analyzing the interbank network, this study uses several *centrality* measures including *degree centrality, betweenness centrality, closeness centrality* and *eigenvector centrality.* We code the banks based on the group of banks namely Bank S (Private Bank), Bank P (Government Owned Bank); Bank D (Regional Development Bank; Foreign Bank; and Bank C (Mixed Bank).

3.2.2 Event Study

To evaluate price changes in response to policy rate changes, this study covers two key periods, namely April 24, 2024 when the BI7DRR rate increased from 6% to 6.25% and September 18, 2024 when the BI7DRR rate decreased from 6.25% to 6%. We utilize price data on each security instrument, with the appropriate approach for each instrument. Bank Indonesia Rupiah Securities (SRBI) prices are evaluated using *yields*, while Repo transactions are analyzed based on Repo rates, and *time deposits* based on *time deposit* rates.

We obtained data covering three transaction tenors of three types of securities, namely overnight, 1-week, and 2-week tenors, with each having a different settlement schedule. For Bank Indonesia Rupiah Securities (SRBI), all tenors are settled on the same day (H+0). Meanwhile, for time deposit and repo transactions, settlement of overnight tenors also occurs on H+0, but for 1-week and 2-week tenors, settlement can be done on H+0 or H+1.

We assume that (1) the market is efficient, so the market already knows the interest rate changes before the announcement, (2) market participants consist of two groups of objectives, namely the objective of meeting liquidity needs that are not sensitive to changes in interest rates and speculation objectives that are sensitive to changes. We will look at the objectives of market participants, whether liquidity or speculation. Since we use daily data, we cannot analyze the data on the date of the interest rate change announcement.

In a market dominated by speculators, information on rising interest rates will make market participants delay transactions. Vice versa, information on a decrease in interest rates will make market participants accelerate transactions.

3.2.3 Liquidity Measurement

We measure the liquidity of volume, transaction frequency, and market depth before and after *primary dealer* implementation. According to Olbrys & Murstyn (2016), the definition of *market depth* is a measure of the order flow innovation required to affect changes in a given price. In this study, market depth uses *volume-based measures*, which are conventional liquidity *measures* that relate price changes to trading volume. This equation describes how much volume is required to change a certain price level. The higher the ratio of volume to price change, the deeper the market. The market depth measurement uses the Sarr & Lybek (2001) model as follows:

$$Depth_t = \left|\frac{V}{\Delta r}\right| \quad (3.3)$$

where is the change in interest rate, the difference between the interest rate at time and the previous interest rate. denotes the total volume traded at time.

This study explores the movement of several instruments, namely: repo, SRBI, and *time deposit*, each of which has three tenors: *overnight*, 1-week, and 2-week.

3.2.4 *Primary Dealer* Concentration Risk Simulation

We conducted a game theory simulation of how primary dealers compete for as many clients (non-primary dealer OM participating banks) as possible, resulting in market concentration risk. Each primary dealer has a strategy in the form of SRBI yield recommendations requested by the client. World Bank (2010) states that it is necessary to design a primary dealer structure to support monetary policy through its role as a market maker. However, there are two limitations to being dominant, namely client bias and the ability of primary dealers to provide bailout funds.

Client bias is when a client submits an incorrect request according to the primary dealer 's recommendation by increasing or decreasing the yield. Thus, the primary dealer earns from the competition with other primary dealers and the client's activities increase or decrease the yield. All clients will assess and choose the primary dealer that provides the highest utility.

The primary dealer 's ability to bailout is the primary dealer' s availability of cash to cover client orders. SRBI settlement time is the same day. Clients are used to settling in the money market within two business days.

We assume that the factors affecting client utility in choosing a primary dealer bank are: total orders; successful rate (S); liquidity usage (L). Total order is the number of client orders served by the primary dealer (bandwagon effect); successful rate shows the percentage of total bids received by the primary dealer bank (short-term memory); while liquidity usage is the ratio between the total volume of winning bids to the liquidity available to each primary dealer bank.

We construct the client' s utility function in choosing a primary dealer bank as follows:

$$U(N_i, L_i, S_i) = 1 - e^{-(\alpha_j x_i + \beta_j y_i + \gamma Z)} \quad (3.4)$$

where is the *client'* s utility function to the PD and is a matrix, is the total *client*s and is the number of *primary dealers*, and is the *sensitivity* coefficient of each client to the *client* 's assessment to the *primary* dealer and is the *client* 's assessment to the *primary dealer*.

The three *client* assessments to the *primary dealer* are sigmoid functions as follows:

$$x_i = \frac{1}{1+e^{-N_i}} \quad (3.5)$$

$$y = \frac{1}{1+e^{-S_i}} \quad (3.6)$$

$$y = \frac{1}{1+e^{-L_i}} \quad (3.7)$$

where N is the number of clients, S is the successfull rate, L is the liquidity usage of the primary dealer.

The algorithm/flowchart of the primary dealer selection simulation program by the client can be seen in Figure 3.1.

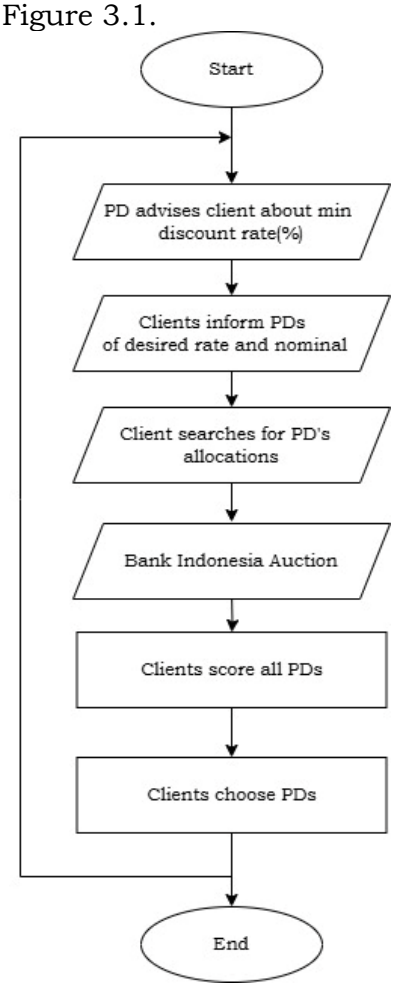


Figure 3. 1 Client Procedure for Selecting a Primary Dealer

The flowchart in Figure 3.1. shows the Client's procedure for selecting a primary dealer, namely:

1. PD advises client about min discount rate (%)
   We start the first stage which is before the auction, the primary dealer bank informs the non-primary dealer bank (client) about the discount rate (%) or

"PD Suggested Rate", with PD Suggested Rate ~ $N(BI\ Rate - 0.75, \sigma_{PD})$. We set the sigma of each primary dealer bank (σPD_i) between 0.15 - 0.18.

2. Clients inform PDs of desired rate and nominal.
   After getting the suggested rate from each primary dealer bank, the client informs the primary dealer bank of the desired rate (client rate) and nominal. The client submits ten bids with different rates and volumes to the primary dealer bank. The bid price of each client to the primary dealer bank is determined based on the function: $suggested\ rate \sim N(-0.1, 0.02)$.
3. Client searches for PD's allocations
   After receiving all bids from clients, each primary dealer bank assigns a random queue number starting from 1 to each client bid. Any queue with an accumulated amount less than 60% (assuming the fraction of client bailout requests) of the PD's liquidity is marked as "served" or logically marked as "true" and recorded in the "is allocated" column. Client bids that exceed the PD's liquidity limit cannot all be served. This process takes place in three rounds. In the first round, if the client's bid is not served by the PD, the client will seek another allocation to a PD with sufficient liquidity in the second round. The same process is carried out in the third round if the client's bidding is still unserved. At the end of the third round, each PD has complete information about the orders it has successfully served, including the volume and rate of each order. The PD then submits these orders to Bank Indonesia to be included in the auction.
4. Bank Indonesia Auction
   In the Bank Indonesia auction stage, the total volume to be approved is determined in advance. The determination of the winning bidder is done by the "Competitive Auction" method, where the price starts from the lowest level and gradually increases until it reaches a level where the total bidding matches the available amount. The accumulated bidding amount is calculated from the top row downwards until it reaches the "winning limit row", which is the point at which the accumulation does not exceed the total approved auction volume. Clients at and below the winner's cut-off line are deemed to be auction winners.
5. Client score all PDs
   At this stage, we score all PDs based on several variables obtained from the previous process: PD name, total clients, number of orders, success rate, winning volume, and liquidity usage. Total clients is the number of clients per PD whose bids were successfully served and won the auction. The number of orders includes the total bidding of each PD that was successfully served and won the auction (see Equation 3.5). Success rate is calculated as the ratio of the total winning volume to the total bidding volume of each PD. Winning volume is the total volume won by each PD (see Equation 3.6), while liquidity usage is the ratio of the total volume won to the liquidity available to each PD (see Equation 3.7).
6. Clients Choose PDs
   Clients choose the PDs that provide the highest utility, using the utility function in Equation 3.4. In this function, we consider the variables obtained from "Client score all PDs," namely total orders (N), success rate (S), and liquidity usage (L). These values generate the client's score for each PD, and we assume that the client will choose the primary dealer bank with the highest utility value. In addition, the client's utility score of the PD is used to measure the overall score of the primary dealer bank. To assess market concentration risk, we calculate the number of client orders that can be served by each primary dealer bank. This process is performed for 20 iterations.

Some important notes in simulating the concentration risk of primary dealers are:

1. The number of primary dealer banks is 18
2. The number of clients (non_primary dealer banks) is 42 Banks
3. Based on the results of focus group discussions (FGDs)[2], around 60% of orders require temporary funding facilities. This facility is needed to bridge the difference in settlement time between same day transactions and settlement within two business days.
4. The total liquidity of all primary dealer banks is 102 trillion so that they can serve 170 trillion client auctions.
5. The total liquidity of the 5 largest primary dealer banks is 79.47 trillion so that they can serve client auctions of 132.46 trillion.
6. Simulation with several conditions.
    - First, PD liquidity > client bank demand.
    - Second, PD liquidity = client bank demand.
    - Third, PD liquidity < client bank demand.
7. Explore with three conditions of order size per client bank into three (small, medium and large size).

Table 3. 2 Summary of Simulation Conditions

Conditions	Size order	Bidding Volume	Order Per Client	Volume won auction
PD Liquidity Greater than Client Demand	Small Order	210 Trillion	20	175 Trillion
	Medium Order	210 Trillion	10	175 Trillion
	Big Order	210 Trillion	2	175 Trillion
PD Liquidity Almost Equal to Client Demand	Small Order	150 Trillion	20	125 Trillion
	Medium Order	150 Trillion	10	125 Trillion
	Big Order	150 Trillion	2	125 Trillion
PD Liquidity Less than Client Demand	Small Order	60 Trillion	20	50 Trillion
	Medium Order	60 Trillion	10	50 Trillion
	Big Order	60 Trillion	2	50 Trillion

Notes: Total Primary Dealer Liquidity is 170 trillion

Table 3.2 shows several simulation conditions. First, the liquidity capacity of primary dealer banks is more than the demand of client banks (non-primary dealer banks). Second, the liquidity capacity of the primary dealer bank is equal to the demand of the client bank. Third, the liquidity capacity of primary dealer banks is less than the demand of client banks. Respectively to the above three conditions, we also explore with three conditions of order size per client bank into three, (a) small size; (b) large size; and (c) medium size.

We will simulate the assessment of primary dealer banks to understand the preferences of client banks in selecting primary dealers based on the utility level of each client. This assessment uses the utility function in Equation 3.4, which considers liquidity, total orders, and auction success rate.

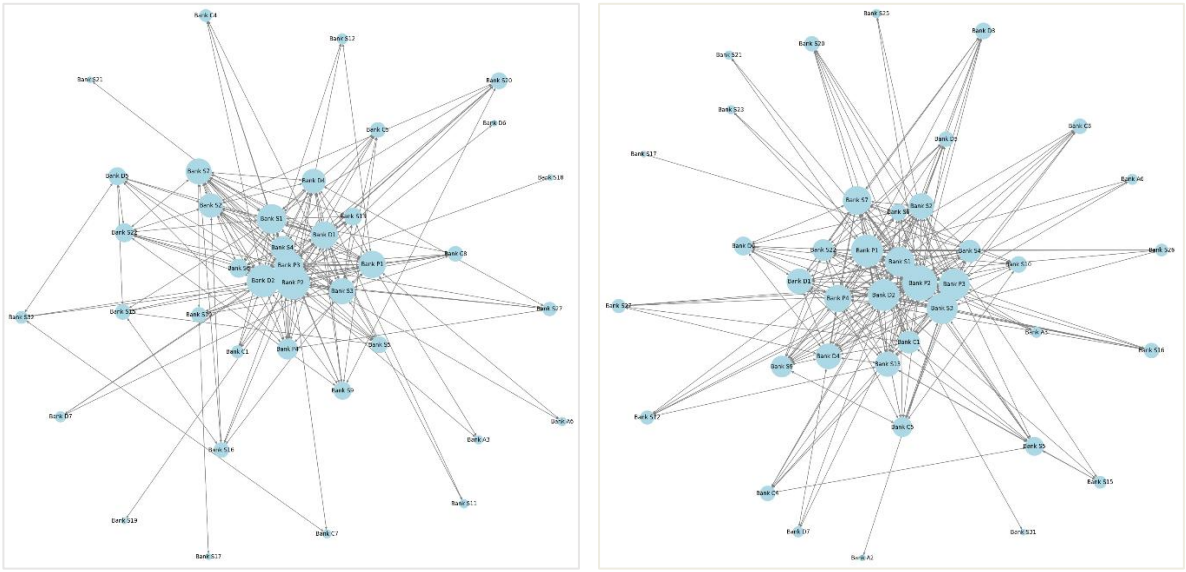
We also use two settlement conditions, namely when the transaction occurs on “Same Day” and “2B”. In Same Day settlement, the simulation corresponds to the above process and the liquidity is the same as the real condition. In 2B settlement, the simulation follows the process above, liquidity is made infinite and the sensitivity of liquidity becomes 0 ($\gamma=0$).

[2] FGD conducted by the research team with several banking representatives on October 24, 2024.

4. Result and Discussion

4.1 Network Analysis Before and After Main Dealer Implementation

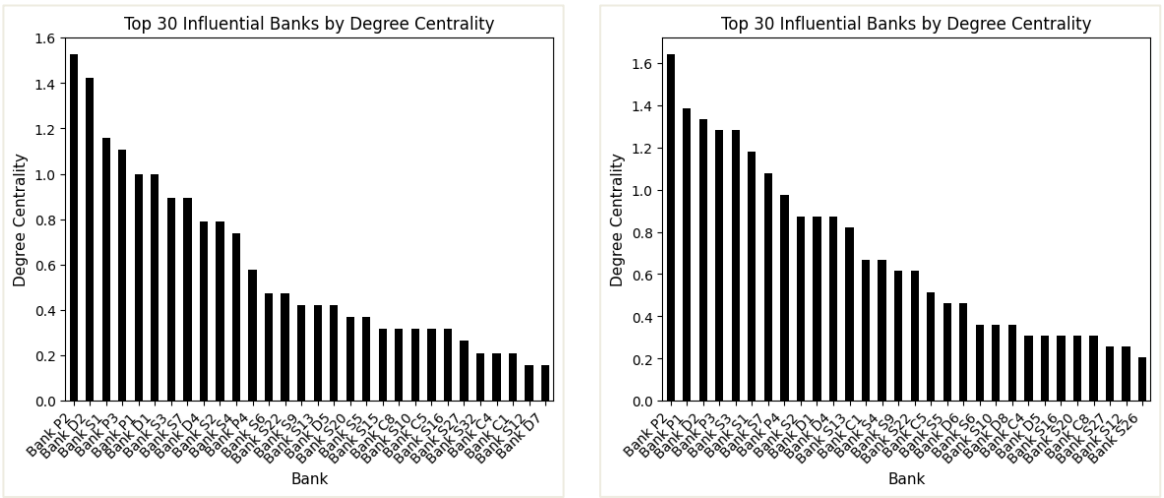
4.1.1 Repurchase Agreement (Repo)



Before After

Figure 4. 1 Interbank Repo Transaction Network Before Primary Dealer Implementation

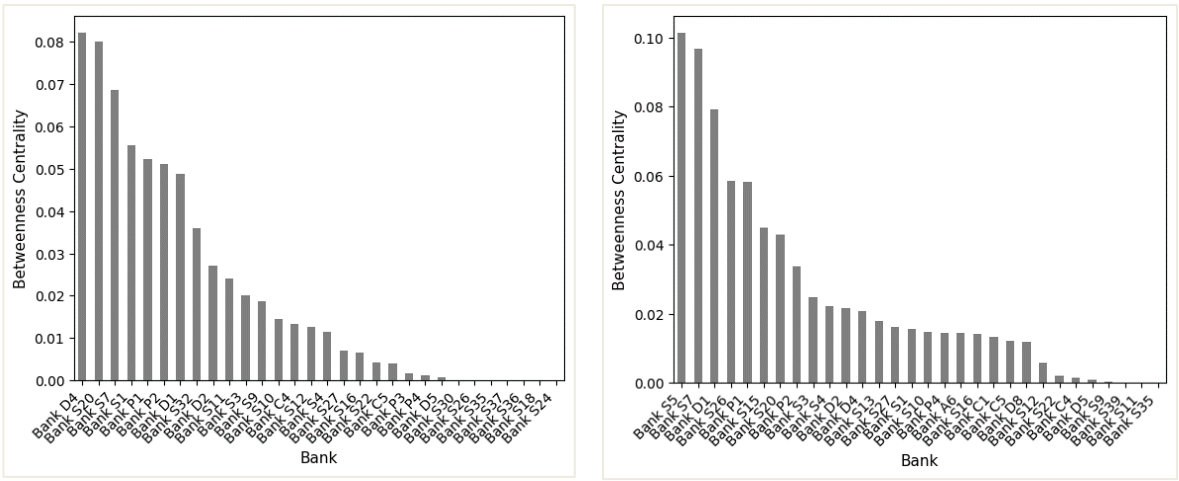
Figure 4.1. shows the visualization of the repo transaction network before and after the primary dealer implementation. From the visualization, it is known that government-owned banks (Bank P) and private banks (Bank S) dominate repo transactions in Indonesia both before and after the implementation of primary dealers.



Before After

Figure 4. 2 Banking Interconnection in Repo Transactions (Degree Centrality)

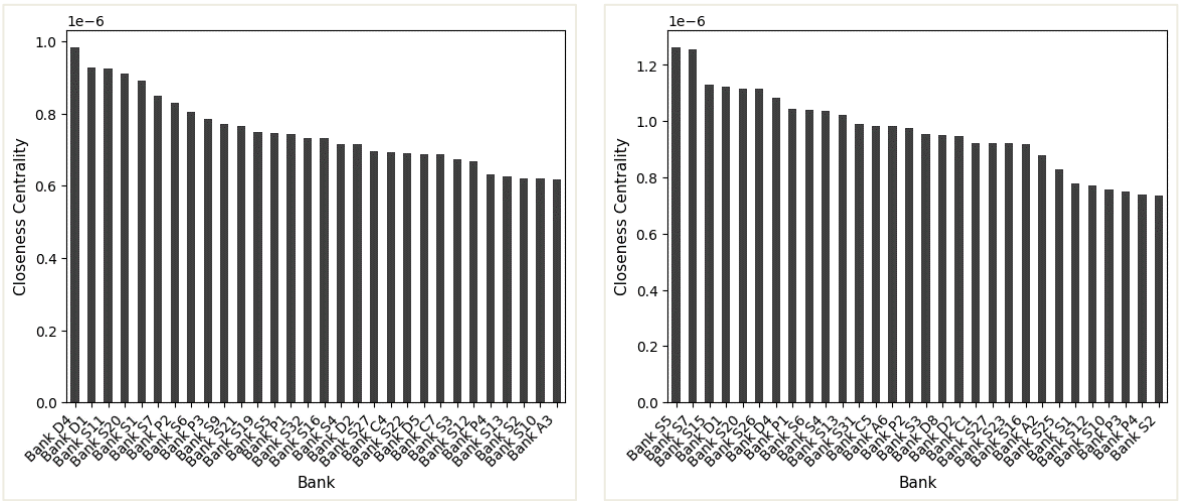
Figure 4.2 shows that degree centrality indicates that after the implementation of primary dealers more banks are directly connected in the network than before, reflecting increased transaction activity and expanded interbank engagement. This creates a more broadly connected repo market.



Before After

Figure 4. 3 Banking Interconnection on Repo Transactions (Betweenness Centrality)

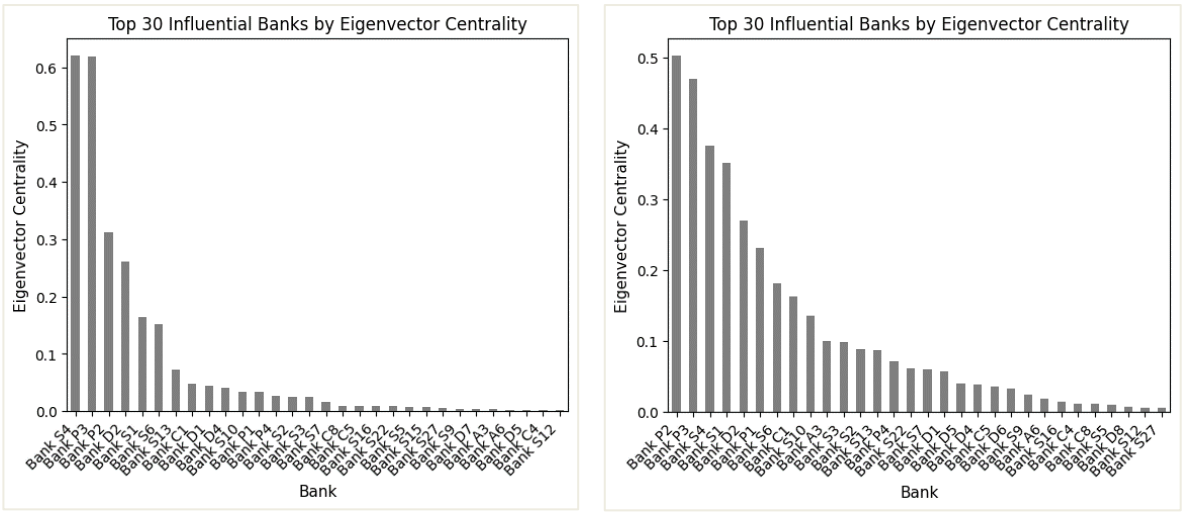
The betweenness centrality indicator (Figure 4.3), which before the implementation of primary dealers showed a concentration in a few large banks, became more evenly distributed afterwards. This more proportional distribution of intermediary roles reduces dependency on certain banks and increases the resilience of the network to the risk of single point of failure.



Before After

Figure 4. 4 Banking Interconnection on Repo Transactions (Closeness Centrality)

Furthermore, Figure 4.4 shows that the increase in closeness centrality after the implementation of primary dealers indicates an improvement in access efficiency between banks than before. Banks in the network can interact more quickly and easily, resulting in smoother liquidity flows. This indicator confirms that the presence of primary dealers improves the repo market structure by accelerating the flow of information and liquidity.



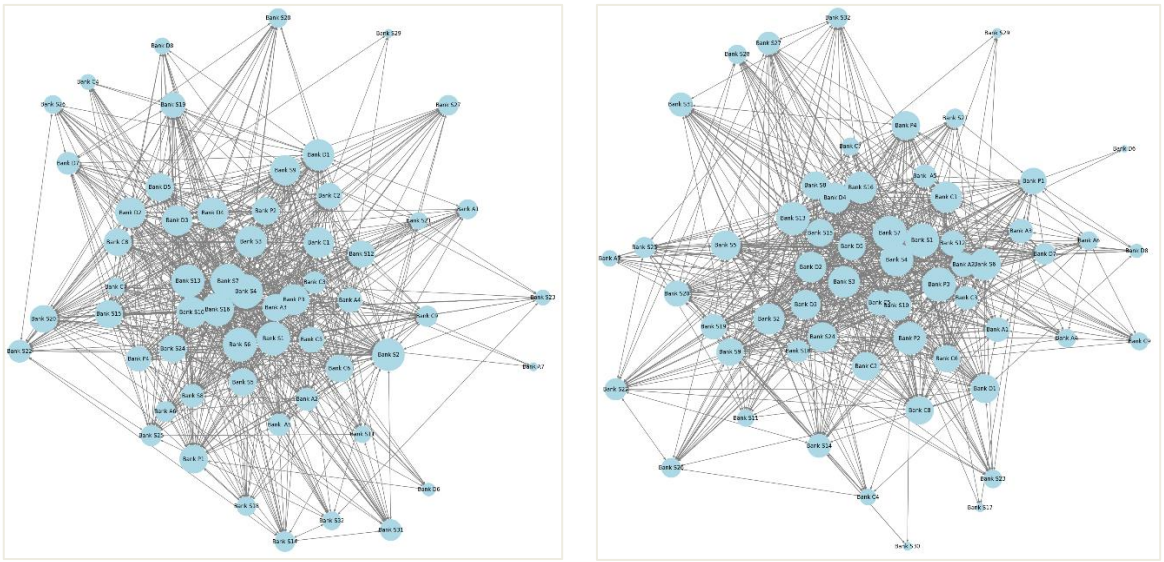
Before After

Figure 4. 5 Banking Interconnection on Repo Transactions (Eigenvector Centrality)

Figure 4.5 shows an increase in eigenvector centrality, where banks with extensive connections become more influential in the network after primary dealer implementation than before. The strategic role of these banks is reinforced by the implementation of primary dealers, which also encourages connections with other participants in the network.

As expected, the implementation of primary dealers has improved the quality of the repurchase agreement money market network. This is evident from the increased connectivity, diversification of intermediary roles, efficient access to liquidity, and strengthened strategic influence of key participants in the network.

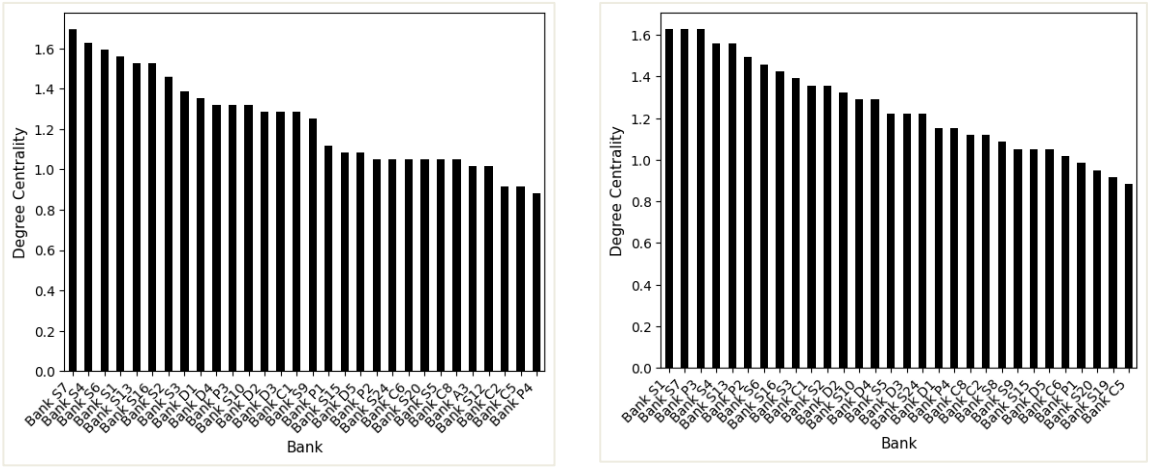
4.1.2 Time Deposit



Before After

Figure 4. 6 Interbank Time Deposit Transaction Network Before Primary Dealer Implementation

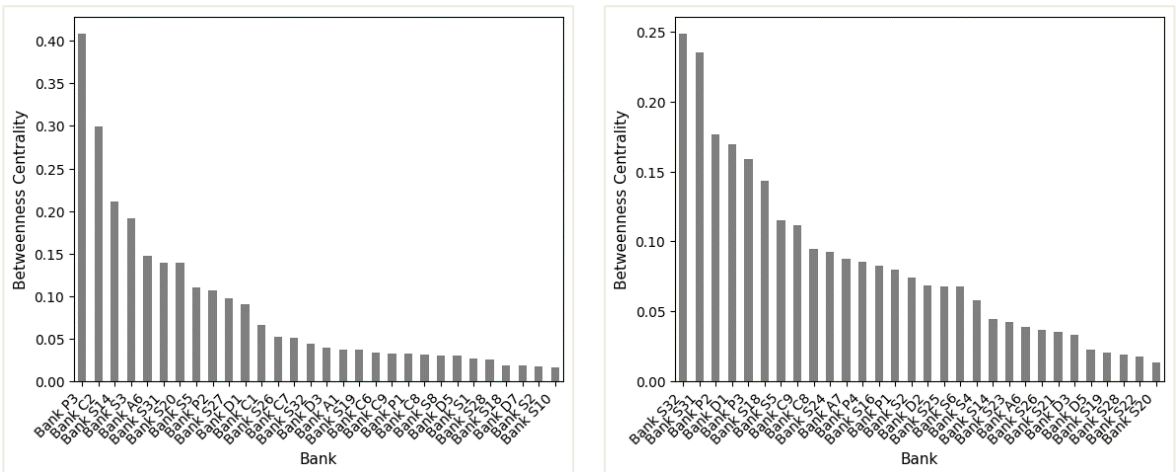
Figure 4.6 shows that prior to the implementation of primary dealers, private banks dominated time deposit transaction activity in Indonesia. After the implementation of the primary dealer system, government banks and regional banks also began to play an active role in money market transactions. This is because increased market accessibility and efficiency can encourage wider participation from various types of banks in supporting liquidity stability and money market deepening (Bank Indonesia, 2023).



Before After

Figure 4. 7 Banking Interconnection on Time Deposit Transaction (Degree Centrality)

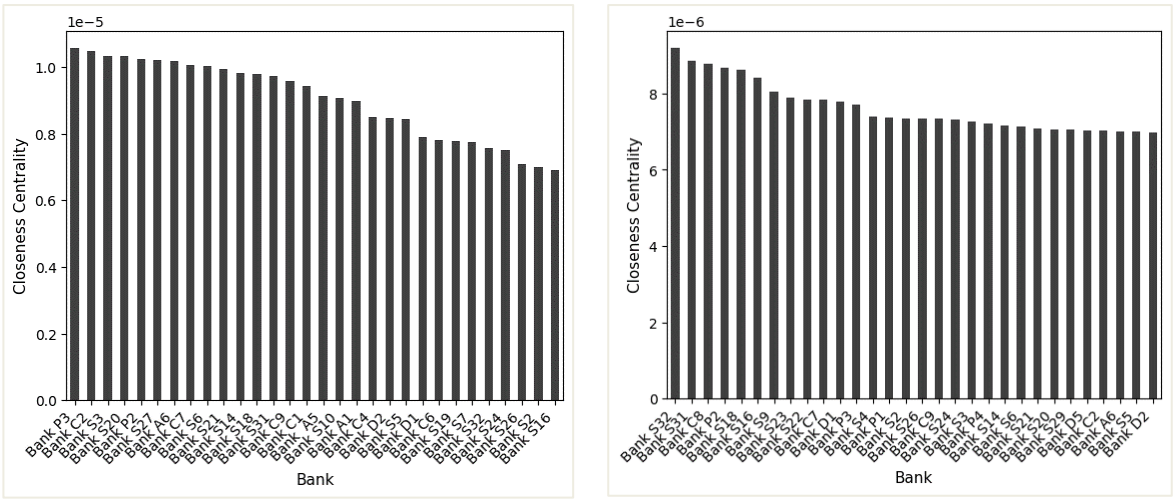
Figure 4.7. shows that the *degree centrality* value after the implementation of *primary dealers* in state-owned banks and regional development banks increased, indicating more active participation in the network than before.



Before After

Figure 4. 8 Banking Interconnection on Time Deposit Transactions (Betweenness Centrality)

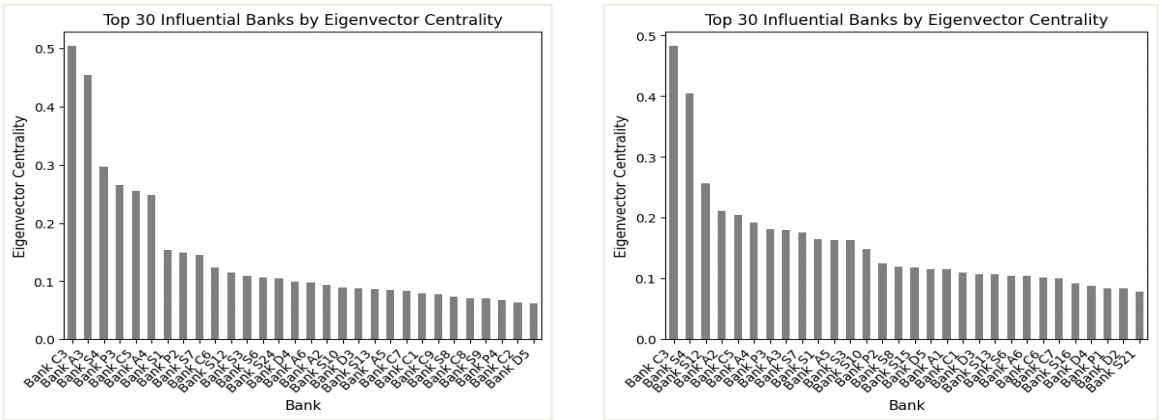
Figure 4.8. shows that the distribution of betweenness centrality values also became more even after the implementation of primary dealers than before, reducing the dominance of private banks as the main link in liquidity flow.



Before After

Figure 4. 9 Banking Interconnection on Time Deposit Transaction (Closeness Centrality)

Figure 4.9 shows an increase in closeness centrality after the implementation of primary dealers than before, indicating better network integration, enabling faster linkages between banks.



Before After

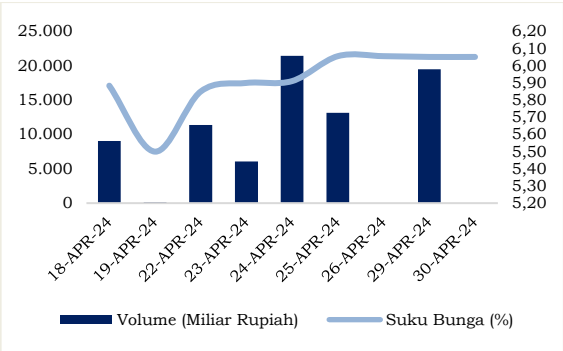
Figure 4. 10 Banking Interconnection on Time Deposit Transaction (Eigenvector Centrality)

Figure 4.10 shows that the eigenvector centrality indicator indicates that the strategic role in the network after the implementation of primary dealers is not only dominated by private banks, but also started to involve state and local banks than before which supports liquidity stability and overall money market deepening.

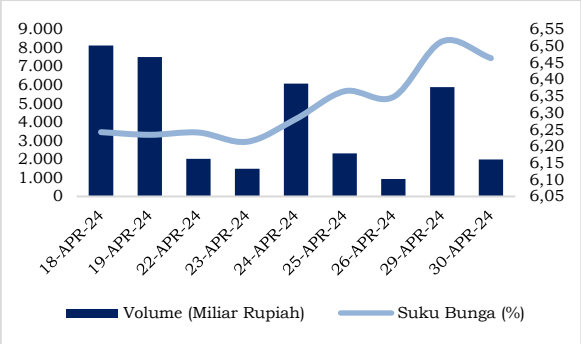
As expected, various centrality indicators in time deposit transactions show an increase, as shown in Figure 4.7 to Figure 4.10. After the implementation of the primary dealer's system, the network analysis of interbank time deposit transactions shows an increase in inclusiveness and diversification of roles between bank groups.

4.2 Impact of Policy Rate Changes on Money Market Prices

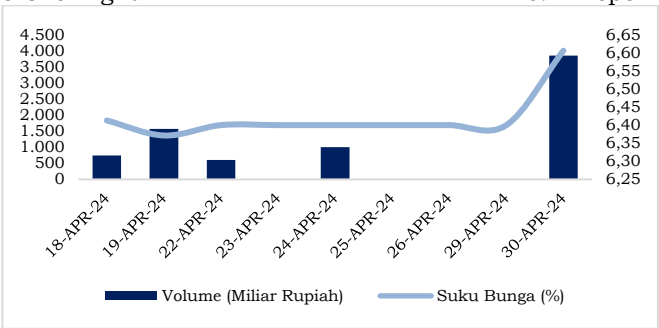
4.2.1 Repurchase Agreement



a. Repo Overnight



b. Repo 1 Week

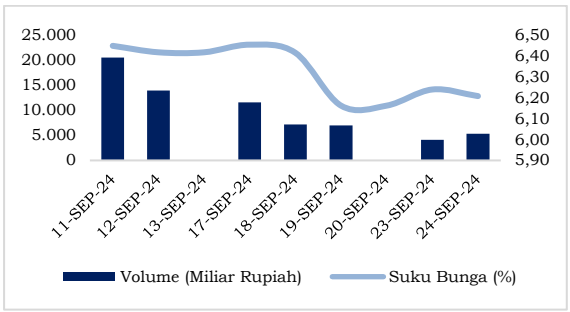


c. Repo 2 Weeks

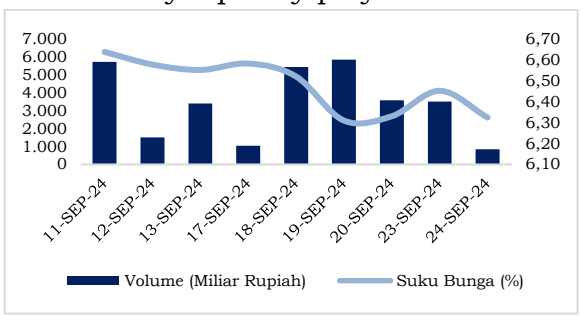
Source: Author's Data Processing
Notes: Interest Rate Increase Occurs on April 24, 2024

Figure 4. 11 Effect of BI7DRR Rate Increase Announcement from 6.00% to 6.25% on Time Deposit Interest Rate

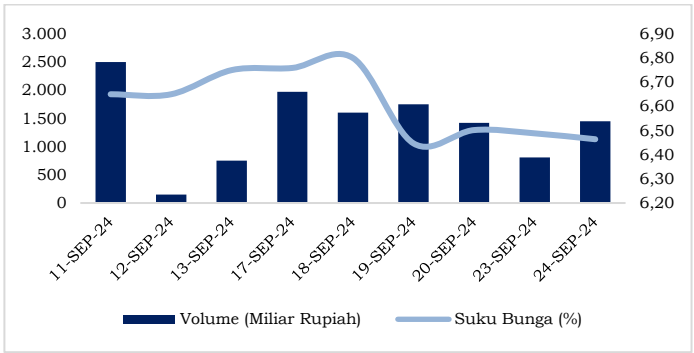
Figure 4.11 shows that one-week repos are dominated by speculators while one-week and two-week tenors are more dominated by liquidity players.



a. Repo Overnight



b. Repo 1 Week



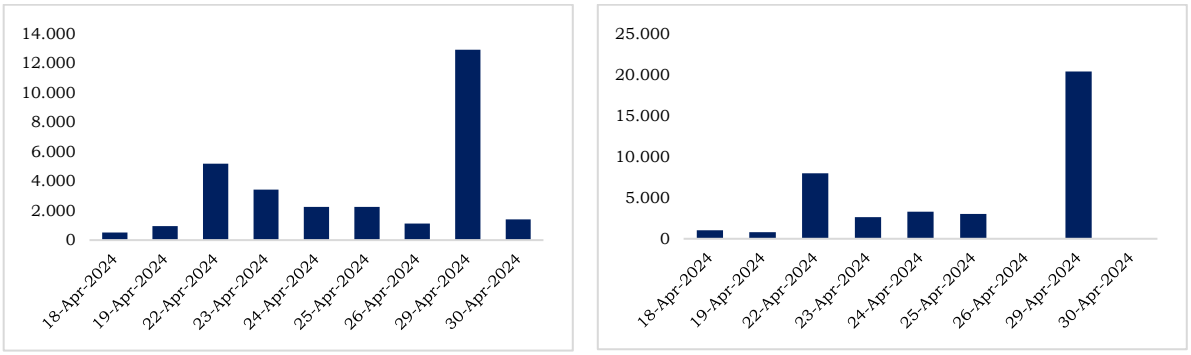
c. Repo 2 Weeks

Source: Author's Data Processing
Notes: Interest Rate Cut Occurs on September 18, 2024

Figure 4. 12 Effect of BI7DRR Rate Cut Announcement from 6.25% to 6.00% on Repo Rate

Figure 4.12 shows confirmation of Figure 4.11 that one-week repos are dominated by speculators. In addition, speculators also control the one-week and two-week tenor market, i.e: the volume of the 18th is greater than that of the 20th (one-week and two-week tenors) and the volume of the 17th is higher than that of the 23rd (two-week tenor).

4.2.2 Sekuritas Rupiah Bank Indonesia (SRBI)

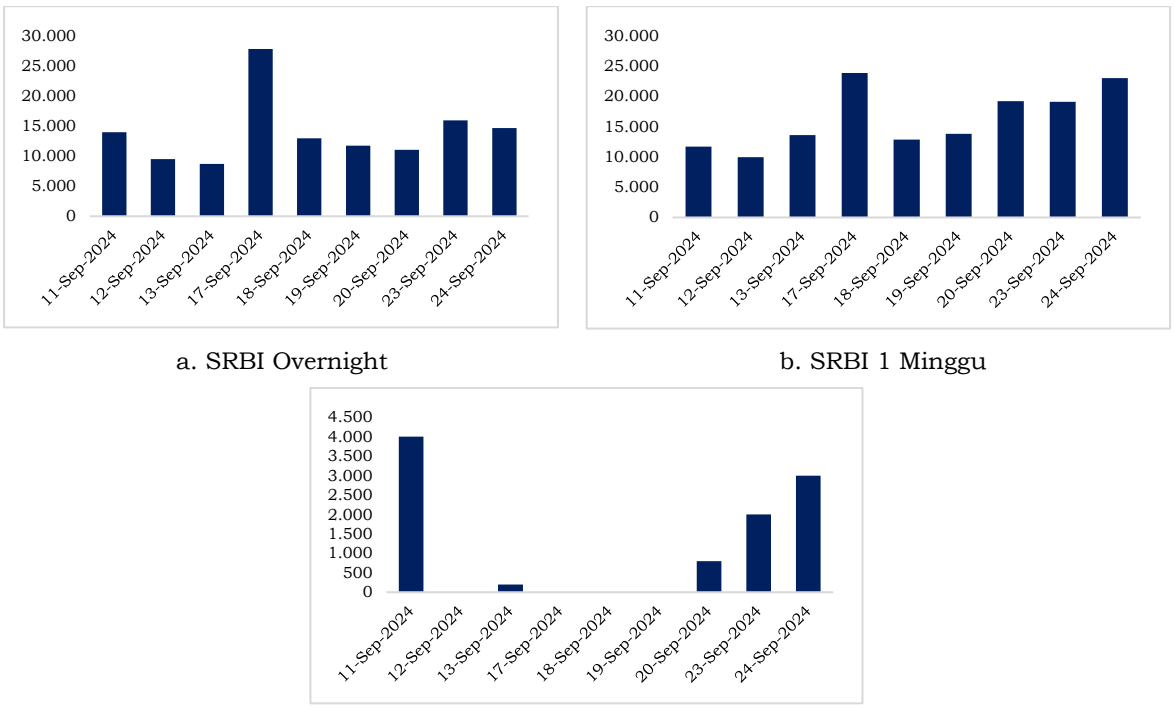


a. SRBI Overnight b. SRBI 1 Week

Source: Author's Data Processing
Notes: Interest Rate Increase Occurs on April 24, 2024

Figure 4. 13 Effect of BI7DRR Rate Increase Announcement from 6.00% to 6.25% on SRBI Interest Rate

Figure 4.13 shows that the overnight and week SRBI market can be dominated by speculators with high volume on April 29.



a. SRBI Overnight b. SRBI 1 Minggu

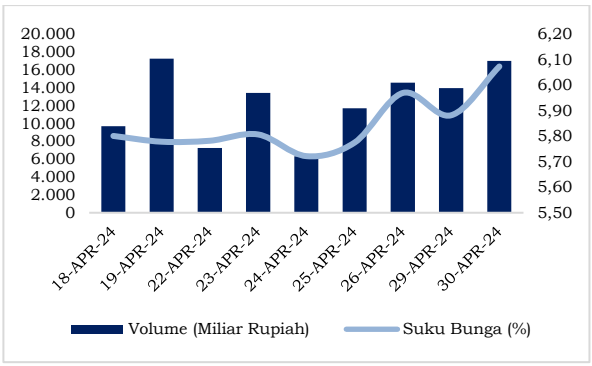
a. SRBI 2 Minggu

Source: Author's Data Processing
Notes: Interest Rate Cut Occurs on September 18, 2024

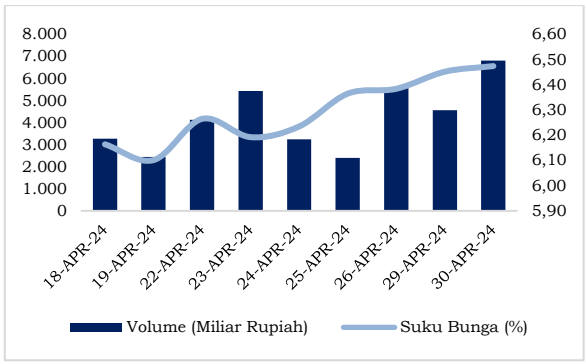
Figure 4. 14 Effect of Announcement of BI7DRR Rate Cut from 6.25% to 6.00% on SRBI Interest Rate

Figure 4.14 shows that the overnight, one-week, and two-week SRBI markets may have been dominated by speculators, with the dominant volume on September 17.

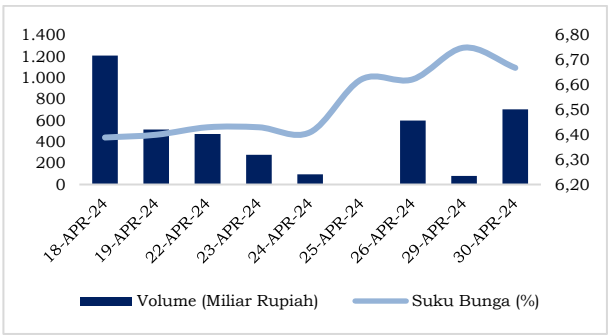
4.2.3 Time Deposit



a. Time Deposit Overnight



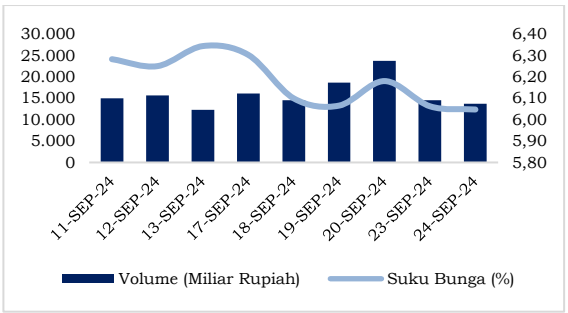
b. Time Deposit 1 Minggu



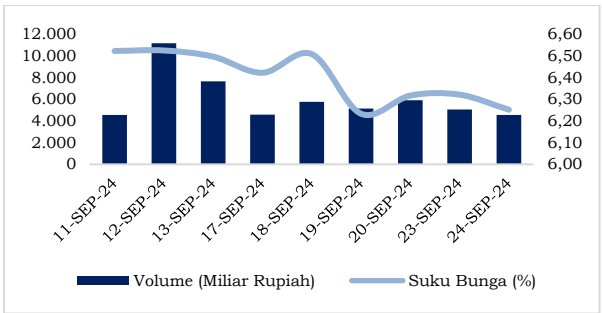
c. Time Deposit 2 Minggu

Figure 4. 15 Effect of BI7DRR Rate Increase Announcement from 6.00% to 6.25% on Time Deposit Rate

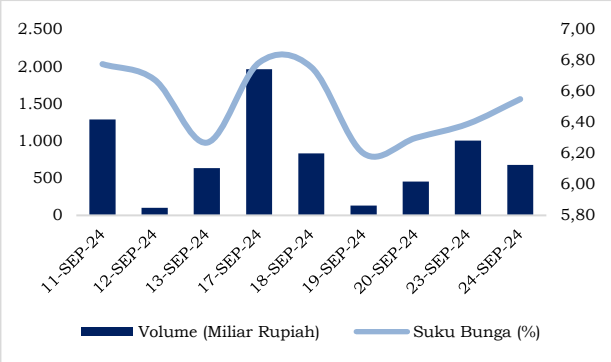
Figure 4.15 shows that the overnight, one-week, and two-week time deposit markets may be dominated by speculators, as seen from the 26th and 29th transactions which are higher than before the hike.



a. Time Deposit Overnight



b. Time Deposit 1 Minggu



c. Time Deposit 2 Minggu

Source: Author's Data Processing
Notes: Interest Rate Cut Occurs on September 18, 2024

Figure 4. 16 Effect of BI7DRR Rate Cut Announcement from 6.25% to 6.00% on Time Deposit Rate

In contrast to Figure 4.15, Figure 4.16 shows that the overnight and one-week markets are dominated by liquidity players, while the two-week market is dominated by speculators with transaction volumes on the 17th and 18th higher than on the 20th and 23rd.

4.3 Impact of Primary Dealer Implementation on Money Market Liquidity

4.3.1 Repurchase Agreement

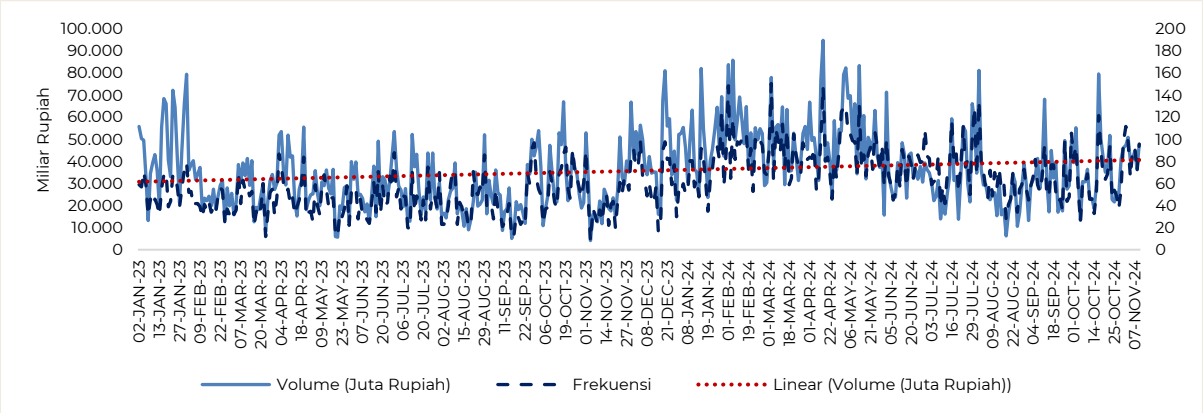
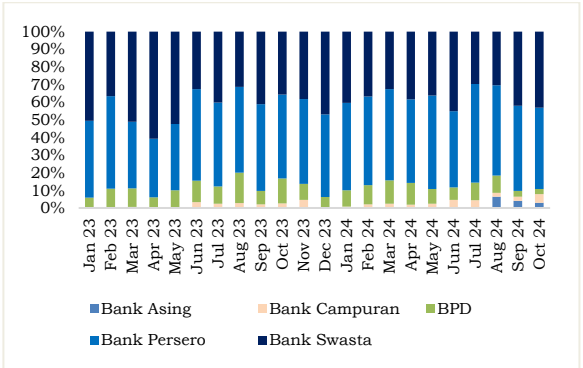
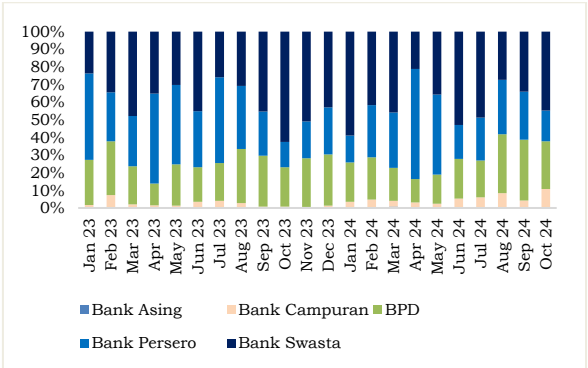


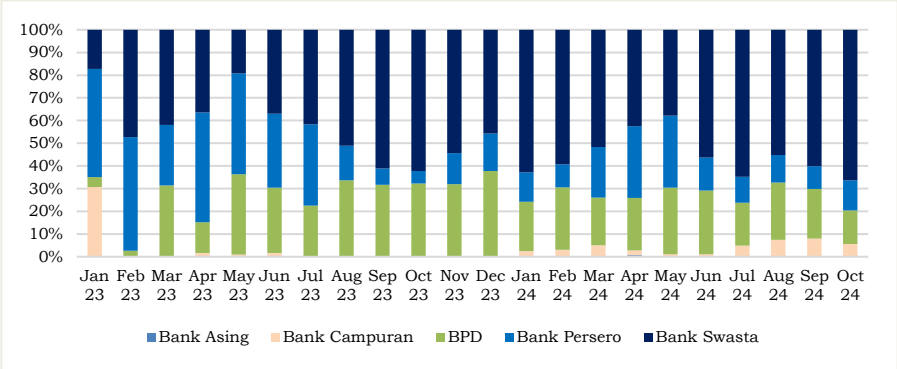
Figure 4. 17 Development of Volume and Frequency of Daily Repo Transactions in Indonesia

Figure 4.17 shows that the implementation of the primary dealer system has not had a significant impact on the volume and frequency of repo transactions.





Repo Overnight Repo 1 Minggu



Repo 2 Minggu

Figure 4. 18 Contribution of Banking Repo Transactions in Indonesia (Repo)

Figure 4.18 shows that private banks dominate transactions across all tenors, indicating their role as major players in money market deepening. Regional development banks (BPD) and state-owned banks tend to be more active in the 1-week and 2-week tenors, indicating a more specific focus on medium liquidity needs.

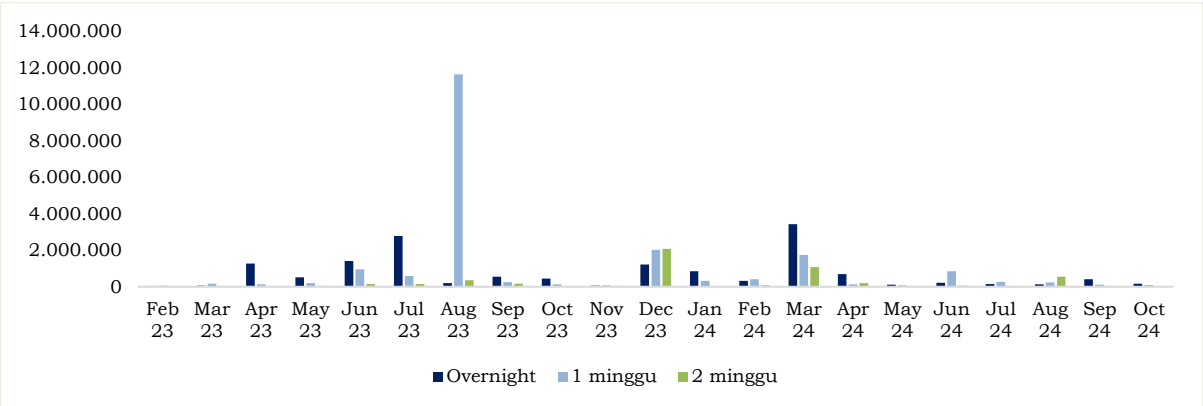
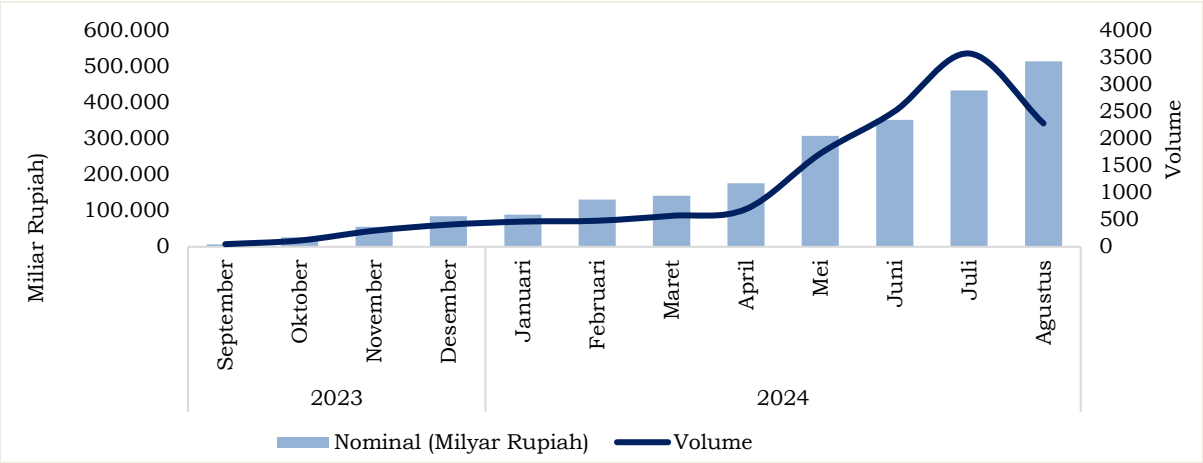


Figure 4. 19 Money Market Depth (Repo) in Indonesia

Figure 4.19 shows that the depth of the repo market is patterned with fluctuations that are closely related to the dynamics of liquidity in the banking sector. The spike in August 2023 is in accordance with the results of the Bank Indonesia survey which states that in the banking sector shows that new lending, Weighted Net Balance (WNB), in August 2023 was recorded at 86.2 percent, higher than the WNB in the previous month which was recorded at 45.1 percent. Likewise, in March 2024, the depth of the repo market was driven by the fasting month.

4.3.2 Sekuritas Rupiah Bank Indonesia (SRBI)

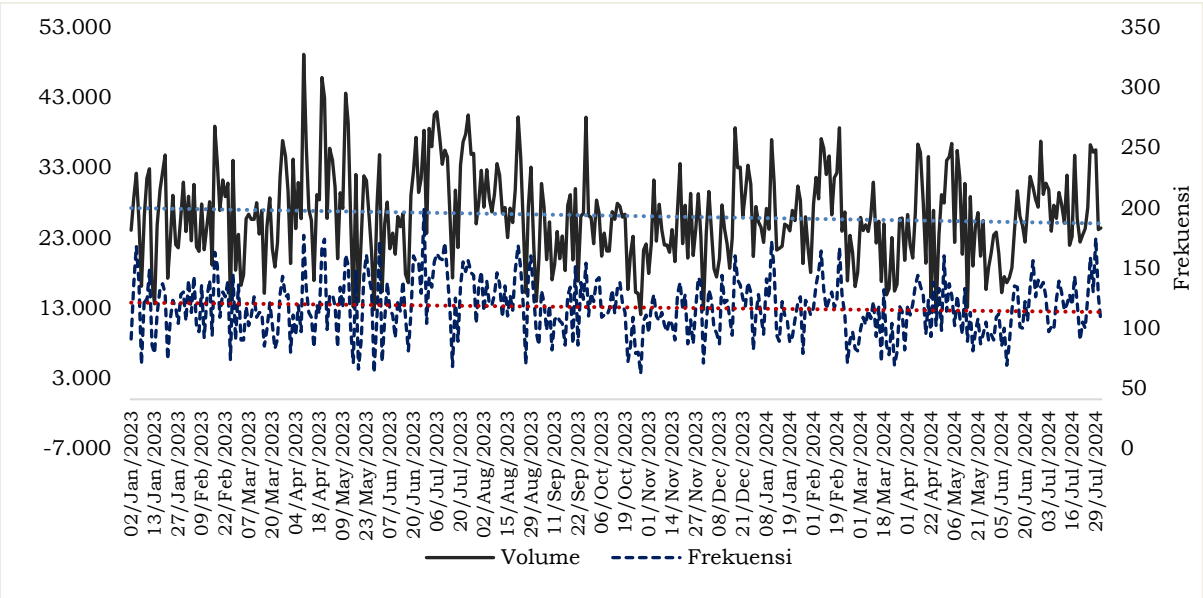


Notes**:** The implementation of Primary Delaer (PD) in Money Market and Forex Market (PUVA) was conducted for the first time on May 17, 2024 at the SRBI Primary Market auction accompanied by the obligation of PD to become a market maker in the money market.

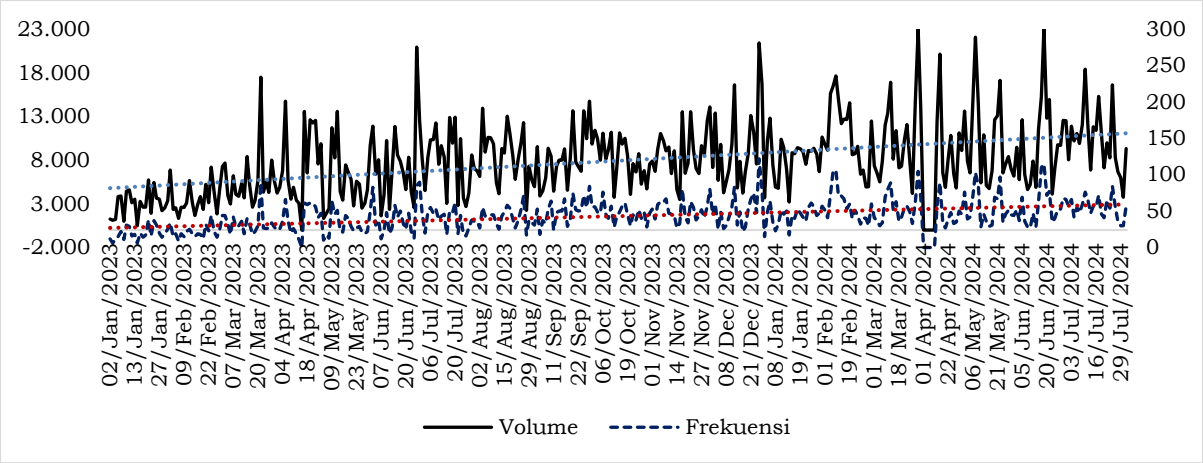
Figure 4. 20 Development of Nominal and Transaction Volume of Bank Indonesia Rupiah Securities (SRBI) in Indonesia

Figure 4.20 shows that the implementation of primary dealers on May 17, 2024 has a significant impact on increasing liquidity and transactions in Bank Indonesia Rupiah Securities (SRBI). Before the implementation of primary dealers, the nominal value and transaction volume of SRBI increased gradually. After the primary dealer implementation, the transaction volume peaked in June 2024.

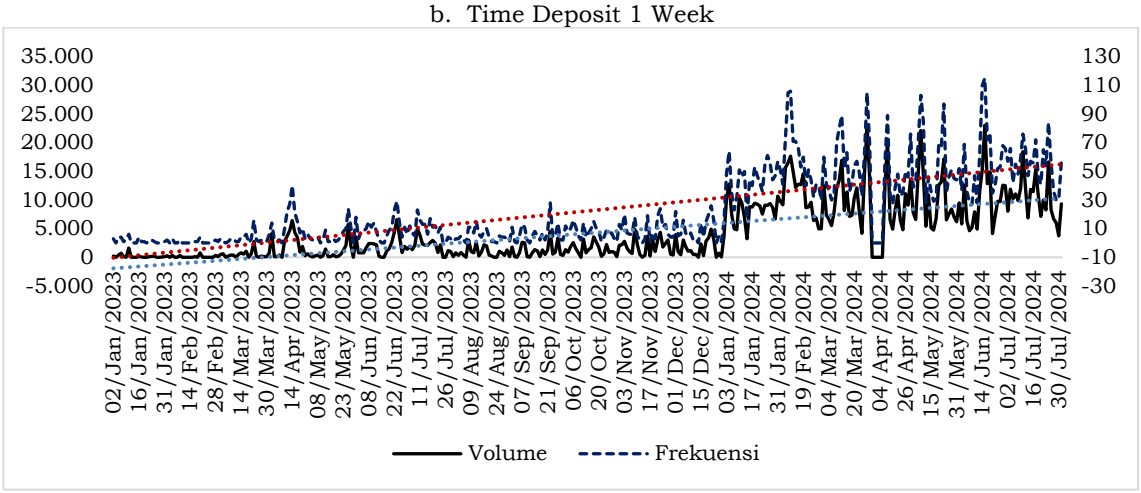
4.3.3 Time Deposit



a. Time Deposit Overnight



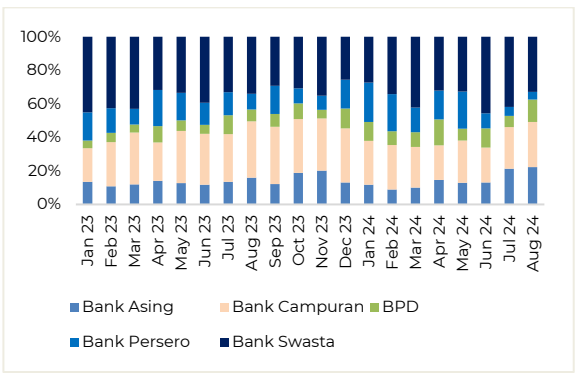
b. Time Deposit 1 Week



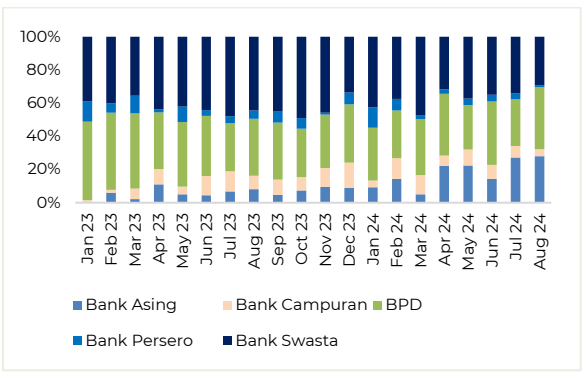
Time Deposit 2 Weeks

Figure 4. 21 Development of Volume and Frequency of Daily Time Deposit Transactions in Indonesia

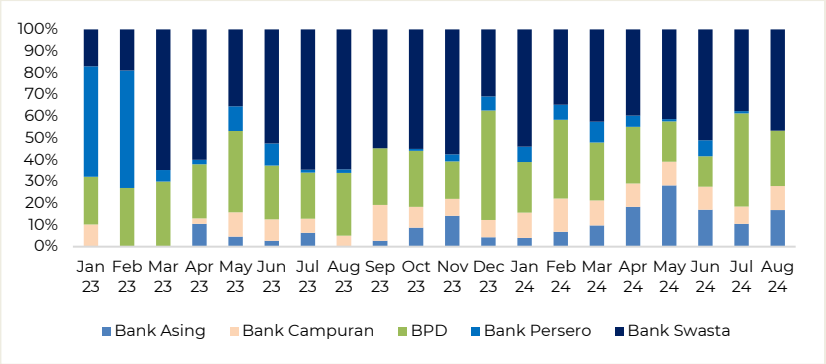
Figure 4.21 shows that the volume and frequency of daily time deposit transactions at overnight, 1-week and 2-week tenors have not shown a significant increase after the implementation of the primary dealer system.



Time Deposit Overnight



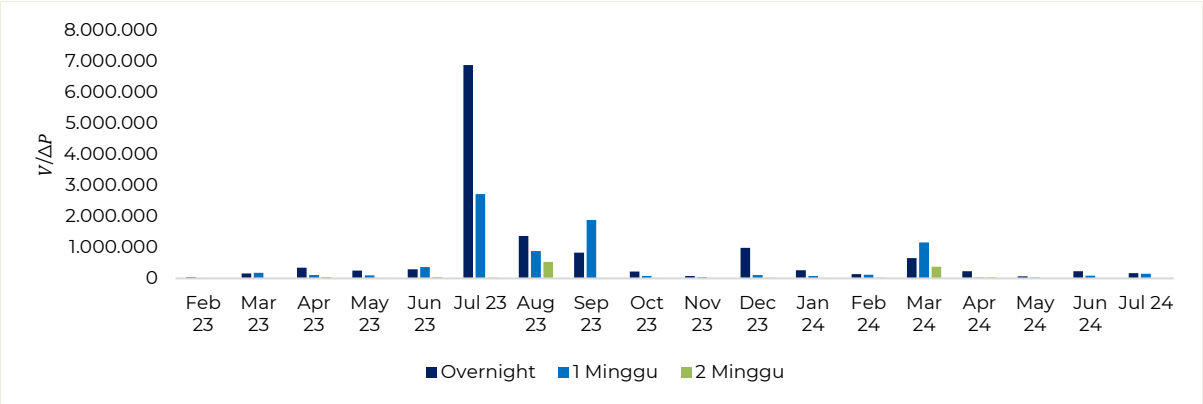
Time Deposit 1 Week



Time Deposit 2 Weeks

Figure 4. 22 Banking Contribution of Time Deposit Transactions in Indonesia

Figure 4.22 shows the contribution of time deposit depth by bank ownership. Private Banks contribute heavily to transactions in the overnight, 1-week, and 2-week tenors. BPD is also active in the 1-week and 2-week tenors, while state-owned banks are weak in the overnight tenor. Mixed banks are quite active in overnight time deposits, but not in 1-week and 2-week tenors.



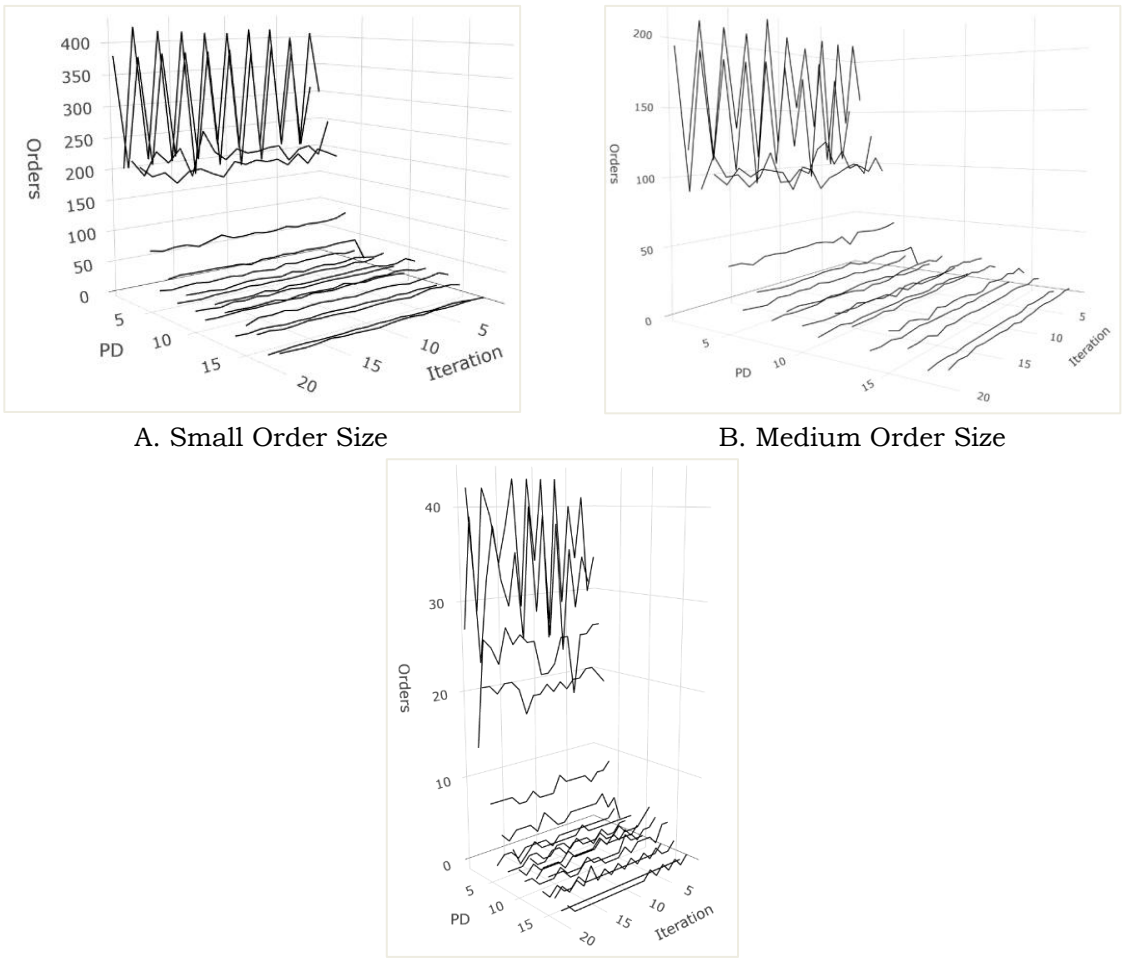
Source: Author's Data

Figure 4. 23 Money Market Depth (Time Deposit) in Indonesia

Figure 4.23 shows the market depth of time deposits in Indonesia. Deposits with 2-week tenors tend to be more stable than overnight and 1-week tenors. Overnight and 1-week deposits are more sensitive to changes in interest rates, leading to sharper liquidity fluctuations.

4.4 Simulation of Market Concentration Risk from Primary Dealer Implementation

4.4.1 Market Concentration Risk from Primary Dealer Implementation



A. Small Order Size

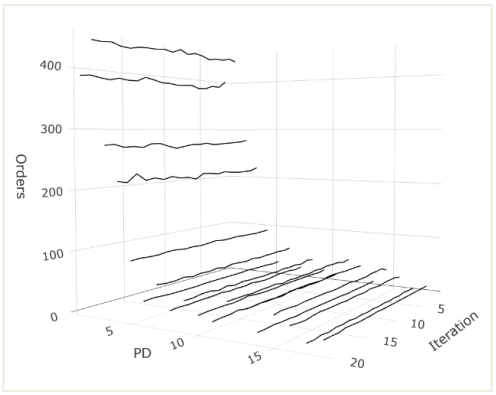
B. Medium Order Size

C. Big Order Size

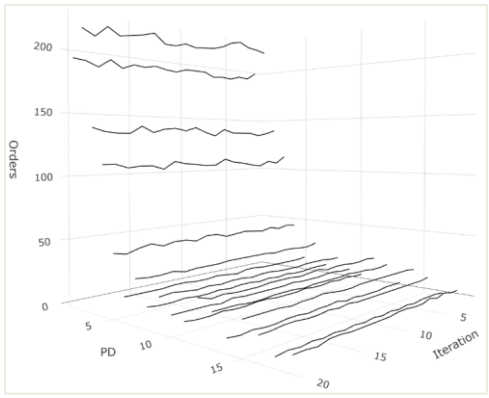
Source: Author's Data Processing

Figure 4. 24 Simulation of Market Concentration (Primary Dealer Capacity More than Client Demand)

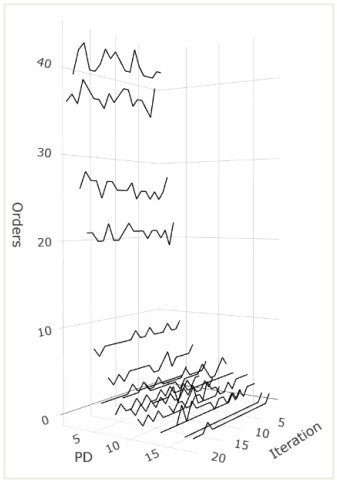
Figure 4.24 shows that when the liquidity capacity of primary dealer banks exceeds the demand of client banks, orders are evenly distributed in the market, especially for small-sized orders. Almost all primary dealer banks can accommodate orders from client banks within their respective liquidity limits, which creates a diversified market. Primary dealer banks with larger liquidity capacity, such as PD 2 and PD 3, receive more orders than other primary dealers with limited liquidity, which is consistent with the theory of capacity-based resource allocation (Cachon & Lariviere, 1999).



A. Small Order Size



B. Medium Order Size

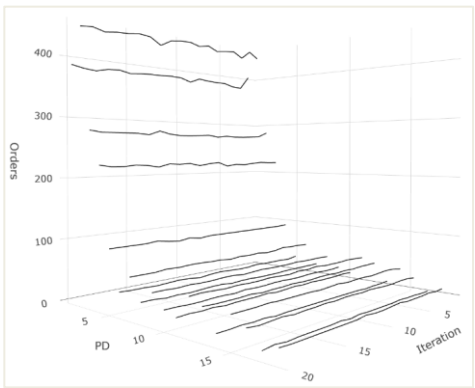


C. Big Order Besar

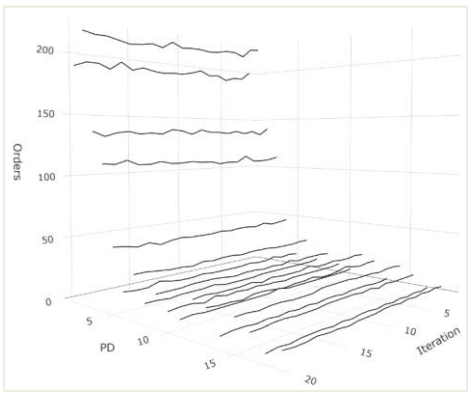
Source: Author's Data Processing

Figure 4. 25 Simulation of Market Concentration (Primary Dealer Capacity Equals Client Demand)

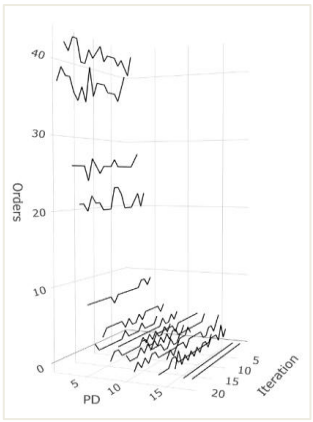
Figure 4.25 illustrates that while the liquidity capacity of primary dealer banks is equal to the demand of client banks, the distribution of orders shows a more moderate pattern. For small orders, almost all primary dealer banks can still accommodate the orders, although the degree of concentration remains to a lesser extent. However, when the order size increases to medium or large, the market starts to concentrate on primary dealers with stronger liquidity. This finding is consistent with the research of Jiang et al (2016), who said that when liquidity capacity is limited, institutions with higher liquidity tend to attract more demand, resulting in uneven market allocation and tend to be concentrated.



A. Small Order Size



B. Medium Order Size



C. Big Order Besar

Source: Author's Data Processing

Figure 4. 26 Simulation of Market Concentration (Primary Dealer Capacity Less than Client Demand)

Figure 4.26 illustrates when the liquidity capacity of primary dealer banks is lower than the demand of client banks. In this scenario, when the order size is small, some primary dealer banks are still able to accommodate the order, but market concentration starts to appear. For medium and large orders, there is a significant increase in concentration, where primary dealer banks with greater liquidity dominate the market, and primary dealer banks with less liquidity are unable to fulfill demand.

Overall, the simulation results show that the greater the demand of banks participating in monetary operations with limited primary dealer liquidity, the more orders tend to be concentrated in primary dealers with large liquidity. Vice versa, the smaller the demand of banks participating in monetary operations with large liquidity, the more dispersed the orders tend to be. Because primary dealers with limited liquidity cannot serve client requests.

The larger the order size of banks participating in monetary operations, the orders tend to be concentrated on primary dealers with large liquidity. Vice versa, the smaller the order size of banks participating in monetary operations, the orders tend to be scattered. Because primary dealers with limited liquidity cannot serve large order sizes.

4.4.2 Simulation of Assessment of Primary Dealer Banks

In Figure 3.1. regarding the simulation flowchart of the assessment of primary dealer banks (fifth step), the assessment is carried out to understand the preferences of client banks in choosing primary dealers based on the level of utility for each client. The utility function in Equation 3.4 considers liquidity, total orders, and auction success rate. The results show that primary dealer banks with high liquidity and competitive pricing, such as PD 1 to PD 5, are preferred by clients across a range of order sizes, namely small, medium and large bids. This supports the theory of liquidity preference in the primary market, where liquidity is one of the main elements in attracting clients (Backer, 2021).

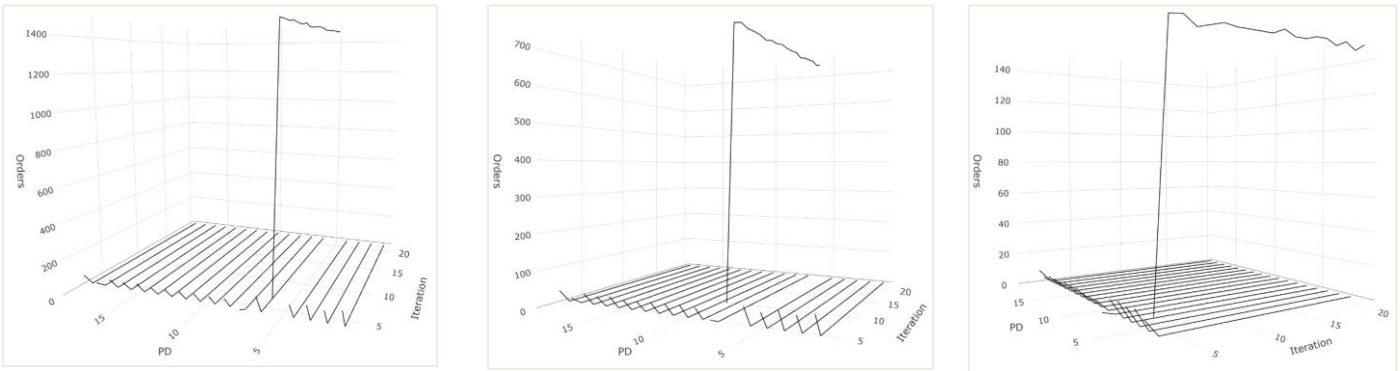
Results (Appendix 1) show that with both small and medium bids, PDs with greater liquidity get higher utility scores, consistent with the assumption that *client*s will prefer *primary dealer*s with liquidity capacity that can fulfill their smaller order sizes. This shows a relatively even distribution pattern among *primary dealer*s with large liquidity, where success in serving *client* orders also increases utility scores.

Results also shows the utility scoring results for each PD under the large bid condition. Under this condition, in addition to liquidity, the success rate in winning auctions is also a key determinant in the selection of PDs. For example, PDs such as PD 16 and PD 10, which may not have high liquidity, still show high utility scores due to their success in winning significant auction volumes. This shows that clients do not only consider liquidity, but also consider the PD's success in winning auctions as an indicator of reliability.

Overall, the results of this simulation show that in addition to liquidity, the auction success factor plays a significant role in increasing the utility of primary dealers from the client's perspective. This implies that in order to maintain client interest, primary dealers need to consider strategies that not only focus on improving liquidity, but also on optimizing the success rate in auctions.

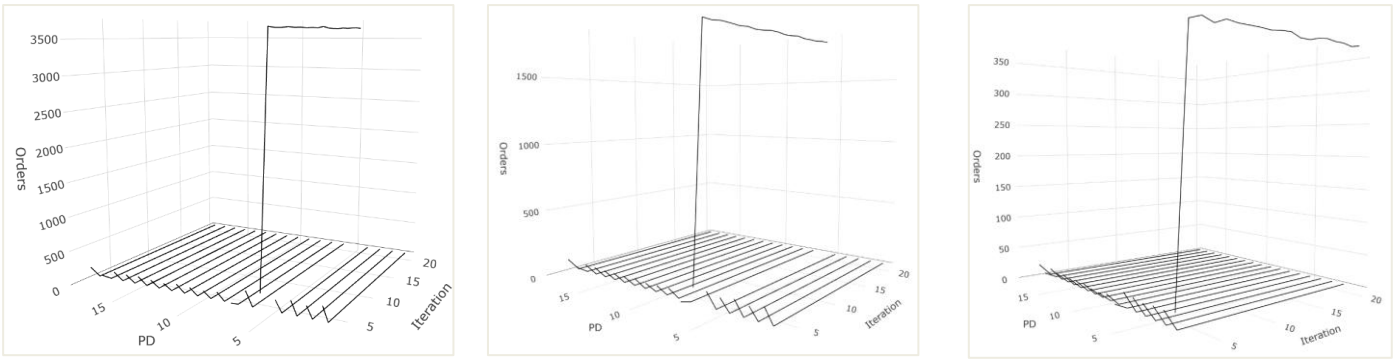
4.4.3 Market Concentration Risk from Primary Dealer Implementation (Settlement to 2B days)

In this section, we simulate the market concentration risk from *primary dealer* implementation when *Settlement* becomes two business days. As shown in Figure 4.27, when Bank Indonesia removes the same-day settlement *constraint* or removes the bank liquidity *constraint*, the concentration of orders on *primary dealer*s with large liquidity occurs immediately. The concentration occurs due to the slight difference in the number of orders at the initial stage and the successful rate, while the difference in sensitivity between clients is also slight. Thus, one of the *primary dealers* who has a slight superior *utility* value will monopolize the orders.



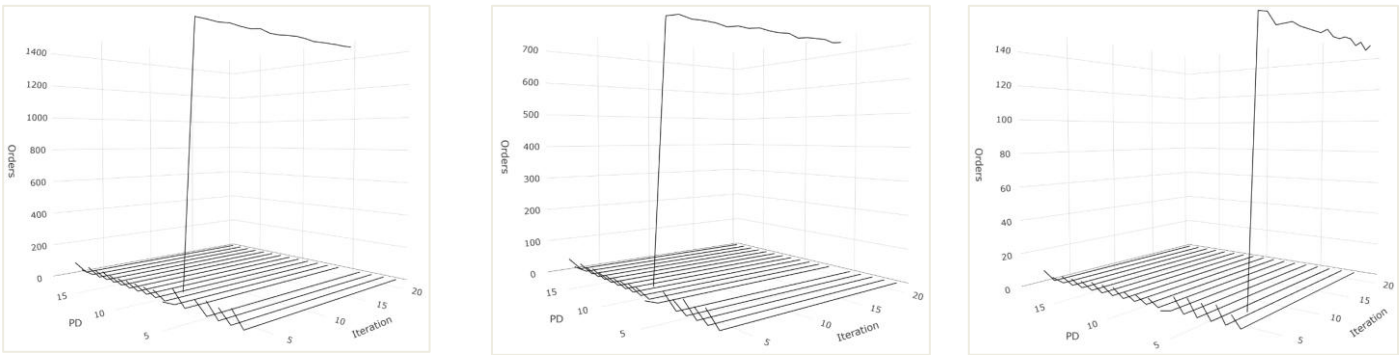
A. Small Order Size B. Medium Order Size C. Big Order Size

Primary Dealer Capacity Less than *Client* Demand



A. Small Order Size B. Medium Order Size C. Big Order Size

Primary Dealer Capacity Equal to *Client* Demand



A. Small Order Size B. Medium Order Size C. Big Order Size

Primary Dealer Capacity More than Client Demand

Figure 4. 27 Simulation of Market Concentration Risk from Primary Dealer Implementation (Settlement to 2B days)

5. Conclusion and Policy Recommendation

Implementation of the primary dealer system increases the connection of counterparties to repurchase agreement (repo) transactions and term deposits between banks with ownership types (private, regional, government). The implementation of the primary dealer system increases the volume and nominal value of Bank Indonesia Rupiah Securities (SRBI) transactions, which is a monetary instrument of Bank Indonesia. However, the implementation of primary dealers has not had a significant effect on transaction changes for the repo and time deposit markets.

In the market concentration simulation, we show that the larger the demand of banks participating in monetary operations with limited primary dealer liquidity, the more orders tend to be concentrated in primary dealers with large liquidity. Vice versa, the smaller the demand of banks participating in monetary operations with large liquidity, the more dispersed the orders tend to be. The larger the order size of banks participating in monetary operations, the orders tend to be concentrated on primary dealers with large liquidity. Vice versa, the smaller the order size of banks participating in monetary operations, the orders tend to be scattered. If Bank Indonesia removes the same-day settlement constraint or eliminates the bank

liquidity constraint, the concentration of orders on primary dealers with large liquidity will occur immediately.

The results of this study imply that to maintain healthy competition among primary dealers, i.e. orders are dispersed among primary dealers, Bank Indonesia should not change the same-day settlement, and the nominal bid amount of monetary operation securities is smaller than the liquidity capacity of primary dealers. Then, to maintain healthy primary dealer competition, Bank Indonesia offers securities that are larger than the liquidity of the Banking. Bank Indonesia may suggest to primary dealers that clients with large order sizes submit to primary dealers with large liquidity. Vice versa, clients with small orders should submit to primary dealers with small liquidity.

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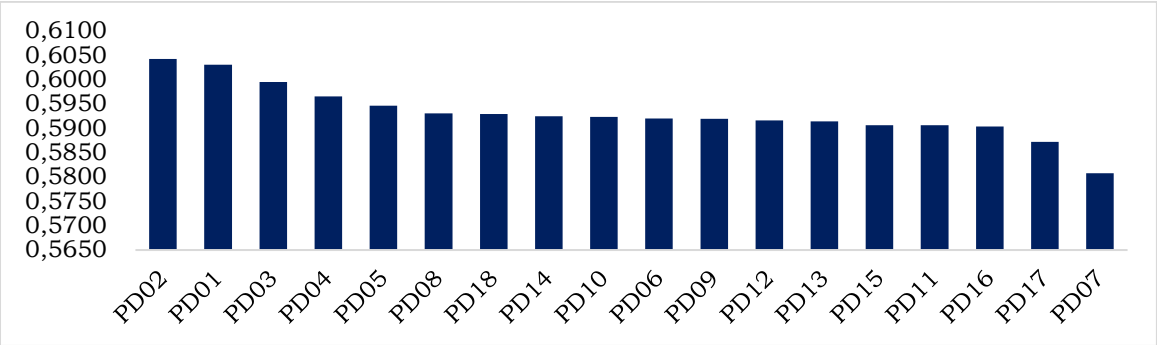
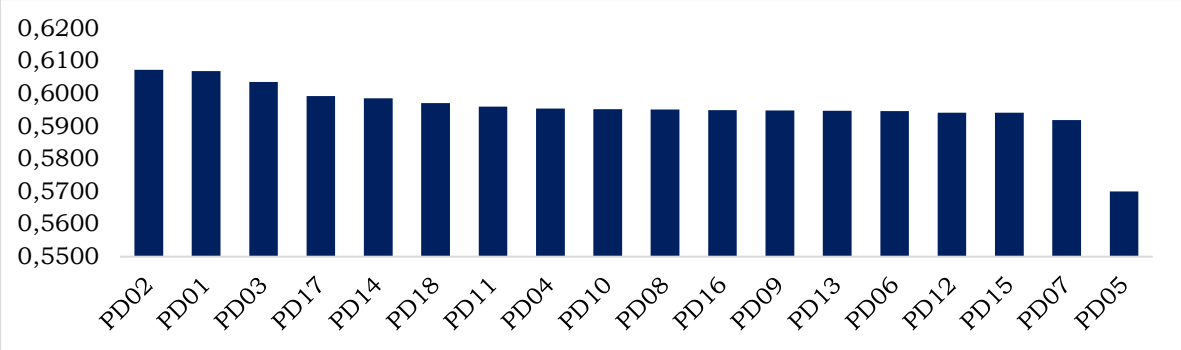
Appendix

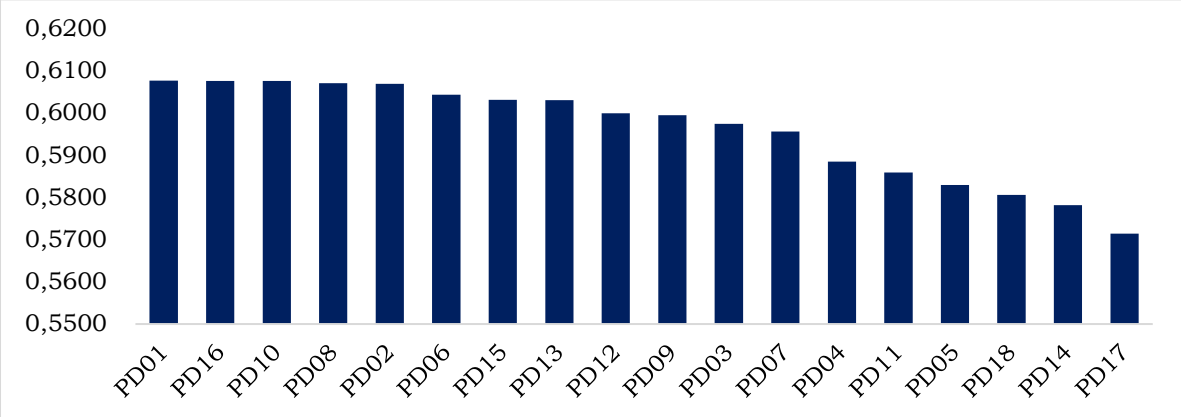
A1. Scoring Utility of each Primary Dealer



Small Order Size



Medium Order Size



Large Order Size