Dynamics Analysis of Credit Transmission on Foreign Bank Penetration in Indonesia

Mahjus Ekananda
University of Indonesia, Indonesia
*Corresponding Author: mahyusekananda@gmail.com

Abstract

Studies explore mode penetration bank foreign in transmission credit channel in Indonesia. ARDL-PMG is used for analyzing Office Bank branch Foreign (FOB) and Foreign Acquired Banks (FAB) on data panel bank-level, using the BI-7DR Days Reverse-repo rate and JIBR as monetary policy indicators. This study uses data on individual banks classified as FBO and FAB in Indonesia. The use of the ARDL-PMG model as an alternative to solve dynamic heterogeneous panels on credit channel problems in Indonesia. The main finding of this study proves that FBO and FAB show different credit channel transmission mechanisms in response to monetary policy. Studies also show that monetary policy contraction significantly impact towards FBO and FAB in Indonesia in the long-run. This studies due to the characteristics of Foreign Bank Branch Offices that are risk averse and have higher liquidity and Foreign Acquired Banks with higher capitalization. This characteristic causes the impact of contractionary monetary policy insignificant on FBO credit growth and FAB. The research has implications for financial and banking authorities to improve supervision over credit transmission at FBO and FAB due to differences in credit channel transmission mechanisms in response to monetary policy.

1.   INTRODUCTION

Advances in technology have led to more integration of the global financial system. The technological progress trend is marked by increased penetration of foreign banks in various countries through cross-border capital flows and the opening of branches in the host country. The role of foreign banks is increasing in the domestic financial system (Chen et al., 2018; Dang, 2020). The view that supports the penetration of foreign banks argues that foreign banks have a positive impact by increasing domestic financial stability and causing technology spillovers on the efficiency of domestic banks. However, with the increasingly integrated global financial system, subsequent studies argue that the penetration of foreign banks increases the exposure of the domestic financial system to the risk of transmission of the global financial crisis (Marcelin et al., 2022). The increase in foreign bank penetration has at least an impact on domestic banking stability, banking efficiency, and competition and on monetary policy through credit channel transmission (Fadloli & Chalid, 2017; Segev & Schaffer, 2020). Easing banking regulations in the host

country also facilitates increased penetration of foreign banks. Foreign banks are believed to have their characteristics in balance sheet composition and portfolio management compared to domestic banks (Hamada, 2018; Kapuściński, 2017).

Through their integration with Parent Banks, foreign banks can transmit monetary shocks from the home country to the host country (Hamada, 2018; Kapuściński, 2017). Foreign banks are also reported to have shown decreased sensitivity to domestic monetary policy. Its impacts the effectiveness of monetary policy (Fadloli & Chalid, 2017). Bank Integration Foreign with Parent banks gives access to the internal capital market, which is believed to be the cause of the decreased sensitivity of foreign banks to domestic monetary policy. The degree of integration of foreign banks with parent banks is influenced by the structure of foreign banks operating in the host country, which is determined by the mode of penetration (Wu et al., 2017).

The mode of penetration of foreign banks into the host country is one of the issues that has not received much attention, although it has implications for the stability of the financial and economic system in the host country. The difference in the penetration mode of foreign banks has at least an impact on the level of competition in domestic banking (Hryckiewicz & Kozlowski, 2018), the level of lending by foreign banks to the real sector domestic (Hamada, 2018; Marcelin et al., 2022), as well as to the effectiveness of monetary policy through credit channel transmission (Aysan et al., 2018; Gupta et al., 2022). Foreign Banks penetrate host countries by opening Foreign Bank Branch Offices/FBOs (greenfield/foreign de novo banks). Foreign Banks can also conduct mergers & acquisitions against domestic banks (acquired/subsidiaries banks) or are referred to as Foreign Acquired Banks (FAB). This penetration mode causes differences in the structure and character of foreign banks, which have implications for credit transmission channels (Aysan et al., 2018).

Ehlers & Mcguire (2017) studied foreign banks making financial transfers to several countries. The study used Bank for International Settlements (BSI) data. This research helps isolate the share of total bank credit (domestic credit and cross-border credit to non-banks) provided by foreign banks. Data sets that are not possible to obtain using standard proprietary data sets. The results show that while cross-border credit exacerbates the credit cycle, foreign banks do not necessarily have a destabilizing effect because their local operations (i.e., local loans funded in local currency) are a source of stability.
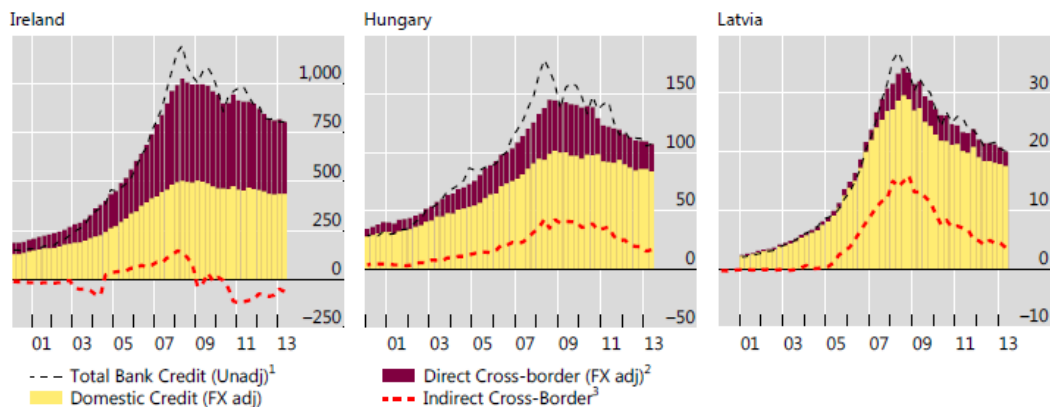

Figure 1. direct and indirect cross-border credit to non-banks in selected European countries.
Source : Ehlers & Mcguire (2017)

The country cases in Figure 1 highlight the various roles played by direct and indirect cross-border credit in the lead-up to the 2007–09 financial crisis. Direct cross-border credit to non-banks in Ireland (left panels) accounted for more than half of the country's total

bank-to-non-bank credit stock in 2008. In Hungary and Latvia (middle and right panels), indirect cross-border credit plays a more important role (dotted red line). Foreign banks channel funds (inter-office) across borders to their subsidiaries in these countries, which in turn provide foreign currency loans to residents (Ehlers & Mcguire (2017)McCauley (2010)). The stacked bars indicate total bank credit (in US dollars at end-Q2 2012 exchange rates). The dotted black line shows the bank's total credit (converted to US dollars at contemporary exchange rates). 2 The BIS reports on cross-border bank claims on non-banks located in countries in panel titles. 3 Net cross-border borrowing (liabilities minus claims) by banks in the country (Zapotichna, 2017).

Three studies discuss the response of foreign banks to change policy monetary however have not yet shown conclusive results. The wrong studies state that penetration bank foreign through mergers & acquisitions leads to reduced sensitivity to monetary policy. The accumulation of assets and market share due to the merger and acquisition process causes the FAB type to require more funding support from Parent Banks to operate. This funding support leads to FAB. Dependence on the internal capital market reduces sensitivity to monetary policy (Gambacorta & Shin, 2018).

On the other hand, subsequent studies stated that the type of FBO is less sensitive to monetary policy. The impact is due to the characteristics of the FBO type, which is highly dependent on Parent Banks' funding. The higher level of integration of foreign banks with Parent Banks causes a decrease in sensitivity to domestic monetary policy (Hamada, 2018; Wu et al., 2017). Study this to find that response growth credit FAB is more similar to domestic banks, which implies that FAB and FBO have substantial differences. These studies show that there is still a gap in understanding the response of foreign banks to monetary policy. The response of foreign banks based on the penetration mode is a research gap that this study will identify.

Indonesia is one of the countries that can be observed to support the study on the research gap above. As a host country, Indonesia has a financial sector that is dominated by sector banking and a trend of increased foreign bank penetration. The banking sector owns 76.1% of the total assets of the financial sector in Indonesia. Foreign bank penetration in Indonesia is indicated by foreign ownership controlling more than 50% of the assets of National Private Commercial Banks and 27.6% of total bank assets domestically (Hamilton-Hart, 2018). The trend of foreign bank penetration in the Indonesian banking sector tends to increase through the merger and acquisition of bank domestic.

Foreign ownership in the Indonesian banking sector is regulated through the Financial Services Authority (OJK) regulation; namely, the ownership of bank shares by legal entities is limited to a maximum of 40% (POJK No. 56/POJK.03/2016). However, this limit on the number of shareowners can be exceeded if it obtains OJK approval. This limitation is often violated by foreign ownership buying shares of domestic banks exceeding 40% and reaching almost 99%. OJK implicitly encourages foreign banks to conduct mergers & acquisitions against domestic banks through POJK regulation no. 41/POJK.03/2019. Regulation in on supported by easing on policy single presence policy (POJK No. 12 /POJK.03/2020) that allows the Controlling Shareholder (PSP) to have more than one bank that is part of a group Effort Bank (KUB). However, a policy is not arranged by a specific PSP, a foreign individual, or a business entity. Concerning the regulation on the limit of bank share ownership which is not specific to foreign ownership, this easing has the potential to increase FAB in Indonesia, either by the number of banks or in terms of market share.

In relation to the trend of penetration of foreign banks in Indonesia, this policy has the potential to concentrate the market share of Indonesian banking, which is dominated by foreign ownership. The problem related to this condition is the definition of foreign bank ownership in Indonesia which is not yet definitive. This type of FAB is still classified as a National Private Commercial Bank even though a foreign party already owns the ownership. No ownership restrictions share foreign, limitation capital and market share on FAB, Thing this may have implications for the effectiveness of monetary policy through a credit transmission channel (Aysan et al., 2018; Gambacorta & Shin, 2018).

Studying foreign banks in Indonesia also defines foreign banks from different perspectives. Naiborhu (2020) studied transmission credit channels in Indonesia but observed Banks in general and assumed a FAB-type foreign bank as a domestic bank. A foreign bank is a Bank with PSP from foreign parties. Hamada (2018) defines foreign banks based on PSP and does not look at the number of shares. However, Hamada (2018) separates FAB. Type banks with FBO in his research. Whereas in studies literature before, bank foreign is defined as a bank with a minimum 50% share owned by most foreign owners. This difference in definition is a research gap that can be explored further.

Several previous studies have shown a gap in understanding the response of foreign banks to the transmission of credit channels based on their penetration mode (Wu et al., 2017). Differences in the behavior of foreign banks based on the mode of penetration, namely FAB and FBO, are not yet conclusive, and the arguments presented are not consistent and can still be refuted through other studies. So based on the research gap above, this study's research question is as follows: Do Branch Offices of Foreign Banks (FBO) and Foreign Acquired Banks (FAB) in Indonesia show different responses to monetary policy when viewed from a credit perspective?

This study aims to explore the behavior of foreign banks based on their mode of penetration in credit channel transmission in Indonesia. This study was conducted on Branch Offices of Foreign Banks (FBO) and Foreign Acquired Banks (FAB) in Indonesia. This research contributes to proving differences in the response of FBO and FAB to monetary policy in Indonesia. This study shows that monetary policy does not significantly impact FBO and FAB credit growth. Then there are differences in the credit channel transmission mechanism between FBO and FAB. The contractionary monetary policy in the FBO was transmitted through an increase in liquid asset growth and a decrease in capital growth, followed by a decrease in loan growth. Meanwhile, in the FAB, contractionary monetary policy was transmitted through a decrease in liquid assets growth, which was followed by a decrease in capital growth and a decrease in loan growth.

The above responses are caused by differences in the characteristics of foreign banks based on their penetration mode. This characteristic difference causes different behavior in the credit channel transmission mechanism (Wu et al., 2017). FBO has risk-averse characteristics and a higher level of Liquidity, and FAB has a higher capitalization. The study focused on two foreign banks in Indonesia: Foreign Bank Branch Offices (FBO) and Foreign Acquired Banks (FAB). This study focuses on proving the existence of different transmissions between groups of FBO and FAB banks. This difference can be seen in several studies—first, a dynamic review of how the loans of this bank group make adjustments to long-term rates. The second is dynamic analysis of the co-integration equation. Third, how monetary policy responds differently by bank groups.

Theories regarding the transmission of monetary policy are generally divided into two perspectives: the neoclassical/money view and the credit view. The argument that supports the money view perspective explains that there is only a single interest rate that

affects the real economy through the IS-LM mechanism. This mechanism assumes that the financial system works efficiently; there are only two types of assets, namely money and bonds, and both are perfect substitutes for each other.

Criticism was conveyed against the money view; bank credit is a stand-alone asset and cannot be equated with bonds. This argument is presented by Gambacorta & Shin (2018), which explains that monetary policy is transmitted through bank loan supply, called credit channel transmission. Credit channels affect the real economy's investment level through bank loan supply to companies that depend on bank credit as access to capital. Bernanke & Blinder added that a credit channel is a transmission that amplifies the channel's interest rate and is not a stand-alone transmission alternative. Bank characteristics are essential in transmitting credit channels because they will influence the response bank against monetary policy. The literature review in the study will focus on credit channels and will specifically discuss their relationship to the characteristics of foreign banks (Hamada, 2018; Wu et al., 2017).

Several observations on the transmission of monetary policy found that (i) change in short-term rate takes effect on goods which should respond to long-term rate, for example, property. (ii) response sector real against shock still permanent continues through shock on short term rate already stop. (iii) there is an amplification of monetary policy on output. A phenomenon explained that credit channel transmission links monetary policy shocks with sector economy real through period lag. Then transmission credit channel amplifies monetary policy toward output (Aysan et al., 2018; Kapuściński, 2017; Leroy, 2014; Wu et al., 2016).

Cesa-Bianchi & Sokol, (2022) and Segev & Schaffer, (2020) explain the role of credit as an asset in addition to money and bonds in a theoretical model that supports the credit view. The Model explains that output is a function of monetary policy (reserve deposits) and loan supply-demand; that is balance sheet bank, the assets, and liabilities side are affected by changes in monetary policy. Open-market activities by the Central Bank resulted in a decrease in bank deposits, so banks experienced funding difficulties which impacted loan supply (Cesa-Bianchi & Sokol, 2022; Forbes & Forbes, 2019). The basic assumption of this Model is that there is friction that causes banks to be unable to substitute deposits with other funding sources.

The credit channel can work assuming that (i) bank loans and open market bonds cannot be substituted entirely. So the company cannot replace the lack of capital financed by bank loans by buying bonds. (ii) Bank Central could influence loan supply through reserve deposits, i.e., the bank cannot wholly replace the shortage of deposits using other liquid assets. (iii) the existence of sticky prices, namely changes in nominal interest rates, is not directly followed by changes in lending rates, so it impacts the bank's balance sheet (Hussain & Bashir, 2019).

The above assumption is that in addition to friction on access to funding, a decrease in bank deposits causes an increase in the cost of funding, thereby shifting the loan supply inward (a negative shock to the loan supply). This effect causes a drop in loan growth, increasing the lending rate, which impacts debtors who borrow money from banks. This explanation leads to the credit branch channel, the balance sheet channel that is practical policy monetary impact on firms that depend on banks as a source of capital. However, this channel is not will discuss in more detail because the focus studies this transmission credit channel (Kapuściński, 2017).

The credit channel theory explains that the Central Bank transmits contractionary

monetary policy through open market activities that affect bank deposit levels. Bank deposits became a shock on the deposit side, resulting in a decrease in deposits, and banks faced funding constraints. If the bank does not get alternative funding, the shock will be transferred to the asset side, and the bank will liquidate its assets and reduce the loan supply. The decrease in loan supply will impact companies that depend on bank credit, so the level of investment will decrease. Through the above scenario, the contractionary monetary policy effectively reduces the real economy's investment level through credit channel transmission (Cesa-Bianchi & Sokol, 2022; Gupta et al., 2022).

The bank's balance sheet's position affects credit channel transmission. Kapuściński (2017) explores credit channel transmission by considering the aspect of the cross-sectional bank. Using asset as bank size, Kapuściński (2017) differentiate response between small and big banks based on assets in transmission credit channels. Studies find that level loans to small banks are more sensitive to monetary policy shocks.

At the beginning of the development of the credit channel theory, the bank capital factor was not taken into account or assumed to be ceteris paribus. Bank balances that respond to changes in monetary policy are the assets and liabilities, while capital (or equity in the balance sheet) is separate from the liabilities. However, the development of further credit channel studies argues that bank capital is included as a determinant factor in bank balance sheets and dynamically responds to changes in monetary policy (Cesa-Bianchi & Sokol, 2022; Gambacorta & Shin, 2018).

Two concepts explain capital's role in influencing a bank's balance sheet characteristics. First, through high capitalization (total equity to total assets), banks can use excess capital directly to finance projects and investments. This concept explains that bank capital will be procyclical to the business cycle. The second draft explained that high capitalization causes a lower cost of funding. The lower cost of funding causes the perception of banks to be " less risky" so that it is easier for banks to obtain funding through bonds and deposits. Important point What needs to be underlined is (i) the level of bank capitalization is inversely proportional to the bank's cost of funding (ii) the increase in capitalization is directly proportional to the increase in funding. These two points lead to the next point (iii) the higher the level of capitalization, the higher the annual loan growth (Gambacorta & Shin, 2018).

In terms of Liquidity, portfolio management theory explains that the characteristics of risk-averse banks will tend to choose portfolios in the form of low-risk liquid assets. These conditions occur explicitly in conditions of volatile interest rates (Chen et al., 2018; Dang, 2020). Characteristics of banks in avoiding risk also affect the bank's level of loan supply. Beyhaghi et al. (2020) argue that credit rationing is a manifestation of the tendency of banks to mitigate risk through the selection process of debtors who will be given credit. This behavior is based on adverse selection conditions in the debtor screening process. The bank will mitigate credit risk by only providing credit to debtors who meet the credit criteria. This behavior is known as a "cherry pick" because banks tend only to extend credit to corporate debtors with a low-risk profile. This adverse selection can affect credit channel transmission because it has implications for the intermediation function bank.

The trend of foreign bank penetration described in the Introduction section raises questions about the relationship between foreign bank penetration modes and credit channel transmission. There are two ways for foreign banks to penetrate, namely through opening a Foreign Bank Branch Office (FBO). They are also referred to as a foreign de novo or greenfield bank. The second is through the process of Mergers and Acquisitions (M&A) against domestic banks in the host country as Foreign Acquired Banks (FAB) or

subsidiaries (Hamada, 2018; Kapuściński, 2017). FBO operates through Support funding from Parent Banks in the home country.

Meanwhile, FAB has its legal entity and operates through: integration with a domestic bank that was acquired, so that has a network that is larger when compared to FBO. Different penetration approaches make a difference in the characteristics of the balance sheet and the response to monetary policy (Kapuściński, 2017; Segev & Schaffer, 2020; Wu et al., 2017). The characteristics of foreign banks based on the mode of penetration are still debatable because there are not many studies that discuss this field. However, compared to domestic banks, foreign banks have their character. Foreign Bank Motivation in choose mode penetration is at least influenced by profit from each type of penetration to operations in the host country, namely the efficiency and performance of foreign banks (Hamada, 2018).

Foreign Banks' response to changes in monetary policy based on mode penetration so far this covered by empirical by Hamada (2018); Kapuściński (2017). These two studies focus more on integrating Foreign Banks with Parent Banks to explain the different characteristics of the two types. Wu et al. (2017) research show that the FAB type is more integrated with Parent Banks due to a larger market share, thereby reducing its sensitivity to monetary policy. Nevertheless, this argument is inconclusive because researchers also explain that penetration of Bank Foreign depends on many factors, namely the profile of Parent Banks and the profile of domestic banks which acquired.

The explanation contradicts by Hamada, (2018) and Kapuściński (2017). They argue that FBO is more integrated with Parent Banks, reducing sensitivity to monetary policy. Structure FBO in the form of branch offices / de novo makes it more flexible in cross-border funding activities to make it easier to access the internal capital market. On the other hand, FAB has a more rigid structure in carrying out cross-border funding activities and has a better domestic funding base than FBO. The implication is that FAB tends to be more independent from internal capital market support and more dependent on access to domestic funding. The FAB is more sensitive to domestic monetary policy than the FBO. Though contrary, the second studies agree that other mode penetration causes different characteristics on the balance sheet of Bank Foreign in terms of market share size, liquidity level, and capitalization.

Regarding the internal capital market, this issue is quite popular and is being observed by Lee & Bowdler (2019) and then further explored by Gambacorta & Shin (2018). They observe that banks with relatively small assets become less sensitive to monetary shocks when Parent Banks own them in the form of multibank holdings. The support from affiliates explains this through the internal capital market. Researchers Lee & Bowdler (2019) reveal the internal mechanism of the capital market: cross-border funding cash flow between Bank Foreign. This study shows that foreign bank liquidity reacts to monetary policy shocks on an international scale between the host country and the home country. Hamada (2018) even added that the effect of the internal capital market on foreign banks in the host country is not determined by geographic location. The existence of an internal capital market causes global financial spillover, which is transmitted through the expansion of foreign banks. Apart from the internal capital market issue, this study focuses on the different characteristics of the penetration mode of foreign banks and their effect on credit channel transmission in Indonesia and other developing countries.

In determining monetary policy indicators, the policy rate often uses two interest rates: the central bank reference rate/ anchor rate and the market-interbank rate or a short-term rate. The Central Bank's reference interest rate is the implementation of the objective/

stance of monetary policy, which is then transmitted to the short-term rate through open market operations. Short-term rates are often used as an alternative if the Central Bank's benchmark interest rate is considered to contain the central bank's response to economic conditions Bernanke (2007) in Gambacorta & Shin (2018).

The market-interbank rate is the indicator closest to the Central Bank's benchmark interest rate. There is a strong relationship between these two interest rates (Kapuściński, 2017; Lee & Bowdler, 2019). The theory explains that monetary policy is transmitted through the short-term nominal rate, then transmitted to long-term nominal rates in the long term, and influences real interest rate and level of investment (Fadloli & Chalid, 2017; Hussain & Bashir, 2019). Bank Central will control the market-interbank rate so that permanent following ethnic group flower reference through open market operations intervention. In Indonesia, the market-interbank rate used is JIBR (Jakarta Interbank Offered). Rates).

The study of credit channel transmission has developed broad and evolved into several branches of study. The distribution of the research strand in the credit channel is as follows:

Aysan et al. (2018); Cesa-Bianchi & Sokol (2022) and Gupta et al. (2022) explain the transmission of credit channels that work through the bank's liabilities and assets. The transmission of the Credit channel explains the lag on investment, the effect of the short-term rate on long-term assets, and the amplification effect on monetary policy — Bank Capital Channel (sub theory of Credit Channel at Gambacorta & Shin, 2018). Bank capital is one of the determinants in the transmission of credit channels. Banks with more capital higher will have a higher cost of funding low. A "less risky bank" reputation makes it easier to access funding. The characteristics of foreign banks' balance sheets are different from those of domestic banks, so foreign banks have their role in credit channel transmission. The following study explores the role and characteristics of foreign banks and their relation to monetary policy (Gambacorta & Shin, 2018).

This study focuses on the behavior of foreign banks in a contractionary monetary policy condition as reflected by the response of loan growth during a shock to the bank's balance sheet. When the Central Bank implements a monetary policy to control the amount of money circulating, attitude will be reflected by movement interest rate reference Bank Central which is followed by short-term rates, then lending rate, and long-term rate. The central bank intervenes in the money supply to keep the short-term rate from moving too far from the benchmark interest rate (Fadloli & Chalid, 2017; Hussain & Bashir, 2019). Short-term rates affect deposit and liquid assets on the bank's balance sheet, indicating an increase in the cost of funding in the interbank money market. A higher reverse repo rate will attract money circulating in the market, so these operations directly affect the bank's deposit and liquid asset positions.

Deposits and liquid assets are endogenous to each other in that the bank always balances the trading book on the balance sheet. From this point of view, the bank can allocate its funds as credit or as short-term liquid assets. Allocating funds as credit can result in higher returns but also higher risks. The difference in maturity between the short-term asset rate and lending rate can affect the bank's net profit.

When the Central Bank raises the benchmark interest rate, bank deposits will go down and influence liquid assets and allocation credit (Chen et al., 2018). If banks cannot find alternative funding, liquid assets will act as a deposit substitution. Nevertheless, in an actual condition with asymmetric information, the bank could not perfect substituting

both, resulting in a drop in loan growth. This asymmetric information is the significant impact of credit channel transmission on monetary policy contraction.

Banks can protect their loan growth from monetary shocks by having a higher capital capacity. Higher capital could protect against impact shock contraction monetary through access funding which better and lower the cost of funding (Gambacorta & Shin, 2018). With higher capital, banks have easier access to non-reservable funding to maintain loan stability growth.

Thus the composition of a bank's balance sheet, namely deposits, liquid assets, capital, and loans, is endogenous to each other. In the case of foreign banks, different characteristics distinguish their behavior in credit channel transmission. First, the different capital structure, especially in FBO. The FBO operates in the host country depending on the support of the Parent Banks. The FBO capital structure does not consist of share ownership but in the form of accounts fund investment from the office center, which is more flexible than having shared. The Liquidity of the FBO depends on the size of the capital and assets of the Parent Banks. In response to contractionary monetary policy, the FBO can access the internal capital market to protect loan growth from shock (Gambacorta & Shin, 2018).

Foreign Acquired Banks (FAB) do not have the flexibility of FBO but have higher capitalization than domestic banks. The merger & acquisition process accumulates capital, assets, and market share. Two foreign banks may behave differently in response to the shock of a monetary contraction through different allocations of funds deposits, liquid assets, capital, and loans. Composition balance sheet bank explains that deposits, liquid assets, capital, and the loan will be measured in form growth. For example, in loan growth, an increase in interest rates impacts decreasing new loans and not reducing existing loans. Loan demand is controlled by using GDP growth in each period. If economic growth increases, credit growth will also follow procyclical.

This research model uses the PMG-ARDL approach (Attiaoui et al., 2017). The bank-level data is divided into two-panel groups, namely FBO and FAB. This classification is based on different foreign banks based on mode penetration to the host country. Difference main second panel will discuss on part descriptive statistics. The second group will be regressed on Model which separated but on period time which same. The Model first will use the BI Rate (BI - 7DR) as an indicator of monetary policy, and the second Model will use the JIBR as an indicator alternative.

2. HYPOTHESES DEVELOPMENT

Based on the research problem, objectives, and literature study discussed earlier, and the research establishes the following hypothesis.
H1: there is a long-term relationship between FBO and FAB group bank loans.
H2: There is a loan correction in the long term caused by the determinant.
H3: The speed of adjustment through the BI-7DR monetary instrument is greater than the JIBR financial market instrument on FAB

3. METHOD

This study uses balanced panel data taken from the monthly published reports of each bank with a sample of 19 foreign banks that have been filtered based on the number of foreign shares and ownership. The period used is 2018:M8 - 2021:M12, considering the use of 7-Days Reverse-repo (BI-7DR) as the benchmark interest rate starting from August 2016. Data is available in millions of Rupiah, which is then transformed into natural

logarithms, except for NPL and the number of shares in percentage.

GDP Growth data is available in a quarterly frequency, namely QoQ growth, so it is interpolated to a monthly frequency using the cubic-spline method. The calculation of GDP growth refers to the constant price of GDP in 2000 based on the type of business field. GDP growth data is taken from the Indonesian Central Statistics Agency. BI-7DR and JIBR data are available on the official website of Bank Indonesia. The JIBR overnight rate is not used because, since August 2018, the overnight rate has been switched to the Indonesian interest rate.

Theoretically, loan growth is a function of monetary policy when viewed within the framework of credit channel transmission. The contractionary monetary policy reflected through the increase in the Central Bank's interest rate will have a negative impact on loan supply (Gambacorta & Shin, 2018). Therefore, foreign bank loan growth becomes the dependent variable influenced by changes in monetary policy interest rates. The endogenous bank balance variables used in this Model refer to the sequence used by Wu et al. (2017). Respectively are bank deposit growth (dL n DEP), bank liquid assets growth (dL n LIQ), bank capital growth (dL n CAP) and bank loan growth (dL n LOAN), and the exogenous variable GDP Growth (dL n GDP). These variables are transformed into natural logarithms where the difference is equivalent to the growth rate.

The notations dL n DEP and dL n LIQ represent the transmission of credit channels on a bank's balance sheet, where banks adjust liquid asset growth and loan growth to deposit growth in response to the shock of monetary contraction. The variable dL n DEP is the total Third Party Funds, namely Current Accounts + Time Deposits + Savings. dLnLIQ is the total cash and securities, except for credit, fixed, and intangible assets. The dLnLOAN is total credit minus the percentage of NPL, i.e., Loan = Credit × (1-% NPL). All variables use monthly frequency, which is bank-level data with the shortest publicly available frequency. The shortest frequency is used to directly observe the impact of the short-term rate on deposits and liquid assets. The exogenous variable used is GDP Growth (g GDP) to control loan demand for credit growth. However, because GDP growth data is available in QoQ growth, the data is interpolated using the cubic-spline method to become a monthly frequency (Ekananda, 2016). GDP growth is based on business fields and constant prices in 2010 and is taken from the official publication of the Central Statistics Agency.

We use the Monetary policy indicators by BI 7 Days Reverse-repo (BI-7DR), which is the reference interest rate of Bank Indonesia. The Central Bank's interest rate is the right choice to represent the stance of monetary policy (Sven & Hans-Werner, 2014). The characteristics of the BI-7DR as the benchmark interest rate are non-volatile and published on average every 30 days with changes of ± 25 bps. The BI-7DR value is taken from the last value in each monthly period to be consistent with bank balance data. To mitigate this characteristic in the Panel VAR estimation, the interbank market rate in Indonesia, namely JIBR, is used as an alternative to BI-7DR. The maximum value of the weekly JIBR rate is used to reflect the shock that occurs in the interbank market rate movement. Use the weekly rate of JIBR to be consistent with BI-7DR. These two indicators are measured at the level with a percentage unit to reflect contractionary monetary policy, namely through a percentage increase in interest rates. In addition to these reasons, considering the stable character of BI-7DR, the use of data in first-difference will eliminate the significance of the data because it generates many data with zero values.

Table 1. Variables and Description

Variable	Description
BI-7DR	BI Percentage 7 Days Reverse-repo; using the last value of each period; monthly data.
JIB R	JIBR percentage; using the maximum value of each period; monthly data.

Variable	Description
gDEP	Percentage of deposits growth (dLnDEP). Total of Current Account + Time Deposit + Savings. Using the last value of each period, monthly data.
gLIQ	Percentage of liquid assets growth (dLnLIQ). Total of cash and securities, using the last value of each period; monthly data.
gCAP	Percentage of capital growth (dL n CAP). Total of bank equity. Using the last value of each period, monthly data.
g LOAN	Percentage of net loan growth (dLnLoan). Total credits x (1-%NPL). using the last value of each period; monthly data.
g GDP	Percentage of GDP growth. QoQ GDP growth is interpolated into monthly data using *the cubic-spline method*

Bank Indonesia classifies Foreign Banks based on their establishment and is limited to Foreign Bank Branch Offices (FBO). Meanwhile, Commercial Banks whose majority shares are owned by foreigners are still classified as National Private Commercial Banks. However, the definition of a *Controlling Shareholder* is a shareholder with shares of 25% and registered as a Controlling Shareholder. This definition is regulated in POJK No. 41/ POJK.03 / 2019 about mergers, consolidation, acquisition, integration, and conversion of the commercial bank. The World Bank defines *foreign banks* as banks with foreign shares > 50% (Fadloli & Chalid, 2017; Segev & Schaffer, 2020; Wu et al., 2017).

This study screens a sample of banks based on the amount shared foreign > 50%, and owner share foreign must register as the Controlling Shareholder in the financial statements and the OJK Banking Directory. Banks that do not meet the two criteria above are excluded from the sample. The filter results are divided into two groups based on the mode of penetration: Foreign Bank Branch Offices (FBO), consisting of 5 banks, and Foreign Acquired Banks (FAB), consisting of 14 banks. This study uses a sample of 19 foreign banks in Indonesia which is the result of a filter based on the number of foreign shareholdings and the identity of the holder Share controller. Following is details from sample Bank Foreign in this research :

Table 2. Foreign Acquired Banks (FAB) and Foreign Bank Branch Offices (FBO)

Name	Bank Type	Share	Classification	Name	Bank Type	Share	Classification
CIMB	BU	91.48%	FAB	ANZ	BU (Mix)	99%	FAB
OCBC	BU	85.08%	FAB	KEB	BU	89%	FAB
FUND	BU	52.93%	FAB	UOB	BU	99%	FAB
MAYB	BU	98.13%	FAB	CTBC	BU (Mix)	99%	FAB
HSBC	BU	98.94%	FAB	SCB	FBO	100%	FBO
MAYA	BU	57.31%	FAB	BOC	FBO	100%	FBO
BTPN	BU	59.88%	FAB	MUFG	FBO	100%	FBO
DBS	BU (Mix)	99%	FAB	CITI	FBO	100%	FBO
MIZUHO	BU (Mix)	99%	FAB	BANGK	FBO	100%	FBO
ICBC	BU	98.98%	FAB				

Source: Indonesian Banking Directory 2020, Financial Services Authority (2021)

Traditional methods of estimating cointegration relationships, such as the Engle-Granger or Johansen methods in Ekananda & Suryanto (2021), or single-equation methods, such as fully modified OLS or dynamic OLS, both require all variables to be I (1) or require knowledge and variable specification. I(0) and I(1). To overcome this problem, Pesaran et al. (1999) show that a cointegration system can be estimated as an ARDL model. The advantage is that the variables in the cointegration relationship can be either I(0) or I(1)

without needing to repeat the specification (0) or I(1).

Pesaran and Shin also note that unlike other methods of estimating cointegration relationships, the ARDL representation does not require a symmetrical lag length; each variable can have a different number of lags. Some cointegration methods, such as those proposed by Engle-Granger and Johansen, require that the analyzed variables be integrated in the same order. It allows the variables used to be integrated on I(0), I(1), or a mixture of I(0) and I(1). The initial identification of the stationary level is used to indicate that data is possible to obtain non-stationary data at the same level. This study uses the Bound Testing Cointegration method with the Autoregressive Distributed Lag (ARDL) approach by Pesaran et al. (2001) in (Attiaoui et al., 2017).

The Autoregressive Distributed Lag (ARDL) model is an OLS estimation that includes the lag of both the dependent and independent variables in the Model. On the data panel with individual effects, the standard regression estimation of the ARDL model is problematic because of the bias caused by the correlation between the difference in the regression means and the error. So alternative A popular one is the Pooled Mean Group (PMG) estimator of Pesaran, Shin, and Smith (PSS, 1999). This Model takes from a simple ARDL model. This Model is adapted for panel settings by enabling intercept, run coefficient short, and different coefficient cointegration throughout the cross-section.

$$\Delta y_{it} = - \sum_{i=1}^{p-1} \gamma_i^* \Delta y_{it-1} + \sum_{j=1}^{k} \sum_{i=0}^{qj-1} \Delta X_{ij,t-i} \beta_{j,i}^* - \varphi EC_{t-1} + \mu_i + \varepsilon_{it}$$

(1)

Where the EC component as is

$$EC_{t-1} = y_{it-1} - \alpha - \sum_{j=1} X_{j,t-1} \theta_j$$

(2)

This study uses the Pooled Mean Group-Autoregressive Distributed Lag. The estimation method (PMG-ARDL) was developed by Pesaran et al. (1999) in Attiaoui et al. (2017). This method can avoid the problem of non-stationary data because this method accepts variables that have integration on I(1) and I(0) but no can use on variable I(2). This model is also a consistent and efficient estimation method because this method enters lags on the dependent and independent variables, which will eliminate the problem of endogeneity. Namely, there is a correlation between the models' independent variable and error term. In this study, PMG-ARDL was used to answer the main objective: whether using renewable energy can affect the ecological footprint in the long-term education and GDP. PMG-ARDL is expressed as follows Attiaoui et al. (2017). PMG has similar specifications to ARDL. This study worked on two groups of equations according to the bank group, FAB and FBO. The PMG-ARDL equation is written in the format of equation 1. If y is the natural logarithm of Loan, Ln(LOAN), then Δy is $\Delta Ln(LOAN)$ = gLOAN. Likewise, if x is the natural logarithm of GDP, Ln(GDP), then Δx is $\Delta Ln(GDP)$ = gGDP. The same thing happened to the other variables. The short-term equation (cointegration equation) for the FBO group is as follows.

$$gLOANK_{it} = \alpha_{0i} + \beta_1(l)Interest_{t-j} + \beta_2(l)dLDEPK_{it-j} + \beta_3(l)dLLIQK_{it-j}$$
$$+ \beta_4(l)dLCAPK_{it-j} + \beta_6 dLGDP_{t-j} + \gamma_1 ECK_{it} + u_i + e_{1it}$$

(3a)

The EC equation becomes:

$$ECK_{it} = gLOANK_{it} - (\alpha_{0i} + \beta_1(l)Interest_{t-j} + \beta_2(l)dLDEPK_{it-j} + \beta_3(l)dLLIQK_{it-j}$$
$$+ \beta_4(l)dLCAPK_{it-j} + \beta_6 dLGDP_{t-j} + u_i)$$

(3b)

The FAB group equation fulfills the same equation as the Main model, which is as follows

$$gLOANF_{it} = \alpha_{1i} + \delta_1(l)Interest_{t-j} + \delta_2(l)dLDEPF_{it-j} + \delta_3(l)dLLIQF_{it-j} + \delta_4(l)dLCAP_{it-j}$$
$$+ \delta_6 dLGDP_{t-j} + +\gamma_2 ECK_{it} + u_i + e_{2it}$$

(4b)

The EC equation becomes:

$$ECF_{it} = gLOANF_{it} - (\alpha_{1i} + \delta_1(l)Interest_{t-j} + \delta_2(l)dLDEPF_{it-j} + \delta_3(l)dLLIQF_{it-j}$$
$$+ \delta_4(l)dLCAP_{it-j} + \delta_6 dLGDP_{t-j} + u_i)$$

(4b)

Interest applied consists of BI-7DR and JIBR. There are four main equations. The main advantage of PMG-ARDL compared to ECM is that it applies a bound test to models with different data integrations. Using the form of cointegration relationship in Equation (4b), Pesaran et al., (2001) in Attiaoui et al. (2017), in the article by Waluyo & Terawaki (2016), describes a methodology for testing whether the ARDL model contains a degree of the long-term relationship between the independent variable and the regressor. The procedure for transforming Bounds Test (3) into the following representation:

$$\Delta y_t = -\sum_{i=1}^{p-1} \gamma_i^* \Delta y_{t-1} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \Delta X_{j,t-i} \beta_{j,i}^* - \rho y_{t-1} - \alpha - \sum_{i=1}^{k} X'_{j,t-1} \delta_j + \varepsilon_t$$

(5a)

The test for the existence of a relationship level is then tested:

$$\rho = 0$$
$$\delta_1 = \delta_2 = \cdots = \delta_k = 0$$

(5b)

Statistical tests based on Equations (5a and 5b) have different distributions under the null hypothesis (no level relationship), depending on whether the regressors are all I (0) or all I (1). Furthermore, in both cases, the distribution is non-standard. Pesaran, Shin, and Smith assign a critical value to cases where all regressors are I (0) and cases where all regressors are I(1) and suggest using the critical value as the limit for the larger case. Typical where the regressor a is a mixture of I(0) and I(1).

The discussion of the research results starts with an explanation of the data description and continues with data testing and model selection. The steps for model selection are presented as follows—first, the panel data co-integration test. Second, Determination of Maximum Lag. The third is to test the bound test criteria: co-integration equation analysis and error correction equation. Statistical hypotheses to answer the research hypothesis are as follows.

H1: there is a long-term relationship between FOB and FAB group bank loans.
Hipotesis 1 H₀: $\delta_1 = \delta_2 = \cdots = \delta_{km} = 0$ H_a : not H₀

H2: There is a loan correction in the long term caused by the determinant.

Hipotesis 2 H_0: $\gamma_k=0$ dan H_a: $\gamma_k \neq 0$, k = 1 for FBO and k = 2 for FAB

H3: The speed of adjustment through the BI-7DR monetary instrument is greater than the JIBR financial market instrument on FAB

Hipotesis 3 H_0: $\gamma_1=\gamma_2$ dan H_a: $\gamma_1 \neq \gamma_2$

4. RESULTS

The total *asset share* for FAB and FBO is 21% and 6%, respectively, of the total assets of commercial banks. In total, the sample of foreign banks analyzed confirms the Hamilton-Hart (2018) report which states that the *asset share* of foreign banks in Indonesia is 27.6% of total domestic banking assets.

Table 3. Descriptive Statistics.

	Capital (IDR bio)	Deposit (IDR bio)	Liq. Assets (IDR bio)	Nett.Loan (IDR bio)	LDR %	NPL %	Capitalization %	Liquidity %	Size %
FBO groups									
mean	7,620	30.052	28.062	40,540	159.02%	2.14%	10.37%	40.71%	0.83%
median	5,124	30,083	32,311	24,796	108.30%	2.16%	11.44%	40.30%	0.52%
Maximum	26,386	63,455	77.011	118.891	401.06%	5.77%	21.65%	61.00%	2.18%
Minimum	366	5.039	4,986	12.167	62.94%	0.12%	0.59%	19.93%	0.28%
Std. Dev.	7,107	18.027	15,602	32,054	93.43%	1.61%	5.69%	10.14%	0.64%
Obs.	202	202	203	203	202	203	202	203	203
FAB Group									
mean	15,130	64,220	28.088	61,850	105.61%	2.63%	16.23%	30.11%	1.26%
median	10,940	61,399	24,452	57,747	93.86%	2.80%	14.68%	28.71%	1.16%
Maximum	44,937	177.305	81,658	159,340	240.01%	6.52%	39.10%	61.55%	3.67%
Minimum	2,672	6,443	3.184	7,392	77.10%	0.56%	8.84%	16.99%	0.15%
Std. Dev.	11.216	44,852	17,527	39,317	28.00%	1.30%	5.79%	7.28%	0.80%
Obs.	574	574	574	574	574	574	574	574	574

Source: Bank Monthly Report; SSKI Bank Indonesia, processed (2020). * *Capitalization* is total capital to total assets, *Liquidity* is total liquid assets to total assets, *Size* is market share, namely total loan to total national loan (Wu et al., 2011).

Table 3. shows the balance sheet characteristics of foreign banks based on the penetration mode. FBO has a small size and capitalization but higher liquidity than FAB. FBO has a capital and deposit rate of only half of FAB, but its liquid assets are almost as large as FAB and a 2/3 of FAB's loan. High liquidity and LDR indicate that FBO has external funding sources to build its assets in the form of securities and credit. FBO's flexibility in

getting funding to operate in the host country without being completely dependent on domestic funding. FAB has a capitalization and size level showing a larger market share resulting from previous mergers and acquisitions of domestic banks. FAB showed a better intermediation function than FBO, with an LDR level close to 100%. Regarding risk, the average Non-Performing Loan (NPL) of FBO is lower than FAB despite a higher LDR. The FBO is more risk-averse and conservative in lending, so the NPL level is at a higher low.

The movement of the BI-7DR and JIBR interest rates is shown in Figure 1. The two indicators show a similar pattern in which the JIBR reflects the movement of the BI-7DR. However, it can be seen that JIBR is more volatile compared to BI-7DR.
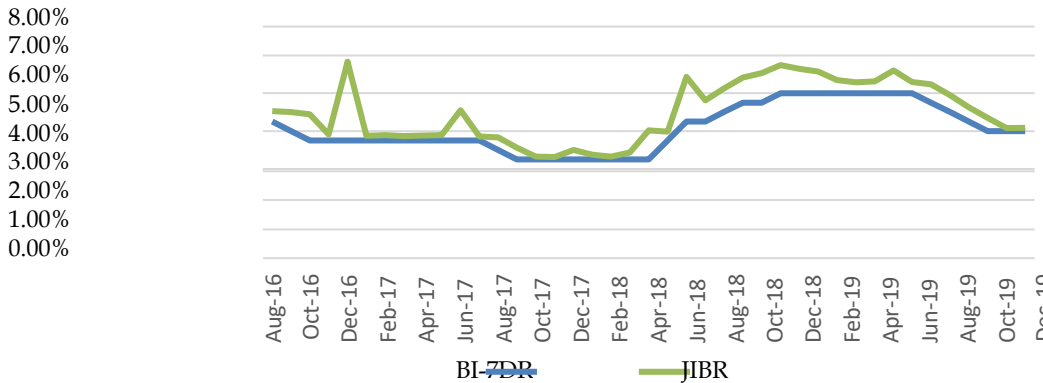

Figure 2. Indicator BI7DRR and JIBOR
Source: Bank Indonesia, (2020), has been reprocessed.

The stationary Test at all variables by Panel Fisher test (Pesaran, 2007), Dickey-Fuller method on the level and first differences. The stationarity test results are follows:

Table 4. Stationarity Test Results

	Level*				**Diff***		
	FBO	**FAB**	**ALL**		**FBO**	**FAB**	**ALL**
	P-value	**P-value**	**P-value**		**P-value**	**P-value**	**P-value**
Variables:				Variables:			
GDP	0.0000	0.0000	0.0000	GDP	0.0000	0.0000	0.0000
BI-7DR	0.0025	0.0000	0.0000	DBI-7DR	0.0000	0.0000	0.0000
JIBR	0.0097	0.0001	0.0001	DJIBOR	0.0000	0.0000	0.0000
LnCAP	0.0118**	0.0001	0.0001	DLOGCAP	0.0000	0.0000	0.0000
LnDEP	0.0000	0.0000	0.0000	DLOGDEP	0.0000	0.0000	0.0000
LnLIQ	0.0000	0.0000	0.0000	DLOGLIQ	0.0000	0.0000	0.0000
LnLOAN	0.0014	0.0000	0.0000	DLOGLOAN	0.0000	0.0000	0.0000

Source: STATA 14 output results, (2020)
(*) All test variables with Reject Ho results at the 1% level, except for the LnCAP variable (**) Significant at the 5% level.

Hypothesis Zero on test stationary Fisher is that all panel contains a unit root, so the variable is non-stationary. Suppose the null hypothesis is rejected, then the variable character is stationary. With a check score p-value that is chi-square Inverse, it can be determined whether the variable is stationary or not by rejecting Ho if the p-value is below the confidence interval. The p-value shows all variables at the level and significant differences at a p-value < 1%, except for the LnCAP variable in the FBO panel, which is significant at a p-value < 5% (Table 4). So, results from the stationary test conclude that all panels contain no unit root or are stationary for reject Ho.

The first step is testing the panel data cointegration. Table 4 shows the results of the

panel data cointegration test. The table shows the long-term balance and correction of the cointegrated variables. Kao Residual Cointegration Test to the. Data Series: logloan, jibor_avg, logliq, loggdp, npl, inf, logliq, and logdep. Null Hypothesis: No cointegration, indicating the Newey-West automatic bandwidth selection and Bartlett kernel. The study conducted a panel unit root test to ensure stationarity existed in all data. We apply the method of Maddala & Wu (1999) in Juodis & Westerlund (2019) to the balanced panel data format. The unit root test panel used the Kao Residual Cointegration Test (results in Table 5). The length of the lag is determined in the first lag. The FBO test results show that the Null Hypothesis is rejected at the HAC variance of 0.000952 and the t statistic of -2.276347. Table 5 below shows the test results for non-panels.

Table 5. Unit Root Test Panel

	FBO		FAB	
Kao-Engle Granger (Data Panel)	t-Statistic	Prob.	t-Statistic	Prob.
ADF	-2.276347	0.0114	-5.546424	0.0100
Residual variance	0.001225		0.002863	
HAC variance	0.000952		0.002116	
Non-Panel Data				
Levin, Lin & Chu t*	-0.56232	0.2869	-1.90388	0.0285
Im, Pesaran and Shin W-stat	-4.98945	0.0000	-15.6726	0.0000
ADF - Fisher Chi-square	66.9720	0.0000	305,184	0.0000
PP - Fisher Chi-square	80.1660	0.0000	219,323	0.0000

Null Hypothesis: No cointegration

Table 5 shows the Unit Root Test Panel for the two models, FAB and FBO. Both tests used KAO Kao-Engle Granger and several other tests. The results of all tests show the rejection of H0: No cointegration, meaning that the model and variables show a cointegration relationship.

We start using Model 1 (Model FBO) and Model 2 (FAB) with the PMG equations (equations 3 and 4), respectively. In equation form, we do the second step of determining the Maximum Lag. The criteria for selecting this lag can use the Schwarz Bayesian Criterion (SBC) or Akaike Information Criterion (AIC) with a minimum value. Then the best ARDL model is selected based on the set lag, the Best ARDL Model Selection, and Cointegration Test. After determining the maximum lag, the best ARDL model is selected using the Eviews 11 software.

Table 6. Lag Optimal Selection

Model	Eq.		LogL	AIC*	BIC	HQ	Specification
FBO BI-7DR	3	4	442,943	-3.850	-2.456	-3.285	ARDL(2, 2, 2, 2, 2, 2, 2)
FBO JIBR	3	4	461.502	-4.048	-2,653	-3.483	ARDL(2, 2, 2, 2, 2, 2, 2)
FAB BI-7DR	4	3	1350.502	-4.463	-3.423	-4.057	ARDL(2, 1, 1, 1, 1, 1, 1)
FAB JIBR	4	1	1333,741	-4.453	-3.523	-4.090	ARDL(1, 1, 1, 1, 1, 1, 1)

The selection of the lag of the variables in this study is based on the best lag determination criteria according to Akaike Information Criterion (AIC), Hanan-Quiin Information (HQ), and Schwarz Information Criteria (SC). Table 6 shows the smallest AIC value chosen to determine the PMG Model Specification Pesaran et al. (1999) in Hafsi et al. (2021). Other AIC specification values are not displayed.

The third is to test the bound test criteria. The determination of the existence of cointegration is based on the calculated F value compared to the critical value at a certain level of confidence in the bound table (Kaur & Dhiman, 2021). The conclusion of cointegration is based on the F-statistic bound table on Pesaran et al. (1999) with the

following criteria.

Table 7. F-Bounds Test, Null Hypothesis: No levels relationship

	FBO			FAB		
Value	2.31			2.60		
K	6			6		
Sample	572			194		
Test Statistics	Significant.	I(0)	I(1)	Significant.	I(0)	I(1)
Asymp: n=1000	10%	1.99	2.94	10%	1.99	2.94
	5%	2.27	3.28	5%	2.27	3.28
	1%	2.88	3.99	1%	2.88	3.99
Finite Sample: n=80	10%	2,088	3.103	10%	2,088	3.103
	5%	2.431	3.518	5%	2.431	3.518
	1%	3.173	4.485	1%	3.173	4.485

If the F-count is smaller than the lower bound (LB), it can be concluded that there is no cointegration. If the F-count is between the lower bound and the upper bound (UB), it cannot be concluded that cointegration exists. If the F-count is above the upper bound, it is concluded that there is cointegration between variables (Pesaran et al., 2001). Table 7 shows the bound test results for the FBO and FAB group models. The results of this test are rejection of H_0: $\delta_1 = \delta_2 = \cdots = \delta_{km} = 0$. In conclusion, there is a long-term relationship between FOB and FAB group bank loans.

Now we are ready to do the analysis of equations 3 and 4. PMG displays the Long-Term equation and the Short-term equation (Attiaoui et al., 2017; Kaur & Dhiman, 2021). Long-term equations are displayed in the EC format in equations 3b and 4b. Let's copy the equation again

$$ECK_{it} = gLOANK_{it} - (\alpha_{0i} + \beta_1(l)Interest_{t-j} + \beta_2(l)dLDEPK_{it-j} + \beta_3(l)dLLIQK_{it-j}$$

$$+ \beta_4(l)dLCAPK_{it-j} + \beta_6 dLGDP_{t-j} + u_i)$$

Table 8 shows the results of ARDL PMG data processing. FBO/FAB Model This model explains the long-term relationship between loans and their determinant variables, interest rates, liquidity, GDP growth, NPL inflation, and deposit growth. PMG method adopts model selection with bound test (PPS) and Lao optimal selection. This method allows researchers to obtain cointegration relationships at various levels of integration, I(0) or I(1).

Table 8. Long Run Equation

	FBO JIBR		FBO BI-7DR		FAB JIBR		FAB BI-7DR	
Variable	**Coef.**	**t-Stat**	**Coef.**	**t-Stat**	**Coef.**	**t-Stat**	**Coef.**	**t-Stat**
Interest	3.835	1,837	1,588	0.788	4.187	6.305	4.056	9,218
LnLIQ	0.042	0.406	2.108	8.815	-0.307	-8.125	-0.291	-9,317
LnGDP	0.885	4,527	-6,868	-6.322	0.348	5.180	0.306	5.863
NPL	-7.038	-2.857	-1.025	-0.601	-0.926	-2005	-0.694	-1.902
INF	-10,777	-3.683	-0.062	-1.464	-2,650	-3.205	-2.221	-3,536
LnDEP	0.114	0.980	-0.140	-2.573	0855	23.975	0.854	27,711

Table 8 shows the long-term relationship with the bound test method. The Interests explain JIBR and BI-7DR. Columns 2 and 3 are models for the JIBR interest rate. Columns 4 and 5 are models for the BI-7DR interest rate. In the long run, these relationships go hand in hand in non-stationary situations (Attiaoui et al., 2017). The changes in the determinant variable will dynamically affect changes in the Loan. Dynamic changes explain that the changes are due to adjustments and loan corrections at the fundamental level (Ekananda &

Suryanto, 2021)(Ekananda, 2022). All loan determinants show effects that are following theoretical expectations. However, in the case of FBO, several determinants showed an insignificant impact.

The MPG model (Hafsi et al. 2021) indicates a short-term relationship between various variables. The short-run equation is more appropriate if it is referred to as the correction equation (ECM). Deviations that occur in the variable from the long run will be adjusted. The adjustment is recorded in the EC variable parameter (equation 1). The EC equation (Equation 1) decomposes into a long-term equation (equation 2). The regression results in Table 9 are equation 1 as the ECM equation.

Table 9. Short Run Equation

FBO	JIBR		BI-7DR		FAB	JIBR		BI-7DR	
Variable	Coef.	t-Stat	Coef.	t-Stat	Variable	Coef.	t-Stat	Coef.	t-Stat
COINTEQ	-0.21	-2.98	-0.162	-1,377	COINTEQ	-0.22	-3.47	-0.25	-3.31
D(LnLOAN(-1))	-0.15	-1.46	-0.269	-1.970	D(LnLOAN(-1))	0.01	0.01	-0.08	-1.85
Inerest	0.21	0.37	4,583	2,064	Inerest	-1.17	-5.17	0.92	1.27
Inert(-1)	0.45	0.63	0.890	0.390	D(LnLIQ)	-0.11	-2.71	-0.10	-2.25
D(LnLIQ)	-0.23	-3.17	-0.309	-0.895	D(LnGDP)	0.05	0.73	-0.06	-0.83
D(LnLIQ(-1))	-0.14	-3.76	-0.058	-0.234	D(NPL)	-0.40	-0.33	-0.45	-0.36
D(LnGDP)	-0.01	-0.06	-1.822	-1.045	D(INF)	-0.19	-0.25	-0.22	-0.27
D(LnGDP(-1))	0.18	0.77	0.458	0.272	D(LnDEP)	0.31	1.99	0.30	1.74
D(NPL)	-1.59	-1.34	3.029	2.182	C	-0.04	-1.84	0.04	2.01
D(NPL(-1))	0.00	0.00	-2,195	-1.353					
D(INF)	3.75	3.22	-0.189	-3.222					
D(INF(-1))	-1.22	-0.77	-0.140	-2.893					
D(LnDEP)	0.32	3.09	0.288	3.627					
D(LnDEP(-1))	0.15	3.71	0.183	4049					
C	-0.54	-3.41	-2,695	-1.344					
Mean dependent var	0.005		0.005			0.007		0.007	
SE of regression	0.031		0.029			0.037		0.035	
Sum squared resid	0.116		0.104			0.609		0.549	
Likelihood logs	442,943		461.501			1369,355		1350.502	
Akaike info criterion	-3.584		-3.767			-4,360		-4.246	

The format of the short-run equation is generated from the model selection (optimal lag selection) so that each equation will be different according to the data. Table 4 shows the results of model selection for FBO and FAB data. Therefore, interpretation is not carried out on the impact parameters of the independent variables (Hafsi et al., 2021). The analysis was carried out on the COINTEQ variable parameters. The COINTEQ parameter captures the speed of adjustment of the Loan to the long-term Loan. The long-term Loan is determined by its determinant in the long-term equation (Attiaoui et al., 2017; Hafsi et al., 2021). Table 10 shows that FAB data for both types of interest (JIBR and BI-7DR) has a correction factor. This correction factor explains the adjustment of the Loan to the long-term Loan.

The results of this test prove that there is a rejection of Hypothesis 2 H_0: $\gamma_k=0$. The result is that there is a loan correction in the long term caused by the determinant..

Attiaoui et al. (2017) and Hafsi et al. (2021) show the concept of estimation using MPG displays the estimation results of short-term equations and speed of adjustment parameters for each bank. Through this output, researchers can analyze the adjustment behavior of FBO and FAB at each bank. The formulation of the short-term equation is the same as equations 3a and 4a. In equation 3a, the researcher can see that each bank's speed of adjustment (SoA) parameter is quite varied (Table 10 and Table 11).

Table 10. Parameters of speed of Adjustment FBO

	FBO	FBO JIBR			FBO BI-7DR		
		Coefficient	Prob. *	Rank	Coefficient	Prob. *	Rank
1	SCB	-0.018	0.009	5	-0.040	0.000	4
2	BOC	-0.124	0.000	4	0.026	0.000	
3	MUFG	-0.355	0.000	2	-0.042	0.046	3
4	CITI	-0.377	0.000	1	-0.132	0.000	2
5	BANGK	-0.158	0.000	3	-0.624	0.000	1
	Av SoA	-0.206			-0.209		
	Max SoA	-0.018			-0.040		
	Min SoA	-0.377			-0.624		

Table 10 summarizes the speed of adjustment coefficients of 5 banks in the FBO group for JIBR and BI-7DR interests. The results of this test prove that there is a rejection of Hypothesis 2 H_0: $\gamma_k=0$. The result is that there is a loan correction in the long term caused by the determinant.. All banks show a significant speed of adjustment value. Nevertheless, only BOC showed no adjustment. A negative speed of adjustment value indicates that there has been a correction and adjustment of the Loan to the long-term Loan. So a positive speed of adjustment value does not indicate an adjustment. The loan position above the long-term balance will not decrease, and vice versa. The greater the absolute value (speed of adjustment), the faster the loan variable adjusts to the equilibrium point (Attiaoui et al., 2017; Hafsi et al., 2021).

Table 11. Parameters of speed of Adjustment FAB

No	FAB	FAB JIBR			FAB BI-7DR		
		Coefficient	Prob. *	Rank	Coefficient	Prob. *	Rank
1	CIMB	-0.039	0.001	11	-0.005	0.204	13
2	OCBC	-0.020	0.007	13	-0.146	0.000	6
3	FUND	-0.050	0.001	10	-0.061	0.001	11
4	MAYB	-0.518	0.000	3	-0.580	0.000	3
5	HSBC	-0.035	0.000	12	-0.046	0.000	12
6	MAYA	-0.079	0.000	9	-0.067	0.000	10
7	BTPN	0.029	0.001		0.076	0.000	
8	DBS	-0.640	0.000	1	-0.823	0.000	1
9	MIZUHO	-0.107	0.000	7	-0.077	0.000	9
10	ICBC	-0.137	0.001	6	-0.137	0.002	8
11	ANZ	-0.554	0.000	2	-0.504	0.000	4
12	KEB	-0.296	0.000	5	-0.298	0.000	5
13	UOB	-0.483	0.000	4	-0.693	0.000	2
14	CTBC	-0.096	0.001	8	-0.142	0.000	7
	Av SoA	-0.235			-0.275		
	Max SoA	-0.020			-0.005		
	Min SoA	-0.640			-0.823		

In general, the loans of all banks (both FBO and FAB) were adjusted. DBS Bank, ANZ, and Mayapada Bank Loans experienced the fastest adjustments. The equation with interest BIRate will cause the Loan to adjust faster than the equation with JIBR. Banks with BI-7DR as reference interest will cause loans to adjust faster. The results of this test prove that there is a rejection of Hypothesis 2 H_0: γ_k=0. The result is that there is a loan correction in the long term caused by the determinant.

5. DISCUSSIONS

The results of data processing with PMG show various policy implications that can be applied in the current economy. PMG shows a long-term relationship between loans in the FAB and FBO bank groups. Loan determinant in cointegration condition shows a significant impact. Changes in GDP growth, NPL, and inflation will result in a balance of loans in the long term. In 2021, the Indonesian economy experienced a recovery due to policies in the form of good fiscal and monetary coordination (Attiaoui et al., 2017; Hafsi et al., 2021).

The economic shock caused by the Covid -19 pandemic gradually subsided as the domestic financial market stabilized and the recovery of several economic sectors. However, given the nature of hitting both the supply and demand sides of credit demand, recovery efforts still need more time.

The results of the PMG analysis applied to FAB and FBO bank group loans can predict the adjustments that will occur if there is a disturbance in the loan determinants. The results of the MPG estimate imply that the shock that occurs in several loan determinant variables will be absorbed, and loans will experience a shock in the short term (Table 9). These disturbances will soon be neutralized towards long-term equilibrium (Table 8).

PMG analysis on loans can also be applied to the case of an estimated global economic crisis in 2023. Stagflation, characterized by high inflation and declining economic growth, causes unemployment to increase, and purchasing power weakens. The results of this study imply that loans will decrease because economic growth decreases, inflation rises, and interest rates increase. Adjustments will undoubtedly occur but will take a long time because economic growth is slow.

Foreign bank through mergers & acquisitions lead to reduced sensitivity to monetary policy. The accumulation of assets and market share due to the merger and acquisition process causes the FAB type to require more funding support from Parent Banks to operate. Dependence on the internal capital market, thereby reducing sensitivity to monetary policy. Loans from FBO and FAB are more responsive to the capital market (JIBR interest rate) than monetary policy responses. The long-run relationships are shown in Table 8. The coefficient of interest is higher in JIBR than in BI-7DR. This result is under research (Wu et al., 2016; Jeon et al., 2013). This result is under research (Wu et al., 201 6 and Jeon et al., 2013). In the case of bank groups, the effect of interest on loans is more significant in the FAB group than in the FBO group. This evidence agrees with research (Wu et al., 201 6 and Jeon et al., 2013). Table 9 shows that the speed of loan adjustment is more incredible in the FAB group compared to the FBO group. This evidence follows the research of Hamada, (2018); Kapuściński, (2017); Wu et al., (2017). In the analysis of the speed of adjustment of each bank (Table 10 and Table 11), it is evident that the average speed of adjustment in the FAB group is more significant than that in the FBO group.

If the current GDP growth is 5.4%, interest rates are 4%, and inflation is 4.6%, then the increase in these variables is expected to affect loans. The Loan will immediately be

corrected by its determinants to go to long-term balance. The new normal is also an opportunity to strengthen the economy as long as it is accompanied by transparent priority setting and proper policy coordination and synchronization.

6. CONCLUSIONS

Several conclusions have been drawn here. PMG-ARDL analysis can analyze the dynamic relationship between short-term and long-term loan positions. The PMG model considers the diversity of loans according to FBO and FAB bank groups. FBO and FAB banks have proven to have transmitted changes in monetary instruments to Loans differently. Theoretically, FBO and FAB loans are more responsive to the capital market (JIBR interest rate) compared to the response to monetary policy (BI7-DR).

Empirical results show that the impact of JIBR is higher than BI-7DR. This is under research. In terms of bank groups, the effect of interest (both JIBR and BI7_DR) on loans is greater in the FAB group compared to FBO. Banks that have Bank Integration Foreign with Parent banks give access to the internal capital market, which is believed to be the cause of the decreased sensitivity of foreign banks to domestic monetary policy.

The speed of loan adjustment is greater in the FAB group compared to the FBO group. The level of integration of foreign banks with parent banks is influenced by the structure of foreign banks operating in the host country, which is determined by the penetration mode (Jeon et al., 2013). Each bank has a specific level of adjustment, but in general, the speed of loan adjustment is greater in the FAB group than in the FBO group.

Loan determinants for the FAB bank group showed a more responsive transmission to monetary policy than the FBO group. The long-term equation shows that the determinants of Loans on FBO are more significant than other groups.

The results of the study describe the implication that disturbances that occur in Loans, Loan variables will immediately adjust to the long term as long as the determinants of care are the controllers. The crisis situation that may occur in 2023 will allow the loan growth to shift. Control through its determinants is needed to control the loan so that it adjusts to long-term levels under normal conditions.

REFERENCES

Attiaoui, I., Toumi, H., Ammouri, B., & Gargouri, I. (2017). Causality links among renewable energy consumption, CO2 emissions, and economic growth in Africa: evidence from a panel ARDL-PMG approach. *Environmental Science and Pollution Research*, 24(14), 13036–13048. https://doi.org/10.1007/s11356-017-8850-7

Aysan, A. F., Disli, M., & Ozturk, H. (2018). Bank lending channel in a dual banking system: Why are Islamic banks so responsive? *World Economy*, 41(3), 674–698. https://doi.org/10.1111/twec.12507

Bernanke, B. S. (2007). *Ben S Bernanke: The financial accelerator and the credit channel (Central Bank Articles and Speeches)*. *June*, 1–7. https://www.bis.org/review/r070621a.pdf

Beyhaghi, M., Firoozi, F., Jalilvand, A., & Samarbakhsh, L. (2020). Components of credit rationing. *Journal of Financial Stability*, 50. https://doi.org/10.1016/j.jfs.2020.100762

Cesa-Bianchi, A., & Sokol, A. (2022). Financial shocks, credit spreads, and the international credit channel. *Journal of International Economics*, 135. https://doi.org/10.1016/j.jinteco.2021.103543

Chen, Y. K., Shen, C. H., Kao, L., & Yeh, C. Y. (2018). Bank Liquidity Risk and Performance. *Review of Pacific Basin Financial Markets and Policies*, 21(1). https://doi.org/10.1142/S0219091518500078

Claessens, S., & Van Horen, N. (2014). Foreign banks: Trends and impact. *Journal of Money, Credit and Banking*, *46*(SUPPL.1), 295–326. https://doi.org/10.1111/jmcb.12092

Dang, V. D. (2020). Do non-traditional banking activities reduce bank liquidity creation? Evidence from Vietnam. *Research in International Business and Finance*, *54*. https://doi.org/10.1016/j.ribaf.2020.101257

Ehlers, T., & Mcguire, P. (2017). *Foreign banks and credit conditions in EMEs. 91*, 101–123.

Ekananda, M. (2016). *Analisis Ekonometrika Data Panel: Edisi Kedua* (Second). Mitra Wacana Media.

Ekananda, M., & Suryanto, T. (2021). The influence of global financial liquidity on the indonesian economy: Dynamic analysis with threshold var. *Economies*, *9*(4). https://doi.org/10.3390/economies9040162

Fadloli, A., & Chalid, D. A. (2017). *Competition Analysis of Banking Industry in Indonesia: Bank Size, Bank Type, and Efficiency Transfers*. https://doi.org/10.2991/icbmr-17.2017.13

Forbes, K. J., & Forbes, B. K. J. (2019). *THE One Hundred Thirty-First Annual Meeting OF THE AMERICAN ECONOMIC Macroprudential Policy : What We ' ve Learned , Don ' t Know , and Need to Do †*. *109*(May).

Gambacorta, L., & Shin, H. S. (2018). Why bank capital matters for monetary policy. *Journal of Financial Intermediation*, *35*, 17–29. https://doi.org/10.1016/j.jfi.2016.09.005

Gupta, A., Sapriza, H., & Yankov, V. (2022). The Collateral Channel and Bank Credit. *Finance and Economics Discussion Series*, *2022*(024), 1–59. https://doi.org/10.17016/feds.2022.024

Hafsi, R., Dadene, A., & Guennoun, A. (2021). The relation between economic growth and oil production in the gulf cooperation countries: Panel ARDL approach. *International Journal of Energy Economics and Policy*, *11*(3), 301–307. https://doi.org/10.32479/ijeep.11048

Hamada, M. (2018). Impact of foreign bank entry on SME credit in the Indonesian banking sector. *Journal of Southeast Asian Economies*, *35*(1), 50–78. https://doi.org/10.1355/ae35-1f

Hamilton-Hart, N. (2018). How well is Indonesia's financial system working? *Journal of Southeast Asian Economies*, *35*(2), 125–142. https://doi.org/10.1355/ae35-2b

Hryckiewicz, A., & Kozlowski, L. (2018). A horserace or boost in market power? Banking sector competition after foreign bank exits. *International Review of Economics and Finance*, *58*, 371–389. https://doi.org/10.1016/j.iref.2018.04.007

Hussain, M., & Bashir, U. (2019). Impact of Monetary Policy on Bank Lending: Does Market Structure Matter? *International Economic Journal*, *33*(4), 620–648. https://doi.org/10.1080/10168737.2019.1668820

Juodis, A., & Westerlund, J. (2019). Optimal panel unit root testing with covariates. *Econometrics Journal*, *22*(1), 57–72. https://doi.org/10.1111/ectj.12118

Kapuściński, M. (2017). The Role of Bank Balance Sheets in Monetary Policy Transmission: Evidence from Poland. *Eastern European Economics*, *55*(1), 50–69. https://doi.org/10.1080/00128775.2016.1255559

Kaur, G., & Dhiman, B. (2021). Agricultural Commodities and FMCG Stock Prices in India: Evidence from the ARDL Bound Test and the Toda and Yamamoto Causality

Analysis. *Global Business Review*, *22*(5), 1190–1201. https://doi.org/10.1177/0972150919830803

Lee, S., & Bowdler, C. (2019). Banking sector globalization and monetary policy transmission: Evidence from Asian countries. *Journal of International Money and Finance*, *93*, 101–116. https://doi.org/10.1016/j.jimonfin.2018.12.011

Leroy, A. (2014). Competition and the bank lending channel in Eurozone. *Journal of International Financial Markets, Institutions and Money*, *31*(1), 296–314. https://doi.org/10.1016/j.intfin.2014.04.003

Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, *61*(SUPPL.), 631–652. https://doi.org/10.1111/1468-0084.0610s1631

Marcelin, I., Egbendewe, A. Y. G., Oloufade, D. K., & Sun, W. (2022). Financial inclusion, bank ownership, and economy performance: Evidence from developing countries. *Finance Research Letters*, *46*. https://doi.org/10.1016/j.frl.2021.102322

Naiborhu, E. D. (2020). The lending channel of monetary policy in Indonesia. *Journal of Asian Economics*, *67*. https://doi.org/10.1016/j.asieco.2020.101175

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association*, *94*(446), 621. https://doi.org/10.2307/2670182

Segev, N., & Schaffer, M. (2020). Monetary policy, bank competition and regional credit cycles: Evidence from a quasi-natural experiment. *Journal of Corporate Finance*, *64*. https://doi.org/10.1016/j.jcorpfin.2019.101494

Wu, J., Chen, M., Jeon, B. N., & Wang, R. (2017). Does foreign bank penetration affect the risk of domestic banks? Evidence from emerging economies. *Journal of Financial Stability*, *31*, 45–61. https://doi.org/10.1016/j.jfs.2017.06.004

Wu, J., Lim, H., & Jeon, B. N. (2016). The Impact of Foreign Banks on Monetary Policy Transmission During the Global Financial Crisis of 2008–2009: Evidence from Korea. *Emerging Markets Finance and Trade*, *52*(7), 1574–1586. https://doi.org/10.1080/1540496X.2016.1152796

Zapotichna, R. (2017). Banking on Multinationals: the Determinants of Cross-Border Credits To Central and Eastern Europe, 1990-2015. *Baltic Journal of Economic Studies*, *3*(1), 45–51. https://doi.org/10.30525/2256-0742/2017-3-1-45-51