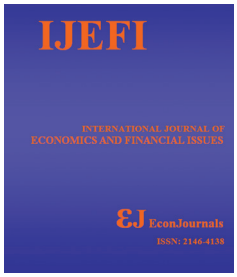

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Determinants of Net Interest Margin: An Analytical Study on the Commercial Banks Operating in Jordan (2005-2015)

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ABSTRACT

This study aimed at measuring the factors that affect the net interest margin (NIM) in the commercial banks operating in Jordan using the data on annual frequency for 19 commercial banks covering the study period (2005-2015) (panel data). Econometric models were built and analyzed using testing both fixed effects model and random effects model. The Hausman test was used to get the optimal model. The results revealed that external factors had bigger effect on the NIM than the internal factors.

Keywords: Net Interest Margin, Commercial Banks, Monetary Policy Instruments, Panel Data
JEL Classification: G21

1. INTRODUCTION

The NIM[1] is one of the most important factors that measure the efficiency of banks as intermediaries that manage savings and provide loans. According to several studies, the high NIM is a barrier for investment and would most likely affect economic growth diversely, especially in the developing economies.[2] This vital impact of NIM on the macroeconomy made several countries explore the structure and components of NIM and their effect on the banking sector. Literature included varied opinions on the optimal NIM. However, some studies indicated that the high NIM resulting from low interest on deposits and high interests on loans discourages savings and increases the cost of borrowing for potential borrowers and, hence, leads to a decrease in investment.[3] As the same time, however, the notably low NIM cannot be considered a positive indicator sometimes, especially, when the systems are free and insufficient supervision systems as the mechanisms that regulate the intervention of the central bank in any bank that suffers from financial problems will be most likely absent. In other words, if a weak bank is allowed to continue its business and operations, it might adopt strategies that are based on offering low interest rates on loans to get bigger market share.

On the other hand, there are some studies that linked the high NIM to the decline in the efficiency of the banking system. However, this situation might help enhance the soundness of the banking system through utilizing the gains from the high NIM margins in sustaining the capital bases of banks.[4]

Regarding the components of the NIM and its determining factors, the literature indicated that there are several determinants that vary by country. For example, some studies stated that the determinants are bank-specific factors while other studies pointed that the industry-specific factors, especially monetary policy instruments, are more important. Nevertheless, some other studies inserted that the macroeconomic variables are of the most important determinants of the NIM, especially in the developing countries.[5]

1 NIM is measured as the interest received on credit facilities (loans) minus the interest paid on deposits.
2 Financial Stability Report. 2014. Central Bank of Jordan.
3 Brock, P.L., Suarez, L.R. (2000), Understanding the behavior of bank spreads in Latin America. Journal of Development Economics, 63, 113-135.
4 Saunders, A., Schumacher, L. (2000), The determinants of bank interest margins: An international study. Journal of International Money and Finance, 19(6), 813-832.
5 Hamadi, H., Awdeh, A. (2012), The determinants of bank net interest margin: Evidence from the Lebanese banking sector. Journal of Money, Investment and Banking, 23(3), 86-98.

This paper tries to determine the factors that affect the NIM in the sample of the commercial banks in Jordan.

2. STUDY IMPORTANCE AND OBJECTIVES

The Jordanian banking system is relatively high relative to the size of the Jordanian economy compared to the countries of the region. The assets of licensed banks reached JD 45.2 billion at the end of 2015 with the credit facilities portfolio comprising the bulk of banks' assets. The share reached 46.8% of banks' assets at the end of 2015 compared to 43.2% at the end of 2014. The high percentage of banks' interest revenues (credit interest - debit interest) to their total revenues is a good indicator since it implies the increasing reliance of banks on their core business represented by extending credit facilities that helped sustain the profits of banks and, hence, the financial stability in Jordan. Therefore, it is important to determine the factors that control NIM in the commercial banks in Jordan. The NIM is an indicator of operational efficiency in banks that is considered an important and a vital instrument for evaluating managerial effectiveness and efficiency in utilizing their resources and controlling their expenses. The interest of the supervisory authorities and bankers in the operational efficiency of banks is attributed to several reasons of which the most important is that efficiency measures signal the success or the failure of banks, and capacity of banks in continuing their core role in the national economy of providing liquidity and financing needs to finance various economic activities that in turn enhance economic growth in Jordan.[6]

This paper aims at investigating the effect of the macroeconomic variables on NIM in the commercial banks operating in Jordan, besides analyzing the factors that affect their NIM to present suitable recommendations that help the commercial banks operating in Jordan in improving their operating efficiency and enhancing their profits that then reflects positively on the national economy and helps achieve the desired economic development as the study provide an opportunity for the banks to address the issues that might lead to increase in the losses or decrease in profits to consider when designing their policies and strategies.

3. STUDY PROBLEM

This study investigates the determinants of NIM of the commercial banks operating in Jordan through studying and analyzing the effect of internal and external factors on the NIM. The internal factors refer to bank-specific factors, whereas external factors are represented by industry-specific and macroeconomic variables. The study problem can be formulated by the following questions:

- What are the determinants of NIM in the commercial banks operating in Jordan?
- Are economic variables an important determinant of NIM in the commercial banks operating in Jordan?
- How effective are the monetary policy instruments in affecting NIM?

6 Financial Stability Report. 2014. Central Bank of Jordan.

4. STUDY HYPOTHESES

The study examines the following hypotheses:

1. There is no effect of banks' assets on NIM in the commercial banks operating in Jordan.
2. There is no effect of clients' deposits on NIM in the commercial banks operating in Jordan.
3. There is no effect of leverage ratio on NIM in the commercial banks operating in Jordan.
4. There is no effect of operating expense ratio (cost-income ratio) on NIM in the commercial banks operating in Jordan.
5. There is no effect of loans to assets ratio on NIM in the commercial banks operating in Jordan.
6. There is no effect of provisions to loans on NIM in the commercial banks operating in Jordan.
7. There is no effect of the share of assets of the largest five banks in total assets on NIM in the commercial banks operating in Jordan.
8. There is no effect of the share of foreign currency loans in total loans on NIM in the commercial banks operating in Jordan.
9. There is no effect of the share of foreign currency deposits in total deposits on NIM in the commercial banks operating in Jordan.
10. There is no effect of macroeconomic variables (growth rate of gross domestic products and inflation) on NIM in the commercial banks operating in Jordan.
11. There is no effect of monetary policy instruments on NIM in the commercial banks operating in Jordan.

5. INTEREST RATE CONCEPT

The classical economists looked at interest rate as an incentive for individuals and institutions to save. In other words, it encourages deferring consumption. The classical theory of interest rate is known as the saving and investment theory and time preference theory. One of the most prominent proponents of this theory from the economists of this school is Ricardo. This theory was revised by other economists like Wallace and Peugeot.

The classical theory inserted that interest rate is a premium that must be paid to individuals to motive them to postpone consumption in the present time. At the same time, the interest rate is a price that must be paid for using money as a capital. This theory assumes that individual by nature prefers current consumption to future consumption but could be persuaded to save in return for monetary premium on saving (interest rate). Nevertheless, interest rate is one of the elements of the cost of investment. Interest rate is determined by the intersection of saving and investment curves, i.e., it sets the equilibrium between the supply of money and the demand for money (capital). In other words, the equilibrium interest rate is determined by the intersection of the saving supply curve and investment demand curve, the point at which the quantity supplied of savings equals the quantity demanded of investments.

After the classical school, the Swedish economist Knut Wicksell developed the Loanable Funds Theory, which is looked at as an extension or an improvement of the classical theory in interest rate. It is therefore called the neoclassical theory of interest rate.

The theory was also developed by several Swedish economists like Bertil, Lindahl and Hansen. This theory is distinguished for its focus on the vital economic role of money. It takes into consideration monetary and non-monetary factors when determining the interest rate. It also takes into consideration the banking credit as a part of the quantity supplied of money and its impact on interest rate. The theory also discussed the money hoarding and claimed that it is an effective element and a part of the demand for loanable funds.

After the Loanable Funds Theory, the Keynesian school developed a theory called liquidity preference Theory. Keynes was one of its pioneers. Keynes considered interest rate as a pure monetary phenomena and not a real phenomenon as was considered by the classical school. Interest rate is determined by the interaction of monetary factors, meaning the demand and supply of money. According to Keynes, there is no return from money hoarding. On the contrary, giving up money (liquidity) is the source of return. Money is scarce, and since it is demanded by households and investors, a price must be paid to the holders of money to give them an incentive to give up money and buy less liquid but more risk assets. Therefore, interest rate is defined according to Keynes as the price paid for using the liquid money. Liquidity preference theory is an integral part of his theory of effective aggregate demand. It explains the relationship among the demand for liquid assets, interest rates, illiquid asset prices, and profit rates expectations, investment and employment. In other words, both uncertainty and expectations play a prominent role in determining interest rates and thus affecting income levels and other economic variables.

Keynes means by liquidity preference the incentives for individuals to accumulate wealth in the form of liquid assets (cash) instead of illiquid assets (like bonds). According to Keynes, there three motives that affect the demand for money. They are transaction motive, precautionary motive and speculative motive.

After Keynes, Baumol claimed that the demand for liquid assets for transaction and precautionary motives is positively related with interest rates. In other words, speculation is not the only motive that depends on interest rate. Transaction and precautionary motives do as well Harris (1981).

In light of the above, it can be concluded that classical theory, the theory of loanable funds, the liquidity preference theory of interest rate, are not theories of interest rate determination. Classical theory highlighted the real factors represented by savings and investment as determinants of interest rates. The theory of loanable funds combined monetary and real factors to illustrate how the interest rate was determined. Whereas the liquidity preference theory focused on the monetary factors represented by the money supply and the demand for money in determining the interest rate. The new theory of interest addressed the critiques of these schools. The most known economist who developed this theory are Hicks and Hansen. They combined both the loanable funds theory and Keynesian liquidity preference theory to build a complete and a comprehensive theory of interest rate determination. This theory was built by combining four factors: Savings, investment, liquidity preference, and quantity of money. In other words, the theory combined real and monetary factors to determine Interest rates. Hansen used these factors as determinants of interest rates.

The development of interest rate theories continued with Fridman who developed the Monetary Theory to determine interest rates. He distinguished between equilibrium and disequilibrium interest rates. He stated that the relationship between capital and interest rate in the demand equation is negative, while in the money supply equation is positive. The intersection of demand and supply outputs the equilibrium interest rate and capital. This is the situation when the equilibrium prevails.

In case of disequilibrium, Friedman distinguished between the presence and absence of production motive. In there is a motive for increasing output the investors will not be motivated to raise capital at any rate of interest. Consequently, the market equilibrium interest rate will be low. Therefore, investors will be motivated to borrow for the future while savers will not be willing to lend money.

In there was a motive for increasing production and the use of technology by investors, the demand for capital increases, and consequently interest rates will increase.[7]Therefore savers will be willing to lend capital. At the same time, investors will refrain from raising the amount of capital in the light of their fears that this will raise interest rate.

6. THE DEVELOPMENTS OF NIM IN THE COMMERCIAL BANKS IN JORDAN DURING THE PERIOD (2005-2015)

The NIM in the commercial banks in Jordan witnessed varied trends during the period (2005-2015). It increased from about 5.78% at the end of 2005 to 6.10% at the end of 2015, or an increase by 32 percentage points. As Figure 1 shows, the NIM fluctuated upward and downward during the period (2005-2015). However, witnessed a declining during the period (2010-2014) before moving upward in 2015. Regarding the average interest rate on deposits, it realized an upward trend during the period (2005-2008) increasing from 2.23% at the end of 2005-4.02% at the end of 2008, with the latter being the maximum rate during the period. However, it witnessed a fluctuating trend during the period (2008-2015). It followed a downward trend during the periods (2008-2010) and (2013-2015) and an upward trend during the period (2010-2013). The interest rate on deposits reached 2.11% at the end of 2015, which is the lowest rate during the period (2005-2015).

Regarding the average interest rate on credit facilities, it followed an upward trend during the periods (2005-2008) and (2011-2013) and a downward trend during the periods (2008-2011) and (2013-2015). The average interest rate on credit facilities increased from 8.01% at the end of 2005-8.21% at the end of 2015.

The average interest rates on deposits and credit facilities recorded their highest values in the wake of global financial

7 Fridman, M. (1983), Prix et Theorie Economique. Paris: Economica.

crisis at the end of 2008 when they reached 4.02% and 9.45% respectively as the banks tried to attract liquidity and savings by offering high interest rates on deposits. At the same time, the banks raised the interest rates on credit facilities to protect against the possible risks in that time. The NIM recorded its highest value at the end of 2010 because of the relatively high value of the average interest rates on credit facilities at the end of 2010 and the relatively low average interest rate on deposits. The lowest average interest rates on deposits were at the end of the study period (the end of 2015) when it reached 2.11%. Oppositely, the lowest average interest rates on facilities were at the beginning of the study period (the end of 2005) when it reached 8.01%. Regarding the NIM, it achieved its minimum at the end of 2007 when it reached 5.41%.

By comparing NIM in the commercial banks in Jordan with some selected 12 countries, it is noted that ranks fifth among these countries ranked in descending order.[8]

Since the NIM in Jordan is still high relative to a number of selected countries, the CBJ asked the banks in several occasions to adopt more flexible policy and response to its measures represented by the cutting of the interest rates on its monetary policy instruments several times and reflect these on lowering the interest rates, especially on credit facilities. The CBJ also restricted the ability of banks in raising interest rates on credit facilities by releasing Treating Clients with Transparency and Fairness Instructions No. 56/2012 dated 31-10-2012 that mandated the banks to link the variable interest rates on the loans to individuals with one of the monetary policy instruments, JODIBOR[9] or treasury bills rates.

In light of this analysis, it is noted that the NIM remains is still high in the banking sector and reflects some kind of exaggeration in achieving the greatest possible profit by passing some costs and expenses through this margin despite the above-mentioned measures of the CBJ. As stated previously, the NIM measures the efficiency and effectiveness of banks in utilizing their sources of funds and playing a key role in financial intermediation between savers and borrowers. However, if the high margin is accompanied by low interest rates on deposits and high interest rates on facilities, savings will be discouraged and the cost of borrowing for investors will increase. Consequently, investment declines and the economic growth contracts.[10] This entails on the CBJ to adopt further measures that help reduce the NIM and to use the monetary policy tools more deliberately in a way to that reduces the NIM or curbs its increases and exploring the ways to achieve this, in addition to the CBJ could use moral suasion to convince banks to reduce the margin (Figure 2).

Figure 1: Evolution of interest rate margin and interest rate on deposits and credit facilities (2005-2015) (%)

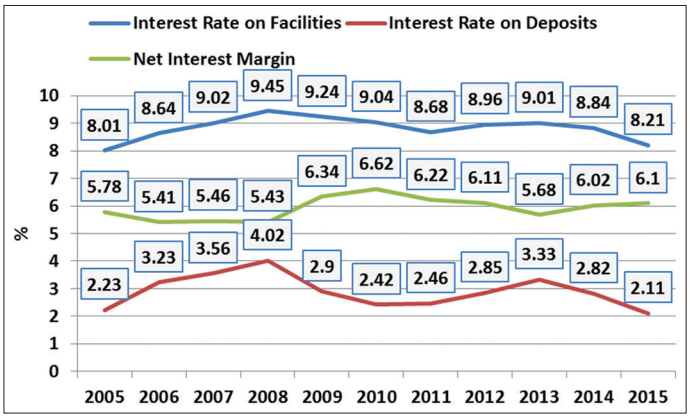
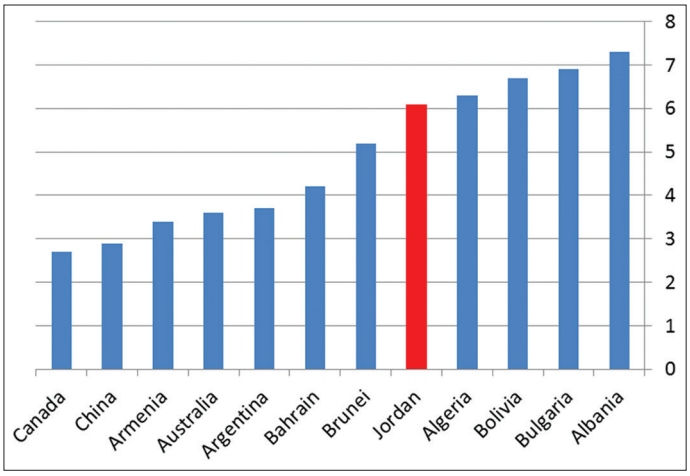


Figure 2: Net interest margin for Jordan and Selected Countries (2015) (%)



7. LITERATURE REVIEW

There are several studies that researched the determination of the factors that affect the NIM.

A study by Husni and Al-Abadi (2008) analyzed the factors that affect the interest margin in banks operating in Jordan for the period (1992-2005). The study concluded that achieving higher interest margin is constrained by the bank's ability to maintain low leverage and grant loans. The study also found a statistically significant correlation (association) between the size of bank and interest margin. In addition, the study revealed that the banks that have large market shares are not capable of determining the prices. Moreover, there were no statistically significant effect of macroeconomic variables on interest margin.

Another study by Shami et al. (2015) aimed at investigating the impact of the marketing policies of the banks operating in Jordan on the performance of the banking sector through measuring the effect of several variables on the return on assets and NIM. The study used the data for 13 commercial banks covering the period (2002-2012). Regarding the effect on NIM, the analysis results showed that the value of rewards that banks give to their clients are passed through to the interest margin. The effect was positive and statistically significant for the variables of rewards, bank

8 Financial Stability Report. 2015. Central Bank of Jordan.

9 JODIBOR is a domestic reference indicator of interbank lending rates in Jordanian Dinar. The Association of Banks in Jordan selected 10 banks that were asked to price overnight interbank lending rates. The JODIBOR is then calculated by averaging eight out of ten of these rates after excluding the highest and lowest values.

10 Brock, P.L., Suarez, L.R. (2000), Understanding the behavior of bank spreads in Latin America. Journal of Development Economics, 63, 113-135.

size, expenses, loans and inflation. Whereas it was negative and statistically significant for the variables of economic growth and capital.

Hishem et al (2008) analyzed the factors that affect the profitability of commercial banks in Tunisia for the period (1996-2003). The study concluded that there exists a direct relation between both operational expenses and size and NIM. It also found an inverse relation between equity and NIM. Moreover, there were no statistically significant effect of macroeconomic variables on NIM.

Fungacova and Poghosyan (2008) aimed at analyzing the determinants of NIM in the banks operating in Russia focusing on the banks' ownership structure using data covering the period (1999-2007). They found evidences indicating that the bank ownership structure is an important determinant of NIM. For example, the impact of risk aversion, credit risk and the size of operations varies by the type of bank owners (public sector, domestic private sector or foreign private sector). The study also found that the effect on NIM of operational expenses is positive and statistically significant and of liquidity is negative and statistically significant for the three bank ownership categories. However, there was no effect of market share on NIM.

The study of Hamadi and Awdeh (2012) included an analysis of the determinants of NIM in the banks operating in Lebanon using bank-specific variables, industry-specific variables, variables measuring monetary policy and macroeconomic variables for the period (1996-2009). The paper built seven models for both domestic and foreign banks separately. The study found that the NIM of domestic banks was different from foreign banks. The study found that the size of the bank, liquidity, efficiency, capital (leverage), credit risk, concentration, dollarization and economic growth all have negative impact on the NIM. Whereas deposit growth rate, lending, inflation, rediscount rate, national savings, investment, interbank lending rates all had a positive impact on NIM. Regarding the foreign banks, the variables of size, liquidity, capital and credit risk had no statistically significant effect on NIM. The other variables as well had no statistically significant effect on NIM, except for the cost to income ratio that had a negative and statistically significance effect on NIM and national savings that had a positive and a statistically significant effect on NIM.

Dumicic and Ridzak (2012) analyzed the determinants of NIM in the banks in the MENA region for the period (1999-2010). The study concluded there was a decline in the NIM in the period that preceded the year 2008 because of the high capital inflows and the sustainable economic environment. However, during the global financial crisis, with the rise in public debt accompanied by the surge in economic risks and slowdown of capital inflows, the NIM increased. Whereas other variables.

Raharjo et al. (2014) analyzed the determinants of NIM in the commercial banks in Indonesia by studying internal factors (bank-specific factors) and external factors. Regarding the internal factors, it included the following variables: Bank assets, profitability, efficiency, capital adequacy, liquidity and risk. The external factors included market power, inflation and interest rate. The used the fixed effects regression models over panel data for the Indonesian commercial banks covering the period (2008-2012). The study concluded that NIM in the Indonesian banks is affected by the internal factors of varying levels of statistical significance. For the external factors, inflation was the only variable that affected NIM at 5.0% level of significance.

8. RESEARCH METHODOLOGY AND THE ECONOMETRIC MODEL

In general, and according to the studies surveyed previously in this paper about the factors that might affect the NIM, the factors that might affect NIM are internal and external factors. The internal factors include variables that are bank-specific, whereas the external factors include industry-specific factors ad macroeconomic variables.[11] It can be noticed in the studies surveyed previously that there are several determinants of NIM that vary across countries. For example, some studies pointed to the bank-specific factors as the most important determinants of NIM, while some other inserted that the banking industry-specific factors, especially monetary policy tools, are more important. Whereas some other studies considered the macroeconomic factors as of the most important factors that explain NIM, particularly in the developing countries.[12]

It can be noticed from many of the studies published in this context that the studies that researched the factors that affect the NIM applied to the commercial banks operating in Jordan are limited, especially after the developments that took place in 2012, when the CBJ set the monetary policy operational framework through the corridor system. The system aims at directing the short-term interbank interest rates towards its targeted level. And hence affect the market interest rates. The deposit window represents the lower limit for the corridor system. The upper limit is the overnight repurchase agreement. The CBJ strengthened the role of monetary policy in affecting the interest rates in the market b releasing the Treating Clients with Transparency and Fairness Instructions No. 56/2012 dated 31-10-2012 that mandated the banks to link the interest rates on the loans to retail clients with one of the monetary policy instruments, JODIBOR or treasury bills rates. This shows the vital role of monetary policy in affecting the NIM. Therefore, this study is distinguished from the previous work by including the overnight deposit window rate as the most important tool that affect the interest rates on the retail loans directly or indirectly. If the banks link the deposit window rate with their variable interest rates, then the impact will be direct on the interest rate on loans at these banks. However, if the link was with JODIBOR, then, according to corridor system explained above, the impact will be indirect through the effect of deposit window rate on interest rates on interbank loans, and hence affecting the reference rate (JODIBOR) and the interest rate in the market. However, unlike

11 Raharjo, P.G., Hakim, D.B., Manurung, A.H., Maulana, T.N.A. (2014), The determinants of bank's interest margin in Indonesia: An analysis of fixed effect panel regression. International Journal of Economics and Financial Issues, 4(2), 295-308.

12 Hamadi, H., Awdeh, A. (2012), The determinants of bank net interest margin: Evidence from the Lebanese banking sector. Journal of Money, Investment and Banking, 23(3), 86-98.

previous studies, this study did not use interbank loans rate as an independent variable. The reason behind this idea is the existence of high (strong) correlation between deposit window rate and interbank loan rate; the correlation coefficient between these two variables was 0.91.

Regarding the other monetary policy tools, the required reserve ratio was not included in the study as one of the variables due to its high constancy since rarely changed this ratio over the study period. Regarding the overnight repurchase agreements interest rate (the upper limit of the corridor), its effect on NIM was not included in this study. The trace of the interbank loans rate according to the corridor system during the period (2005-2015) shows that they move with the overnight deposit window with values close to these of the deposit window rate (Figure 3). Whereas the interest rates on the overnight repurchase agreements are not close to the interest rates on interbank loans. This might be attributed to the high interest rates on the overnight repurchase agreements, which shows the existence of a strong impact from the overnight deposit window rates on the interbank loans interest rates, and consequently on the interest rates on the loans to the clients of banks, not to mention the other effect of the interest rate of the deposit window on the interest rates of the deposits of banks clients, which means that there is a clear and a predictable effect of interest rates on the NIM.

In order to determine the factors that might affect NIM in the commercial banks in Jordan, the impact on the NIM will be measured by proposing a multiple regression model that takes into consideration the internal factors as well as the external factors, including the macroeconomic factors that might affect the NIM in the commercial banks in Jordan. The panel data will be used as a sample of the study that includes 19 commercial banks and covering the period (2005-2015). Using the fixed-effects model and random effects model. The panel data estimation outputs more precise results as it takes into consideration the data that are time variant in the time series and the cross-sectional dimension for variance units (banks). The cross-sectional time series estimation helps contain the severity of multicollinearity that takes place in the time series. It also controls the Heteroscedasticity problem when using the cross-sectional data.[13]

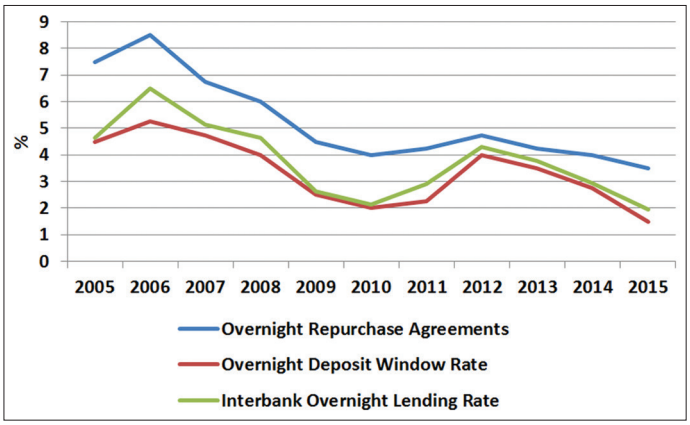
Latter in this study, Hausman test will be used to determine the best tool to examine this model, meaning fixed-effects model versus random effects model. This study uses the following model:

$$NIM_{it} = \beta_0+\beta_1 SIZ_{it}+\beta_2 DEP_{it}+\beta_3 EQT_{it}+\beta_4 CIR_{it}+\beta_5 LOAN_{it}+\beta_6 LLP_{it}+\beta_7 DIW_t+\beta_8 CONC_t+\beta_9 LOANDOL_t+\beta_{10} DEPDOL_t+\beta_{11} GDPR_t+\beta_{12} INF_t+\epsilon_t$$

Where:
β's: Model parameters.
i: Bank.
t: Time series in years.
ϵ_t: Random error.

13 Green ,W. 2003, Econometric Analysis, 5th ed. New Jersey, Upper Saddle River: Prentice Hall. p 272.

Figure 3: Interbank overnight lending rate, overnight deposit window rate and overnight repurchase agreements (corridor system) (2005-2015) (%)



Source: Database of the Central Bank of Jordan

8.1. The Dependent Variable

Net interest margin (NIM). It equals the difference between credit interest rates (on loans) and debit interest rates (on deposits) divided by total assets. This method of measurement was adopted frequently in the relevant literature (Shami et al., 2015; Raharjo et al., 2014; Hamadi, and Awdeh, 2012).

1. The variables that measure the internal factors (Bank-specific factors). These include:
   a. SIZ: Natural logarithm of assets. Several studies showed that the relationship of this variable with NIM is direct, the bank takes advantage of its size by reducing expenses (cutting the interest rates on deposits) and, hence, the NIM increases.
   b. DEP: The rate of change in the clients' deposits. The relationship of this variable with NIM might be direct or inverse. The decline in clients' deposits might lead to a decline in bank's liquidity that then leads to an increase in interest rates on deposits to attract new clients and/or an increase in interest rates on loans because of the decline in bank's liquidity. The net impact on NIM depends on which of these two effects dominate the other.
   c. EQT: Equity to assets ratio (leverage ratio). This ratio enhances the bank's ability to withstand risks. Hamadi, and Awdeh (2012) found that there is an inverse relationship between this variable and NIM. When the bank retains a high portion of equity might lead the bank to increase interest rates on deposits to attract new clients to enhance its liquidity, hence, the NIM goes down especially if accompanied with cutting the interest rates on credit facilities. Nevertheless, Koehn and Samtomero (1980) found that the relationship between this variable and NIM is positive.
   d. CIR: Cost (expenses) to income ratio, despite the fact that the high CIR might lead the bank to include it in the NIM and hence increasing the margin, some studies like Hamadi, and Awdeh (2012), found that there is a positive relationship between this variable and the NIM. The study attributed this positive relationship to the fact that the

banks that have higher operational efficiency relatively will be able to cut interest rates on loans and/or increase interest rates on deposits since such types of banks that have a high operational efficiency targets to enhance its competitiveness in the market.

e. LOAN: Loan to asset ratio. The 2014 financial stability report issued by the Central of Jordan indicated that the expansion of lending lead to increase in NIM. Several studies showed that the relationship between this ratio and NIM is positive.

f. LLP: Provisions to loans ratio. This ratio measures credit risk. The high LLP ratio increases the NIM because bank often pass the costs of provision to NIM (Poghosyan, 2012). Therefore, the relationship between this ratio and NIM is expected to be positive (Ben Naser et al., 2014).

2. Variables related to monetary policy:
   a. DIW: Overnight deposit window rate in JD. This tool reflects the attractiveness of the Jordanian Dinar. The increase in the rate of this monetary policy tool leads to increases in the interest rate on deposits and on loans in Jordanian Dinar. The net impact on NIM depends on the magnitude of the increase in interest rates on loans and on deposits. Raising the overnight deposit window rate will make the banks deposit their excess liquidity in the central bank. These banks will also increase the interest rates on deposits to attract more savings. On another strand, as previously mentioned, the impact of this monetary policy tool on the interest rates on loans will be evident especially after the release of the instructions of treating customers with fairness and transparency besides the design of the monetary policy operational framework and the corridor system. According to the "treating clients with transparency and fairness instructions," if banks linked the overnight deposit window rate with the variable interest rates, there would have been a direct effect on the interest rates on loans at these banks. However, if the link was to JODIBOR, according the previously mentioned corridor system, there will an indirect effect through the impact of deposit window rate on the interest rates on interbank loans, and consequently affecting the reference rate (JODIBOR) and, hence, the interest rates in the market.
3. Industry-specific variables
   a. CONC: The share of assets of the largest five banks in total assets. This variable measures the competitiveness and concentration in the banking sector. The higher the concentration in the banking sector, the higher the NIM because this will help banks that have high excess liquidity- that usually do not need to pay high interest rates on deposits - stronger power in determining NIM (Financial Stability Report, 2014. Central Bank of Jordan).
   b. LOANDOL: The ratio of loans in foreign currency to total loans. This direction of the relationship of this ratio to NIM depends on the outcome of two effects: The decline in the interest rates on deposits in Jordanian Dinar and the decline in the interest rates on loans in Jordanian Dinar. The final impact depends on the magnitude of decline in the two interest rates.
   c. DEPDOL: The ratio of deposits in foreign currency to total deposits. As with the previous variable, this direction of the relationship of this ratio to NIM depends on the outcome of two effects: The share of foreign currency deposits relative to the domestic currency deposits (dollarization) and liquidity. The higher the share, the higher the rates the banks offer to deposits to attract more clients. The decline in liquidity might force the banks to increase interest rates on the loans in Jordanian Dinar. The final impact depends on which of these two forces dominates the other.
4. Economic variables
   a. GDPR: The growth rate of real GDP as a very common reflection of the economic conditions. The higher the growth rate in real GDP, the higher the NIM since the improvement in economic conditions is usually connected with the increase in the demand for loans. Therefore, banks may not cut interest rates on credit facilities at the same rate of reduction on deposits as a response to the central bank's interest rate cuts (the Central Bank of Jordan's Financial Stability Report, 2014).
   b. INF: Inflation rate (consumer's price index). It measures the general price level. Regarding its effect on NIM, it depends on whether inflation is expected or not expected. If the inflation is expected, then the relationship is positive. However, if inflation is not expected, the relationship will be negative (Perry, 1992). There are other studies that indicated that the high inflation rates leads to uncertainty in the economy, and, hence, might lead to an increase in NIM (Poghosyan, 2012).

Regarding the correlation matrix that includes the correlation coefficients among all the variables in the study, it is shown in Table 1. The strength of the relationship among study independent variables is used to examine the presence of the problem of multicollinearity. This problem is considered severe in case the correlation coefficient between two explanatory variables exceeded 0.80. As shown in Table 1, most of the variables are weakly correlated except for the correlation between the growth rate of real GDP and The ratio of deposits in foreign currency to total deposits whose coefficient approximated 0.81. Since the correlation coefficient between these two variables exceeded 0.8 slightly, another test was conducted to check the presence of multicollinearity problem between these two variables, which is variance inflation factors test (VIF). In this test, the explanatory variable is used as a dependent variable and then regressed o all the other explanatory variables. The coefficient of determination (R^2) is used to calculate the VIF as follows:

$$VIF = \frac{1}{1 - R^2}$$

If VIF <5, then this indicates the presence of severe multicollinearity (O`Breien, 2007). Therefore, one of the variables must be eliminated from the estimated model. The test is shown in Table 2. As appears in the table, the VIF values for DEPDOL and RGDP

Table 1: Correlation matrix

Variable	NIM	SIZ	DEP	EQT	CIR	LOAN	LLP	DIW	CONC	LOANDOL	DEPDOL	GDPR	INF
NIM	1	0.07	−0.11	0.08	−0.24	0.14	0.05	0.14	0.18	−0.06	0.22	0.17	0.05
SIZ	0.07	1	−0.12	−0.04	−0.20	0.08	0.06	−0.21	−0.22	0.21	−0.25	−0.24	−0.06
DEP	−0.11	−0.12	1	0.05	0.00	−0.10	−0.11	0.09	0.12	−0.07	0.14	0.12	−0.01
EQT	0.08	−0.04	0.05	1	−0.14	−0.12	−0.03	−0.07	−0.08	0.07	−0.10	−0.09	0.01
CIR	−0.24	−0.20	0.00	−0.14	1	0.20	0.37	0.20	−0.06	0.09	−0.23	−0.23	−0.01
LOAN	0.14	0.08	−0.10	−0.12	0.20	1	−0.04	0.07	0.11	−0.08	0.04	0.09	0.13
LLP	0.05	0.06	−0.11	−0.03	0.36	−0.04	1	−0.17	−0.19	0.18	−0.15	−0.29	−0.14
DIW	0.14	−0.21	0.09	−0.07	0.20	0.07	−0.17	1	0.62	−0.47	0.75	0.67	0.50
CONC	0.18	−0.22	0.12	−0.08	−0.06	0.11	−0.19	0.62	1	−0.69	0.63	0.71	0.50
LOANDOL	−0.06	0.21	−0.07	0.07	0.09	−0.08	0.18	−0.47	−0.69	1	−0.64	−0.68	−0.03
DEPDOL	0.22	−0.25	0.14	−0.10	−0.23	0.04	−0.15	0.75	0.63	−0.64	1	0.81	0.31
GDPR	0.17	−0.24	0.12	−0.09	−0.23	0.09	−0.29	0.67	0.71	−0.68	0.81	1	0.38
INF	0.05	−0.06	−0.01	0.01	−0.01	0.13	−0.14	0.50	0.49	−0.03	0.31	0.38	1

NIM: Net interest margin

Table 2: VIF for DEPDOL and RGDP

Dependent variable	Independent variables	R^2	VIF
DEPDOL	All the other explanatory variables in the model	0.70	3.33
RGDP	All the other explanatory variables in the model	0.76	4.17

were 3.33 and 4.17 respectively. Therefore, based on the previous benchmark, the multicollinearity problem is not present among the study variables.

Regarding the descriptive analysis of the study variables, they are shown in Table 3. There are important implications that can be concluded from the table. For example, credit facilities ratio for the commercial banks operating in Jordan for the period (2005-2015) averaged 45.0% (i.e., the formed 45.0% of total assets). Moreover, the ratio of deposits in foreign currency to total deposits was 26.0% on average during the study period. The share of foreign currency credit facilities from total credit facilities averaged 12.0% during the study period. It is also noticed that the share of the assets of the largest five banks in total assets ranged from 54.0% and 66.0% during the study period. Finally, the growth rate of real GDP and inflation during the study period approximated 5.0% and 4.0% respectively.

9. ANALYSIS OF ECONOMETRIC MODEL RESULTS

9.1. Stationarity of the Panel Data

Before analyzing the results of the econometric model, the stationarity of panel data series must be tested to examine the presence unit root problem in any of the model variables using Im, Pesaran and Shin W-stat and PP - Fisher Chi-square tests. As shown in Table 4, all variable were stationary when testing the level of the variables, except for the share of assets of the largest five banks in total assets, the ratio of loans in foreign currency to total loans the growth rate of real GDP that became stationary on the first difference.

This leads us to another test, which is Kao Residual Cointegration to test the presence of cointegration of the variables that were not level stationary. This testing tool tests the presence of unit root for the estimated residuals. The test results are shown in Table 5. As appears in the table, there exists a cointegration among the non-stationary variables, there the null hypothesis of the absence of cointegration is rejected.

9.2. Estimating the Model the Determinants of NIM in the Commercial Banks in Jordan

Table 6 shows the statistical results of the two models of the fixed and random effects. As realized, the explanatory power of the two statistical models is different. The coefficient of determination (R^2) was 55.0% for the fixed effects model and 35.0% for the random effects model. Whereas the value of adjusted R^2 was 47.4% for the fixed effects model and 31.0% for the random effects model. F statistic was statistically significant for both models. The value Durbin Watson statistic was 1.78 and 1.67 for the fixed effects and the random effects model respectively, which adds to the strength the models of this study. Regarding the variables used in the models, the analysis results were as follows:

1. Bank-specific variables: The statistical results showed that there is a negative and statistically significant effect of the clients' deposits (liquidity) on the NIM. This shows that the banks raise the interest rates on deposits in case these declined. Consequently, the NIM declines. To compensate for the increase in the interest rate on deposits, the banks raise the interest rates on loans. This raising of the interest rates increases the NIM more the higher loans to deposits ratio (the increase in the interest rates on loans may exceed the increase in the interest rates on paid on deposits, therefore the NIM may increase).

   Regarding the cost (expenses) to income (CIR) ratio, the results showed that there exists a statistically significant negative relationship between this ratio and NIM. The higher the CIR ratio, the lower the NIM. This relationship could be positive, this will be the case if banks pass the additional cost or expenses to their clients either by raising the interest rates on loans or by cutting the interest rates on deposits or both.

   Regarding equity to assets ratio, the results showed that there exists a statistically significant positive relationship between this ratio and NIM. The higher this ratio, the more liquidity allocated to strengthen the capital base in the bank to withstand risks. This in turn reduces the bank's liquidity. Consequently, banks increase the interest

Table 3: Descriptive statistics of the explanatory variables

Variable	Observations	Mean	Median	Standard deviation	Minimum	Maximum	Skewness
SIZ	209	8.89	8.91	0.76	2.33	9.94	−5.82
DEP	209	0.27	0.09	1.77	−0.4	25.53	13.93
EQT	209	0.14	0.14	0.04	0.07	0.33	1.13
CIR	209	0.57	0.53	0.2	0.18	1.74	1.91
LOAN	209	0.45	0.46	0.12	0.05	0.72	−0.83
LLP	209	0.05	0.04	0.04	0	0.24	1.81
DIW	209	0.03	0.04	0.01	0.02	0.05	0.01
CONC	209	0.62	0.63	0.03	0.54	0.66	−1.14
LOANDOL	209	0.12	0.12	0.01	0.1	0.14	−0.19
DEPDOL	209	0.26	0.24	0.06	0.2	0.36	0.59
GDPR	209	0.05	0.03	0.02	0.02	0.08	0.35
INF	209	0.04	0.05	0.04	−0.01	0.14	1.05

Table 4. Stationarity testing using Im, Pesaran and Shin W-Stat and PP - Fisher Chi-square tests

Variable	Type of test	Value on level without trend (I (0))	Value on first difference without trend (I (1))
NIM	IPS	7.47494 (0.0000)***	-
	PP	163.157 (0.0000)***	-
SIZ	IPS	12.0367 (0.0000)***	-
	PP	92.2445 (0.0000)***	-
DEP	IPS	5.33704 (0.0000)***	-
	PP	200.604 (0.0000)***	-
EQT	IPS	0.50692 (0.6939)	8.70911 (0.0000)***
	PP	56.3321 (0.0280)**	-
CIR	IPS	4.03289 (0.0000)***	-
	PP	61.6602 (0.0089)***	-
LOAN	IPS	0.98106 (0.1633)	5.76331 (0.0000)***
	PP	60.2619 (0.0122)**	-
LLP	IPS	1.80986 (0.0352)**	-
	PP	84.7630 (0.0000)***	
DIW	IPS	2.23029 (0.0129)**	-
	PP	12.9026 (1.0000)	51.7435 (0.0677)*
CONC	IPS	10.0214 (1.0000)	3.47506 (0.0003)***
	PP	0.00079 (1.0000)	50.1589 (0.0896)*
LOANDOL	IPS	1.08707 (0.8615)	7.38492 (0.0000)***
	PP	18.0815 (0.9975)	349.993 (0.0000)***
DEPDOL	IPS	1.50030 (0.0668)*	-
	PP	34.1464 (0.6483)	79.8564 (0.0001)***
GDPR	IPS	0.54491 (0.7071)	3.24184 (0.0006)***
	PP	13.1595 (0.9999)	51.3631 (0.0725)*
INF	IPS	0.20378 (0.4193)	3.89506 (0.0000)***
	PP	134.744 (0.0000)***	-

*Values in parenthesis represent probability. *Significant at 10.0% level of significance, **significant at 5.0% level of significance, ***significant at 1.0% level of significance

Table 5: Kao residual cointegration testing among non-stationary variables

ADF	t-statistic	P
ADF	−7.563741	0.0000
Residual variance	0.000314	-
HAC variance	0.000369	-

rates on loans. This might also be accompanied by paying higher rates on deposits (the increase in the interest rates on deposits may be lower than the increase in the interest rates on loans) to attract more clients, especially due to the high equity to assets ratio.

The results showed that there is a positive but not statistically significant relationship between assets and the NIM. It is known that large banks have a competitive advantage and are able to determine the prices in the market. As for the provisions to loans ratio, the results showed that this ratio is positively related to NIN but not statistically significant. If the relationship was statistically significant we would have reached to a conclusion that the banks raise the NIM to cover the costs of provisions. Finally, With regard to the loans to assets ratio, its relationship with the NIM was positive but not statistically significant.

2. Variables related to monetary policy tools: The statistical results clearly showed that that the biggest effect on the NIM is the interest rate on the overnight deposit window. The statistical models showed that there is an inverse relation between the deposit window interest rate and the NIM. The coefficients of the deposit window interest rate in both the fixed effect and the random models was −0.94 and −0.92 respectively. This indicates the strength of the relationship between the deposit window interest rate and the NIM. It also reveals the effectiveness of monetary policy in affecting

Table 6: Statistical results of the estimated econometric model to measure the determinants of NIM

Variables	Coefficients fixed effects	Coefficients random effects
SIZ	0.001658 (0.1112)	0.001484 (0.1298)
DEP	−0.001396*** (0.0001)	−0.001257*** (0.0002)
EQT	0.081290*** (0.0002)	0.062109*** (0.0009)
CIR	−0.007453** (0.0467)	−0.008169** (0.0250)
LOA	0.004437 (0.6450)	0.011703 (0.1194)
LLP	0.006382 (0.7492)	0.016695 (0.3670)
DIW	−0.942639*** (0.0000)	−0.925264*** (0.0000)
CONC	0.155271*** (0.0000)	0.150691*** (0.0000)
LOANDOL	0.501602*** (0.0000)	0.494889*** (0.0000)
DEPDOL	0.220918*** (0.0000)	0.215535*** (0.0000)
RGDP	0.077564* (0.0922)	0.077953* (0.0877)
INF	−0.023902 (0.2710)	−0.023780 (0.2715)
CONSTANT	−0.179000*** (0.0000)	−0.173656*** (0.0000)
R^2	0.550047	0.350041
Adjusted R^2	0.474213	0.310248
Number of observations	209	209
F-statistic	7.253238	8.796464
P (F-statistic)	0.0000	0.0000
Durbin-Watson	1.780744	1.668757
Hausman test		
χ^2 statistics	27.465486	
P (χ^2)	0.0001	

Values in parenthesis are probabilities. *Significant at 10.0% level of significance, **significant at 5.0% level of significance, ***significant at 1.0% level of significance

the NIM either directly or indirectly as previously stated. The low interest rate of the overnight deposit window will result in a decrease in the interest rate on the deposits of banks' clients, which will consequently increase the NIM. Moreover, according to the Corridor system, the decrease in the interest rate of overnight deposit window will lead to a decrease the lower limit of the Corridor system, and may result in a lower interbank lending rate and then the reference price (JODIBOR), which may lead to a reduction in the interest rate on customer loans. Since the relationship between the deposit window interest rate and the NIM was negative, the decrease in interest rate may be greater on the customer deposits than on customer loans and thus will lead to an increase in NIM.

3. Industry-specific variables: The statistical models showed that the share of assets of the largest five banks of total assets with NIM is positive and statistically significant. This indicates that large banks have monopolistic power in setting market prices (interest rates). Regarding the share of foreign currency deposits in total deposits, its relationship with NIM was positive and statistically significant. This means that the higher share of foreign currency deposits at the expense of their counterpart in Jordanian Dinar (dollarization) will force the banks to raise the interest rates on deposits in the domestic currency to attract more JD deposits. Moreover, in light of the decline of banks liquidity in Jordanian Dinar, the banks might as well raise the interest rates on JD loans to compensate for the decline in liquidity. However, the increase in interest rate may be less on the customer deposits than on customer loans and thus will lead to an increase in NIM.

   Regarding the ratio of loans in foreign currency to total loans, its relationship with NIM was positive and statistically significant, will implies that the demand for loans in Jordanian Dinar might lead to a decline in interest rates on deposits in the Jordanian Dinar and/or a decline in interest rates on loans in the Jordanian Dinar. However, the decline in interest rate may be greater on the deposits than on loans. Therefore, the NIM increases.

4. Variables related to the macroeconomy: Regarding the macroeconomic variables, the results showed that there exists a positive and a statistically significant relation between the growth rate of real GDP and the NIM. The improvement in the economic conditions leads to improvements in the banking business in general. Consequently, the confidence of investors in establishing projects and/or expanding their established projects. Therefore, the demand for loans increase, and, hence, the interest rates on loans increase and so the NIM as a result. Regarding inflation, the model showed that there exists a negative and statistically significant relationship between inflation and NIM. This is attributed to the reason that the price decline decreases the need of individuals to their savings in banks and their need to borrow. Therefore, the increased savings at banks make them cut interest rates on deposits. Moreover, the decline in the need of individuals for borrowing make the banks cut interest rates on loans. Consequently, the NIM increases. Nevertheless, the price increase force individuals to withdraw part of their savings to meet their consumption needs. Their need for borrowing increases also. These forces make the banks raise interest rates on deposits and loans. The magnitude of increase may be bigger on loans than on deposits. Consequently, the NIM increases.

To determine which of the two models and fixed effects and random effects is more appropriate in explaining the NIM variations, Hausman test was used. In this test, the more precise model is determined and selected. In case of accepting the null hypothesis, the random-effects models is selected. I case the null hypothesis was rejected, the fixed-effects models is selected:

H_0: The random-effects model is preferred to the fixed-effects model. Therefore, the generalized least squares (GLS) method is used.

H_1: The Fixed-Effects model is Preferred to the Random-Effects model. Therefore, the ordinary least squares method is used.

In other words, if the calculated value of χ^2 is statistically significant at 5.0% level of significance, then the null hypothesis is rejected and the fixed effects model is selected. As appears from Table 6, the values of χ^2 statistics is approximately 27.5 and is statistically significant. The tabulated χ^2 at 11 degrees of freedom (the number of explanatory variables) is 19.68. Therefore, the calculated value of χ^2 statistic is greater than the value χ^2 from the relevant table. Consequently, the null hypothesis is rejected and the fixed-effects model is preferred to the random-effects model.

10. CONCLUSIONS AND RECOMMENDATIONS

The study investigated the factors affecting the NIM in the commercial banks operating in Jordan during the period (2005-2015) using the fixed-effect panel least squares and the random-

effect estimated GLS. The study showed that the NIM is affected by several internal and external factors. The showed that there is an indirect effect of monetary policy instruments on NIM through their effect on inflation rate. The testing showed that the effect of these instruments on the inflation rate was statistically significant, which in turn affected the NIM; the effect was statistically significant. Accordingly, this study came out with the following recommendations:

1. It is important to that the concentration in the banking sector be reduced due to its unfavorable effect of raising the NIM. One path for this is licensing new banks in a deliberate manner. Banks with excess liquidity that usually do not need to pay high interest rates on deposits have higher market power in determining the interest rate margin in Jordan.
2. It is important that the Central Bank of Jordan stress on banks to keep improving their operational efficiency and enhance their contribution to financing various economic activities at a reasonable cost. It is also important request banks not to raise their profit margins overstatedly, especially when both operating expenses and provisions for non-performing loans are relatively low.
3. It is important that the banks allocate their profits to their capital bases in a deliberate manner due to their effect on rising the NIM.
4. The Central Bank of Jordan should use its monetary policy instruments in a prudent manner and take into consideration its direct and indirect effects on NIM through the effect of these instruments on economic variables that in turn affect the NIM.
5. The Central Bank of Jordan should use its monetary policy instrument of moral suasion to convince banks to reduce their NIM. In turn, the commercial banks should also fulfill their moral responsibility to reduce the interest rate margin by NOT pricing their products in an exaggerated manner, and a way that commensurate with their real costs and expenses.

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