



DETERMINANTS OF BANK INTEREST MARGINS: EVIDENCE FROM BANKING SECTOR OF PAKISTAN

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Abstract

This study aims to explore the determinants of net interest margin which is one of the most important variables of banking industry. It determines the efficiency and development of banking sector which in turn augment growth in the overall economy. 20 banks have been selected on the basis of availability of data for the period of 12 year from 2013-2024. Current study also takes into account the bank specific, industry specific and economy specific variables and builds an econometric model for analyzing these determinants of net interest margin. In order to test the proposed relationship ten hypotheses have been formulated indicating the proposed sign and strength of relationship. On the basis of panel fixed effect regression the variable of credit risk, default risk, degree of risk aversion, firm performance, market structure and inflation rate were significant while for the rest of variables no significant relationship was found. Thus out ten hypotheses formulated for the study 6 were accepted while the remaining four could not be accepted. On the basis of results of the study the variables considered as determinants have proved as important factor for the determination of interest margin and in order to modify, manipulate or adjust net interest margin. These factors can be manipulated accordingly so that the bank profitability and efficiency may increase which cause overall prosperity of financial sector and subsequently the overall economy.

Keywords: Net interest rate margin, Bank specific variables, Economy specific variables, Fixed effect regression analysis, credit risk, default risk.

1. Introduction

Banking sector plays an intermediary role by channelizing the funds from individual or businesses which have fund in excess and called surplus unit to those who have deficiency of fund and seek to acquire funds and called deficit units. The source of these funds for banks are individuals who deposit money in banks for the sake of periodic compensation in the form of interest for the period funds are retained by the banks. The banks in turn provides funds to deficit unit from which the interest is charged at higher rates than rate provided to depositors (Angbazo, 1997; Qauder, 2024). The objective of this higher lending rate is to cater the risk which the banks face during this transformation process. This difference of lending and borrowing rate is termed as interest rate spread which is also defined as the difference of credit and debit interest rate. This margin or spread enables the banks to compete in the market and continue their operations (Kwakye, 2010; Marc et al., 2022; Iqbal & Abbas, 2024; Siddique et al., 2025). Hence banks provide bridging mechanism for the flow of funds in the economy.

Just like all other segments of economy banking sector too has undergone intense competition with the development of world's economy (Rosuhaila, 2018; Ali & Rehman, 2015; Wadud, 2022; Ismail & Saeed, 2024; Marc et al., 2022; Khalid et al., 2025). This banking sector is also called the life line of economy as it channels funds to its most productive use which in turn used for economic development. So survival of banks is inevitable for the survival of economy and the interest rate margin provides sufficient funds for banks survival (Allen, 1981). However due to increased competition in all sectors of economies and globalization of world this spread has shrunk with the passage of time. Digitalization and particularly the integrative used of information technologies in this sector has further enhanced the competition and subsequently reduced interest rate spread (Khan, 2018; Kabir & Rashid, 2019; Raza & Khan, 2023; Ammar et al., 2025; Liu & Cai, 2025; Lestari et al.,

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2025; Amir et al., 2025). So ensuring sufficient amount of interest rate spread and in turn active performance of banks is necessary for economic development. Banking sector also provides support to the countries' economies by active role playing in domestic and international trade as it revitalizes these operations. Moreover it provides funds to the economic project which help as engine for economic growth (Hasan & Sadat, 2023; Iqbal et al., 2025). For all this the net interest margin quantum and utilization is a key factor in saving and investment boosting in economy.

Interest rate margin plays a key role in increasing the productivity and profitability enhancement of banks. This profitability in turn encourages the flow of money supply and supports the budget in the macroeconomic level. Hence banks play intermediary role in the economy. Main regulator and supervisor for all of these commercial banks in the economy is the central bank. This central bank controls the overall money supply in the economy. The tool used at macroeconomic level for controlling this supply is monetary policy (Folawewo and Tennant, 2008; Theriou 2015; Boldeanu and Tache, 2016; Cipovová and Dlaskova, 2016; Farras et al., 2025; Arshi et al., 2025; Zahid et al., 2025).

Net interest margin (NIM) is the most appealing factor which evaluates the efficiency and effectiveness of financial institutions. Investment and economic growth also depends upon this NIM as its higher level deters investment and subsequently the efficiency of economy suffers. Hence this NIM is one of the determinants of efficiency and performance of banking sector can also be measured with the help of this factor. Thus the intermediation role of bank for saving collection and loan advancement also depends upon NIM. (Hamadi and Awdeh, 2012). Dominant bank can exercise monopoly power in the market and can set price of their own choice and charge rent of monopoly. However this practice deters completion and efficiency of sector suffers and subsequently the welfare loss prevails (Chortareas et al. 2012; Rafique et al., 2025; Ullah et al., 2025; Karim et al., 2025; Khalid et al., 2025). Hence the banking system efficiency can be judged by the study of NIM (Kasman et al. 2010; Ali et al., 2025). This net interest margin can be determined by taking difference of the interest income earned by the bank from loan advancement to the bank borrowers and income from other sources and the amount paid to the depositors on their saving deposits and then dividing this difference on bank income. (Raharjo et al., 2014; Ali et al., 2025).

It is interest rate which determines the level of competition among banks. Interest rate which are offered to customers on their deposited amount and the rate which is charged on the loans which banks offer. Banks margin can also be determined by these both rates of deposits and loans. If the margin is reduced the money supply is increased which leads to increased efficiency and economic growth (Chirwa, 2001; Thalassinos et al., 2013; Fetai, 2015; Ali et al., 2025; Aziz et al., 2025). Hence understanding banks behavior in determining interest rate margin is integral so that the direction of economy can be predicted and efficiency of banking sector can be determined. If the margin of interest rate increases it not affect banking sector but non banking segment and its efficiency is also affected and operating cost of non banking activities also increases. This cost increase results in reduction of lending and decrease of investment and subsequent drop of economic growth.

The classical approach to the process to understand interest rate margin is intended to curtail the lending rate and in turn perform arbitrage operations to overcome credit risk, however modern understanding encompasses variation in the market as a result of interest rate change. The new approach also takes in account the mechanism of cashflow hedging and derivative instrument for interest rate changes (Folawewo and Tennant, 2008; Rana et al., 2025; Ali et al., 2025; Kumar et al., 2025; Khan et al., 2025).

Interest and commission which the bank charges for its various services are also determinants of banks profitability. These services to bank customers are aimed to achieve a cost revenue equilibrium. The key focus of banks is the appropriate price determination for loans as the main source of income for banks is constituted by the loan proceeds (Khan et al., 2025; Shahid et al., 2025; Khanwal et al., 2025; Ahmad et al., 2025). If efficiently priced it will increase the profitability of banks. The beneficiaries to banks profitability heavily criticize it as burden is ultimately transferred to them. The competitiveness of banks is redefined as a result of this new market based floating interest rate phenomenon. This has also affected the interest rate spread and banks' ability to attract new customers.



In order to understand and improve the role of net interest margin on the overall prosperity and efficiency of banking sector it is necessary to explore those factors on which this net interest margin depend or those factor which help in determining net interest so that these factors can be modified in order to adjust net interest margin in more useful way. That is why this study attempts to examine the banking sector and the impact of different factors specifically bank related and macro-economic factors on the net interest margin which in turn determine the efficiency of banking sectors which subsequently promote economic growth of country.

Along with operating cost various other determinants of net interest margin have been discussed in literature. Seminal work in this regard is the study and model of HO and Sunders (1981). In this study banks have been described as intermediary for deposits of funds and supply of loans. The funds may face time mismatch between deposits and demand for loans. Due to this potential mismatch banks may undergo uncertainty and incur cost.

A set of determinants of net interest margin however can be derived through this uncertainty. Since banks are assumed to resist risk so the higher interest margin will be set if higher risk is expected and bank needs to avoid it. Bank will set higher margin in order to compensate potential loss of value. If uncertainty of mismatch prevails and that term of year ends then the interest rate risk would arise as the money market interest rate would change for the next term. For example if the resources deposited in the first term were insufficient with respect to demand for loans the bank may fund those demands with the next term money market borrowings (Ahmad et al., 2025; Niaz et al., 2025; Khan et al., 2025; Ahmad et al., 2025; Nasir et al., 2025). This situation will raise short term interest rate and reinvestment risk will also increase which in turn would increase the interest margin.

Market structure in which banks are operating constitute another key determinants of interest rate margin. In majority of literature there are two hypothesis to analyse the impact of market concentration on the pricing mechanism of banks. These hypothesis intend to clarify “commonly observed positive correlation between market concentration and profitability” (Berger and Hannan, 1989).

The two popular hypothesis are that of structure performance hypothesis and efficient structure hypothesis. Prior hypothesis contends that as there is higher level of market concentration firms tends to demonstrate and maintain non competitive behavior. Efficient structure hypothesis provides an alternative explanation that some firms have greater efficiency and their market share increases which raise concentration level. As a result of efficiency profitability also increases so market concentration is likely to positively affect net interest margin.

It can be inferred from the above discussion that both of the hypothesis of efficient structure and structure performance hypothesis market competition would reduce as a result of increased concentration. Either efficiency provides firms with comparative advantage and subsequently higher profit or firms may face collusion, market structure has the ability to set prices with either lower competition or maintaining same level of it. In other words price relative to cost is openly increased in structure performance hypothesis and in contrary in case of efficient structure hypothesis profitability is increased as a result of cost reduction relative to price. Nevertheless it is also argued that there can be other way to relate concentration and competition (Van Leuvenstein et al. 2013).

This study intends to empirically investigate the determinants of interest rate margin by considering a sample of Pakistani commercial banks. These factor could possibly belong to one of the group of economic, financial and market indicator.

2. Literature Review

Banking industry supports economic growth in the country hence it has a critical role for the country's economy. Moreover it channelizes funds from surplus unit to deficit unit which is crucial for capital allocation for development purpose. Another concern for this intermediary role of this sector is that cost of this transformation should be minimal so that maximum funds can be utilized for greater social welfare cause and margin of banks should be lower which in turn result in minimal social cost. Merton (1993) advocated this low cost intermediation in following way:



“A well developed, smoothly functioning financial system facilitates the efficient life-cycle allocation of household consumption and the efficient allocation of physical capital to its most productive use in the business sector.”

From above statement we can realize the importance of banking sector in the economy and the inevitability of this intermediation role with due efficiency and subsequently lowest possible net interest margin charged by banks. Hence this fundamental important of net interest margin as determinant of efficiency of banking services and subsequently overall economy motivates researcher to have insight of this particular dimension so that a through understanding can be developed regarding the net interest margin and its determinants so that these determinants can be manipulated for improving the efficiency and in turn resource allocation of banking sector.

This net interest margin which is variable of prime interest for this study is strongly and negatively influenced by the volatility of interest rate as interest margin varies with this volatility. Samuelson (1945) for the first time, pointed out this impact of interest volatility on the behavior of bank portfolio. the theoretical underpinning for this topic is expected utility maximization and hedging hypothesis. According to this hypothesis, financial intermediaries tend to match the maturities of liabilities with that of asset of financial institution with the intention to minimize the stockholder risk and as result ensure a positive risk premium. Michaelsen and Goshay (1967) pointed out this mechanism.

2.1. Dealership Model

Hedging hypothesis and expected utility approach was further extended by Ho and Saunders (1981) in their dealership model which can be considered as the starting point for determinants of net interest margin. for the sake of determining net interest margin they proposed two stage model in their seminal work. They argued that as there is mismatch of timing of supply of deposit and demand of loan so for providing immediate service bank charge price in the form of ‘pure spread’ in first stage. In second stage, the spread was measured which result due to number of regulatory restrictions and imperfections. Difference between lending and deposit rate was defined as bank spread. Lending rate denoted with PL and deposit rate with PD. Due to the uncertainty in the market bank use a margin along with the money market interest rate which is being denoted with p in the following equation.

$$PD = p - a \quad (1)$$

$$PL = p + b \quad (2)$$

Here a and b are margins which is charged by banks to provide required services immediately. Since banks are utility maximizer and risk averse so the pure spread of bank is calculated in the following way:

$$S = PL - PD = a + b \quad (3)$$

Later on this model was criticized by Lerner (1981) that this has not associated any production function with the bank which are also a firm and provide intermediary services. If in the production process of banks cost inefficiencies are present then bank margin would be adversely affected by this process. Later on Maudos and Guevara (2004) responded the criticism and extended the basis model. They included operating cost role in the model. Mcshane and Sharpe (1984) found the evidences of existence of non linear relationship interest rate uncertainty, risk aversion, market power measures and net interest margin of Australian commercial bank when tested Ho and Saunders (1981) dealership model in the context of Australian banking sector.

2.2. Empirical Studies on Net Interest Margin

In an attempt to expand dealership model Allen (1988) employed single kind of deposit and loan and ration with various maturities in order to implement portfolio effect for determining net interest margin.

Local deposit market include the evidences of rigid price in which likelihood of deposit interest decrease is greater than upward shift in these rates when market interest rates change (Hannan and Berger, 1991). Market concentration is one of fundamental reason for such trend. The magnitude of asymmetric adjustment was greater in such concentrated markets’ banks. (Neumark and Sharpe, 1992).

In order to investigate why the sample countries’ lending rates remain stick and find answer Cottarelli and Kourelis (1994) introduced two stage process. The study of Angbazo (1997) found that both interest rate and default risk premium are reflected in the commercial banks’ net interest margin. It was also found in the study



that in order to collect greater net interest margin bank bank would tend to select those loans which have greater exposure of interest rate risk. Off balance activities were also found to contributing for liquidity risk and cross sectional distinction of interest rate risk.

Bank profitability and earnings was recognized as depending upon the factors of net interest margin (NIM). With increase in the lending rate the intention of people likely to start new business negatively affected. Small and medium enterprises growth suffers as a result of such high rate on lending. Stock of capital also adversely affected by the increase in lending rate. Productivity of economy also decrease due to such circumstances. This phenomenon also adversely affect level of investment and employment.(Kiptui, 2014).

Angbazo (1997) employed the data of US commercial banks and explored the factors of net interest margin. Management efficiency, opportunity cost of non interest bearing reserve, dummy variable for branch restriction, implicit interest payment, leverage, interest rate risk, liquidity risk default risk and their interaction were identified as the determinants of net interest margin. Default risk was measured as ratio of net waived off loan to total loans, leverage was proxied as the ratio of capital and total assets. Management efficiency was calculated as fraction of earning assets to total assets. Management efficiency, leverage, non interest bearing reserves' opportunity cost and default risk were observed to have positive association with net interest margin.

Taking data of monthly return of Argentinan banks for the period of 1993-1997 Catao (1998) also attempted to determine the factors affecting the net interest margin for banking sector assets denominated in both currencies. Market structure, exchange rate risk, liquidity risk, problematic loans, operating cost, reserve requirement cost, tax ratio appeared as the determinants of this spread. The market structure was measured as Herfindahl index. Randall (1998), Catao (1998) Barajas et al., (1999) provided some more evidences of understating the banks interest rate behavior, and developed structural models and tested for empirical evidences for eastern European countries, Argentina and Colombia respectively.

A detailed study was conducted over a bank-level data of 80 countries by Demirgüç-Kunt and Huizinga (1999) in which they examined numerous elements of bank interest margin such as conditions of macroeconomic, bank taxation, credit insurance rule, whole financial structure, and other fundamental and influential factors. Two of the factors they considered namely; bank characteristics and macroeconomic factors have produced much relevant regression to the proposed study.

Saunders and Schumacher (2000) took a sample of banks of seven OECD countries including Switzerland, US, UK, Italy, France, Spain and Germany and applied two-step process suggested by Ho and Saunders. The study was intended to divide the determinants of bank net interest margin into 3 groups of market structure, regulatory and risk premium components and study separate impact of each.

The proxy for fee which is measured by implicit interest payment had a major impact. This was one of the three control variables which were used in the first stage. This implies that in order to fund implicit interest payments bank would have to increase the spread. Apart from that for the most of countries the relationship of opportunity cost with net interest margin was also reported with positive and significant coefficient. Beside this the capital ratios had also positive and significant association.

Taking a large sample of US and European banks Saunders and Schumacher (2000) studied the determinants of net interest margin for the period of 1988-1995. The findings reported interest rate volatility market power, capital to asset ratio, opportunity cost and implicit interest payments have positive relationship with net interest margin but the variables of transaction size and risk aversion were not considered in the study.

Demirgüç et al., (2004) described the relationship of market structure and regulatory framework of institutions in financial intermediary perspective and indicated that for preservation of competition and payment of cost of deposits net interest margin is integral. The study also pointed out that administrative cost is a key determinant of bank's cost efficiency which in turn affect interest margin and banks profitability. In the study of Gelos (2006) the Latin American Banks appeared to have high net interest margin while their neighboring countries had lower interest margin. The efficiency of those banks also observed to be low and reserves were high which was attributed to high cost of intermediation.



In another study Gelos (2006) again studied the Latin American countries and observed high intermediation cost as compared to international standards. Ho and Saunders dealership model was also applied by Valverde and Fernandes (2007) in a framework of multi output. The results suggested that as diversification for output of non-traditional activities increase, it causes a surge in market power.

The study of Hawtry and Liang (2008) intended to determine the factors affecting interest rate spread. The sample included banks for 14 OECD countries and the data was of panel structure. The significant determinants of net interest margin for these countries were management quality, implicit interest payment, volume of loans, credit risk, interest rate volatility, risk aversion, operation cost and market power. All the above mentioned variables were affecting net interest margin of the sample countries. Moreover, non performing loans, and operating cost were documented to be the strong determinants of net interest margin in the study of Hossain (2010).

The effect of variables of liquidity policy, credit risk on interest rate margin was found in the study of Mannasoo (2012) and Were and Wambua (2013) while internal variables including capital adequacy ratio, debt ratio, non performing loans and operating cost were reported to influence Net interest margin by study of Hossain (2010) and Ahmadian and Kyanvnd (2015). Macro economic variables including profit margin, return on assets, inflation, loan loss provision, liquidity, treasury bill rate, exchange rate and gross domestic product were suggested to have impact on net interest margin in the studies of Churchill et al., (2014) and Ghasemi and Rostami (2015).

Administration, efficiency, and human resources were also considered as the determinants of net interest margin in the study of Campisi et al., (2013) and Ahmadian and Kyanynd (2015). In the study of Fungacova and Poghosyan (2011) and Mannasoo (2012) some more determinants of net interest margin were established including market structure of banking sector and ownership of firm.

Islam and Nishiyama (2016) employed a panel regression analysis technique and positive impact of bank specific factors was found while the market power and growth were negatively affecting net interest margin. Similar findings were provided by Hijazeen (2017) who took a sample of Jordanian commercial banks and performed panel data analysis for 13 banks and observed adverse impact of macro economic variables and positive for bank level variables.

Agoraki and Kouretas (2019) examined the European countries with focus on South Eastern region and period of study was 1998-2007. Mesfin and Ram (2019) Focused on Ethiopian sample for study period 2010-2017 and indicated that bank specific variables of liquidity risk, non-performing loans, market structure, and interest rate risk positively contribute for determination of interest rate risk. Angoria (2019) investigated European countries and Dicko (2019) performed analysis of banking sector to explore the determinants of net interest margin Turkish banking industry for pre and post crisis period of 2008-14 and 2003-2015 respectively. The findings of panel data analysis indicated that the impact of bank specific factors were more pronounced in the post crisis period causing a decline in net interest margin for this period.

Interest rate margin also act as a efficient signaling mechanism for the market players (Hawtry and Liang, 2008). Hence study of net interest margin determination can have a significant value for economy. Moreover banking industry provides significant contribution towards economic growth of the country as it transfer funds from surplus unit to deficit unit and effective transformation ignite economic activity. For improvement of social welfare cost of this intermediation should be lowest possible (Maudos and Guevara, 2004).

Alam et al., (2011) focused on liquidity, efficiency and bank size and established comparison of public and private banks. Siddiqui (2012) examined ex post determinants of margin by employing data of 14 commercial banks of Pakistan. The significant adverse impact which was found in these studies was the deterioration of agricultural and industrial sector growth rate and declining the saving deposits in banks.

From the above discussion it can be inferred that net interest margin and its determinants and impact on economy is a burning issue faced by Pakistani banking sector. Hence employing the available data and exploring the new dimension on the topic can be very helpful for policy suggestion and implementation. So current study is intended to incorporate maximum variables of micro and macro nature which affect the net interest margin.



The researches on net interest margin cover almost entire world economies. Ugur and Erkus (2010) for example investigated the determinants of NIM in Turkish banks. For Russian banking industry Fungacova and Poghosyan (2011) conducted a research including ownership structure along with other determinants of net interest margin. Latin American banking sector was studied by Chortareas et al., (2012) for determining factor affecting net interest spread of the country's banks. Dynamic panel approach was implemented for analysis. Structural and nonstructural completion was analyzed for these banks' NIM determination. In Fiji Gounder and Sharma (2012) performed analysis of banking sector for determining dimensions of interest spread. The banking sector of Arabic country of Lebanon was investigated by Hamadi and Awdeh (2012) for net interest margin determination. The study incorporated a sample of 53 banks and panel data regression technique was used for analysis purpose. Similarly for Srilanka and Central and Eastern European countries Gamage (2013) and Rizdak (2013) performed studies respectively.

Efficiency variable was main determining factor in focus for net interest margin in the studies of Demirguc et al., (2004), Gelos (2006) and Horvath (2009). Macroeconomic indicators including inflation rate, discount rate, fiscal deficit and GDP growth rate were main driving factors in the studies of Folawewo and Tennant (2008) and Sheriff and Amoako (2014) for determination of net interest spread.

Many researchers hence included size as determinant of net interest margin (NIM) including Claeys and Vennet (2008) which investigated a sample of Eastern and Central European countries (CEEC). The size was employed as market share which was proportion of assets of particular bank i with respect to total asset of banking sector of country j for a particular time t . it was also termed as market power. Their findings however indicated no significant relationship of market share and net interest margin which suggest that market power don't help these banks in exploiting higher rental income.

As per the claim of Gunter et al., (2013) the ratio of nonperforming loan or loan loss provision have become common proxies of credit risk in order to depict the risk appetite of firms. The different and multiple deposit and loan types have been employed as proxies for diversification gain as determinant of net interest margin (Angbazo, 1997). Gunter et al., (2013) therefore claim that controlling asset structure help to highlight the other risk appetite variables' influence on the net interest spread. Maudos and de Guevara (2004) maintain the requirement of implicit risk premium inclusion in the interest rate and in turn net interest spread for credit risk management.

In this examination attempt is made to characterize the components influencing the assurance of loan fee spreads dependent on past investigations on this issue and to additionally fortify the investigation two extra pointers are incorporated, which are the lawful pointers dependent on the record of financial opportunity and market pointers dependent on market concentration.

3. Model, Data and Methodology

The section incorporates the determinants explored from the empirical literature and constructs the basic econometric models for analyzing the data. Twenty banks from financial sectors of Pakistan have been selected on the basis of availability of data and data has been collected and organized for these banks for period of 12 year from 2013-2024. Data has been gathered from individual banks websites and then organized.

Table 1: Description of the Variables

Variable name	Measurement
Net interest margin (NIM)	
Size of bank (SZE)	Log of assets of bank
Default risk (NPL)	Non-performing loans
Credit risk (CRDR)	Gross loans
Return on assets (ROA)	Net income/total assets
GDP	Gross domestic product growth rate



Unemployment rate (UNEMP)	Rate of unemployment in the economy
Inflation rate (INF)	Rate of inflation in the economy
Risk aversion (RAVER)	Ratio of equity to total assets
Market concentration/structure (HERFND)	Herfindahl index
Implicit interest payment (NNI)	Net non-interest income

On the basis of review of literature and in order to fulfill the objective of research following econometric model has been proposed for the study which will be tested using unbalanced panel data f 20 banks of Pakistan listed in Pakistan stock exchange (PSX):

$$NIM_{it} = SZE_{it} + NPL_{it} + CRDR_{it} + ROA_{it} + GDP_{it} + UNEMP_{it} + INF_{it} + RAVER_{it} + HERFND_{it} + NNI_{it} + \epsilon_{it} \quad (4)$$

Descriptive for data summary and correlation for any potential degree of association have been reported. In order to control the unobserved heterogeneity of the cross section of data model have been tested for fixed and random effect by using Hausman’s test. On the basis of the results of Hausman’s test fixed and random effect will be finalized and further used in the regression analysis of the above model.

4. Results and Discussion

Descriptive statistics of all of the 11 variables are explain in Table 2 which includes the average value of variables and the minimum and maximum value of each variable along with standard deviation.

Table 2: Descriptive statistics

	Mean	Median	Maxi.	Mini.	Std. Dev.	Skewness	Kurtosis
CRDR	0.4695	0.4734	0.8242	0.1747	0.1081	0.1228	2.5754
HERFND	0.1826	0.1926	0.4647	0.0473	10.9151	0.1030	2.3927
INF	8.7450	8.6206	19.5607	-1.4515	4.7281	0.6864	2.9902
NIM1	0.0357	0.0304	0.4139	-0.0156	0.0386	7.4835	66.2931
NNI	50.9809	19.7315	333.4690	-127.5001	75.0103	1.5218	5.2883
NPL	0.0490	0.0393	0.3570	-0.0129	0.0476	3.2841	17.9196
RAVER	0.1001	0.0819	0.2937	0.0158	0.0550	1.4552	4.8449
ROA	0.6931	0.8425	3.9820	-5.6665	1.2636	-1.8484	9.6396
SIZE	7.8278	8.0463	10.0968	4.5254	1.1638	-0.5323	2.7706
UNEMP	3.8356	4.1530	8.7111	0.8320	2.3946	-0.0085	1.3112
GDP	4.0037	4.3965	6.9953	1.6067	1.4396	-0.3728	1.8536

It provides that to what extend a variable would change with change in another variable. It may be positive or negative relationship among the variables. In case of positive association variables move in the same direction i.e. increase in the value of one variable would also cause the increase in the value of other. In case of negative correlation the movement would be in opposite direction i.e. increasing in the value of one variable would cause decrease in the value of other.

Table 3: Correlation matrix

	CRDR	HERFN	INF	NIM1	NNI	NPL	RAVE	ROA	SIZE	UNEM	GDP
CRDR	1										
HERFND	-0.283	1									



INF	0.152	0.125	1								
NIM1	0.065	0.217	0.162	1							
NNI	-0.341	0.417	-0.143	0.107	1						
NPL	0.409	-0.422	0.234	-0.157	-0.287	1					
RAVER	-0.032	-0.014	0.076	0.0567	-0.036	-0.041	1				
ROA	-0.305	0.47	-0.179	0.203	0.357	-0.503	-0.09	1			
SIZE	-0.152	0.332	-0.251	-0.009	0.497	-0.091	-0.441	0.502	1		
UNEMP	-0.29	-0.203	0.458	-0.191	0.143	-0.17	-0.15	0.145	0.272	1	
GDP	-0.219	-0.1279	-0.468	-0.148	0.146	-0.258	-0.086	0.15	0.268	0.791	1

As per the above table none of the values show strong correlation between variables except the correlation of size and non-interest income which is 0.497 or about 50% with positive sign which means that 100% change in one variable would result in the 50 percent change in the other variable. This correlation too is not much strong. In case of correlation greater than 0.6 is alarming which means that there is problem of multicollinearity between the variables. In case of strong correlation among independent variables one of variables should be dropped so that it may not cause problem in further analysis. It can also be interpreted as such variable cause redundancy i.e. two variables are being considered for measuring the same phenomenon.

Regression analysis provides the impact of independent variables on dependent variables. Major difference between correlation and regression is that correlation just provides degree of association between two variables but does not specify the cause and effect variables. Regression on the other hand also provides that which variable is causing change in the other variable. The independent variable causes change in the dependent variable. In other words the differentiation of independent and dependent is made in regression not in the correlation.

Following table provides the result of panel regression as well as hausman's test.

Table 4: Regression analysis

Variable	Coefficient	Std. Error	t-Stat.	Prob.
C	3.8456	2.8740	1.3381	0.1823
CRDR	0.9237	1.4032	1.7709	0.0718
INF	0.0745	0.0404	1.8460	0.0663
NNI	0.0008	0.0042	0.1811	0.8565
UNEMP	-0.1422	0.2097	-0.6781	0.4984
ROA	0.6510	0.1446	4.5023	0.0000
HERFND	0.0468	0.0229	2.0391	0.0427
SIZE	-0.3578	0.3858	-2.1275	0.0355
GDP	0.0396	0.1711	0.2312	0.8174
NPL	0.1774	0.0961	1.8456	0.0664
RAVER	0.1404	0.0015	1.3863	0.1527
Diagonestic Statistics				
R-squared	0.3377	Mean dependent var		3.5622
Adjusted R-squared	0.2808	S.D. dependent var		3.8473
S.E. of regression	3.3743	Akaike info criterion		5.3795
Sum squared resid	2413.7480	Schwarz criterion		5.7856
Log likelihood	-617.5409	Hannan-Quinn criter.		5.5431



F-statistic	3.6557	Durbin-Watson stat	0.5916
Prob(F-statistic)	0.0000		

Above table provides the results of panel regression. The results of chi square reject the null hypothesis with value of 59.56 (0.000) which means that fixed effect analysis is appropriate for the model so it has been adopted for the study. The value of f stat is 3.655 which indicates overall model fitness i.e. whether the relationship established for the study is statistically feasible. The value of F is which highly significant. On the other hand the value of t-stat indicate significance of individual variables. R square provides the coefficient of variation i.e. to what extent change in dependent variable is explained by the independent variables. As per the above table value of R square is 0.337 which means that about 34 percent change in the dependent variable of net interest margin is due to the variables considered in the model while rest of percent change is due to other factors which are not considered in the model. On the other hand as per the results in the table the variables of non-performing loan, size of bank, herfindahl index for market concentration, return on assets, inflation and credit risk have significant relationship with dependent variable. While the relationship of the variables of GDP, risk aversion, non-interest income and unemployment has not appeared to be significant or in other words the results for these variables' relationship are insignificant. While the coefficient of variable of credit risk is 0.92 which means that if the variable of credit risk is changed 100 percent it will cause the change of 92 percent in the net interest margin which is our dependent variable. However the level of significance for this variable is 10%. It means that there are 10 percent chances of error in these values. Moreover the direction of relationship is also positive indicating movement in the same direction i.e. increase in value of credit would cause the increase in the net interest margin. This result is also consistent with hypothesis of our study which suggest positive relationship between relationships between these variables. Hence our research hypothesis regarding this relationship is also accepted. Macroeconomic variable of inflation is also significantly and positively related with dependent variable of net interest margin with coefficient 0.07 which means that 100 percent increase in inflation would cause about 7 percent change in net interest margin. The results are again significant at 10 percent level of significance. The results of relationship of return on assets or firm performance with net interest margin is significant at 1 percent level with coefficient of 0.65. This result is also consistent with the study hypothesis no 10 which proposes positive relationship between these two variables. Herfindahl index which is indicator of market concentration is also significantly and positively related with net interest margin with coefficient 0.04. Next significant relationship is for variable of size with net interest margin with coefficient of 0.357 with 5 percent level of significance. The sign in this case however negative which means it is negative relationship. It can be interpreted as increase in the bank size causes decrease in the net interest margin. This sign is also consistent with our hypothesis H2 which proposes negative relationship. Hence our hypothesis is also accepted. Non-performing loan which is a proxy of default risk has also significant and positive relationship with net interest margin with coefficient 0.177 at 10 percent level of significance. These results of positive and significant relationship of variable of and net interest margin are consistent with the findings of and which find same relationship in their study in context.

5. Conclusion and Policy Recommendation

This study has been conducted to explore the determinants of net interest margin which is one of the most important variables of banking industry which determine the efficiency and development of banking sector which in turn augment growth in the overall economy. Banking sector is important intermediary which facilitate the flow of funds in the economy. It takes fund from the surplus unit and extends it to deficit unit. These funds if efficiently and smoothly channelized would result in the economic development. Hence the role of banking sector is crucial for overall economic growth of the country.

Now in order to run the bank efficiently and effectively there is certain determinants which play their part. Net interest margin is one of those fundamental determinants. It is the difference of the interest charged on the loans and the interest paid on the deposits to the clients. This margin is also necessary for bank survival. This margin if



adjusted properly would result in the growth of financial system which in turn augment the overall economic growth. Negative interest margin means bank is suffering loss and could not survive in such circumstances while the greater is margin greater would be the profitability and prosperity of bank. Hence due to its prime importance this study has tried to explore the important factors which may affect the net interest margin so that in order to modify this margin the key determinants can be adjusted and manipulated.

The seminal work in determining net interest margin was done by Ho and Saunder in 1981 via dealership model which introduced two step model for determining the margin later on lerner (1981) improved the model and Mchane and Sharpe (1985) applied the model in Austrian context. Similar researches were done in almost all parts of world majority of the researchers find the market structure, operating efficiency, size of bank, credit risk, operational risk, default risk, volatility of interest rate risk aversion, and other macroeconomic indicators including gross domestic product, unemployment rate, inflation rate money supply and some industry specific variables including herfindahl index.

Current study also takes into account the bank specific industry specific and economy specific variables and builds an econometric model for analyzing these determinants of net interest margin. After a thorough review of literature ten determinants of net interest margin in the above mentioned three categories have been finalized. The objective of the study was to determining the behavior of these variables for net interest margin. In order to test the proposed relationship ten hypothesis have been formulated indicating the proposed sign and strength of relationship. The variables which have been finalized for the study as determinants of net interest margin include market structure, bank size, credit risk, default risk, degree of risk aversion, bank performance measured as return on assets, implicit interest payment and macro-economic variables of unemployment rate, GDP growth rate, inflation rate.

In order to cater possible endogeneity. Hausman test was run to decide the fixed and random effect technique for establishing the relationship of independent and dependent variables. Fixed effect was applied on the basis of results of Hausman's test.

Taking a sample of 20 banks listed in Pakistan stock exchange for the period of 2007-2018 regression analysis was performed in order to test the significance of relationship of these determinants. On the basis of panel fixed effect regression the variable of credit risk, default risk, degree of risk aversion, firm performance market structure and inflation rate were significant while the rest of variables no significant relationship was found. Thus out ten hypothesis formulated for the study 6 were accepted while the remaining four could not be accepted.

On the basis of results of the study the variables considered as determinants have proved as important factor for the determination of interest margin and in order to modify manipulate or adjust net interest margin these factor can be manipulated accordingly so that the bank profitability and efficiency may increase which cause overall prosperity of financial sector and subsequently the overall economy.

On the basis of findings of the study it is recommended that:

1. Banks should overcome the credit risk in order to improve the efficiency
2. Non performing and impaired loan has to control so that the default risk could be reduced which in turn would increase the efficiency of NIM
3. In order to avert risk the equity portion of bank should be increased so that the bank can absorb possible fluctuation
4. Bank should focus on improving the performance in terms of return on assets which automatically would improve the bank net interest margin and cause strength of banks.

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