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Determinants of non-performing loans in the United Arab Emirates conventional banks

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Abstract
This study attempts to define the bank-specific and macroeconomic determinants of non-performing loans in sixteen conventional banks operating in the United Arab Emirates during the period 2013-2019. The study analyzed the data from banks' annual reports and data streams database where standard descriptive statistics and random effect model for hypothesis testing were used. The independent variables were regressed against non-performing loans ratio by using GRETL statistical tool. The study concluded that the determinants of the non-performing loans were the Return on Assets that had significant negative relationship with the non-performing loans, and Liquidity, and Loans to Deposits Ratios that had significant positive relationship. However, other bank-specific and macroeconomic factors were not a determinant of non-Performing Loans Ratio. Therefore, this study suggests that conventional banks in United Arab Emirates must develop new investments instruments as major source of income rather than relying heavily on lending activities. Additionally, it is especially important to improve the management efficiency of the operating expenses and keep good assets quality. Furthermore, this study suggests measuring the impact of more variables on the non-Performing Loans for longer period of study to have more accuracy and results' generalizations.

Keywords: Non-performing loans, bank-specific, macroeconomics, UAE banks

1. Introduction
The economic importance of banks stems from their role in stimulating the economy in creating development opportunities and attracting savings that are unable to create investment opportunities and direct those savings within a certain strategy and mechanism towards places of demand on savings for the purposes of their use in investment and the development of economic activities. Banks are better able to absorb economic shocks in the event of an economic recession and weakness in the elements of development while there are external pressure factors like economic, social, and political factors. Banks provide necessary financing to support the demand for funds and are therefore the primary driver of liquidity at the level of their economies from financial savings units to investment units or economic activity. Despite this important role played by banks, they face different types of risks such as credit risk, interest rate risks, liquidity risks, market risks, political risks and other risks that may cause heavy losses to this financial sector and result in temporary financial hardship or shortage if it is not managed well which might become a financial distress within a quick period that may eventually lead to bankruptcy. In the other hand, an efficient credit risk management safe banks from financial distress and unexpected losses (Bhattarai, 2016) [13]. Therefore, the current study will address the factors affecting the level of credit risk, which in turn reflects the high level of non-performing loans with banks and is considered one of the most worrying factors for bank managers and heads of credit units of those banks (Nyabicha, 2017) [42], where these risks are the inability of borrowers to pay their obligations to banks either for reasons resulting from their mismanagement of borrowed funds and therefore their poor performance or for reasons beyond their control, but in both cases commercial banks are the biggest losers which Savers' money is exposed to the risk of losing or part of it because they are sometimes unable to withdraw their money from banks easily. Accordingly, it is difficult for banks to avoid this type of risk, so banks always strive to reduce the level of these risks and their negative effects on their performance by identifying the factors leading to these risks and the means available to these banks to deal with them and reduce their disadvantages.

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However, when borrowers are unable to pay their loans or interest to the banks on time, the loans will be categorized as NPLs in most financial sectors which is the most critical issue in banking industry. Furthermore, the International Monetary Fund assumes that loan became a NPL once borrower does not pay the outstanding amount to the bank for more than ninety days whether that amount is an interest that has been renegotiated, promoted, or deferred for the period of ninety days.

There have been many reasons for the increase in NPLs in the world's banking services, including economic environments, political factor, wars, poverty, unemployment, lending policies, and requirements. NPLs played a major role in many economic crises at the level of entire banking agencies and at the level of some countries and regions. This issue gained great importance, especially after the economic crisis in 2008, and therefore there has been considerable interest in research on the causes and impact of non-performing loans on the world economy.

Banking sector in the United Arab Emirates (UAE) is not away from the international financial systems where it is affected by them and the global changes and developments where any positive development in the sector would lead to a better performance and more prosperity which will be reflected on the national economy. However, UAE banking sector is one of the largest sectors in the Middle east and North Africa where the total assets in 2019 reached to almost AED 3.1 trillion and total deposits around AED 1.88 trillion [1]. The studies conducted in UAE about the determinants of NPLs in the conventional banks are limited. However, there are some studies such as: were conducted to define the determinants of the banks' profitability in UAE including some risk factors. Accordingly, the current study attempts to close this gap and define the factors that lead to NPLs in the UAEs' conventional banks through analyzing the data using panel data approach and regression model for the period 2013-2019. The current study used group of micro-economic and financial ratios to determine which ratios are determinant of NPL in the UAEs' conventional banks.

The main objective of this study is to define the determinants of NPL in the UAE conventional banks using the profitability ratios measured by ROE, ROA, CAR, OER, LR, LDR, UER, INF, and GDP which will be evaluated over the period of seven years from 2013-2019 using an appropriate statistical approach and measurements. In addition to filling the gap on the shortage in the research topics in UAE banking sector. Another contribution of the current study is giving a guidance to bank managers, policy makers, and regulators for more focusing on the factors that lead to NPLs and develop the course of actions that have to be taken to minimize the level of NPLs and affect positively on the overall performance of the banks.

The rest of this paper is organized as follows: section 2: materials and methods, section 3: results and discussion section 4: conclusions and recommendations.

2. Materials and Methods
2.1 Literature Review (this study)
2.1.1 Theoretical and conceptual background: practically, there is no worldwide unified definition of NPL.

Accordingly, an appropriate in one country may not be suitable for another country, but NPLs are generally defined as the amounts that pass 90 days and have not been repaid by borrowers, whether loan's installments or interest and commissions argues that repayment of the loan as agreed will not be achieved if the borrower does not commit to repayment for any reason. Credit risk starts from this point as an issue where banks begin the first step of fighting such dilemma and dealing with the circumstances of this risk. However, banks encounter this main type of risk all the time due to the nature of its activities stressed that banks play great role in the stability of their financial system through minimizing credit risk, monitoring the lending circle and loans quality. Furthermore, allocating enough resources to increase bank's lending capacity is particularly an important activity. Furthermore, banks must carefully watch the factors that lead the lending activities into NPLs' problem. The following theories explain the banks' performance theoretical framework:

2.1.1.A The Commercial Loan Theory: This theory is the oldest theory dealing with the basic activities of banks, stating that banks should only grant short-term loans and commercial papers that considered to be self-liquid. This theory came to guide banks about the type of facilities they grant to customers. Therefore, short-term loans are most appropriate to the banks who rely heavily on customer deposits, because deposits can be withdrawn at any time and therefore short-term, indicating that this theory is not in line with banks that maintain large reserves to support economic development through industrial and real estate loans as long-term loans and therefore this theory creates gap in economic development. Thus, followers of this theory believe that short-term loans are the normal context of bank credit, especially since this theory is not aware of the relative stability of bank deposits despite of withdrawals on deposits, which are not usually at the same time, which shows the relative stability of deposits allows banks to use them for reasonable periods without high risks to banks of sudden lack of liquidity when needed. Despite the flaws of this theory, most banks in the world are always trying to apply the basic principle of this theory of short-term lending and the procedures for granting loans and facilities, so thinkers emphasize that understanding the activities of banks depends heavily on understanding the history and environments of these banks, evaluating their activities, and thus understanding this theory.

2.1.1.B Shift ability Theory: Is a process and methodology of transferring part of bank's assets into highly liquid assets during the lack of liquidity. This theory assumes that banks' ability to transfer some of their assets to others easily at predictable prices determine the liquidity of these banks. Shift ability theory came to guide banks to expand the type of their assets by retaining or owning the easy transferable assets such as convertible investments and government securities as a source of liquidity rather than depending on loans which will also maintain these highly liquid assets available to the banks associated with their assets. Furthermore, Shift ability theory is not replacing the commercial loans theory but came to introduce the easy convertible assets as an addition to the principles of the

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[1]Central Bank of the UAE annual report, 2019, P44-45

commercial loan's theory. However, the main weakness of this theory is that the theory assumed banks could meet their needs for liquidity by easily transferring some assets into liquidity, which cannot be applied with all banks.

2.1.1.C The Anticipated Income Theory: In 1944, H.V. Prochanow made a comprehensive study on loans and banks activities in which he developed a new theory called "Anticipated Income Theory" that mainly focused on long-term loans and facilities and assumes that banks should lend their clients based on their anticipated income but not the current value of their assets. conducted a study where they concluded borrowers pay their loans to banks through the expected cash flow or the profit of their business but not through liquidating their assets as in the commercial loans theory or by selling the existing loans to other lenders regardless the borrowers' characters or business activities. However, the anticipated income theory did not deal with the fact that reserves are main sources of liquidity for any bank but came to make the attention of researchers and thinkers to the best types of loans to the banks. In addition, anticipated income theory agreed with the principles of the commercial loan theory but could not compete with the shift ability theory.

2.1.1.d The Credit Risk Theory: This theory refers to delaying the risk of inability to repay the instalments or interest owed by the bank or the borrower. However, the risk according to the credit risk theory is coming from the inability of the banks to meet their obligations toward their lenders or depositors due to the losses of capital and interest or the exposure to big losses due the borrower's inability to pay their loans' instalments and interest to the banks which is currently called NPLs. However, for banks to minimize the risk of NPLs, they make credit check and ask borrowers for an insurance from a third party on their loans, mortgages or guarantees regardless of the type of guarantee. In addition, the cost of borrowing including fees and interest is affected by the level of risk that the lenders is exposed to.

2.1.1.e The Liability Management Theory: This theory indicates that the traditional methods used by banks in managing liquidity and obligations are not important because of the possibility of obtaining liquidity through short-term debt instruments in the capital market when there is a need to fill the required liquidity deficit and cash reserves. This means that bank does not only focus on managing obligations, but also on asset management. The theory of liability management emphasizes the importance of the composition and bank's asset's structure to provide liquidity when needed. In addition, liability management theory addressed liquidity indicating that bank can use its liabilities to provide the necessary liquidity for withdrawals of depositors and demand for loans. Furthermore, a bank that is unable to provide proper liquidity to finance the demand for loans and facilities requested by its depositors will not be able to hold these depositors for a long time.

2.1.1.f Financial Intermediation Theory: This theory relates to the transfer of surplus units from their owners through bank deposit to deficit units made up of loan demand. Noted that financial intermediary can be distinguished by four criteria: the first is deposits, which are the main obligation of these financial institutions to the deposits holders, which are considered as fixed cash block that has nothing to do with the performance of the bank's portfolio. Secondly, deposits are by nature short-term and are shorter than assets. Third: The bulk of banks' obligations to third parties are withdrawn upon request. Fourth: The assets and obligations of banks are not easily and quickly transferable to liquidity. The most important contribution of the financial intermediation theory towards financial intermediary is the continuous flow of funds from surplus units to deficit units.

1.1.g The Theory of Delegated Monitoring of Borrowers: This theory refers to the importance of monitoring and collecting information about the borrower before and after the loan is granted by the bank, including reviewing, and examining loan applications, continuously assessing borrowers' credit worthiness, and examining the borrower's compliance with the contract requirement. Taking into account the good information available to the bank about customers through the management of their current accounts and thus provide large amount of information and data about the movement of the customer's cash flows, sources of income and spending movement, this is very important criteria from the point of view of the theory of delegated monitoring of borrowers as it is especially in the case of small and medium scale companies regarding the role of banks in the payment system of these institutions demand. This financing process begins with the collection of information to select the expected borrowers under the so-called "know your customer" due to the importance of this step before entering into credit details, and the use of financial statements and obtaining credit report on the customer from accredited entities and access to customer's credit history are key sources of customer study before granting credit.

2.2 Empirical review and hypothesis development
Bank specific and macroeconomic factors are main factors that affect the financial system stability. However, the NPLs are of important to be studied carefully by banks and other entities who are affected by such factors. This would help policy and decision makers in building up an efficient prevention measurement. Several studies have been conducted worldwide to identify the determinants of bad debt in the banking sector where some of them were conducted on a single country while others were made in one region or different countries together. In addition, each research studied a group of factors to identify which one affects the NPLs and which does not. However, there are no uniformed group of factors that all researchers used to identify as the determinants of NPLs in the banking sector. In a study about the determinants of NPLs by identified CA, ROA, ROE, liquidity, bank size, GDP, inflation rate, UE, volume of deposits and interest rates as determinants factors of NPLs. investigated the determinants of bad debts in Greek financial sector and concluded that ROA, ROE, and GDP affect NPLs negatively, while UE and inflation rate have positive affect. In the other hand, CA ratio and LDR have insignificant relationship with NPLs. In another study by on 20 banks in Indonesia concluded that GDPG and

inflation rates impacted negatively the NPLs, and the ROE have significantly positive relationship with NPL. Another investigation of the determinants of NPLs in the Indian public banking sector by concluded that CAR have negative significant effect on NPLs. In addition, a study about the effect of bank-specific and macroeconomic factors on the NPLs in the Jordan commercial banks for the period 2008-2012 by concluded that the inflation significantly and negatively affected the NPLs. In Bangladesh, concluded in a study about the factors that affect the NPLs that unemployment rate significantly affect the NPLs. In their study, measured the relationships between internal and external factors and bad loans in the banking sectors of Italy, Greece, and Spain during the period 2004-2008, they concluded a negative relationship between the NPLR and GDPGR and ROA. In the other hand, the study found a positive relationship between NPL and UER. In contrast, Saba *et al*. (2012) as cited by concluded in a study that there is positive relationship between GDP and NPLs. In a study by about the factors that affect loans' quality, it revealed that the inefficiency and poor cost control increases the NPLs. Other study by investigated the effect of profitability on NPLs and concluded that ROA and ROE have negative relationship with NPLs. In the other hand, examined the effect of banks' specific factors on the loans' quality of Eurozone banking system for the period 2000-2008 and revealed that ROA had insignificant relationship with NPLR which is contrasted with who conducted a research in the MENA region on the NPLS and found that ROA has significant negative impact on NPLs.

On the bases of the above literature and empirical review, the current study is seeking to measure the relationships between the non-performing loans and ten bank-specific and microeconomic factors in the United Arab Emirates (UAE) conventional banks during the period 2013-2019 namely: CAR, OER, LRR, LDR, ROA, ROE, UER, INFR, and GDP. Accordingly, the researcher developed the following null hypotheses:

H01: Capital adequacy ratio (CAR) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H02: Operating efficiency ratio (OER) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H03: Liquidity ratio (LRR) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H04: Loans-to-deposits ratio (LDR) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H05: Return on assets (ROA) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H06: Return on equity (ROE) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H07: Unemployment ratio (UER) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H08: Inflation rate (INFR) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

H09: Gross domestic product (GDP) has no significant effect on the non-performing loans (NPLs) in UAE conventional banks.

2.3 Methodology

2.3.1 Conceptual framework: The conceptual framework is a design that researchers make to predict and explore the correlation between variables to meet their studies' objectives. In addition, it is a design pictorial guided by models and theories where the researcher show the links between the dependent and independent factors to measure the relationships between these factors, Therefore, the following is the conceptual framework developed by the researcher based on the review of the pervious literature and empirical studies:

Fig 1: Conceptual framework of the study

Independent Variables	Prior Expectation		Dependent Variable
Capital Adequacy Ratio (CAR) Total Capital / Total Assets	$\beta1 < 0$		
Operating Efficiency Ratio (OER) Total Operating Expenses/Total Assets	$\beta2 < 0$		
Liquidity Ratio (LR) Liquid Assets / Total Liabilities	$B3 > 0\ or < 0$		
Loans -to-Deposits Ratio (LDR) Total Loans & Advances / Total Deposits	$B4 > 0$		Non-Performing Loans Ratio (NPLR) Non-performing Loans / Total Loans & Advances
Return on Assets (ROA) Net Income/Total Assets	$B5 < 0$		
Return on Equity (ROE) Net Income/Owners Equity	$B6 < 0$		
Unemployment Ratio (UER)	$B7 > 0$		
Inflation Rate (INFR)	$B8 > 0$		
Gross Domestic Product (GDP) Annual GDP growth rate	$B9 < 0$		

Source: Researcher's own Conceptualization

Data and research method: The primary data used in the current study were collected from the audited financial reports of sixteen commercial banks operating in the United Arab Emirates (Table 1) over the period of 2013-2019 which consists of 112 observations. These data are statistically classified under the pooled time-series and cross-sectional data for high accuracy of statistical results. The secondary data were collected from the published annual reports of the UAE central bank, the Securities and Commodities Authority, the previous empirical studies,

literature reviews, and some reports from the internet. The sample size is 13 local commercial banks out of 14 banks, in addition to 3 foreign banks who published their audited financial reports on their websites for the period 2013-2019. The pooled time-series and cross-sectional data are used to find out the determinants of NPLs in the UAE banking sector through applying an appropriate statistical method to reveal the relationships between the NPLs as a dependent variable and a group of independent factors.

2.3.3 Dependent variable: The researcher uses the NPLR measured NPLs to total loans and advances as dependent variable which is good measure of bank's credit risk management and loans efficiency management. Furthermore, determining the NPLs' level would be crucial importance to the bank to avoid unhealthy financial situation and take proper measurements and action to avoid financial distress through revealing the variables that have significant effect on this level. In addition, high level of NPLR is bad signal to the bank management and credit supervisors which indicate high risk and low quality of assets, and negatively affect the overall bank's efficiency and performance.

2.3.4 Independent variables: There is big number of factors that would affect the NPL level in the banking sectors. However, most of the researchers studied bank-specific and microeconomic variables. The current study highlights a group of independent bank-specific and microeconomic variables that would affect the NPLs ratio, these factors are limited within the following variables as based on the most previous studies and availability of data:

- **Capital adequacy Ratio (CAR):** This ratio is measurement of total capital to total assets and an indicator of the bank's need for an external funds to finance part of its activities. However, "Capital adequacy ratio according to the Basel criteria amounts to 8% of risk weighted assets and based on the principle of caution: the banking regulatory and supervision agency (BRSA) imposed an additional 4% requirement". The current study predicts negative relationship between CAR and NPLR in the United Arab Emirates conventional banks.

- **Operating efficiency ratio (OER):** This ratio is defined as operating expenses to total assets. Efficient operating expenses management reduces bank's cost structure and thus improves the bank's profitability. The high ratio implies efficient management of operating expenses and deteriorating bank profits. On the contrary, a low ratio refers to effective management of operating expenses that will eventually translate into higher profits. In a study conducted by on the efficiency of the management of public sector banks and their impact on profitability, it was concluded that there is strong positive relationship between NPLs and problems of inefficiency. However, the current study expects negative relationship between OER and NPLs.

- **Liquidity ratio:** This ratio refers to the sum of liquid assets divided by total liabilities and is considered one of the main indicators of the efficiency of bank's liquidity management. In addition, insufficient level of liquidity to meet the bank's obligations and liabilities is

one of the main reasons behind the failure of banks, and the rise in the level of liquidity beyond the needs of banks indicates mismanagement of liquidity and thus high opportunities costs. In a study conducted by concluded that bank's liquidity affects positively the ROA and therefore affects the NPL. On the contrary, concluded in a study on factors affecting the performance of banks that liquidity negatively affects the profitability of banks. As for the current study, it expects that there is no statistically significant negative relationship between liquidity in UAE banks and NPLs

- **Loans-to-deposit ratio:** This ratio refers to the efficiency of banks in managing deposits and the extent to which they are dependent on financing for third parties and therefore reflects the extent to which banks rely on their external sources in providing facilities and loans to their applicants, so it is an indicator of the ability of banks to regulate and control credit; The quality of loans is reflected positively on the profit margin through higher interest on those loans. However, some studies have shown that the ratio of loans to deposits has had little impact on NPLs, such as a study conducted by on Greece's banking sector, which concluded that the ratio of loans to deposits has little impact on the level of NPLs. In the UAE, the researcher expects a positive relationship between NPLs and the ratio of loans to deposits due to the increase in customer deposits which increases the granting of credit facilities to third parties and result an increase in likelihood of weakness in the process of granting and managing credit facilities and thus leads to a rise in the volume of NPLs.

- **Return on Assets (ROA):** The ROA is one of the most important measures of the overall banks' profitability which indicates the bank efficiency in making profits using its assets. Many studies used ROA as proxy of overall performance such as. Furthermore, the level of ROA gives an indication of the financial performance. In addition, the relationship between ROA and NPLs is theoretically ambiguous, and the ROA depends on many factors including the accuracy of expected return for investors especially when the expected investment returns of banks are greater than real return, which opens up prospects for the decline in the ability of these investors to meet their obligations to banks and thus higher levels of NPLs. As for the current study, it expects that there is significant negative relationship between ROA and NPLs in UAE.

- **Return on Equity (ROE):** This ratio measures the rate at which the bank achieves profits as a result of its investment of equity and is therefore one of the main indicators of profitability, the high ROE shows the efficiency of management in investing the bank's private funds that come from the equity of shareholders, and therefore the high rate of ROE. As for the association of this indicator with NPLs, the relationship between them can be negative when there are high profits due to the decrease in the volume of NPLs and on the other hand the rate of ROE may be high because the owners' equity is basically low which means the bank is more dependent on obligations and that would cause the risk of inability to pay, so this reality

increases the likelihood of NPLs because there are not enough sources of self-funds to deal with the credit process and improved management efficiency in the lending process and its control to reduce NPLs. The current study expects significant negative relationship between ROE and NPLs in UAE banking sector.

- **Unemployment:** This defined as the number of unemployed when compared to the size of the workforce. However, the increase in the unemployment rate negatively affect the purchasing power of individuals and increases the burden of liabilities which leads to an increase in the NPLs. Unemployment is one of the most important factors affecting the economies of any country, which clearly reflects on the size of per capita income and its ability to meet the requirements of life and its obligations to others, as increasing unemployment rates in an economy reduces the likelihood of borrowers paying off their obligations to lenders such as banks and other financial institutions and therefore it is expected to increase NPLs. The current study expects significant positive relationship between unemployment and NPLs in UAE.

- **Inflation:** There are different opinions about the impact of inflation on NPLs, some of whom believe that the increase in inflation leads to an increase in NPLs due to the financial conditions of the borrowers, and others see the exact opposite, but theoretically inflation affects NPLs negatively on the grounds that high inflation strengthens the ability of borrowers to pay off their debts due to the decline in the real value of those debts. Interest on loans with banks thus increases loan costs and reduces borrowers' cash flows, which has negative impact on borrowers' ability to pay off their debts. The current study expects significant positive relationship between inflation rate and NPLs.

- **Gross Domestic Product (GDP) growth:** The GDP growth rate is an indication of an improvement in the economy and has positive impact on the income and thus obtaining appropriate financing from banks at low-risk costs and therefore the ability to pay off obligations comfortably, which clearly affects the low levels of NPLs at banking sector and vice versa. As for studies conducted on NPL determinants; many of them concluded a negative relationship between GDP growth rate and NPLs, as the higher the GDP, the lower the NPLs' in the banking sector and on the contrary, some studies such as a study conducted by found that there is positive relationship between the rate of GDP and the level of NPLs based on the fact that higher GDP leads to higher returns of banks and income of individuals and companies. This makes banks expand their lending process and thus raise the probability of NPLs. However, the current study expects significant negative relationship between GDP and NPLs in UAE.

2.3.5 Model Specification: The current study applied the central tendency measurements on 16 conventional banks operating in UAE and listed in the Stock Exchanges (Table1) with total observation of 112 for the period of 2013-2019 to analyze the primary data. Additionally, the Multicollinearity test was used to observe whether the explanatory variables were highly correlated or not, panel data regression model and the fixed effects model were also used at the time of concentrating on specific set of N entities and the results are restricted to the behavior of these N entities as many studies used the same context and structure such as the studies of However, other studies use the random effects model when the dependent and independent variables are not correlated to each other. The used panel data regression model in the current study is a set of data called longitudinal consisting of time series (t= 1 to T periods) and cross-sectional data (n cross-sectional units, denoted i= 1 to N), the study also used the total observation of n*T to measure the statistical regression to define the determinants of NPLs in the UE conventional banks among the following independent factors (figure 1): CAR, OER, LR, LDR, ROA, ROE, UER, INFR, and GDP. The Panel Data Regression model is illustrated as follow:

$$NPLR_{it} = \alpha_0 + \beta_1 CAR_{it} + \beta_2 OER_{it} + \beta_3 LR_{it} + \beta_4 LDR_{it} + \beta_5 ROA_{it} + \beta_6 ROE_{it} + \beta_7 UER_{it} + \beta_8 INFR_{it} + \beta_9 GDP_{it} + \varepsilon_{it}$$

Where
NPLR is the non-Performing Loans Ratio (dependent variable)
α_0 is the intercept
β_1-β_9: Coefficients of determinants of NPLR.
CAR: Capital Adequacy Ratio
OER: Operating Efficiency Ratio
LR: Liquidity Ratio
LDR: Loans-to-deposits ratio
ROA: Return on Assets
ROE: Return on Assets
UER: Unemployment Ratio
INFR: Inflation Rate
GDP: Gross Domestic Product
i (number of bank): 1,2, …. 16
t (time-interval): 1, 2, …. 8
ε: Error term

The *β_1-β_9 will be* statistically assessed and the restrictions in the above Panel Data Regression model are based on the economic theory, previous studies, and the following signs:

$\beta_1<0$, $\beta_2<0$, $\beta_3>0$ or <0, $\beta_4>0$, $\beta_5<0$, $\beta_6<0$, $\beta_7>0$, $\beta_8>0$, $\beta_9<0$

This sign ($\beta<0$) indicates that an increase in the independent variable will result in a decrease in the dependent variable and vis versa in case of *($\beta_1>0$) sign. In addition, ($\beta>0$ or <0) indicates no effect.*

Table 1: The sample of the study - Commercial Banks Operating in the UAE

S. N.	National Banks	Foreign Banks
1.	Abu Dhabi Commercial Banks	Bank of Baroda
2.	Invest Bank	HSBC Bank M. E. L.
3.	Al Masraf Bank	Al Khaliji Bank
4.	Commercial Bank of Dubai	
5.	Emirates NBD	

6.	MASHRQ Bank	
7.	Bank of SHARJAH	
8.	Union Arab Bank	
9.	RAK Bank	
10.	Commercial Bank International	
11.	National Bank of Fujairah	
12.	NB of Um Al Quwain	
13.	Emirates Investment Bank	

Source: Central Bank of the United Arab Emirates, May 31, 2020

3. Results and discussion

3.1 Panel Unit Root Test: The current study uses the panel unit root test through applying Levin-Lin-Chu and Choi meta tests for the verification of the following variables for stationarity: non-Performing loans Ratio (NPLR), Capital Adequacy Ratio (CAR), Operating Efficiency Ratio (OER), Liquidity Ratio (LR), Loans-to-Deposits Ratio (LDR), Return on Assets Ratio (ROA), Return on Equity Ratio (ROE), Unemployment Ratio (UER), Inflation Rate (INFR), and Gross Domestic Product (GDP). Table 2 shows that NPLR, CAR, LR, LDR, ROA, ROE, INF, and GDPR are stationary and representing 100% while OER and UER are also stationary at level representing 98.3% and 86% respectively in one of the tow tests.

Table 2: Panel Unit Root Test (PURT) Results for stationarity

PURT	Probability									
	NPLR	**CAR**	**OER**	**LR**	**LDR**	**ROA**	**ROE**	**UER**	**INF**	**GDPR**
Levin-Lin-Chu	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.140	0.000	0.000
Choi meta test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Computation of the statistical data from the banks' annual reports (2013-2019) using GRETL

3.2 Descriptive Statistics: The current study's descriptive statistics for the period 2013-2019 are presented in figure 2. The figure shows that the average value NPLR is 0.0676 which means out of 1 dirham loans and advances granted to borrowers, a 6.76% became NPLs and the average highest NPLR reached to 17.5% during the period 2013-2019 while the minimum was 0.07%. These results indicate that the average NPLR in UAE banking sector was quite high, close to the global average of 6.1% [2] and is at the second lowest level in the MENA countries after Saudi Arabia [3]. However, the minimum average during the investigated period shows that some banks in UAE were able to maintain low level of NPL due to their lending policy and taking care of the lending risk factors. In addition, some banks reached high NPLs level of 17.5 % because of their credit management system and a lenient lending policy. In terms of CAR, the descriptive statistics shows that the mean value of CAR in the UAE banking sectors during the period 2013-2019 was 18.2% which was within the requirements of the UAE central bank of minimum of 11.75% in 2017 and 13% in 2019 [4]. The minimum value was 0.06933 and the maximum was 0.9991. The mean of 18.2% indicates that banking sector in UAE was keeping adequate capital during the investigated period to meet the solvency risk. However, some banks were not able to meet the order of the central bank where the minimum CAR value in some banks was less than the requested value by almost 4%. In the other hand, the mean value of CAR indicates that more than 50% of UAE banks exceeded the minimum capital requirements during the period 2013-2019.

The mean of OER in UAE banking sector during the 2013-2019 was 0.01646 indicating that the average operating expenses were 1.646% of the total assets, this average is still high compared to the banks' average ROA of 1.277%. In addition, the highest OER during the investigated period was 0.0476 and the lowest was 0.0023 in some banks. However, the mean value of OER is indicating that there is a need for improving the quality of assets and watching their operating cost and main sources of income. Figure 2 also shows that the average LR of UAE conventional banks during 2013-2019 was 0.283 which is equal to almost 2.8 times of the minimum required ratio by UAE central bank of 0.10 to keep banks safe and sound taking into consideration that banks must balance between profitability and liquidity levels as high liquidity usually causes lower profitability. In the other hand, LDR revealed that the mean value was 0.878 indicating that banks in UAE financed 87.80% of loans and advances from deposits, the minimum average value of LDR was 0.0649 and the maximum average value was 1.20 which means that some banks in UAE during the period 2013-2019 were using all their liquidity for lending and 21% of loans and advances were financed through other resources. The average value of ROA in UAE commercial banks was 0.01277 indicating that the average return on assets that banks in UAE achieved was 1.28% of their total assets during the period 2013-2019. However, the minimum average value was -0.10 and the maximum was 0.0475 indicating that the average ROA that banks in UAE achieved was 1.28% of their total assets during the period 2013-2019. In the other hand, the mean of the ROE was 0.067 and some banks got a maximum of 0.223 and a minimum of 1.97. The average value of ROE indicates that more than 50% of UAE banks made a net profit of 6.7% on their equities which is an acceptable compared to the average inflation rate of 1.86% during the same period in the UAE [5]. This means that banks at the time were effective in using their own resources to make reasonable returns. The average UER during the investigated period was 0.022 while the maximum rate reached to 0.026 and the minimum was 0.016 which
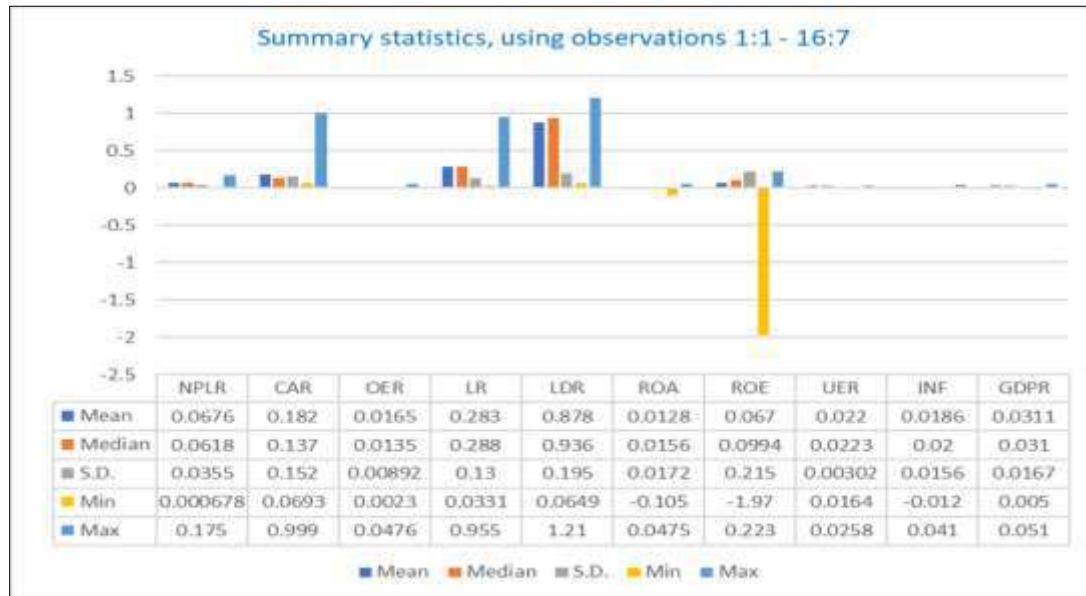
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[2] The Global Economy (https://www.theglobaleconomy.com/)
[3] The Global Economy (https://www.theglobaleconomy.com/)
[4] Central Bank of the UAE annual report, 2017, P7-10

[5] The researcher calculations using GRETL

indicates that the UAE economy accommodated almost 98% of the work force, this is an indication of healthy economy and diversity of work opportunities. Additionally, the INFR over the review period was 0.01757. The highest level of 0.041 were recorded during the same period and the lowest was -0.012, these figures are an indication of low inflation where governments usually target a rate of 0.020. The average low inflation rate in UAE during the period 2013-2019 contributed toward economic stability which was reflected on investments, saving levels in banking sector, and the overall economic growth. Figure 2 is showing an average of 0.03114 Gross domestic product with maximum value of 0.05100 and minimum value of 0.005, these figures indicates that the UAE economy was expanding during the period 2013-2019 as far as the GDP growth rate was positive which affected the economic growth and development.

Summary statistics, using observations 1:1 - 16:7

	NPLR	CAR	OER	LR	LDR	ROA	ROE	UER	INF	GDPR
Mean	0.0676	0.182	0.0165	0.283	0.878	0.0128	0.067	0.022	0.0186	0.0311
Median	0.0618	0.137	0.0135	0.288	0.936	0.0156	0.0994	0.0223	0.02	0.031
S.D.	0.0355	0.152	0.00892	0.13	0.195	0.0172	0.215	0.00302	0.0156	0.0167
Min	0.000678	0.0693	0.0023	0.0331	0.0649	-0.105	-1.97	0.0164	-0.012	0.005
Max	0.175	0.999	0.0476	0.955	1.21	0.0475	0.223	0.0258	0.041	0.051

Source: Researchers' Calculation using GRETL

3.3 Multicollinearity diagnostic: To know whether the data that are used in the current research are free from multicollinearity problems, the researcher measures the correlation level of independent variables by using the Variance Inflation Factor (VIF). Table 3 shows that the data have no collinearity issues as the Variance Inflation Factor is less than 10 for all independent variables.

Table 3: Variance Inflation Factor (VIF) – Collinearity

Independent Variable	Variance Inflation Factor
CAR	1.226
OER	1.079
LR	1.330
LDR	1.288
ROA	5.416
ROE	5.059
UER	1.200
INF	1.258
GDPR	1.157
VIF(j) = 1/ (1 - R(j)^2), where R(j) is the multiple correlation coefficient between variable j and the other independent variables	
Minimum possible value = 1.0 and if	
Values > 10.0 may indicate a collinearity problem	

Source: Researchers' Calculation using GRETL

3.4 Fixed-Effects and Random-Effects Models: Fixed-Effects and Random-Effects Models are used to regress the dependent on the independent variable. However, if the coefficients of the independent variables are different in both models, the correlated random effect- Hausman test is used to determine which models is more appropriate panel estimator to be used in the current study. Table 4 shows that the individual coefficient of the independent variables is different in both models which means that Hausman test must be used.

Table 4: Fixed Effects and Random Effects Models: NPLR is the dependent variable

	Fixed Effects Model				Random Effects Models			
	Coefficient	Std. Error	z	p-value	Coefficient	Std. Error	z	p-value
const	0.0183492	0.0363685	0.5045	0.6139	0.00342732	0.0340862	0.1005	0.9199
CAR	0.0141457	0.00895483	1.580	0.1142	0.0359861	0.0140593	2.560	0.0105**
OER	−0.634973	0.237827	−2.670	0.0076***	−0.755526	0.316828	−2.385	0.0171**
LR	0.0384112	0.0226014	1.700	0.0892*	0.0673609	0.0204984	3.286	0.0010***
LDR	0.0475022	0.0146184	3.249	0.0012***	0.0521552	0.0153005	3.409	0.0007***
ROA	−1.08572	0.221772	−4.896	<0.0001***	−1.15780	0.247152	−4.685	<0.0001***
ROE	0.0163308	0.0150339	1.086	0.2774	0.0169390	0.0160039	1.058	0.2899
UER	0.971952	1.05392	0.9222	0.3564	1.02208	0.997699	1.024	0.3056
INF	−0.0649633	0.227642	−0.2854	0.7754	−0.0107539	0.227406	−0.04729	0.9623
GDPR	−0.0887539	0.193365	−0.4590	0.6462	−0.106785	0.221785	−0.4815	0.6302

Source: Researchers' Calculation using GRETL

3.5 Correlated Random Effects - Hausman test: As table 4 shows different coefficients of independent variables, the researcher uses the Hausman test (Table 5) to determine which model is best suitable with the data sets through the measurement of the correlations between the unique errors and the regressors. In case of a correlation, the Fixed Effect Model (FEM) is preferable; otherwise, Random Effects Model (REM) is more suitable.

Table 5: Results of the Random Effects-Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	68.2137	6	9.4994e-013

Source: Researchers' Calculation using GRETL

Table 5 shows that the Chi-Sq. statistic is 68.2137 and the probability (p-value) is (9.4994e-013) which is statistically insignificant, this indicates that the null hypotheses is accepted. These results are favoring the use of the random-effects model (REM). Therefore, the researcher for further discussions uses the Random Effect model as shown in Table 6.

Table 6: Summary of Regression Result using the Random-effects model

Variable	Random-effects model (REM)
Constant	0.00342732 (0.9199)
CAR	0.03598610 (0.0105) **
OER	−0.7555260 (0.0171) **
LR	0.06736090 (0.0010) ***
LDR	0.05215520 (0.0007) ***
ROA	−1.157800 (<0.0001) ***
ROE	0.01693900 (0.2899)
UER	1.02208 (0.3056)
INF	−0.0107539 (0.9623)
GDPR	−0.1067850 (0.6302)
Chi-square (6)	68.2137 P-value 0.894239
S.D. dependent variable	0.035498 Hannan-Quinn -451.9497
S.E. of regression	0.029211 Durbin-Watsonz 1.781916

Source: Researchers' Calculation using GRETL

Note: The value in parentheses for variables are P-value, and the value against the regression coefficient.

3.6 Discussion
3.6.1 Capital Adequacy Ratio (CAR): This ratio has statistically positive effect on the NPLR in the UAE banking sector, where the CAR p-value was 0.0105 at 5% level of significant and the regression coefficient was 0.0036 as indicated in table 6. This result means that 1% increase in CAR causes an increase in the NPLR by 0.0036%. This finding does not support H01, and it is consistent with the conclusion of who found that the increase in capitalizations is followed by an increase in the NPLs. It is therefore especially important to the UAE conventional banks not to depend heavily on their capital to meet the demand on loans and advances but to diversify their sources to meet this demand and they must carefully study all loans applications to minimize the NPLs as possible as they can.

3.6.2 Operating Efficiency Ratio (OER): The statistical results stated in table 6 shows that the OER statistically has negative impact on NPLR at 5% level of significant where p-value was 0.0171 and the regression coefficient was -0.755526. This means an increase of 1% in OER was accompanied with a decrease of 0.76% in the NPLR which indicates that the higher the operating expenses to total assets, the lower the NPLR to total loans and advances. This result does not support hypothesis H02. The result have contradiction with the findings of who concluded that poor cost control increases the NPLs. Additionally, concluded in a study of the Impact of Macroeconomic and Endogenous Factors on Non-Performing Bank Assets that there is significant positive relationship between NPLs and OER. It is therefore especially important to the UAE conventional

banks to manage their main activities to keep the OER as low as possible through improving the management efficiency of the operation expenses and hold good assets quality, this would pave the way for these banks to improve and diversify their business activities instead of concentrating in lending activities that increases the probability of NPLs.

3.6.3 Liquidity Ratio (LR): There is a statistically significant positive effect of LR on the NPLR in the UAE conventional banks during the period 2013-2019 that p-value was 0.0010 and the regression coefficient was 0.0674 which is not consistent with hypothesis H03 and indicates strong positive relationship between LR and NPLR where an increase of 1% in LR associated with 0.0674 increase in NPLR which is matching with the fact that high LR indicates that banks have high level of non-working assets in their custody, this causes a trend for more lending activities to employ the unutilized funds and increase the probability of NPLs. This result is in consistent with the findings of who concluded that LR has statistically significant positive effects on the NPLE. It is therefore conventional banks must continuously explore new type of investments as new source of income rather than relying heavily on lending activities to minimize NPLs levels where high level of liquidity makes banks look for more uses of funds to generate new income through more lending which increases the probability of NPLs.

3.6.4 loan-to-deposit ratio (LDR): Table 6 shows that LDR has statistically significant positive influence on the NPLR at 5% level of significance where p-value was 0.0007 and the regression coefficient is 0.05216. This means that an increase of 1% in LDR would increase the NPLR by 0.052%. The result is not matching with the prior expectation of H04, but it is consistent with the findings of on the Indian banking sector who concluded that NPLs have been positively and strongly affected by LDR. Accordingly, conventional banks in UAE can minimize the risk of NPLs by decreasing the LDR through creating new type of investments instruments and opportunities to balance between the different uses of available funds which decrease the level of NOLs.

3.6.5. Return on Assets Ratio (ROA): The statistical results reflected in table 6 revealed that the ROA statistically has significant negative impact on NPLR at 5% level of significance where p-value was 0.0001 and the regression coefficient was -1.1578. This result means that a 1% increase in ROA was associated with 1.1578% decrease in NPLR which is not consistent with H05 and supported by who measured the impact of ROA on NPLs in a study and concluded that a decrease in ROA is associated with an increase in NPLs and vice versa. However, when ROA decreases, banks start looking for new and diverse types of investments as new sources of funds, but quality of assets is also important to keep ROA in an acceptable level specially during the risky periods of investments and risky environment.

3.6.6 Return on Equity Ratio (ROE): Table 6 shows that that ROE does not have significant impact on NPLR at 5%

level of significance, the p-value was 0.2899 and the regression coefficient was 0.01694 during the investigated period of 2013-2019 which means that a 1% increase or decrease in ROE was not associated with any increase or decrease in the NPLR, this statistical result is in consistent with H06 and inconsistent with the findings of a study by who found negative relationship between NPLs and ROE. Therefore, when banks can maximize the net profit out of using their own equity, which means banks have more sources of funds for financing more investments through loans and advances. This might lead for a higher probability of NPLs unless banks follow conservative lending policy to minimize the risk of inability for borrowers to repay their debts.

3.6.7 Unemployment Ratio (UER): There was positive impact of UER on the NPR at 5% level of significance as the p-value was 0.3056 and the regression coefficient was 1.02208 which indicates that 1% increase in UER would increase the NPLR by 1.0221% but this impact is statistically insignificant which supports H07, and inconsistent with the findings of a study about the determinants of NPLs by who concluded that there was a positive relationship between UER and NPLs which is in contrast with who found negative relation between UER and NPLs; whereas. In the other hand, unemployment decreases when economic is booming causing an increase in the real salaries, wages, and purchasing power of the households which increase the demand on credit and ability to repay these credits.

3.6.8 Inflation Rate (INFR): The statistically results show that the INFR does not have significant impact on NPLR at 5% level of significant as stated in table 6 where p-value equal to 0.9623 and regression coefficient was -0.010754 which indicates that a 1% change in INFR does not make any change or impact on NPLR. This result is in consistent with H08 and not supported by who concluded in a research paper that INFR has positive relationship with NPLR where the decrease in inflation rate affects positively the ability of borrowers to repay their debts which eventually decrease the NPLR. In another study conducted by it was concluded that inflation rate negatively impacted NPLs. The statistical result of the current study encourages policymakers and bank management to carefully watch the inflation changes and it is effect on the NPL levels although the statistical results shows no relationship between the two variables taking into consideration that inflation is an indicator of the economy healthiness level which will impact the purchasing power of households per capita, and ability of borrowers to repay their loans.

3.6.9 Gross Domestic Product Growth Rate (GDPGR): Table 6 reveals that statistically there is no significant impact of GDPGR on NPLR at 5% level significance. The statistical results shows that the p-value was 0.3065 and the regression coefficient was -0.1068 meaning that 1% increase in GDPGR was associated with 0.1068 decrease in NPLR, but this effect is weak and insignificant. This result is supporting H09 and inconsistent with who found in a study about the determinants of NPL in the Indian banking system that the GDPGR have significant negative impact on

NPLR which is contradicted with the argument of who found that the GDP growth rate has significant positive effect on NPLs. Therefore, the increase in GDPGR causes an increase in the level of income and financial capacity of people where the ability to repay debts will be higher which will consequently reduce the possibility of loans default.

4. Conclusions and Recommendations

Spotting the determinants of NPLs is very crucial to minimize the risk of loans' default where NPLs are key factor that reflects the soundness of the banking sector. The current study is seeking the determinants of NPLs among bank-specific and macroeconomic factors of sixteen conventional banks in the United Arab Emirates during the period 2013-2019 through applying the panel data approach and random-effects model. The bank-specific factors were limited to CAR, OER, LR, LDR, ROA, and ROE, while the macroeconomic factors are limited to UER, INFR, and GDP.

The main conclusions of this study revealed that the ROA followed by LR, and LDR are the most significant determinants of the NPLR in UAE conventional banks with the highest coefficients compared to the other bank-specific and macroeconomic variables. Accordingly, banks can diversify their investments as new sources of funds in addition to investment in quality of assets to keep their ROA healthy and would take advantages of closely watching the liquidity level to be able to make good utilization of the available liquidity and monitor the quality of loans. In other words, high liquidity ratio indicates that banks have high level of non-working assets in their custody, which causes a trend for more lending activities to employ the unutilized funds and increase the probability of NPLs. Furthermore, OER and CAR have weak implication on NPLR but not a driver of the financial performance of the UAE conventional banks, where there was negative statistical relationship between OER with NPLR and positive statistical relationship between CAR and NPLR. Therefore, banks would manage their cost of operating activities to improve their financial performance and make good utilization of their assets to improve the balance between capital and assets.

However, all other bank-specific and macroeconomic variables including ROE, INFR, and GDPGR have no vital impact on NPLR, taking into consideration that the increase in inflation would decrease the borrowers financial capacity to repay their debts to banks which will reduce the possibility of loans defaults and the way around in the case of GDPGR which the increase causes an increase in the income level and the people financial ability to repay debts which will consequently reduce the possibility of loans default.

As per the current study's findings and conclusions, the researcher suggest that UAE conventional banks must diversify their sources of funds through finding and developing new investments instruments as source of income rather than relying heavily on lending to minimize NPLs levels and at the same time they should carefully study all loans applications to minimize the NPLs as possible as they can. It is therefore especially important to the banks to improve their management efficiency and make good utilization of their assets to keep the OER as low as possible through the operation expenses and hold good assets quality. Furthermore, the researcher suggests that future studies can be done on the impact of more bank-specific and macroeconomic variables on the NPLs on all type of banks and for longer period of study such as 20-30 years to reach more accuracy and generalized results. On the other hand, this study was implemented only on the conventional banks in UAE.

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