EMPIRICAL ANALYSIS OF THE DETERMINANTS OF THE NON-PERFORMING LOANS IN AZERBAIJAN

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ABSTRACT

This paper aims to identify the factors influencing non-performing loans (NPLs) within the Azerbaijani banking sector. The study focuses on both macroeconomic and bank-specific variables as determinants of NPLs in six prominent commercial banks in Azerbaijan: Pasha Bank, Access Bank, Bank Republic, International Bank of Azerbaijan, Kapital Bank, and Unibank. The period of analysis spans from 2015 to 2021, with data obtained from publicly available reports of the selected banks. The research questions revolve around the effects of macroeconomic variables (GDP growth rate, unemployment rate, real interest rate, inflation rate, and public debt) and bank-specific variables (return on assets, capital adequacy ratio, income diversification, and total assets) on NPLs. The findings of this study indicate that return on assets (ROA) has a significant negative impact on non-performing loans (NPLs) within the Azerbaijani banking sector along with the inflation rate and unemployment rate. Furthermore, the analysis revealed that a substantial portion of the variability in NPLs across banks can be attributed to differences between the banks themselves. This suggests that each bank has unique characteristics, policies, or practices that significantly influence its NPL ratio. Policymakers, regulators, and stakeholders in the banking industry should consider these bank-specific contexts when assessing and comparing NPL ratios.

Keywords: Non-performing loans, GDP growth rate, inflation rate, unemployment rate, return on assets, CAR

INTRODUCTION

The banking sector indeed plays a crucial role in the economy of any country. It provides credit to various entities such as companies, organizations, and households, enabling them to carry out their operations, save, invest, and spend. This credit flow stimulates economic growth and development. Numerous studies highlight the positive correlation between a well-functioning banking system and high levels of economic growth (Zhang et al., 2012; Tongurai & Vithessonthi, 2018; Bukowski & Kraczkowski, 2021).

However, loan portfolios within the banking sector can give rise to several challenges. One such challenge is the issue of non-performing loans (NPLs), which contributes to the deterioration of the banking system. Non-performing loans refer to loans where the borrower has not made any payment for a period of three months (90 days). Non-performing loans (NPLs) are loans that are in default or close to default, posing a significant risk to the banking sector and the economy (Kumar, Hossain and Islam, 2020).

The presence of a substantial amount of non-performing loans poses a significant risk to banks and can lead to adverse consequences. Extensive research has been conducted on bank failures, and these studies consistently show that a large volume of non-performing loans, also known as bad debts, is a common cause of bank failures. Guo (2007) and Kumar et. al., (2020) both highlight the detrimental effects of NPLs on the banking sector, with the latter emphasizing the need for effective risk management. When banks accumulate excessive non-performing loans, their financial stability becomes compromised, and they may face difficulties in meeting their obligations, leading to potential insolvency or bankruptcy. Ghosh (2017), Diakomihalis and Economakou (2021) and Anik et al. (2020) delve into the specific challenges and potential solutions for NPLs, including their impact on bank efficiency and the need for good governance and strong monetary policy.

As of now numerous researches has been conducted to determine the factors that affect NPL in the banking system of these certain countries across the world. Similar research was conducted in Baltic countries- Denmark, Estonia, Latvia, Lithuania, Finland and Sweden(Kupčinskas and Paškevičius, 2017), Jordan (Rajha 2017), Nigeria (Akinlo & Emmanuel, 2014), Italy, Greece and Spain (Messai & Jouini, 2013), Pakistan (Khan, Siddique and Sarwar, 2020), Türkiye (Vatansever and Hepsen, 2013), sub-Saharan countries (Fofack, 2005), Bangladesh (Akhter, 2023), Guyana (Khemraj and Pasha, 2009) and India (Gulati, Goswami and Kumar, 2019) financial markets.

A range of studies have identified various determinants of non-performing loans (NPLs) in different contexts. Akinlo and Emmanuel (2014) and Kocisova and Pastyriková (2020), both found that economic growth and unemployment are significant factors, with the latter also highlighting the importance of capital adequacy and private debt ratio. Ghosh (2015) emphasized the role of bank-specific factors such as capitalization, liquidity risks, and credit assessment. Sheefeni (2015) further underscored the impact of risk assessment, monitoring, and bank-specific financial indicators. Beck, Jakubik and Piloiu (2015) and Ikram et al. (2016) expanded the discussion to include macroeconomic factors like real GDP growth, share prices, and lending interest rates, as well as bank-specific microeconomic factors such as branch age and credit policy. These studies collectively suggest that a combination of macroeconomic and bank-specific factors drive NPLs, with the specific determinants varying across different contexts.

While analyzing Azerbaijani market it is revealed that only three studies were conducted to investigate the determinants of the NPLs in the local financial market. The first research was conducted by the Kastrati (2011) who examined the impact of the macroeconomic factors across fifteen transition economies including Azerbaijan across 1994 to 2009. Based on the outcome of that research GDP growth and inflation, have significant negative impact on non-performing loans. Contrary to this finding, the latest relevant research was conducted by the Seyfullali (2020) similar to the first research, current research also examined the impact of the macroeconomic factors only. Interestingly, according to his findings, interest rate as well as inflation rate are positive and statistically significant determinants of the NPL while impact of the GDP growth rate is not significant. Contrary research conducted by Mukhtarov, Yüksel and Mammadov (2018) also includes bank specific indicators, however it only encompassed the time period between 2010-2015. Consequently, only unemployment rate, CAR, interest rate as well as total assets has statistically significant impact to the credit risk. In turn the importance of the current research is conditioned by the fact that this study incorporates both bank specific and macroeconomic determinants for the time period of 2015 to 2021. The main objective of this study is to identify the factors that influence non-performing loans (NPLs) within the Azerbaijani banking sector. The research focuses on both macroeconomic and bank-specific variables as determinants of NPLs in commercial banks. To conduct the study, six commercial banks in Azerbaijan, namely Pasha Bank, Access Bank, Bank Republic, International Bank of Azerbaijan, Kapital Bank, and Unibank, are considered for the period from 2015 to 2021.

The selection of these six banks is justified by their prominent position in the Azerbaijani banking sector. Moreover, the main reason for choosing a specific year range (2015-2021) is that selected banks do not provide relevant information for the period before 2015. For the given years, all financial data, especially financial statements of banks, have been reflected on the publicly available reports of each bank.

Research questions of the current empirical study is as following:

1. What are the effects of macroeconomic variables such as GDP growth rate, unemployment rate, real interest, inflation rates and public debt on the non-performing loans?

2. How bank-specific variables such as return on assets (ROA), capital adequacy ratio (CAR), Income diversification and amount of total assets influence the non-performing loans?

1. OVERVIEW OF THE BANKING SECTOR IN AZERBAIJAN

Based on the statistics for the 2023 provided by the Central Bank of Azerbaijan currently there 24 banks operating in Azerbaijan. Banks play a dominant role in the financial sector of Azerbaijan accounting for approximately 95% of the total assets within the sector. According to the report provided by the Central Bank of Azerbaijan (Figure 1) the trend in the banking sector in Azerbaijan shows a decline in both total assets and total liabilities from 2015 to 2017, followed by a period of growth and expansion from 2018 to 2022. These trends may be influenced by various factors, including economic conditions, regulatory changes, and market dynamics.

Figure 1: Banking system assets and liabilities, in billion AZN
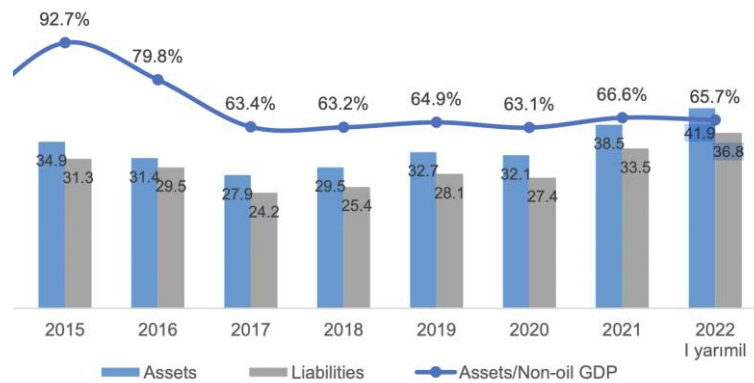
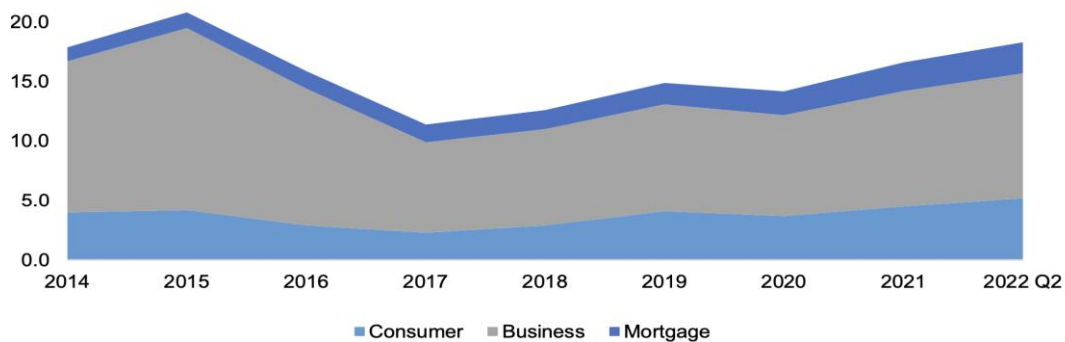**Source:** Central Bank of Azerbaijan

Figure 2 in turn depicts the profitability of the banking sector in Azerbaijan. Years 2015 and 2016 were especially problematic in terms of the net profit and return of assets, followed by the gradual stabilization beginning from 2017. The primary reason for the observed trend is the existence of the problematic banks and as a result 19 banks were closed in 2016, which led to the stabilization of the profitability in the banking sector of Azerbaijan. 4 banks also closed later in 2020. It also should be noted that Azerbaijani manat experienced devaluation in February 21, 2015 after the oil price drop in 2014. That was the cause of the problems in the certain banks which ended with the shutdown of those banks.

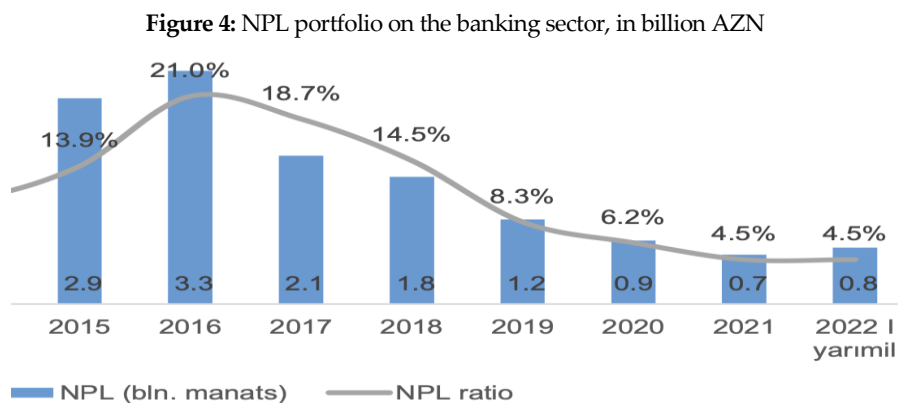**Figure 2**: Banking System profitability in million AZN
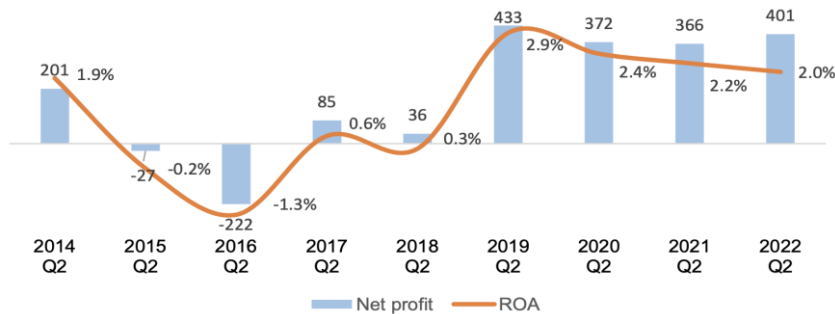
Source: Central Bank of Azerbaijan

Figure 3: Lending portfolio structure, in billion AZN

Source: Central Bank of Azerbaijan

Figure 4: NPL portfolio on the banking sector, in billion AZN

Source: Central Bank of Azerbaijan

Figure 3 shows a decrease in the amount of lending from 2015 to 2017, which can be attributed to the general economic downturn caused by the decrease in oil revenue and devaluation. These factors likely impacted the lending activity and borrower demand during that period. However, beginning in 2017, there was an increasing trend in the lending portfolio. Despite the marginal decline in credits during the pandemic period, the overall trend indicates a rise in lending activity. It's important to note that the lending structure is an essential statistic, with business lending dominating the portfolio. The amount of consumer credits remained relatively stable throughout the identified period, while the level of business lending showed significant variations.

As can be seen from the Figure 4, there is a rising trend in overall NPL for the years 2015 and 2016. The main underlying reason is the general economic problems in the country stemming from the oil price fall and devaluation at the beginning of 2016. However, beginning from 2017 a considerable increase in non-performing loans is visible. In general, as a credit risk indicator the NPL ratio is on a satisfactory level compared to benchmark countries.

2. LITERATURE REVIEW

The literature review reveals that considerable research has been carried out regarding the operations of the banking industry and the numerous challenges it faces. Non-performing loans have drawn significant attention from researchers and policymakers due to their adverse effect on financial institutions, economics, and overall financial stability. NPLs refers to loans where borrowers have failed to make timely payment according to the agreed schedule, within the specific timeframe varying across industries and loan types. Typically, this timeframe is set at either 90 days or 180 days. It should be noted that NPL is a measure of the credit risk of the banking sectors and can even be regarded as a predictor or indicator of the banking crisis Handley (2010).

So far there a lot of the empirical research dedicated to the examination of the different factors that impact non-performing loans (Menon & Rahman, 2017; Drączkowski & Śmiech, 2019; Calice & Ioannidis, 2016; Kalyvas & Mamatzakis, 2014; Dziwinski & Gajewski, 2017). A comprehensive review of the literature indicates that the majority of studies examining non-performing loans (NPLs) distinguish between two main categories of factors that influence NPLs: bank-specific factors (Ahmed et al., 2021) and country-specific factors or macroeconomic factors (Becket al., 2015). These factors are extensively studied to understand the determinants of NPLs and their

effects within different financial systems. It also should be noted that the majority of the research examines the impact of both macroeconomic and bank-specific factors in one model.

A range of studies have identified various determinants of non-performing loans (NPLs) in different countries and regions. Akinlo and Emmanuel (2014) and Kocisova and Pastyriková (2020) both found that macroeconomic factors such as economic growth, unemployment, and exchange rates significantly influence NPLs. Bank-specific factors, including the ratio of loans to total assets and the lagged NPLs, were also found to be important determinants (Rajha, 2017; Morakinyo & Sibanda, 2016). The impact of public finance variables on NPLs was highlighted by Roman and Bilan (2015), while Adusei (2018) and Bhattarai (2017) emphasized the role of money supply, financial development, and real interest rates. Ikram et. al. (2016) further underscored the significance of bank-specific microeconomic factors, such as branch age and credit policy, in influencing NPLs.

In terms of the macroeconomic or country-specific indicators interest rate exchange rate political risk, GDP growth rate, unemployment rate, inflation, and government gross debt are mostly used indicators. Akinlo and Emmanuel (2014) and Roman and Bilan (2015), both found that economic growth, unemployment, and domestic bank credit are key factors, with the latter also highlighting the importance of public finance variables. Messai and Jouini (2013) and Bayar (2019) further emphasized the negative impact of economic growth and the positive impact of unemployment, with the latter also noting the influence of inflation, economic freedom, and bank-specific factors. Beck, Jakubik and Piloiu (2013) and Wood and Skinner (2018) both highlighted the significance of real GDP growth, share prices, exchange rates, and lending interest rates, with the latter also underscoring the role of bank-specific factors. Louzis, Vouldis and Metaxas (2012) and Rajha (2017) both found that macroeconomic variables, particularly economic growth, unemployment, and interest rates, are key determinants, with the latter also noting the impact of the global financial crisis. In their study, Rajha (2016) examines the Jordanian banking sector and identifies macroeconomic factors influencing NPLs. The findings show that inflation rate and economic growth hurt NPLs, while the global financial crisis has a positive and significant influence on NPLs. In turn, in their study, Vasiliki, Athanasios, and Athanasios (2014) investigate the Eurozone's banking systems and explore the relationship between NPLs and macroeconomic factors. The findings reveal strong correlations between NPLs and macroeconomic variables such as GDP growth rate, unemployment, and public debt. Similarly, Vatansever and Hepşen (2015) investigates the relationship between NPLs and various macroeconomic factors in Turkey. The findings reveal that macroeconomic variables such as consumer price index, exchange rates, money supply change, interest rate, GDP growth, and global factors do not significantly explain the NPL ratio. However, the unemployment rate, return on equity, and capital adequacy ratio positively impact the NPL ratio, whereas the industrial production index, Istanbul Stock Exchange 100 Index, and inefficiency ratio of all banks have a negative effect. In their study, Kupčinskas and Paškevičius (2017) revealed a positive relationship between the unemployment rate and NPLs, as well as a negative association between NPLs and the GDP growth rate. Apart from the above-mentioned studies, Akinlo and Emmanuel (2014) examined the impact of other macroeconomic factors like money supply, the stock market index as well as the inflation rate for the period between 1981 and 2011 based on annual data for Nigeria.

According to the outcome of the study, an increase in money supply leads to an increase in NPLs, the inflation rate is negatively associated with NPLs, and the stock market index hurts NPLs. Another comprehensive study was conducted by Messai and Jouini (2013) across 85 banks in Italy, Greece, and Spain. Their findings indicate that a decrease in GDP and an increase in the unemployment rate led to higher NPLs. Furthermore, they find a positive relationship between NPLs and the unemployment rate, as well as a negative association between NPLs and the GDP growth rate. The study also highlights the impact of real interest rates, showing that an increase in interest rates hampers borrowers' ability to repay debts, resulting in higher NPLs. It is also worth noting that Kastrati (2011) conducted a study using a dynamic panel data model to investigate the factors influencing non-performing loans in fifteen transition economies. These economies include Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Bulgaria, Croatia, Macedonia, Moldova, Montenegro, Kosovo, Romania, Serbia, and Ukraine. The study examined data from the period 1994 to 2009. The research findings indicated that macroeconomic variables, specifically GDP growth and inflation, were found to have a significant negative effect on non-performing loans. In other words, higher GDP growth rates and lower inflation rates were associated with lower levels of non-performing loans in these transition economies.

Another group of factors that impact the non-performing loans can be grouped as bank-specific factors. A range of studies have identified various bank-specific determinants of non-performing loans (NPLs) Return on assets, return on equity, capital adequacy ratio, efficiency ratio, and income diversification are among most studies of bank-specific factors. Bilal et al. (2013) found that bank size, net interest margin, and industry production growth rate positively influence return on assets (ROA) and return on equity (ROE) in Pakistan. Al-Sharkas and Al-Sharkas (2022) observed a negative correlation between capital adequacy ratios and ROA, but a mixed impact on ROE in Jordan. Hewaidy and Alyousef (2018) highlighted the significance of bank size, asset quality, management quality, and liquidity in determining the capital adequacy ratio in Kuwait. Olalere, Omar and Kamil (2017) and Al-Homaidi, Tabash, Farhan and Almaqtari (2018), both identified the positive impact of capital adequacy and liquidity on bank profitability in Nigeria and India, respectively. AL-Omar and AL-Mutairi (2008) further emphasized the importance of bank size, assets management, and leverage in Indian bank profitability. Lastly, AL-Omar and AL-Mutairi (2008) and Kalifa and Bektaş (2018) underscored the role of equity ratio, loan-assets ratio, and operating expenses in Kuwaiti bank profitability, and the positive relationship between the capital adequacy ratio and bank-specific and macroeconomic variables in Islamic banks. Ghosh (2015) found that greater capitalization, liquidity risks, poor credit quality, and banking industry size increase NPLs, while higher bank profitability lowers them. Boudriga, Taktak and Jellouli (2010) highlighted the role of foreign participation, high credit growth, and loan loss provisions in reducing NPLs, and the importance of a sound institutional environment. Bayar (2019) emphasized the impact of economic growth, inflation, and institutional development on NPLs. Rajha (2017) and Sheefeni (2015), both identified the lagged NPLs and the loan to total asset ratio as significant factors. Ikram et. (2016) and Louzis, et al. (2012) further underscored the influence of branch age, loan duration, credit policy, and management quality. Lastly, Bhattarai (2017) found that macroeconomic variables such as the real effective exchange rate and the inflation rate also play a role in NPLs.

Kupčinskas and Paškevičius (2017) highlight the significance of bank-specific factors, specifically ROA, in determining the NPL to total gross loans ratio. The findings suggest that a decrease in

the ROA ratio leads to an increase in NPLs. Similarly, in their study Khan et al. (2020) explore the determinants of NPLs in the banking sector of Pakistan. The research focuses on bank-specific factors such as return on assets (ROA), capital adequacy ratio (CAR), income diversification, and bank efficiency. The findings indicate a negative association between ROA and NPLs, suggesting that higher ROA leads to lower NPLs. Additionally, operating efficiency and banking capital are negatively associated with NPLs. Interestingly, findings from the Turkish market indicated that debt ratio and loan-to-asset ratio do not have a significant impact on NPL (Vatansever and Hepşen, 2015). Another study conducted by Akinlo, and Emmanuel (2014) in Nigeria supports that the banking lending rate has a positive relationship with NPLs because the persistence of high and prohibitive lending rates causes the transformation of a fragile banking system into a financial crisis. In terms of the effect of the stock market index, it hurts NPLs. Rajha (2016) examined the Jordanian banking sector from 2008 to 2012. According to the results of research, lagged NPL and loans to total assets ratio were the most important variables that positively influence non-performing loans. Based on other research (Makri, Tsagkanos and Bellas (2014)) bank-specific factors like capital adequacy ratio, and return on equity have an impact on NPL. According to the results of this research, there is a significant correlation between NPL and ROE. A deterioration of profitability ratios causes a rise in NPL. These negative relationships show that bad management leads to risky activities and weak performance. Capital Adequacy Ratio (CAR) variable, as a determinant of risk behavior of banks, displays a negative relation. This relationship is also accepted by Espinoza and Prasad (2010), Allen Berger and Robert DeYoung (1997), and Salas and Saurina (2002). Another interesting research was conducted in the Indian banking sector spanning from 1997 to 2009 (Swamy, 2012). The results reveal that loan-to-deposit ratio and ROA have strong positive effects on non-performing loans, bank size has a strong negative effect, while capital adequacy and bank lending have statistically insignificant impacts. Contrary, in its study Prasanna (2014) found that (using panel data for the 2000 to 2012 period) The growth rates in GDP, savings, and per capita income have a noteworthy adverse effect on non-performing loans (NPLs), while the impact of interest rates and inflation is significantly positive. In other words, higher growth rates in GDP, savings, and per capita income are associated with a reduction in NPLs, indicating a healthier loan portfolio. On the contrary, higher interest rates and inflation tend to contribute to increased NPL levels, implying a greater risk of loan defaults.

3. CONCEPTUAL FRAMEWORK

3.1. Country-specific variables

The impact of GDP growth on non-performing loans (NPLs) is a complex relationship, with mixed findings across different studies. Beck et al., (2013) and Shingjergji (2013), both found a significant negative correlation between GDP growth and NPLs, suggesting that a stronger economy can reduce the likelihood of loan defaults. However, Ahmad et al. (2016) and Tarron and Sukrishnalall (2009) reported a positive relationship, indicating that higher GDP growth may lead to an increase in NPLs. Beck et al., (2015) and Dao et al. (2020) also identified GDP growth as a significant factor, but did not specify the direction of the relationship. Ghosh (2015) and Mazreku et al. (2018) further explored the impact of other macroeconomic variables on NPLs, with Ghosh's finding (Ghosh, 2015) that higher state real GDP growth rates can reduce NPLs, and Mazreku et al. (2018) reporting a negative correlation between GDP growth and NPLs in transition countries. An increase in real GDP growth leads to an increase in the level of

income eventually. The capacity of borrowers to pay their debts is affected and developed by the impacts of this case. Reduction in debts means a decrease in NPL as well. This association is also found in the empirical studies of different researchers (Salas and Saurina 2002; Fofack, 2005; Jimenez and Saurina, 2006; Khemraj and Pasha, 2009; Dash and Kabra, 2010). Baboušek and Jančar (2005) found a negative correlation between GDP growth and NPL.

H1. A higher GDP Growth rate has a negatively and statistically significant impact on NPL

The relationship between the unemployment rate and non-performing loans (NPLs) has been extensively studied, with consistent findings across different countries and time periods. The unemployment rate directly affects the well-being and solvency of the country. Because of unemployment cases, people are not able to pay their debts to banks. Iuga and Lazea (2012) and Szarowska (2018), both found a positive correlation between the two, with Szarowska (2018) identifying unemployment as the most important macroeconomic factor for NPLs. This relationship is further supported by Roman and Bilan (2015), Siakoulis (2017), Akinlo and Emmanuel (2014), Ghosh (2015), Mazreku et al. (2018), and Klein (2013), who all found that higher unemployment rates are associated with an increase in NPLs. As the country's unemployment rate increases, banks' loan quality gets worse (Salas and Saurina, 2002). According to another research paper, borrowers with low income face a higher chance of unemployment, which decreases the reimbursement capacity (Ghosh, 2015). With low income, clients are considered riskier. As a result, banks set higher interest rates for these kinds of borrowers due to uncertainty of their unemployment status (Lawrence, 1995). These findings suggest that a rise in the unemployment rate can lead to a higher incidence of NPLs, potentially due to reduced income and financial strain on borrowers. Departing from above mentioned discussion it is concluded that:

H2. The unemployment rate has a positive and statistically significant impact on NPL.

According to research when a bank raises its real interest rate, it causes a decrease in the ability of borrowers to meet their obligations. The real interest rate, which accounts for inflation, reflects the cost of borrowing and the return on savings adjusted for changes in purchasing power. A higher real interest rate can affect borrowers' ability to repay their loans, potentially leading to an increase in non-performing loans. As a result, non-performing loans increase. (Fofack, 2005; Jimenez, Salas and Saurina, 2006; Khemraj and Pacha, 2009; Dash and Kabra, 2010). The higher interest rates lead to an increase in non-performing loans (Sheefeni, 2016; Khemraj and Pacha, 2009; Maivald and Teplý, 2020; Beck et al. 2015). This relationship is particularly pronounced in the presence of bank size-induced risk preferences and macroeconomic shocks (Rajan and Dhal, 2003). The stock of non-performing loans also affects bank lending rates, with a higher stock of non-performing loans leading to higher lending rates (Bredl, 2022). Fofack (2005) assumes that real interest rate is an important factor for the determination of bad loans in sub-Saharan countries. Saba, Kouser and Azeem (2012) have selected real interest rates as a main factor to determine NPL, and they identified that there is a significant relationship between interest rate and NPL. Therefore:

H3. The real interest rate has a positive and statistically significant impact on NPL.

A range of studies have explored the impact of interest rates on non-performing loans (NPLs). The relationship between inflation and NPL is ambiguous. Different authors of papers have sufficient evidence for this contradictory direction of association. According to Rinaldi and

Sanchis-Arellano's (2006) research, higher inflation deteriorates banks' credit risk. Their study is based on European countries. So, high inflation rates limit the reimbursement capacity of borrowers. Additionally, the real value of borrowers' revenue is negatively affected by the high inflation rates. Other studies report that under inflationary conditions, the default probability of borrowers increases suddenly and in large amounts. (Amuakwa, Marbuah, and Marbuah, 2017; Klein, 2013). Similarly in their studies, Prasanna (2014) and Akther (2023) found a positive correlation between these 2 variables in the banking sector of India and Bangladesh respectively. In addition, Sheefeni (2016) and Maivald and Teplý (2020), both found that higher interest rates can lead to an increase in NPLs, with Maivald specifically noting a rise in the NPL ratio after a year of low interest rates. Bredl (2022) further supported this, showing that a higher stock of NPLs is associated with higher lending rates.

In opposing views, Nkusu (2011) in his paper mentioned that inflation decreases the value of outstanding debt. So, this means the repayment capacity of borrowers improves as well. This case is also investigated in the banks of Guyana and the researchers (Khemraj and Pasha, 2009)) argued that labor wages are more likely to adjust to the increase in prices. As a result, this situation ensures the sustainability of the repayment of borrowers to the banks. Gulati et. al., (2019) has researched Indian banks and they reported the same situation-negative relationship between inflation and NPL.

H4. The inflation rate has a positive and statistically significant impact on NPL.

Bank-specific variables

The impact of Return on Assets (ROA) on Non-Performing Loans (NPLs) is a complex relationship, influenced by various factors. Empirical studies have examined the relationship between return on assets and NPLs, and some findings suggest a negative correlation. Higher return on assets has been associated with lower NPL levels in various financial institutions and sectors. This implies that institutions with better profitability metrics tend to exhibit a reduced risk of non-performing loans. According to Godlewski (2014), ROA and NPL have a direct relationship. When ROA is lower, NPL will be higher or vice versa. Makri et al. (2014) stated that there is a negative association between these 2 variables. Also, Boudriga, Taktak and Jellouli (2010) and Khan et al. (2020) came to the same result. Berger and DeYoung(1997) concluded that when banks have a high level of income, mostly they do not invest in risky investments which can cause nonpayment cases for the bank. This shows the negative affiliation as well. Hertina, Rahmat, and Furqon (2022) and Azeem and Amara (2014). both found that NPLs have a negative impact on ROA, with Azeem and Amara (2014). emphasizing the need for transparent loan procedures. However, Thyovani and Manda (2022) and Hadian (2021) found that NPLs have a negative but insignificant impact on ROA. The same trend was confirmed by Jati, W. (2021) who found a significant negative impact of NPLs on ROA.

H6. Return on assets has a negative and statistically significant relationship with NPLs.

Capital Adequacy ratio is the comparison of available capital that a bank has on hand to its risk-weighted assets. This ratio indicates how a bank faces abnormal losses and how it survives that case. The impact of Capital Adequacy Ratio (CAR) on non-performing loans (NPL) has been a subject of interest in the banking sector. Purnamasari and Achyani (2022) found that CAR significantly affects NPL, while Kusuma and Haryanto (2016) and Rahadian and Permana (2021) also reported a significant negative relationship between CAR and NPL. Gulati et al. (2019)

stated that there is a negative association between NPLs and CAR in the banking sector. The same result is shown in the research paper of Koju, Koju, and Wang (2018) in which they conducted a study in the banking sector of Nepal. Makri et al. (2014) also stated the negative relationship between these 2 variables. Akther (2023) in her research paper mentioned the negative relationship between the Capital adequacy ratio and NPL as well in the banking sector of Bangladesh. However, some researchers- Constant and Ngomsi (2012), and Amuakwa and Boakye (2015) claimed that NPL and CAR have a positive relationship with each other. Amuakwa and Boakye's study was conducted in Ghana, and they concluded that even though some microeconomic factors hurt NPLs, bank capital or CAR has a positive impact on NPLs. Moreover, Konstantakis, Michaelides and Vouldis (2016) and Akinlo, and Emmanuel (2014) highlighted the role of macroeconomic and financial factors, such as economic growth, unemployment, and exchange rate, in driving NPL.

H7. CAR has a negative and statistically significant impact on NPL

Income diversification indicates from which sources banks receive earnings: from lending activities and non interest activities. The impact of income diversification on non-performing loans is a complex issue with mixed findings. Bikker and Hu (2002) stated that there is no relationship between NPLs and noninterest income. The same was confirmed by Zhou (2014), who found no significant relationship between income diversification and bank risk in China. However, Louzis et al. (2012) conducted a study on different banking and microeconomic factors as determinants of NPLs in the Greek banking system. Researchers concluded that noninterest income has a positive impact on NPLs. The same determinants, including bank capital and income diversification, were investigated by Rachman, Kadarusman, Anggriono and Setiadi (2018) based on Indonesian banks. This study revealed that other factors do not affect NPLs, however, there is a negative association between NPLs and income diversification. Meslier, Tacneng and Tarazi (2014) and Sanya and Wolfe (2011) both found that diversification can decrease insolvency risk and enhance profitability, particularly for banks with moderate risk exposures. However, Hahm (2008), caution that excessive income diversification can increase income volatility and negatively impact risk-adjusted performance. Adzobu, Agbloyor and Aboagye (2017), found that loan portfolio diversification does not necessarily improve bank profitability or reduce credit risks. Chiorazzo, Milani and Salvini (2008), and Goddard, McKillop and Wilson (2008), suggests that the impact of income diversification on bank performance may vary based on bank size and the source of non-interest income.

H8. Income diversification has a negative and statistically significant impact on NPL

4. METHODOLOGY

4.1. Research approach

Given the primary objective of the research which is exploratory. This study aims to conduct a qualitative data panel analysis to gain a deeper understanding of the dynamics and changes in non-performing loans over time. Panel data refers to a dataset that includes observations on multiple entities over some time. Panel data analysis methods offer several advantages, including the ability to account for unobservable heterogeneity, increased statistical efficiency, and the ability to study the dynamics of change (Baltagi, 2007; Kitamura? 1990). These methods also provide more informative data, less multicollinearity, and more degrees of freedom, making

them well-suited for studying the effects of policies and other changes (Hsiao, 2006). Panel data analysis offers a range of models, including common-, fixed-, and random-effect models, each with its own advantages and applications (Yaffee, 2003). Fixed and random effects models are particularly useful for controlling time-invariant omitted variables (Bollen and Brand, 2008).

4.2. Sampling

As part of the empirical study, six local banks were selected for analysis: Unibank, ABB, Kapital Bank, Pasha Bank, Access Bank, and Bank Respublika. These banks were chosen because they represent a significant portion of the local financial sector in Azerbaijan, possessing higher market shares and reputable standing. Another factor in selecting these banks was the availability of all necessary data required for the study. The study covers a period from 2015 to 2021, which was chosen based on the availability of complete data for all selected banks within this timeframe. To obtain the required bank-specific data, information was sourced from various financial documents such as balance sheets, income statements, and audit reports of the respective banks. Additionally, country-specific data were gathered from reports published by the statistical committee of Azerbaijan and relevant World Bank reports.

4.3. Variables

The non-financial risk of the banks was measured by NPL, which is a dependent variable in the current study. Predictor variables include two groups of indicators, bank-specific and country-specific data. Bank-specific variables include income diversification, return on assets, capital adequacy ratio, and total assets of the bank. In turn, inflation rate, real interest rate, public debt, and GDP growth rate are country-specific variables. The primary reason for choosing current indicators is that the majority of similar research employs relatively the same set of indicators while analyzing the determinants of the non-performing debts.

Measurement scale of the variables

Non-performing loan ratio (NPLR) is measured as a decimal representing the proportion of the non-performing loans to the total loans. Capital adequacy ratio (CAR) is expressed as a percentage, while Return on Asset (ROA) is also measured as a decimal representing the bank about its total assets. The unit of measurement of the total assets (TOTALAS)is used. In turn Interest Rate (INTRATE), Inflation Rate (INFRATE), and GDP Growth Rate (GDPGR) are represented in percentage form.

Information on bank-specific variables and measurements

NPL ratio (non-performing loans) - assesses the quality of the bank's loan portfolio and determines the proportion of the loans that are in default or the risk of default. The common method of estimating the non-performing loan ratio is to divide NPL by total loans (Alton and Hazen, 2001).

ROA Return on assets - provides insights into a company's profitability and efficacy in utilizing its assets. It is measured by dividing the net income of the company by its total assets (Himawari and Mohammad, 2023).

CAR Capital adequacy ratio - Capital adequacy ratio (CAR) is a financial metric used to assess a bank's ability to absorb potential losses and maintain a stable financial position. It measures the proportion of a bank's capital to its risk-weighted assets. The CAR is a key indicator of a bank's financial strength and regulatory compliance (Salas and Saurina, 2002).

TOTALAS Total Assets - Total assets in the context of banks refers to the aggregate value of all assets held by a bank. Banks' assets include various financial instruments, loans, investments, and physical assets. The total assets of a bank are a key measure of its size, financial strength, and capacity to provide services and meet financial obligations. (Nam, Huang and Sherraden, 2008)

4.4. Data analysis

Both descriptive and inferential statistics were used to analyze panel data via STATA 17 software. The normality of the data was analyzed by estimating skewness and kurtosis as well as conducting the Jarque Bera test for normality. Heteroscedasticity, in turn, is checked by conducting the Breusch-Pagan test or the White test. In terms of inferential statistics, the impact of the bank-specific and country-specific variables on nonperforming loans is measured by the application of the static panel data models. To be precisely fixed and random-effect least square models used for analyzing panel data. Afterward, Hausman's test was used to determine the most suitable model.

4.5. Model and econometric estimation

Static models are statistical techniques to analyze data on multiple entities and over different periods. Fixed effect models and random effect models are widely used static panel models. Fixed effect models refer to the modeling approach used for individual-specific or entity-specific characteristics or unobserved heterogeneity that are treated as constants over time (Green, 2004). So fixed models allow different constants for individual banks, while the coefficients are fixed over time. Contrary to the fixed effect model, random effect models capture unobserved, entity-specific variables that are not constant over time. These unobserved variables are treated as random variables and their variance is estimated (Verbeek, 2008)

$$NPLR_{i,t} = \beta_0 + \beta_1\,GDPGR_{i,t} + \beta_2\,UNEMP_{i,t} + \beta_3\,INTRATE_{i,t} + \beta_4\,INFRATE_{i,t} + \beta_5\,CAR_{i,t} + \beta_6\,ROA_{i,t} + \beta_7\,TOTALAS_{i,t} + \epsilon_{i,t}$$

$NPLR_{i,t}$ represents the aggregate of non-performing loans to total gross loans for bank i at time t.

$GDPGR_{i,t}$ represents the growth rate of the gross domestic product

$UNEMP_{i,t}$ represents the unemployment rate

$INtRATE_{i,t}$ represents the real interest rate

$INFRATE_{i,t}$ represents the inflation rate

$CAR_{i,t}$ represents the capital adequacy assets ratio for bank i at time t.

$ROA_{i,t}$ represents the return on assets for bank i at time t.

$TOTALAS_{i,t}$ represents the total assets of bank i at time t.

β_0 represents the intercept, which represents the baseline level of non-performing loans when all independent variables are zero.

$\epsilon_{i,t}$ represents the disturbance term, which captures the unobserved factors or random errors in the model.

5. RESULTS

Descriptive statistics

The descriptive statistics presented below provide an overview of the distribution and variation in the all variables.

Table 1: Descriptive statistics of the variables

Variable	Mean	Std. dev.	Min	Max	VIF	1/VIF
NPLR	.2232653	.251509	0	.989		
CAR	15.96143	5.91857	3.2	33.04	1.96	0.510923
ROA	.01565	.0389632	-.0823545	.1425164	1.2	0.830063
TOTASS	2.90e+08	7.20e+08	592709	2.43e+09	1.72	0.582009
INFRATE	6.242857	4.344567	2.27	12.94	2.60	0.385266
INTRATE	10.75714	12.56754	-4.2	28.9	2.75	0.363701
GDPGR	.5	3.142005	-4.3	5.6	1.21	0.825705
UNEMP	5.392857	.7239872	4.85	6.58	1.09	0.919501

Mean VIF | 1.86

Multicollinearity test

The VIF column displays the VIF values for each independent variable. VIF quantifies how much the variance of an estimated regression coefficient is inflated due to multicollinearity. Generally, a VIF of 1 indicates no multicollinearity, while values above 1 suggest increasing levels of multicollinearity. In turn, 1/VIF can be interpreted as the proportion of the variance in an independent variable that is not explained by multicollinearity. Higher values of 1/VIF indicate less multicollinearity and more independent variation in the variable. In the output all the VIF values are below 2, indicating that multicollinearity is not a severe concern. The Mean VIF is 1.40, which is relatively low. Generally, Mean VIF values below 5 or 10 are considered acceptable, suggesting that multicollinearity is not a significant concern.

Normality and Heteroscedasticity tests

The normality of the data was tested by running Skewness and kurtosis and Jarque-Bera normality test. According to Table 2, for the Skewness test, Prob>chi2 and the p-value associated with the skewness test is 0.143. Since the p-value (0.143) is greater than the significance level (e.g., 0.05), we fail to reject the null hypothesis. Therefore, we can conclude that the data is normally distributed in terms of skewness. Menvile, in the Kurtosis test (Jarque-Bera test) Prob>chi2: The p-value associated with the Jarque-Bera test is 0.267. Similar to the skewness test, since the p-value (0.267) is greater than the significance level, we fail to reject the null hypothesis. Therefore, we can conclude that the data is normally distributed in terms of kurtosis.

In turn, White's General Test for Heteroskedasticity was applied to investigate the existence of heteroskedasticity in the data set. The p-value associated with the test is reported as Prob > chi2 =

0.0684 which is higher than the accepted significance level, 0.5, we fail to reject the null hypothesis. Therefore we can assert that we do not have sufficient evidence to reject the null hypothesis. That is there is no significant evidence of heteroscedasticity in the model.

Table 2: Normality and Heteroscedasticity tests

Skewness and kurtosis tests for normality	Prob>chi2 0.278	Accept null hypothesis: The data follows a normal distribution.
Jarque-Bera normality test:	Prob>chi2 0.4281	Accept null hypothesis: The data follows a normal distribution.
White's test test for heteroskedasticity	chi2(27) = 38.63 Prob > chi2 = 0.0684	Accept null hypothesis: The data is homoscedastic.
Cameron & Trivedi's decomposition of IM-test Heteroskedasticity Skewness Kurtosis	0.0684 0.2356 0.1043	Accept null hypothesis: The data is homoscedastic.

It also should be noted that generally serial correlation is a concern in macro-panels that involve long time series data, while it is not a significant issue in micro-panels. (Aguade, Ayanaw and Derso 2022). Therefore, the data set was not checked for the existence of the serial correlation.

Correlation

According to the results of the correlation statistics depicted in Table 3, there is no significant pairwise relationship among the independent variables. This is supported by the correlation coefficients of each independent variable, which are all below 0.30.

Table 3. Correlation matrix

	NPLR	CAR	ROA	TOTALAS	GDPGR	INTRATE	INFRATE	UNEMP
NPLR	1.0000							
CAR	-0.1163	1.0000						
ROA	0.3384	0.2330	1.0000					
GDPGR	-0.1322	-0.0649	0.0583	1.0000				
INTRATE	-0.1361	0.2683	0.0119	-0.3590	1.0000			
INFRATE	0.2793	-0.2851	-0.1199	-0.1936	-0.6134	1.0000		
TOTALAS	-0.1877	0.2574	-0.1129	0.0934	-0.0172	-0.0490	1.0000	
UNEMP	-0.2819	0.0987	-0.0476	0.0403	-0.0289	-0.1584	0.1157	1.0000

Based on the outcome of the fixed effect model in Table 4, the R-squared values measure the proportion of variation in the dependent variable (non-performing loan) explained by the regression model. The R-squared (0.6107) indicates that approximately 61.07% of the variation in non-performing loans is accounted for by the independent variables within each group. The F-statistic tests the overall significance of the regression model. In this case, the $F_{(7, 29)}$ value is

6.50, with a p-value of 0.0001. This indicates that the regression model is statistically significant. The value of rho (0.88184245) indicates the proportion of the total variance in the dependent variable due to the random effects (u_i). In this case, it suggests that approximately 88.18% of the variance in non-performing loans is attributed to the differences between banks, that is individual-specific effects. In terms of the interpretation of the coefficients, the Impact of the GDP growth rate and interest rate on non-performing loans is not statistically significant with a p-value higher than 0.5. Contrarily, the impact of the return on assets, capital adequacy ratio, inflation rate, and unemployment rate is statistically significant. To elaborate, a one-unit increase in return on assets is associated with an expected increase of 2.572941 units in non-performing loans. Similarly, a one-unit increase in capital adequacy ratio is associated with an expected increase of 0.023061 units in the dependent variable. A one-unit increase in the inflation rate is associated with an expected increase of 0.0221201 units in credit risk. In contrast, a one-unit increase in unemployment level is associated with an expected decrease of 0.1171376 units in non-performing loans. It is worth noting the impact of the total assets is statistically significant at 0.10 level. A unit increase in total assets is associated with an expected increase of 5.10e-08 units of the dependent variable.

Table 4: Fix effect model results

R-squared:
Within = 0.6107
Between = 0.0554
Overall = 0.0201
 F(7,29) = 6.50
corr(u_i, Xb) = -0.7900
Prob > F = 0.0001

	Coefficient	Std. err.	t	P>t
_cons	.162614	.2338696	0.70	0.492
Return on assets	-2.572941	.8784299	-2.93	0.007
Capital adequacy ratio	.023061	.0079909	2.89	0.007
Total Assets	5.10e-08	2.66e-08	1.92	0.065
GDP growth rate	-.011028	.009492	-1.16	0.255
Interest rate	-.0020864	.0029783	-0.70	0.489
Inflation sate	.0221201	.0084061	2.63	0.013
Unemployment	.1171376	.0364171	3.22	0.003

rho .88184245
F test that all u_i=0: F(6, 29) = 12.68   Prob > F = 0.0000

According to the outcome of the Random effect model provided in Table 5, R-squared indicates that approximately 56.09% of the variation in NPLRAT is explained by the observed independent variables within each bank. In turn, around 1.35% of the variation in NPL is

explained by the differences between the groups (Banks). The associated p-value (Prob > chi2) of 0.000 suggests that the overall effect is statistically significant at the conventional significance level of 0.05. The coefficient for Return on Assets (ROA) is positive (2.61151) and statistically significant (p-value = 0.004). That is It suggests that an increase in the Return on Assets is associated with a positive impact on NPL. In contrast, Capital Adequacy Ratio (CAR) and Total Assets do not have a statistically significant impact on NPL with p=0.114 and p=0.864. In terms of country-specific factors, GDP growth rate, and interest rate do not have an impact on credit risk. Contrary to this observation, the inflation rate and unemployment rate have a statistically significant impact on non-performing loans in Azerbaijan. A one-unit increase in the Inflation rate is associated with a 0.0184261 unit increase in NPLRAT. A similar trend is observed in the relationship between unemployment level and non-performing loans. That is, a one-unit increase in an unemployment rate is associated with a 0.0832619 unit increase in credit risk. The value of rho (0.5937136) indicates that approximately 59.37% of the total variance in non-performing loan ratio is due to the group-level random effects (u_i).

Table 5: Random effect model results

R-squared:
Within = 0.5609
Between =0.0135.
Overall = 0.1798
Wald chi2(7) = 33.33
Prob > chi2 = 0.0000

	Coefficient	Std. err.	z	P>|z|
_cons	.3521116	.2528326	1.39	0.164
Return on assets	-2.61151	.9004633	-2.90	0.004
Capital adequacy ratio	.0109264	.0069145	0.58	0.114
Total Assets	2.97e-09	1.74e-08	0.17	0.864
GDP growth rate	-.0074695	.0101431	-0.74	0.461
Interest rate	-.0011396	.0031993	-0.36	0.722
Unemployment	.0832619	.0360964	2.31	0.021
Inflation rate	.0184261	.0089994	2.05	0.041

sigma_u | .17087918
sigma_e | .14135683
rho |.5937136   (fraction of variance due to u_i)

Table 6. Hausman's test result

Test of H0: Difference in coefficients not systematic
  chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
      = 7.63
Prob > chi2 = 0.2665
(V_b-V_B is not positive definite)

The test statistic for the Hausman test is chi2(6), which follows a chi-squared distribution with 6 degrees of freedom. In this case, the test statistic is 7.63, and the associated p-value (Prob > chi2) is 0.2665. Based on the p-value we fail to reject the null hypothesis (H0) that the difference in coefficients between the fixed effects (fe) and random effects (re) models is not systematic. This suggests that the choice between the fixed effects (fe) and random effects (re) models does not significantly affect the estimated coefficients. Therefore, the random effects model can be considered appropriate for this analysis and further interpretation.

DISCUSSION AND CONCLUSION

The analysis conducted from the perspective of the Azerbaijani bank sector using both fixed effect and random effect models provides insights into the factors influencing non-performing loans (NPL) within the sector. Both models yield valuable information regarding the effects of various independent variables on NPL while the Hausman test helps determine the appropriateness of the random effect model for further interpretation. The random effects model assumes that there are unobserved individual-specific effects that vary across the different entities or units in the panel data.

The present research on the determinants of non-performing loans (NPLs) in the Azerbaijani banking sector holds significant importance in the context of both academia and industry. While various studies have been conducted on NPLs in different countries, there is a notable dearth of research specifically focused on Azerbaijan. This study seeks to fill that gap by examining the factors influencing NPLs within the local banking sector.

By investigating both macroeconomic and bank-specific variables, this research contributes to the existing literature in several ways. Firstly, it expands the understanding of the Azerbaijani banking system by analyzing the impact of key macroeconomic factors, such as GDP growth rate, unemployment rate, real interest rate, inflation rate, and public debt, on NPLs. These findings provide valuable insights into the relationship between the broader economic conditions and the occurrence of NPLs in Azerbaijan.

Secondly, this study incorporates bank-specific variables, including return on assets (ROA), capital adequacy ratio (CAR), income diversification, and total assets, as determinants of NPLs. This approach allows for a comprehensive examination of factors specific to individual banks that may influence their NPL ratios. The identification of such bank-specific characteristics, policies, or practices provides valuable information for policymakers, regulators, and stakeholders in the banking industry, enabling them to assess and compare NPL ratios effectively.

Furthermore, the research encompasses a period of analysis from 2015 to 2021, utilizing publicly available reports from six prominent commercial banks in Azerbaijan. By focusing on a specific time frame and utilizing data from these selected banks, the study captures the recent dynamics and trends in the Azerbaijani banking sector, enhancing the relevance and applicability of the findings.

Examining the individual variable effects, the analysis reveals that the Return on assets is associated with a negative impact on NPL (non-performing loans). This implies that banks with better profitability, as measured by ROA, tend to have lower credit risk. A potential explanation of the observed trend can be the fact that banks with higher return on assets have healthier loan

portfolios with a lower proportion of risky or non-performing assets. Therefore, improving ROA can be a potential strategy to mitigate credit risk. This finding is also aligned with the previous research conducted by Godlewski (2014), Makri et. al. (2014), Khan et al. (2020), Swandewi and Purnawati (2021). They also revealed a statistically significant relationship between Return on assets and credit risk level.

From the country-specific indicators perspective, GDP growth rate and Interest rate do not have a statistically significant impact on credit risk. This indicates that changes in these macroeconomic factors do not strongly influence non-performing loans in Azerbaijan, at least within the scope of the model. Current findings also align with the studies conducted by other scholars. In their research Mukhtarov et. al. (2018) also revealed a statistically insignificant relationship between the GDP growth rate and NPL within the bank sector in Azerbaijan. In addition, a similar trend was absorbed in the studies conducted by Musau, Muathe and Mwangi (2018), Nargis, Ahmad, Ibrahim and Kefeli (2019), Alexandri and Santoso (2015), Nikolov and Popovska-Kamnar (2016), Adeola and Ikpesu, (2017). Fajar and Umanto (2017).

However, from the Azerbaijani perspective, the inflation rate and unemployment rate are statistically significant predictors of nonperforming loans. This assumes that as inflation rises, there is an increase in credit risk, which is the expected result. That is, higher inflation erodes the purchasing power of individuals. As a result, borrowers may face difficulties repaying their loans, leading to an increase in non-performing loans. Again studies conducted by Greenidge and Grosvenor (2010), Ahmad and Bashir (2013), Klein (2013), Jara-Bertin, Arias and Perales (2014), Majumder and Li (2018), Singh, Basuki and Setiawan (2021), Akhter (2023) also prove this finding. Moreover, this finding is also in line with similar research conducted in Azerbaijan (Seyfullali, 2022).

From the unemployment standpoint, there is also a statistically significant and positive relationship between the unemployment rate and credit risk in Azerbaijan which is also an expected result. An increase in unemployment level leads to an increase in the amount of non-performing loans as a consequence of the non-performing loan ratio. Higher unemployment rates often indicate a weaker job market and reduced income opportunities for individuals. Unemployed individuals may struggle to meet their financial obligations, including loan repayments. As a result, the likelihood of loan defaults and non-performing loans increases, leading to higher credit risk. The current trend is also revealed in the findings of Tatarici, Kubinschi and Barnea (2020), Messai and Jouini (2013), Kupčinskas and Paškevičius (2017), Ghosh (2015), Chaibi and Ftiti (2015), Konstantakis et al. (2016), Škarica (2014) and others.

Another important finding of the current study is that approximately 59.37% (rho is 0.5937136) of the variability in non-performing loan ratio can be explained by the differences between the banks included in the analysis. Variance in non-performing loan ratios is attributed to differences between the banks, suggesting that there are substantial variations in non-performing loan ratios across the included banks. This implies that each bank has its unique characteristics, policies, or practices that significantly influence its non-performing loan ratio. Understanding these between-bank differences is crucial for policymakers, regulators, and stakeholders in the banking industry, as it highlights the need to consider the bank-specific context when assessing and comparing non-performing loan ratios. Given the significant influence of group-level effects, the practical implication is that banks should focus on developing and implementing strategies that are tailored to their unique characteristics and circumstances. Generic approaches or industry-

wide initiatives may not be sufficient to improve the non-performing loan ratio effectively. Banks should identify their strengths, weaknesses, and specific areas where they can differentiate themselves to enhance non-performing loan ratio relative to other banks in the analysis. The observed group-level differences in non-performing loans provide an opportunity for benchmarking and learning from the best practices of banks that exhibit lower non-performing loan ratios. Banks with a higher proportion of variability explained by the group-level random effects may need to pay closer attention to their risk management practices. They should evaluate their credit risk assessment processes, loan monitoring mechanisms, and loan recovery strategies. Strengthening risk management practices can help mitigate the impact of group-level factors and reduce the non-performing loans ratio.

Further recommendations are made based on the findings of the study:

The study indicates that a higher ROA has a significant negative impact on NPLs. Banks should focus on improving their profitability by implementing effective strategies to enhance their asset management, cost control, and overall operational efficiency. This can help mitigate the risk of NPLs and improve the overall financial health of the banks.

The research suggests that inflation and unemployment rates have a significant impact on NPLs. Policymakers and regulators should closely monitor these macroeconomic indicators and implement appropriate measures to maintain stable economic conditions. Controlling inflation and reducing unemployment can contribute to a healthier banking sector with lower NPL ratios.

Given that each bank has unique characteristics influencing its NPL ratio, it is crucial for banks to have robust risk management practices in place. Banks should regularly assess their credit risk, conduct thorough due diligence on borrowers, and implement effective loan monitoring systems. Additionally, stress testing and scenario analysis can help banks identify potential vulnerabilities and proactively manage NPL risks.

The study did not find a significant impact of capital adequacy ratio (CAR) on NPLs in Azerbaijan. However, maintaining an adequate capital buffer is still crucial for banks to absorb potential losses and mitigate NPL risks. Regulators should continue to enforce capital adequacy requirements, and banks should strive to maintain a healthy capital position to enhance their resilience to economic shocks.

Banks should aim for income diversification and a well-balanced loan portfolio to reduce concentration risks and improve loan quality. By diversifying their revenue streams and lending activities across different sectors and customer segments, banks can minimize their exposure to specific industries or borrowers, reducing the likelihood of NPLs.

Accurate and timely reporting of NPLs is essential for stakeholders to assess and compare NPL ratios across banks. Regulatory authorities should establish clear guidelines for data reporting, ensuring transparency and consistency in NPL classification and disclosure. Enhanced transparency will facilitate better risk assessment and decision-making by market participants.

Practical implications

These findings provide valuable insights for policymakers and stakeholders in the Azerbaijani banking sector to understand and address the determinants of NPL within the industry. Overall based on the outcome of the current study following recommendations can be made for banks and policymakers:

Banks should prioritize maintaining strong profitability and efficient asset utilization as part of their risk management strategy. Policymakers can encourage banks to focus on improving their ROA through supportive policies, such as promoting a conducive business environment and providing access to capital and technology. Banks should ensure that their credit assessment processes are robust, incorporating thorough due diligence, comprehensive risk analysis, and proper collateral valuation. Policymakers can enforce regulatory standards and guidelines to ensure banks maintain adequate capital buffers and follow prudent lending practices.

Policymakers should focus on maintaining stable inflation levels through effective monetary policies, as inflationary pressures can impact borrowers' repayment capacity and increase credit risk. Banks should also consider macroeconomic factors when assessing creditworthiness and adjusting their risk management strategies accordingly.

Policymakers should prioritize measures to address unemployment, such as promoting job creation, enhancing vocational training programs, and implementing social safety nets. Reducing unemployment can improve borrowers' ability to repay loans and mitigate credit risk for banks.

Policymakers should consider the heterogeneity across banks in terms of non-performing loans ratios. This suggests that one-size-fits-all policies may not be effective in addressing non-performing loans. Policymakers should adopt a risk-based approach, considering the unique characteristics and risk profiles of individual banks or groups of banks.

Accurate and comprehensive data are crucial for analyzing and managing non-performing loans. Banks should invest in robust data collection systems and ensure the quality and integrity of their data. Policymakers can play a role in standardizing data collection and reporting practices across banks, facilitating the availability of reliable and comparable data.

Limitations and future research directions

One of the primary limitations of the research is that it focuses on a certain specific set of independent variables and does not consider other potential factors that could influence the credit risk of the banks, such as bank specific characteristics, regulatory policies or market conditions. Adding other variables in future research could provide a more comprehensive understanding of the determinants of non-performing loans. In addition, current analysis assumes a linear relationship between the independent variables and credit risk. However, the relationship may be more complex and nonlinear in reality. Future studies could explore alternative functional forms or consider non-linear models.

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