Determinants of the Non-Performing Loans in the Arab Banking Sector: Evidence from Dynamic Panel Data Models

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Contents

List of Tables

List of Figures

Executive summary

The weakness of the risk management system and the financial or economic crises may make the banking sector exposed to high credit risks, which may lead to high levels of default. Furthermore, the high level of debt burden ratio may make customers unable to pay their financial obligations, thus increasing credit risks. The current study is in line with this and aims to examine the determinants of the non-performing loans (NPLs) in the Arab banking sector. To that effect, we consider internal factors that include bank-specific variables, and external factors that involve industry-specific and macroeconomic variables. We estimate a dynamic panel data model by the system Generalized Method of Moments (GMM) for a set of 15 Arab economies based on annual data covering the period from 2013 to 2019.

The obtained findings outline the importance of the bank-specific factors in explaining the NPLs ratio. In fact, there are significant and positive linkages between the one-period lagged NPLs ratio, the size of the banks and the capital adequacy ratio on the one hand, and the NPLs ratio on the other hand, and significant and negative linkages between the return on assets (ROA) and the NPLs ratio. The study also indicates that the NPLs ratio reacts significantly and negatively to the fluctuations in economic growth. It is also found that the growth of the gross loan, the interbank interest rate, the credit

information industry, and the inflation rate do not exert any effects on the NPLs ratio.

The study provides important recommendations for bank decision-makers in the Arab region. Indeed, they should work on improving the operational efficiency and enhancing credit risk management and risk management in the banking sector, developing the operational framework for the monetary policy of central banks, enhancing the opportunities to benefit from the credit information industry, boosting the government's role in adopting economic policies that support investment, developing stress tests for banks, and adopting early warning systems.

Introduction

The banking sector plays a vital role in promoting economic growth by providing the necessary liquidity for investment. Banks may be exposed to high credit risks due to weakness of their risk management system and financial or economic crises that may adversely affect cash flows for companies and individuals, thus leading to high levels of default. Additionally, the high credit risks may be due to the high level of debt burden ratio that may make customers unable to pay their financial obligations, and the high default rates that negatively affect the financial position of banks and may cause the bankruptcy of many of them, thus leading to serious repercussions on financial and economic stability.

The concept of bad loans differs across countries. In this context, Basel Committee on Banking Supervision (2016) states that "*definitions commonly focus on qualitative factors relating to doubts about full collectability and/or quantitative factors, primarily a number of days past due trigger (generally 90 days past due)*" (see also International Monetary Fund, 2017).

The ratio of NPLs to total loans is one of the most important ratios that measure the assets quality in the banking sector, as the financial insolvency risks of banks start mostly from the quality of the assets. The NPLs are widely used in the related literature to assess the

creditworthiness of institutions or financial systems in general (Basel Committee on Banking Supervision, 2016).

The NPLs ratio reflects the bank's ability to convert assets into liquidity and is considered by the supervisory authorities in the context of CAMEL (Capital adequacy, Asset quality, Management, Earnings, and Liquidity) classification to assess the safety of the financial positions of the banking sector. Additionally, the ratio is published periodically within the Financial Soundness Indicators (FSIs) issued by the central banks in order to enhance public confidence in the formal financial sector. In this context, the 2007-2009 global financial crisis emphasized that bad loan portfolio is one of the most important factors of fragility of the banking system and could produce negative effects on the financial system and, thus, the overall economic activity.

In this study, we continue in the same momentum of empirical works on the relationship between the NPLs ratio and many related determinants by opting for panel data methods that have not been previously employed to examine such linkages for the Arab banking sector. Indeed, we estimate a dynamic panel data model by the system GMM procedure for a set of 15 Arab countries over the 2013-2019 period. We include three classes of determinants into the model, namely bank-specific factors, monetary policy and industry-specific factors, and macroeconomic variables to consider a more generalized specification, thus avoiding biased outcomes and shedding more light

on several channels that may influence the NPLs ratio. By doing so, we assess accurately the responses of the NPLs ratio to the changes in a number of determinants, thus providing sound recommendations for the Arab bank decision-makers.

The results obtained for some of the determinants are aligned with expectations for the considered panel of Arab economies over the study period. Indeed, there is evidence of significant and positive effects of the one-period lagged NPLs ratio, the size of the banks and the capital adequacy ratio, and significant and negative impacts of the return on assets and the economic growth rate on the NPLs ratio. It is also found that the growth of the gross loan, the interbank interest rate, the credit information industry, and the inflation rate do not have the power to influence significantly the NPLs ratio. Useful recommendations are provided for decision-makers to help them improve the operational efficiency of the Arab banking sector, depending on the intrinsic features of each Arab economy.

The remainder of the study is structured as follows. Section 1 briefly reviews related empirical studies in the field. Section 2 provides some insights on the Arab banking sector. Section 3 presents an overview on the variables and a preliminary analysis of data. The model and estimation issues are introduced in Section 4. Section 5 discusses the empirical findings. Concluding comments and recommendations are set forth at the end of the study.

1. Literature review

Several empirical studies in the literature have examined the effects of many determinants on the NPLs, namely bank-specific factors, banking industry and monetary policy factors, and macroeconomic variables. Oil prices are sometimes used to account for the changes in the external financial conditions (see Beaton et al., 2016). In this context, for oil-exporting economies, higher oil prices may lead to higher earnings and income levels, thus decreasing the NPLs. However, for oil-importing economies, higher oil prices may reduce borrowers' income, thus leading to higher NPLs.

Salas and Saurina (2002) provided evidence of credit risk determinants, namely economic growth, indebtedness of businesses and household, loans growth, inefficiency, portfolio structure, size, net interest margin, solvency ratio, and market power in Spanish banks over the 1985-1997 period. The study reveals some discrepancies between commercial and savings banks and provides some recommendations related to the early warning, the advantages of bank mergers, and the banking competition and ownership.

Curak et al. (2013) analyzed the determinants of NPLs, namely macroeconomic and bank-specific factors in Southeastern European banking systems for a set of ten economies from 2003 to 2010. The results show that the NPLs are negatively affected by economic growth and positively influenced by inflation and interest rate. It is

also found that credit risk responds significantly to bank-specific variables, such as bank size, ROA, and solvency.

Messai and Jouini (2013) examined the determinants of NPLs for a set of 85 banks in Italy, Greece and Spain from 2004 to 2008. The study reveals that economic growth and ROA negatively influence the NPLs, while unemployment and real interest rate positively affect the NPLs. Ghosh (2015) emphasized that inefficiency cost, liquidity risk, size of the banking industry, inflation, unemployment, and public debt impact the NPLs.

Beaton et al. (2016) examined the relationship between the NPLs and some variables in the Eastern Caribbean Currency Union from 1996 to 2015. The results indicate that macroeconomic and bank-specific factors play a crucial role in deteriorating asset quality, and that banks with stronger profitability and lower exposure to the construction sector and household loans tend to have lower NPLs.

Rajha (2017) investigated the effects of bank-specific and macroeconomic variables on the NPLs in Jordan over the 2008-2012 period. The results outline that the ratio of loans to total assets positively affects the Jordanian banking sector, while the size does not significantly affect the NPLs. It is also found that the 2008-2009 global financial crisis has negative effects on the loans default.

2. Insights on the Arab banking sector

The credit facilities portfolio is still the largest component of the assets of the Arab banking sector. The value of the facilities granted by the banking sector denominated in dollars has increased by 3.5% in 2019, as the volume of loans granted $ 2,230 billion, compared to $ 2,155 billion in 2018, thus indicating the increased dependence of banks on their main business of granting facilities. The facilities in 2019 constituted 62% of the total assets and maintained the same pace during the period (2013-2019), where the ratio reached about 63% in 2014, 2015, 2016 and 2018, while it reached 59% and 61% in 2013 and 2017, respectively (see Figure 1 and 2).

The average NPLs ratio has maintained good levels over the 2013-2019 period, with the average reaching 6.8% and 7.1% in 2018 and 2019, respectively, 6.5%, 6.6% and 6.5% in 2015, 2016 and 2017 respectively, and 6.9% and 6.7% in 2013 and 2014, respectively (see Figure 3). It is worth noting that the relative increase in the average NPLs ratio in 2018 is due to the implementation of the International Financial Reporting Standard (IFRS9) in several Arab countries, where the scope of implementation of IFRS9 includes all kinds of credit facilities. IFRS9, especially in the beginning of implementation, increases the ability of banks to face risks and represents additional capital buffer to absorb potential shocks, as it strengthens banks' hedging of risks by building provisions that take into account the predictive dimension of losses (including the

economic dimension) from day one of granting credit. This, in turn, represents an additional hedging buffer that reduces the burden on capital and enhances the solvency of banks.

The average provision coverage ratio reached about 93.4% in 2019 compared to 93.1% in 2018 (see Figure 4). Knowing that the provision coverage ratio increased significantly in 2018, some countries have started applying IFRS9, and according to this standard, additional provisions are built in a hedging manner since the first day of granting credit, so that it takes into account the predictive dimension of credit default, enhancing the banks' ability to cope with credit risk and, thus, enhancing financial stability.

3. Data and preliminary analysis

According to prior empirical studies in the related literature, there are internal and external factors that might affect the NPLs. The internal factors include bank-specific variables, whereas the external factors include industry-specific factors and macroeconomic variables. The impacts of these factors on the NPLs vary across countries. Indeed, the bank-specific factors are significant drivers of the NPLs in some countries, while the macroeconomic variables, especially economic growth, are found to be more important than the other factors in explaining the NPLs in other economies. It is worth noting that there is a limited evidence in the literature on the determinants of the NPLs in the Arab banking sector. For that reason, the current study explores

the empirical evidence of the relationship between the NPLs and various determinants for a panel of 15 Arab economies (Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Tunisia, and the United Arab Emirates (UAE)) based on annual data covering the period from 2013 to 2019.

3.1. Variables

In our specifications, the dependent variable is the NPLs ratio. Regarding the determinants of this variable, we consider some indicators for each class of factors.

Bank-specific factors: These factors first include the size of the banks (SIZE) measured by the assets (in natural logarithm), which is expected to negatively affect the NPLs ratio (see Curak et al., 2013). Indeed, it is shown in the related literature that the size-NPLs nexus is direct, as larger banks are more effective (with their skilled employees and qualitative information bases) in credit analysis and monitoring their debtor due to their ability to manage credit risk and accurate evaluation of the customers. Second, we consider the solvency proxied by the capital adequacy ratio (CAR), which is expected to be positively linked with the NPLs ratio. Indeed, through engaging in more risky activities, banks with higher level of capitalization in the previous period, experience higher level of NPLs in the following year (see Goldewski, 2005). Third, we include the

growth of the gross loan for the banking sector (CREDIT) into the model, which is expected to positively affect the NPLs ratio. Indeed, increases in credit growth are often associated with declining banks loan quality, so higher credit growth increases credit risk and, thus, the NPLs ratio (see Ozili, 2015). The last determinant in this class of factors is the return on assets (ROA), which is expected to be negatively connected with the NPLs ratio. Indeed, several studies emphasized that there is a positive relationship between the managerial efficiency of a bank and the ROA (profits), thus leading to lower the NPLs ratio (see Dimitrios et al., 2016).

Monetary policy and industry-specific factors: We first consider the interbank interest rate (IIR), which is expected to positively impact the NPLs ratio, as changing interest rates (policy rates) directly affects borrowers' lending capacity (see Espinoza and Prasad, 2010). If banks linked the interbank rate with the variable interest rates on loans, there would be a direct effect on the interest rates on loans in these banks, thus leading to an increase in default rates, as the financial burden increases on bank customers. We also consider a dummy variable (D1) that determines the availability of a credit information system (credit bureau) to provide a comprehensive credit information database about the customers. This is expected to help banks rationalize the credit decision making so that a right decision is made based on a precise evaluation of the ability of the customers to repay their loans. In turn, this will enhance the effectiveness of risk management of the banks, implying that the

relationship between the dummy variable and the NPLs ratio is expected to be negative. Several studies show evidence of a positive effect of credit information sharing on the NPLs ratio (see McIntosh and Wydick, 2005).

Macroeconomic variables: We first include the growth rate (GR), based on real GDP, which is expected to have a negative effect on the NPLs ratio (see Messai and Jouini, 2013). Indeed, the decline in the performance of the economy negatively affects cash flows of bank customers, thus limiting their ability to repay the loans. We also consider the inflation rate (INF), proxied by the percentage change of the consumer price index, which is expected to positively impact the NPLs ratio, as high prices may limit the ability of bank customers to repay their loans (see Curak et al., 2013).

Data on the NPLs, the size of the banks, the capital adequacy ratio, the growth of the gross loan for the banking sector, and the return on assets are gathered from financial stability surveys; data on the dummy variable related to the availability of a credit bureau and the interbank interest rate are collected from central banks databases; data on real GDP are gathered from World Development Indicators published by the World Bank; and data on inflation are collected from the United Nations Conference on Trade and Development (UNCTAD) database.

3.2. Preliminary analysis of data

The descriptive statistics for all variables presented in Table 1 reveal that Saudi Arabia records the lowest NPLs ratio (1.514) followed by Qatar (1.700) and Oman (2.200), which may be due to the solvency ability of the banks' customers in these economies. By cons, Libya records the highest NPLs ratio (20.886) followed by Tunisia (14.614) and Iraq (9.658), which may be explained by the difficulties faced by the banks' customers due to disturbances that reign in these countries over the study period. It is worth noting that the average NPLs ratio for Saudi Arabia (Libya), Qatar (Tunisia) and Oman (Iraq) is lower (higher) than the average NPLs ratio over the full panel of countries (6.490). The results also show that the volatility of the NPLs ratio differs across countries, as indicated by the values of standard deviation. Additionally, there is evidence of discrepancy in the averages and volatility of the determinants of the NPLs ratio across economies.

The empirical correlations between the NPLs ratio and the considered determinants displayed in Table 2 are calculated across economies and over the whole panel. The values by country show evidence of mixed (positive and negative) correlations between the NPLs ratio and the other variables across economies. For the full panel of countries, the NPLs ratio is negatively connected with the size of banks (-0.141), the growth of the gross loan for the banking sector (-0.167), the return on assets (-0.459), and the growth rate (-

0.131). However, the NPLs ratio is positively related to the capital adequacy ratio (0.134), the interbank interest rate (0.076), and the inflation rate (0.119). The correlations do not definitively determine the nature of the relationship between the variables under study, which refers us to an in-depth analysis of the linkages between the NPLs ratio and the considered variables in the Arab region based on a reliable econometric methodology to achieve the desired objectives of the study.

4. Model and estimation issues

4.1. Model

We assess the responses of the NPLs ratio in the Arab banking sector to the changes in the bank-specific factors, the monetary policy and industry-specific factors, and the macroeconomic factors by considering the following model:

$$\begin{cases} Y_{it} = \alpha_0 + \alpha_1 B'_{it} + \alpha_2 I'_{it} + \alpha_3 M'_{it} + u_{it} \\ i = 1, 2, \dots, N, \ t = 1, 2, \dots, T \end{cases} \quad (1)$$

where i stands for cross-section dimension (country) and t for time series dimension (time period); Y_{it} is the NPLs ratio; B_{it} is the vector of bank-specific factors, namely SIZE, CAR, CREDIT, and ROA; I_{it} is the vector of monetary policy and industry-specific factors, namely IIR and D1; M_{it} is the vector of macroeconomic variables, namely GR and INF; and u_{it} is the error term. Under these conditions, the

vector α_1 measures the effects of the bank-specific factors on the NPLs ratio, the vector α_2 shows how the NPLs ratio reacts to the changes in the monetary policy and industry-specific factors, and the vector α_3 assesses the impacts of the macroeconomic variables on the NPLs ratio.

4.2. Estimation issues

We employ an appropriate GMM technique to estimate the model specified above. This approach allows us to estimate the model linking the NPLs ratio with the considered determinants over a short period of seven years for a set of 15 economies by pooling cross-section and time series data, and to control for any potential endogeneity that may arise from independent variables. In this study, we employ the system GMM procedure, developed by Blundell and Bond (1998), whose finite sample properties are better when the instruments are weak. To estimate the model coefficients, the system GMM technique considers lagged and differenced versions of the explanatory variables as instruments.[1]

We consider the following dynamic panel data model in which we incorporate unobserved country specific effects given by the coefficient μ_i:

[1] Readers are referred to Hoeffler (2002) and Das and Paul (2011) for more explanations on why the system GMM is a preferred technique.

$$Y_{it} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 X_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where Y_{it} is the NPLs ratio; X_{it} is the vector of bank-specific factors, policy and industry-specific factors, and macroeconomic variables; and $E(\mu_i) = 0$, $E(\varepsilon_{it}) = 0$ and $E(\mu_i \varepsilon_{it}) = 0$. By taking the first difference of Eq. (2) , the model is expressed as follows:

$$\Delta Y_{it} = \beta_1 \Delta Y_{i,t-1} + \beta_2 \Delta X_{it} + \Delta \varepsilon_{it} \quad (3)$$

where the unobserved country specific component μ_i has been eliminated from the model. The estimation of this model by the OLS method generates biased estimate of the coefficient β_1. The GMM approach can alleviate this shortcoming using instruments. To do this, the GMM procedure is based on the following moment conditions under the assumptions that the disturbance term is not autocorrelated and the regressors are not correlated with future values of the disturbance term (see Carkovic and Levine, 2005):

$$E\left[Y_{i,t-j}\left(\varepsilon_{it} - \varepsilon_{i,t-1}\right)\right] = 0, \;\; j \geq 2, 3, \ldots, (T-1); \; t = 3, 4, \ldots, T \quad (4)$$

$$E\left[X_{i,t-j}\left(\varepsilon_{it} - \varepsilon_{i,t-1}\right)\right] = 0, \;\; j \geq 2, 3, \ldots, (T-1); \; t = 3, 4, \ldots, T \quad (5)$$

There are problems of weak instruments in the first difference estimators in Eqs. (4) and (5). To solve this issue, Blundell and Bond (1998) combine the model in differences with the model in levels in a system of equations such that

$$E\left[Y_{i,t+p}\varepsilon_{it}\right] - E\left[Y_{i,t+q}\varepsilon_{it}\right] = 0, \quad \forall\, p, q \quad (6)$$

$$E\left[X_{i,t+p}\varepsilon_{it}\right] - E\left[X_{i,t+q}\varepsilon_{it}\right] = 0, \quad \forall\, p, q \tag{7}$$

Under these conditions, Blundell and Bond (1998) consider the following additional moment conditions:

$$E\left[\Delta Y_{i,t-1}(\mu_i + \varepsilon_{it})\right] = 0 \tag{8}$$

$$E\left[\Delta X_{i,t-1}(\mu_i + \varepsilon_{it})\right] = 0 \tag{9}$$

The system GMM technique is based on the moment conditions given by Eqs. (4), (5), (8) and (9) to obtain consistent and efficient estimates of the model coefficients.

5. Discussion of the results

5.1. Determinants of the NPLs ratio

The system GMM results of the effects of the considered determinants on the NPLs ratio from the full panel of 15 Arab economies over the 2013-2019 period are displayed in Table 3. They indicate that the NPLs ratio reacts positively and significantly to its past own values at the 1% level. Regarding the explanatory variables, the findings reveal that the size of banks and the capital adequacy ratio are relevant drivers of the NPLs ratio for the Arab region since the related coefficients are positive and statistically significant at the 1% level. Indeed, an increase of one unit in the size of banks and the capital adequacy ratio tends to increase the NPLs ratio by 0.763 and 0.033 unit, respectively. However, the NPLs ratio responds

significantly and negatively to the fluctuations in the return on assets and the growth rate. In fact, an increase of one unit in the return on assets and the growth rate leads to a decrease of 0.630 and 0.038 unit in the NPLs ratio. The other determinants, namely the growth of the gross loan for the banking sector, the interbank interest rate, the dummy variable related to the availability of a credit bureau, and the inflation rate do not have the power to influence the NPLs ratio.

It is evident that the relationship between the NPLs ratio and the related determinants is mostly consistent with previous studies. As expected, the increase in the NPLs ratio for the previous period will continue its impact for the subsequent period. The high percentage of NPLs increases the pressure on banks when managing their assets for subsequent years, which requires building more provisions, especially considering the application of IFRS9. It is worth noting that the application of this Standard enhances the soundness and solvency of banks and hedge against potential shocks, as the additional provisions that may result, especially at the beginning of the application, increase the banks' ability to face risks and represent additional protection for capital. This is due to the fact that IFRS9 strengthens banks' hedging of risks by building provisions that take into account the predictive dimension of losses (including the economic dimension) from the first day of granting credit, which in turn represents an additional hedge margin that reduces the burden on capital and enhances the solvency of banks.

The positive relationship between the size of the banks' assets and the NPLs ratio is due to the fact that larger banks may have a higher risk appetite compared to smaller banks that are usually conservative. The positive relationship between the NPLs ratio and the capital adequacy ratio is due to the fact that higher capital adequacy is usually associated with higher credit, and market and operating risks. In addition, deducting part of the liquidity to enhance capital requirements reduces liquidity, thus leading to higher interest rates on loans and, consequently, increasing the likelihood of clients' default.

The negative relationship between the NPLs ratio and the return on assets may be explained by the fact that the higher the return on assets, the lower the credit risk, that is, the lower the NPLs ratio, thus giving a clear indication of the banks' operational efficiency. Furthermore, the return on assets mainly refers to the efficiency of the credit granting process and the ability of the banking sector to maintain assets by achieving appropriate returns on them, thus enhancing the flow of investments to the banking sector and increasing the degree of confidence in its integrity.

There is also evidence of no significant relationship between the loan growth rate and the NPLs ratio, despite of the reasoning that increases in loans growth are often associated with declining banks' loan quality, so higher credit growth increases credit risk and, thus, increases the NPLs. There is no significant relationship between

licensing credit information companies (credit bureau) and the NPLs ratio. Nevertheless, there are still great opportunities to benefit from the credit information industry to reduce the NPLs ratio in the coming years. Whereas, the credit information industry enhances the effectiveness of risk management in banks and leads to rationalization of credit decisions.

There is no significant relationship between interest rates and the NPLs ratio, which may be explained by the constancy of the interest rates over some years of the sample period for many of the considered countries. On the other hand, this result may indicate that the central bank's raising of interest rates did not negatively affect the NPLs ratio. It is known in the literature that interbank lending interest rates and interest rates on monetary policy are directly or indirectly related to higher costs and interest rates on loans. In some countries, central bank instructions require banks to link floating interest rates to interest rates on customers' loans, and in some other countries, central banks give banks the freedom to adjust interest rates on loans according to certain controls. Higher interest rates for interbank lending will push banks to raise interest rates, which may lead to a higher debt burden on the banks' customers, thus increasing the likelihood of the default.

Finally, as for economic factors, the results reveal a negative relationship between economic growth and the NPLs ratio. Indeed, the decline in economic activities or negative economic conditions

lead to a decrease in income for the corporate and individual sectors, reducing their ability to pay off their obligations and, thus, increasing the NPLs ratio. The model does not show a significant relationship between inflation and the NPLs ratio, although higher prices may increase the burden on customers.

5.2. Diagnostic checks

This part is devoted to check whether the estimated models fil well the data by applying some tests for the consistency of the system GMM estimators, namely the Wald test for overall significance of the model coefficients, the second-order serial correlation test for no autocorrelation in the first-differenced disturbance term, and the Sargan test for overall validity of the instruments (validity of the over-identifying restrictions). The results reported in Table 3 indicate that the Wald test concludes in favor of overall significance of the model, as we are able to reject the null hypothesis at the 1% level. The second-order serial correlation test fails to reject the null hypothesis, suggesting no autocorrelation in the first-differenced error term. The Sargan test does not reject the null hypothesis, implying that the over-identifying restrictions are valid. Overall, the test outcomes support the validity of the system GMM estimators.

Conclusion and policy implications

The study provides an in-depth analysis of the relationship between the NPLs ratio in the banking sector and related determinants, namely

bank-specific factors, monetary policy and industry-specific factors, and macroeconomic variables for a panel of 15 Arab economies over the 2013-2019 period. The analysis is conducted by estimating a dynamic panel data model by the system GMM method.

The results of the econometric analysis outline the importance of the effect of the considered determinants on the NPLs ratio, as there are positive and significant relationships between the NPLs ratio for the previous year, the size of the banks and the capital adequacy ratio on the one hand, and the NPLs ratio on the other hand. However, the NPLs ratio reacts negatively and significantly to the changes in the return on assets and economic growth. No evidence has emerged for the existence of an impact of the growth of the gross loan, the interbank interest rates or monetary policy interest rate, the credit information industry, and the inflation rate on the NPLs ratio. The study provides interesting recommendations for decision-makers in the Arab banking sector:

- Continuing to improve the operational efficiency of the Arab banking sector, which will lead to the reduction of NPLs.
- Enhancing credit risk management and risk management in the banking sector, especially considering the adoption of IFRS9.
- Continuing to develop the operational framework for the monetary policy of central banks.

- Enhancing the opportunities to benefit from the credit information industry in enhancing credit risk management, thus reducing the percentage of NPLs, especially as credit information provides a database that enables the bank to conduct accurate evaluation of customers before granting credit.

- Enhancing the governments' role in adopting economic policies that support investment.

- Developing stress tests for banks, considering the banking industry and macroeconomic variables, especially when building econometric models used in the satellite models tests.

- Adopting early warning systems that consider the factors affecting the NPLs ratio.

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Table 1. Summary statistics of the variables

Variable	Bahrain	Egypt	Iraq	Jordan	Kuwait
NPL					
Mean	5.557	6.271	9.658	5.129	2.286
Std. Dev.	0.443	2.109	2.607	0.883	0.758
SIZE					
Mean	4.422	5.697	4.683	4.217	5.318
Std. Dev.	0.070	0.169	0.117	0.070	0.085
CAR					
Mean	19.629	15.057	140.429	18.029	17.986
Std. Dev.	0.832	1.694	26.450	0.828	0.701
CREDIT					
Mean	1.014	7.671	11.386	11.829	6.143
Std. Dev.	5.178	28.162	18.640	14.316	7.576
ROA					
Mean	1.043	1.529	0.590	1.229	1.143
Std. Dev.	0.151	0.364	0.278	0.095	0.098
IIR					
Mean	1.879	15.250	4.857	3.279	1.214
Std. Dev.	0.988	2.309	1.069	0.799	0.424
GR					
Mean	3.385	4.125	3.905	2.340	0.302
Std. Dev.	1.292	1.211	5.986	0.457	2.372
INF					
Mean	2.151	14.500	0.917	2.088	2.267
Std. Dev.	0.816	6.929	0.923	2.383	1.066

Table 1 - bis. Summary statistics of the variables

Variable	Lebanon	Libya	Morocco	Oman	Palestine
NPL					
Mean	6.843	20.886	7.171	2.200	2.729
Std. Dev.	4.195	0.302	0.565	0.622	0.658
SIZE					
Mean	5.303	4.696	4.994	4.352	2.638
Std. Dev.	0.148	0.165	0.096	0.153	0.164
CAR					
Mean	15.829	14.729	14.086	16.843	17.886
Std. Dev.	1.000	2.478	0.803	1.300	1.302
CREDIT					
Mean	-2.286	0.786	6.571	10.371	11.571
Std. Dev.	17.060	8.922	19.575	11.768	6.488
ROA					
Mean	0.874	0.457	0.914	1.629	1.571
Std. Dev.	0.300	0.315	0.107	0.150	0.189
IIR					
Mean	2.857	6.000	2.446	7.500	6.939
Std. Dev.	1.215	0.000	0.287	0.000	0.479
GR					
Mean	0.186	-0.701	3.189	2.767	2.370
Std. Dev.	3.134	17.278	1.314	1.960	1.781
INF					
Mean	2.221	10.371	1.197	0.836	0.895
Std. Dev.	3.451	11.968	0.715	0.551	0.917

Table 1 - bis. Summary statistics of the variables

Variable	Qatar	Saudi A.	Sudan	Tunisia	UAE	Whole panel
NPL						
Mean	1.700	1.514	5.214	14.614	5.586	6.490
Std. Dev.	0.208	0.367	1.907	1.188	0.527	5.309
SIZE						
Mean	5.809	6.395	2.842	3.834	6.554	4.784
Std. Dev.	0.194	0.100	0.276	0.048	0.128	1.113
CAR						
Mean	16.243	19.214	17.386	11.257	18.271	24.858
Std. Dev.	1.251	1.210	1.627	1.316	0.637	31.771
CREDIT						
Mean	12.757	11.329	2.886	0.571	4.771	6.491
Std. Dev.	11.447	10.816	34.820	9.141	5.073	15.824
ROA						
Mean	1.829	1.957	3.586	1.000	1.486	1.389
Std. Dev.	0.304	0.113	0.989	0.208	0.135	0.788
IIR						
Mean	4.643	1.679	14.047	5.321	1.386	5.286
Std. Dev.	0.283	1.021	3.098	1.375	0.696	4.334
GR						
Mean	2.438	2.022	2.298	1.975	3.249	2.256
Std. Dev.	1.651	1.744	3.315	0.859	1.596	4.902
INF						
Mean	1.578	1.224	36.390	5.335	1.748	5.581
Std. Dev.	1.596	1.994	16.736	1.293	1.894	10.589

Table 2. Correlations between the NPLs ratio and the other variables

Country	Bahrain	Egypt	Iraq	Jordan	Kuwait
SIZE	-0.863	-0.483	-0.715	-0.386	-0.908
CAR	0.655	-0.747	0.752	0.165	0.163
CREDIT	-0.264	0.251	0.418	-0.185	0.014
ROA	0.430	-0.559	0.457	0.306	-0.891
IIR	-0.695	-0.346	-0.858	0.806	-0.889
GR	0.815	-0.932	-0.333	0.709	0.254
INF	0.878	-0.540	-0.924	0.493	0.645

Table 2 - bis. Correlations between the NPLs ratio and the other variables

Country	Lebanon	Libya	Morocco	Oman	Palestine
SIZE	0.669	-0.539	-0.737	0.626	0.389
CAR	0.343	0.485	0.506	0.907	-0.286
CREDIT	-0.903	-0.712	0.001	-0.237	-0.635
ROA	-0.843	-0.200	-0.185	-0.376	-0.341
IIR	0.969	-	-0.948	-	-0.295
GR	-0.950	0.329	-0.453	-0.635	-0.694
INF	0.341	0.286	-0.292	-0.423	0.319

Table 2 - bis. Correlations between the NPLs ratio and the other variables

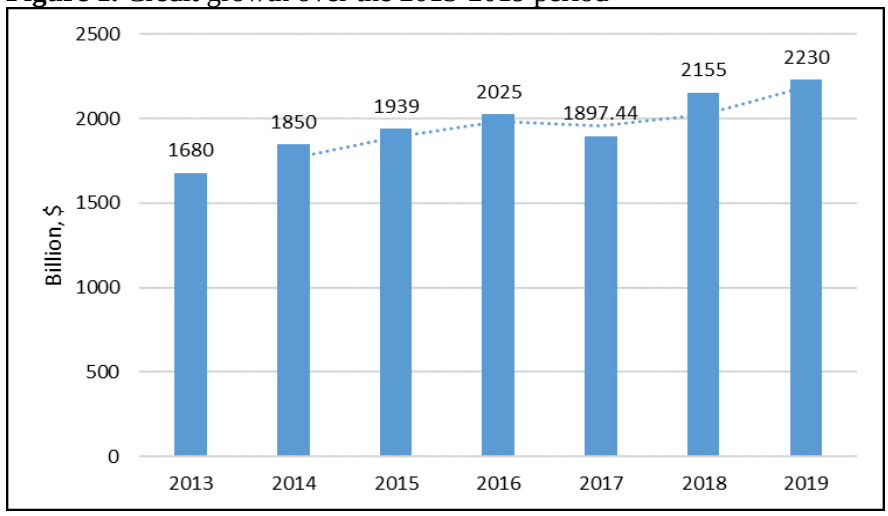
Country	Qatar	Saudi A.	Sudan	Tunisia	UAE	Whole panel
SIZE	-0.122	0.752	-0.006	0.875	0.215	-0.141
CAR	0.550	0.896	0.234	-0.500	-0.190	0.134
CREDIT	-0.823	0.456	0.427	0.354	-0.388	-0.167
ROA	0.184	-0.103	0.181	-0.802	0.514	-0.459
IIR	-0.212	0.813	0.258	-0.797	0.791	0.076
GR	0.074	-0.597	0.443	0.028	-0.287	-0.131
INF	-0.241	-0.500	-0.263	-0.827	-0.828	0.119

Table 3. System GMM estimates

	Estimate	Standard Error
NPL(-1)	0.650***	0.186
SIZE	0.763***	0.269
CAR	0.033***	0.003
CREDIT	-0.004	0.003
ROA	-0.630**	0.245
IIR	0.031	0.053
D1	-0.450	0.782
GR	-0.038***	0.010
INF	0.010	0.007
Wald Test	3717.180+++	
	[0.000]	
Second-Order Autocorrelation Test	1.336	
	[0.182]	
Sargan Test	3.113	
	[1.000]	

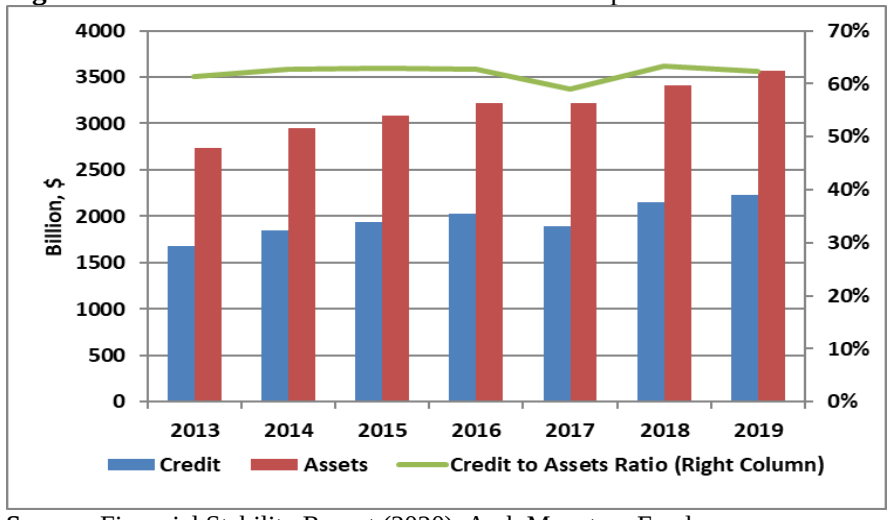
Notes: Wald test for overall significance of the model, Second-order autocorrelation test for no serial correlation in first-differenced errors, and Sargan test for over-identifying restrictions. The values in brackets are the *p*-values of the tests. *** and ** denote significance at the 1% and 5% levels, respectively. +++ denotes rejection of the null hypothesis at the 1% level.

Figure 1. Credit growth over the 2013-2019 period



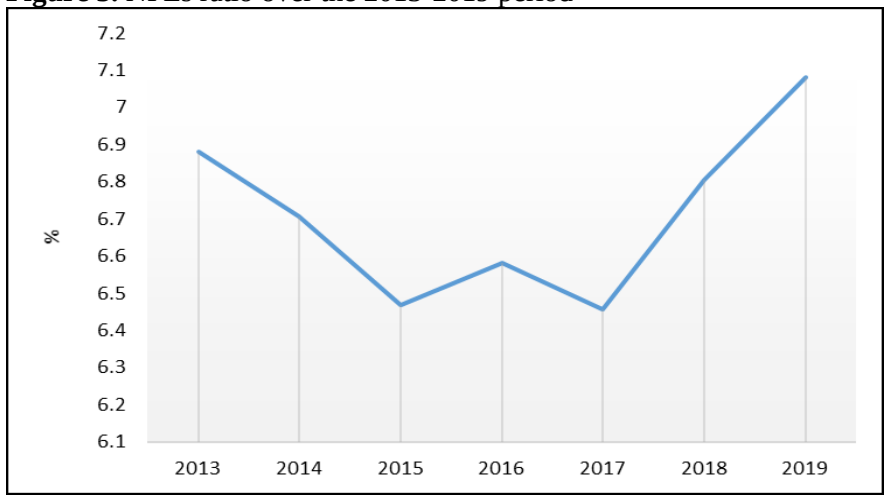
Source: Financial Stability Report (2020), Arab Monetary Fund

Figure 2. Credit to assets ratio over the 2013-2019 period



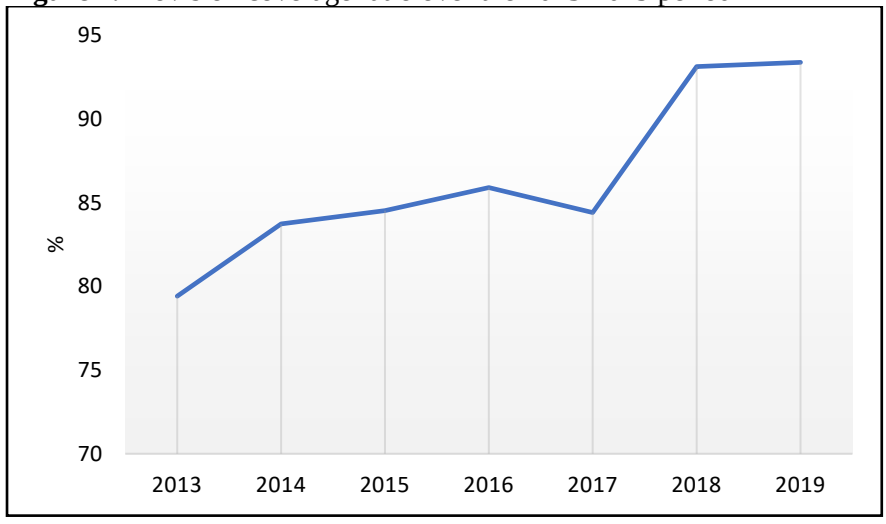
Source: Financial Stability Report (2020), Arab Monetary Fund

Figure 3. NPLs ratio over the 2013-2019 period



Source: Financial Stability Report (2020), Arab Monetary Fund

Figure 4. Provision coverage ratio over the 2013-2019 period



Source: Financial Stability Report (2020), Arab Monetary Fund