The Impact of the Over-indebtedness of the Household Sector on the Non-performing Loans in the Banking Sector in the Arab Countries

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ABSTRACT

The paper examined the potential relationship between household credit risk and its impact on the non-performing loans ratio (NPLs), in ten Arab countries during the period (2015-2020), using the difference Generalized Method of Moments (GMM), the household credit was measured through the household loans to total credit ratio, in a manner that takes into account the existence of prudential tools that mitigate these risks and limit the systemic risks that may arise from this sector, as variables were used that measure the effect of activating or tightening the Debt-to-Income ratio (DTI) and the Loan to the Value ratio (LTV). The results showed that the increase in the household loans to the total loans ratio has a positive relationship with the bank default rate (NPLs ratio), and the results also showed that the macroprudential policy tools play an important role in reducing these risks. While there was a negative relationship between the rate of return on assets (ROA) and the size of the bank on the one hand, and the default rate on the other. While there was no statistically significant relationship between the interbank interest rate and the default rate, as well as the inflation rate, but regarding the real gross domestic product (GDP) growth rate, the results showed a negative relationship between this variable and credit risk. The paper recommended the need to enhance responsible finance, and the deliberate appetite for lending to individuals based on customer risks, and to benefit from the credit database of credit bureaus or credit information companies to rationalize credit and grant loans based on customer risks.

Keywords: Household sector, Macroprudential policy instruments, Loan-to-Value ratio, Debt-to-Income ratio, Non-performing Loans, Generalized Method of Moments.

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I. INTRODUCTION

The global financial crisis in 2008 revealed that achieving financial stability at the level of individual financial institutions is not sufficient to achieve financial stability in the financial system as a whole due to the presence of systemic risks, as central banks expanded the scope of their tasks and objectives to include enhancing financial stability through continuous assessment of systemic risks that may arise from various economic and financial sectors. In this context, the household sector (individuals' sector) is one of the most important economic sectors that should follow up on the systemic risks that may arise from it, in light of the fact that a high percentage of credit goes to this sector. Although the financial sector's willingness to finance the individuals sector leads to diversifying its investments, reducing risks and enhancing profitability, and the important role in enabling this sector to meet its needs and increase its ability to spend in a way that stimulates economic growth, at the same time it burdens individuals with indebtedness, which negatively affects financial stability, as this leads to limiting their ability to pay their obligations, which may decrease the quality of

bank's assets. It should also be noted that the excessive granting of credit to individuals may lead to a decline in economic growth rates if the credit is directed towards imported consumer goods.

The risk of default in the household sector also increases if the high growth in credit granted to this sector coincides with banks raising interest rates on facilities, as this leads to reducing the disposable income of individuals, which increases the possibility of default, especially if the banking market is open, i.e., the interest rates on customers are floating, and there are no explicit instructions that restrict the ability of banks to raise interest rates on customers, as many central banks (including some Arab central banks) have been obligating commercial banks to link interest rates on customers to the interbank lending rate or one of the monetary policy instruments (Obeid and Adeinat, 2017). This, in turn, reduces the risks of changing interest rates on the household sector, and increases the effectiveness of monetary policy in influencing interest rates in the market. In addition, economic indicators may be linked to a higher probability of failure of the household sector, such as unemployment rates, inflation, income, and the economic climate, all of which affect individuals' ability to pay.

On the other hand, perhaps one of the most important causes of the global financial crisis in 2008 was that the excessive real estate facilities led to an increase in real estate prices, which led to the creation of a bubble in the real estate market that negatively affected the financial positions of the banks. In addition, banks expanded lending to the individual sector in a way that became entrapped with obligations that exceeded its available income, and this in turn weakened their ability to pay their obligations even after selling the mortgaged properties. Hence the importance of central banks evaluating and monitoring these risks on an ongoing basis and reducing them by using appropriate macroprudential tools at the appropriate time, in order to enhance the financial sector's ability to absorb potential financial shocks and maintain its financial solvency.

It should be noted that the NPLs ratio is usually used in predicting the failure of banks due to the importance of asset quality as an indicator of the soundness of the financial positions of banks (see for example Obeid 2021).

This paper will address the impact of over-indebtedness in the household sector and its implications for financial stability (NPLs ration), so that Part (1) covers literature review on the subject, and Part (2) provides an overview of some of the macroprudential policy tools used to reduce systemic risks arising from the household sector, and Part (3) an overview of the indebtedness of the household sector in the banking sector in the Arab countries, and part (4) will describe the study variables and a descriptive analysis of them, and part (5) deals with the methodology of the study and the econometric model used and the analysis of the results of the study, while parts (6) and (7) will present an analysis of the results of estimating the econometric model and the reliability and robustness of the results, and Part (8) provides the conclusion and recommendations.

II. LITERATURE REVIEW

The study (Keeton and Morris, 1987) attempted to measure the factors affecting the high rates of bank default (non-performing loans), as the study showed that large-sized banks with a higher risk appetite, were eventually able to absorb the risks specific to credit, in light of their operational efficiency in manage its assets. But for small-sized banks, whose capital and equity ratio on assets were low, bank default rates increased when credit volume increased, and those banks were characterized by poor operational efficiency.

As for the study Salas and Saurina (2002), it examined the determinants of credit risk in Spanish banks during the period (1985-1997), where the study used a set of variables that included economic and banking risks, such as: economic growth, corporate indebtedness, and household indebtedness, credit growth rate, operational inefficiency, lending portfolio structure, asset size, net interest margin, some financial soundness indicators, and the Herfindahl Banking Competitiveness Index. The study showed that the unplanned growth of household sector indebtedness may increase the risks of default. The study recommended the importance of having crisis management plans and early warning systems, enhancing banking competition, and promoting a culture of risk in the banking sector.

Multiple studies (Jakubik and Reiningger, 2013; Klein, 2013; Skarica, 2014; Tomas Zikovic *et al.*, 2015) attempted to identify the main factors affecting the high rate of non-performing loans, where several variables were used, including real GDP growth, the rate of unemployment, household income, and the volume of loans granted to the household sector. The results showed that employment has an inverse relationship with non-performing loans and showed that raising interest rates on household sector loans led to a reduction in the amount of funds available for debt service, and thus higher bank default rates. Bank default rates also rise if interest rates rise accompanied by accelerated credit growth, as the excessive increase in household credit leads to higher levels of non-performing loans.

As for the study Wong *et al.* (2011), it was found that the loan-to-value ratio of the mortgaged property (LTV) reduces the sensitivity of the risks of non-payment of mortgages caused by a shock in real estate prices and setting a ceiling for this ratio leads to a decrease in household debt.

Regarding the study (Messai and Jouini, 2013), it tried to measure the determinants of non-performing loans for a group of 85 banks in Italy, Greece, and Spain from 2004 to 2008. The study revealed that economic growth and return on assets negatively affect non-performing loans, while unemployment and the real interest rate affect Positively on bad loans. While Ghosh (2015) emphasized that low operational efficiency, liquidity risks, the size of the banking industry, inflation and unemployment positively affect non-performing loans.

The study of Luis *et al.*, (2015) used the Fixed Effects-Unbalanced Panel model to estimate the long-term effect of changing the loan-to-value ratio (LTV) on the growth of real estate credit for five countries. The study indicated that the long-term cumulative effect of reducing the loan-to-value ratio of the mortgaged property by 10 percent leads to a reduction in the growth of real estate credit by about 0.7 percent after a period of 15 months, thus reducing the risk of default. While the study (Kuttner and Shim, 2016), included a study of the impact of setting limits on the ratios of debt to income and the value of the loan to the mortgaged property in 57 countries. The study found that placing limits on the debt-to-income ratio reduced home loans by 4 to 7 percent, while placing limits on the value of the loan to mortgaged property reduced home loans by 1 percent. In other words, the two ratios contributed to reducing the household credit risk.

As for the study Beaton *et al.* (2016), which investigated the factors affecting the ratio of non-performing loans in the Caribbean countries, the results showed that macroeconomic variables and micro variables of the bank play a decisive role in the extent of asset quality, and that banks with higher profitability tend to increase Exposure to the real estate sector with low non-performing loans.

The study of Jouini & Obeid (2021) examined the determinants of the ratio of non-performing loans to the total loans in the Arab banking sector. The variables that could affect the ratio of non-performing loans were measured through three groups of variables, including: bank specific variables, monetary policy and the banking industry variables, and variables related to the macro economy. The study concluded that some indicators of financial strength were among the most prominent determinants of the non-

performing loans ratio in the sector, as well as the improvement in operational efficiency, which was positively reflected in reducing credit risks. Economic activity contributed to reducing the percentage of non-performing loans.

III. AN OVERVIEW OF SOME PRUDENTIAL POLICY TOOLS USED TO REDUCE SYSTEMIC RISKS ARISING FROM HOUSEHOLD SECTOR INDEBTEDNESS

In this section, an overview of some of the macroprudential tools that are used to adjust the systemic risks arising from the household sector will be introduced, taking into account that there are other factors that may increase the efficiency of these tools, for example the lack of coordination between the macroprudential policy and the monetary and fiscal policies (Obeid and Awad, 2018; Obeid 2018).

A. The Countercyclical Capital Buffer (CCyB)

After the global financial crisis in 2008, regulatory and legislative reforms were developed and many macroprudential tools were introduced aimed at reducing systemic risks. The Basel III requirements included several banking reforms to enhance the ability of the banking system to absorb potential shocks and enhance the capital and liquidity of the banking sector in terms of quantity and quality. The committee also recommended following up the growth of credit granted to the private sector (of which the household sector is an important component) using the credit gap index, which measures the difference between the ratio of private credit to nominal GDP and its historical trend using a "Hodrick-Prescott filter", whereby a capital buffer is applied as a prudential tool to preserve the banking sector from the risks of excessive growth in private credit, as an additional tier of capital is added in the event that there is excessive credit growth and a credit gap of more than 2 percent. Given the importance of systemic risks arising from excessive credit growth, the CCyB has been required to build from high-quality capital (CET1), while releasing the buffer if the credit gap is less than 2 percent (that is, the private credit risk may decrease). It should be noted that the percentage of credit granted to the private sector is a major component of the financial cycle, which is considered the main criterion for central banks in activating or releasing and easing the tools of the macroprudential policy in them, as the financial cycle describes the behavior of three important indicators to assess the extent of the existence of financial crises, which are: The percentage of credit gap, the real estate asset price index, and the stock price index (Akerlof *et al.*, 2014). On the other hand, the Basel Committee on Banking Supervision is studying the possibility of measuring the credit gap for each economic sector separately, and imposing a sectoral buffer, so that this tool measures the systemic risks arising from each sector more accurately.

B. Activate or Tighten the Loan-to-Value Ratio (LTV), Debt-to-Income Ratio (DTI) or Debt Burden Ratio (DBR)

There are other prudential tools that are used to reduce the accumulation of risks of excessive lending to the household sector, most notably placing a cap on LTV ratio, and/or placing a cap on the DTI ratio or DBR. These tools are the

most common in reducing risks arising from the household sector, followed by capital and liquidity measures, where the two tools can be used as they are sectoral tools that are used to target risks arising from specific sectors in the economy without affecting other sectors. For example, the DTI ratio targets the household sector without affecting the corporate sector. As for the LTV ratio, it targets real estate and residential loans only.

Several studies have indicated the important and effective impact of these two tools in achieving the desired goal. For example, one of the studies issued by the Bank for International Settlements (BIS) showed that tightening restrictions on LTV and DTI ratios in 17 countries has significant effects in the event of the expansion of family credit at an increasing rate, or in the event of an increase in real estate credit, as these two tools limit the occurrence of huge costs for the banking sector during periods of economic recession, in addition to their ability to reduce the accumulation of financial imbalances. The study also revealed that the effect of tightening restrictions on the two tools limits the level of housing loans by between 2 and 3 per cent, while reducing them increases these loans by between 0 and 3 per cent, meaning that the effect of tightening the two instruments is greater than the effect of the reduction (McDonald, 2015).

TABLE I: ACTIVATE THE LTV AND DTI RATIOS IN THE ARAB COUNTRIES

Country	DTI	LTV
Jordan	Not activated	Not activated
UAE	50%-30%	85%-80%
Bahrain	50%	Not activated
Tunisia	40%	Not activated
KSA	Not activated	90%
Iraq	12.5%	Not activated
Oman	60%	80%
Palestine	50%	85%-30%
Kuwait	40%-30%	80%-50%
Libya	Not activated	120%
Egypt	50%	Not activated
Morocco	Not activated	Not activated
Yemen	Not activated	Not activated

Source: Financial Stability Report in the Arab Countries 2021.

C. Limitation on Credit Term

This tool is considered complementary with the debt burden ratio tool, it is used to reduce the risk of default and when burdening the household sector, where the central bank can set limits on the loan term so that credit contracts are included with (or without) determining the debt burden ratio, noting this becomes more important in the absence of instructions issued by the Central Bank that limit the ability of commercial banks to change interest rates, by stipulating that the change in interest rates be linked to a change in the interest rates of interbank lending or one of the monetary policy tools. Here, the importance of continuous coordination between the macro-prudential policy and the monetary policy to support each other and reduce the possibility of conflict between them (Obeid and Awad, 2017).

D. Sectoral Capital Requirements

If this tool is used, the risk weights used when weighting the credit granted to the household sector are changed, when calculating the risk-weighted assets in the capital adequacy ratio requirement, as this depends on the central bank's

assessment and evaluation of the systemic risks arising from the household sector, which increases the solvency of the banking sector and enhances its ability to face any potential losses that may result from those assets. It also limits directing banks' profits to build additional provisions to meet the high risks of the family sector.

E. Household Credit Concentration Restrictions

This tool is used to limit the credit concentrations of bank customers and those related to them, so that ratios are placed on household credit limits, which must not be exceeded, and central banks usually set maximum limits for the real estate loan portfolio, not exceeding a certain percentage of the total deposits (the deposits are short-term sources of funds while mortgages are long-term), or by increasing the weighting of household credit if the ratio is exceeded.

F. Raising the Capital Adequacy or Liquidity Ratio in Light of Stress Tests

Stress test is a risk management tool, and a complement to other tools such as value at risk (VaR), where the central bank may require a particular commercial bank to raise the level of capital adequacy and/or liquidity in the event that the risks of a particular sector (e.g., household sector) are high, according to the results of the micro stress tests, and here this tool is a partial tool. While the tool is a macroprudential tool if there are systemic risks arising from a particular sector.

G. Building Provisions in Accordance with International Financial Reporting Standard (IFRS9):

IFRS 9 is considered an enhanced and complementary tool for the capital adequacy standard to face risks in general and household credit risks in particular. Under this standard, customers are classified based on risks, and their loans are classified into three stages that take into account a set of financial and economic variables, including the scope of applying the good and bad credit criterion, and the greater the client's risks, the greater the volume of provisions allocated to meet those risks, in a way that enhances the strength and solvency of banks and hedges against potential shocks. It was mentioned that the construction of provisions according to this criterion considers the predictive dimension of losses (including the economic dimension) since the first day of granting credit, which enhances the soundness of the financial positions of banks.

IV. AN OVERVIEW OF THE REALITY OF FAMILY SECTOR INDEBTEDNESS IN THE ARAB COUNTRIES¹

The household sector plays an important role in stimulating economic activities, especially if the consumption is directed towards local goods. However, the expansion of lending to this sector must be deliberate and not excessive, as this may lead to an increase in the risk of individuals defaulting on the one hand and directing credit in a way that do not be at the expense of the most productive corporate sector. In this context, after the global financial crisis in 2008, the importance of central banks continually evaluating the extent of harmony and consistency between private credit growth

and nominal GDP, as the lack of consistency between their growth may be an indication of directing credit to consumer sectors at the expense of productivity.

The credit granted to the household sector in the Arab countries witnessed a clear growth during the period (2015-2020), reaching about \$815.3 billion at the end of 2020, compared to about \$786.7 billion at the end of 2019. That is, a growth rate of 3.6 percent. Note that the credit granted to the household sector increased in 2020 by 27.6 percent compared to the end of 2015. One of the most important reasons for the rise in private credit in 2020 is the impact of the Corona virus pandemic on the cash flows of individuals, and the increase in demand for credit due to the sector's need for liquidity to cover its obligations (Fig. 1).

Fig. 1. Evolution of the volume of credit granted to the household sector in the Arab countries included in the study during the period (2015-2020)
Source: Financial Stability Report in the Arab Countries 2021.

As for the growth of household credit before that period, it can be attributed to the banks' preference to lend to the individuals' sector with lower risks in the event that the salary guarantee transferred to the bank from the employer is available, especially since the credit risk management has developed in light of the licensing of credit information companies through which a creditworthiness assessment is conducted. In addition to the application of IFRS 9 and taking into account the high levels of inflation in many Arab countries for the period before 2020, and the real estate price index, which led to the growth of consumer and real estate loans, credit cards and car loans. As for the individual level of the Arab countries, Egypt ranked first in terms of the volume of credit granted to the family sector, reaching about 155.9 billion US dollars at the end of 2020, while Saudi Arabia ranked second with a credit volume of about 125.9 billion US dollars for the same year (Fig. 2).

It is worth noting that the licensing of credit information companies contributed to enhancing the ability of individuals to access finance and enhanced responsible finance, as the credit information base provides a credit record for individuals and companies that contributes to rationalizing credit decisions and enhances risk management leading to credit granting and pricing based on an accurate assessment to customer risks.

¹ This part covers ten Arab countries: Jordan, UAE, Bahrain, Tunisia, Saudi Arabia, Oman, Palestine, Kuwait, Egypt, and Morocco. These

countries account for more than 75% of the total assets of the banking sector in the Arab countries.

Fig. 2. Evolution of the volume of credit granted to the household sector in the Arab countries included in the study during the period (2015-2020)
Source: Financial Stability Report in the Arab Countries 2021.

With regard to the share of private credit in the total credit provided by the banking sector, it fluctuated during the period (2015-2020), reaching 42.3 percent at the end of 2020 compared to 44.4 percent at the end of 2019, while it amounted to 45.3 percent at the end of In 2015, in 2019, banks expanded in granting credit to the family sector, because banks sometimes prefer to grant more retail customers (the household sector) at the expense of small and medium-sized companies, since the retail sector has less risks if there is a salary guarantee transferred to the bank as we have already mentioned, the small and medium enterprises sector suffers from a lack of guarantees that can be provided, and banks are often concern of the failure of small and medium enterprises (especially startups).

As for the year 2020, it is known that the three economic sectors (individuals, companies, and the public sector) have increased their demand for credit during the year 2020, because of the Corona pandemic. On the other hand, government spending has increased in order to support and stimulate economic sectors. As for the ratio of household credit to GDP in the Arab countries, it achieved its highest levels in 2019 and 2020, reaching 39.6 percent and 44.4 percent, respectively, compared to rates ranging between 36 and 38 percent during the period (2015-2018). The reason for the increase in the ratio in 2019 and 2020 is due to the high demand for credit by the household sector (the numerator of the ratio), and the occurrence of an economic downturn due to the effects of the Corona pandemic (the denominator of the ratio) (Figure 3). As the rate of decline in the gross domestic product of the Arab countries during the study amounted to 5.8 percent in 2020, this was accompanied by an increase in bank credit risks in 2020, as the ratio of non-performing facilities to the total credit facilities provided by banks amounted to 5.64 percent, compared to 5.25 percent at the end of 2019, and this percentage achieved its highest value at the end of 2020, as the creditworthiness of good customers was affected by the payment of their obligations due to the effects of the emerging corona virus pandemic, noting that the measures taken by Arab governments and central banks contributed to limiting the rise in the percentage. Significantly, as well as a prominent role for central banks in supporting the family sector and the corporate sector, by postponing the installments due on credit facilities, reducing interest rates on monetary policy tools, strengthening the loan guarantee system and other measures (Fig. 4 and Fig. 5).

Fig. 3. Evolution of the share of credit granted to the household sector in the total credit provided by the banking sector and the ratio of household credit to GDP in the Arab countries included in the study during the period (2015-2020). Source: Financial Stability Report in the Arab Countries 2021.

Fig. 4. Evolution of the share of credit granted to the household sector in the total credit provided by the banking sector compared to economic growth and the percentage of NPLs ratio in the Arab banking sector during the period (2015-2020). Source: Financial Stability Report in the Arab Countries 2021.

Fig. 5. Evolution of NPLs ratio in the Arab banking sector by country during the period (2015-2020). Source: Financial Stability Report in the Arab Countries 2021.

V. STUDY VARIABLES AND THEIR DESCRIPTIVE ANALYSIS

Previous empirical studies were relied on in measuring household credit risk, by measuring the impact of the change in household credit on bank default rates, and other variables were also relied on as potential determinants of bank default rates, including bank specific variables, banking industry and monetary policy variables, and finally macroeconomic variables. The results of previous studies differed in determining the factors affecting non-performing credit facilities. As we mentioned earlier, a number of literatures revealed that the bank's micro variables (such as the high volume of credit granted, the size of the bank's assets, and the ratio of NPLs ratio for the previous year) are the most influential variables. while other studies showed that

macroeconomic variables (especially the unemployment rate, inflation, and economic growth) are the most influential, while other studies showed that monetary policy tools have a prominent role as a determinant of bank default rates. Some studies also used macroprudential policy tools such as the debt-to-income ratio (DTI) and the loan-to-value ratio (LTV) to measure the impact on the bank default rate, and those studies showed the impact of these tools in reducing credit risk, as will be clarified later. This study is characterized by the fact that it uses the ratio of credit granted to the household sector to total credit as a possible determinant of bank default rates, especially in light of the lack of studies that used this variable as a determinant of bank default, in addition to measuring the impact of macroprudential policy tools and taking into account that the evidence indicates a lack of studies that we dealt with this topic with regard to the Arab banking sector. The study attempts to examine the relationship between the indebtedness of the household sector and the rates of banking default for ten Arab countries (Jordan, UAE, Bahrain, Tunisia, Saudi Arabia, Oman, Palestine, Kuwait, Egypt, Morocco), noting that the banking sector in these countries (the study sample) constitute more than 75 percent of the total assets of the banking sector in the Arab countries, for the period (2015-2020).

A. Study Variables

In this paper, the ratio of NPLs ratio (bank default rate) will be used as a dependent variable that measures the state of financial stability, while the following independent variables will be used to examine the relationship between them and the bank default rate:

1) Bank specific variables

These variables include the size of assets, the rate of return on assets (ROA), and household credit. As for the size of assets, it is expected to be associated with an inverse relationship with the bank default rate, in light of the fact that large-sized banks usually have more efficient and effective credit risk management than other banks, and greater skills in terms of credit portfolio management, whether in the beginning of the evaluation phase or in following up the extent of the assets. The obligation of customers to pay the due payments (Curak *et al.*, 2013) especially that large-sized banks are usually subject to more intensive offsite and onsite supervision, according to the requirements of Basel III, for example, the principle of proportionality in supervision, and the requirements of the domestic systemically importance banks (D-SIBs). As for the rate of return on assets, it may be related to a negative relationship with the bank default rate, since the high rate of return on assets indicates the operational efficiency of the bank, and its efficiency in managing its assets, which reflects lower bank default rates (Dimitrios *et al.*, 2016). Finally, the ratio of credit granted to the family sector to total credit was used to measure its potential impact on the bank default rate, as the impact of this variable depends on several potential aspects, for example, credit growth may be accompanied by high interest rates, or high inflation, which leads to a decrease in disposable income, thus a negative impact on the bank default rate, but credit growth is often associated with a decrease in the quality of bank loans, so high credit growth may increase credit risk, and thus the rate of NPLs (Ozili, 2015). While the growth of household

credit may not affect the bank, default rates if the granting of credit is considered by the banks (responsible finance).

2) Monetary policy variable

The interbank lending interest rate has been used, which is influenced by monetary policy according to the corridor system, where the overnight deposit window interest rate represents the minimum for this system, and the overnight purchase agreement interest rate represents the upper limit. For the system, the interbank rate moves between them. It is expected that this variable will be directly related to the bank default rate, as the increase in the interbank interest rate increases costs and burdens on customers, thus reducing their ability to meet their obligations. But at the same time, lowering interest rates may encourage customers to borrow, thus the growth of their burdens and then higher credit risks, so the final effect of this variable depends first on the efficiency of granting credit, and secondly on the effectiveness of monetary policy, as the effect depends on if the Central Bank's instructions require banks to link market interest rates to the Interbank rate or to one of the monetary policy tools, as this increases the effectiveness of monetary policy, and limits the ability of banks to raise interest rates, then upon the periodicity of the adjustment, banks are obligated to raise/reduce interest rates on loans in if the interest rate at which was linked increases/decreased. In the absence of instructions linking market interest rates to the interbank rate or to one of the monetary policy tools, the commercial bank may raise the interest rate on its customers despite when the interbank interest rates or monetary policy tools increased, or it will not reduce the interest rate on its customers despite the fact that the Central Bank to reduce the interest rates of monetary policy tools (Jouini & Obeid, 2021).

3) Macroprudential policy variables

Two dummy variables were used to measure the role of the loan-to-value (LTV) and/or debt-to-income (DTI) tools in reducing credit risk, as some Arab countries used these two tools as a prudential measure to reduce any potential systemic risks may arise from household sector loans, as many studies have shown the effect of these two tools in reducing household credit risks by restricting the ability of families to borrow (Luis *et al.*, 2015). A value of 1 was given if either of these tools was activated or tightened, and a value of zero otherwise.

4) Macroeconomic variables

The GDP growth rate and the inflation rate were used. It is expected that GDP growth will have a negative impact on the bank default rate, as the improvement of economic activity has positive repercussions on improving the income of individuals, and the economic slowdown leads in the long run to higher rates of bank default (Jakubík and Reininger, 2013; Nkusu, 2011; Espinoza and Prasad, 2010). As for the inflation rate, its increase may lead to a decrease in the disposable income of individuals, and consequently a decrease in the ability to service debt and an increase in credit risk (Klein, 2013).

B. Descriptive Analysis of Variables

Table II shows descriptive statistics for all variables according to each Arab country included in the study sample.

Saudi Arabia ranked first with the lowest average rate of NPLs 1.71 percent, followed by Kuwait with an average rate of 1.93 percent, while the highest average was in Tunisia It reached 14.38 percent, due to structural and institutional reasons dating back to the period before 2010, and the supervisory bodies are currently working with the banking sector to gradually reduce this percentage. As for the average percentage for the study period for Arab countries (in aggregate), it reached 5.22 percent. Noting that there are several aspects that may play an important role in determining this ratio, such as average income, efficiency of credit risk management, economic conditions, inflation levels, application of Basel III standards, IFRS 9, and licensing of credit information companies. By analyzing the standard deviation values of the average ratio of NPLs ratio, it becomes clear that there are fluctuations and variances in this variable between the countries under study.

TABLE II: SUMMARY STATISTICS OF THE VARIABLES

Variable	JOR	UAE	BAH	TUN	KSA
<i>NPL</i>					
Mean	4.83	5.95	5.23	14.38	1.71
Std. Dev.	0.50	1.23	0.59	1.29	0.38
<i>SIZ</i>					
Mean	4.26	6.62	4.46	3.83	6.48
Std. Dev.	0.08	0.13	0.06	0.05	0.11
<i>CREDIT</i>					
Mean	31.84	22.38	23.58	25.40	21.94
Std. Dev.	6.73	3.24	1.92	1.45	0.81
<i>ROA</i>					
Mean	1.10	1.30	0.95	1.03	1.85
Std. Dev.	0.25	0.36	0.16	0.16	0.33
<i>INTR</i>					
Mean	2.88	1.78	2.15	2.56	1.61
Std. Dev.	0.81	0.71	0.96	0.35	0.72
<i>GDP</i>					
Mean	1.48	1.52	1.37	-0.12	0.62
Std. Dev.	1.52	3.94	3.60	4.30	2.86
<i>INF</i>					
Mean	1.25	0.58	1.13	5.49	1.04
Std. Dev.	2.19	2.01	1.78	1.39	2.11

Regarding the extent of the correlation between credit risk with other variables, Table IV shows the nature of the correlation and the relationship between the independent variables and the dependent variable, as credit risks in the Arab countries (in aggregate) were associated with most of the variables of the study with a negative correlation (with differences between the Arab countries individually). Credit risk has been associated with a negative relationship with each of the following variables: bank assets (-0.112), household credit to total credit granted by banks (-0.241), rate of return on assets (-0.437), and interbank interest rate (-0.057), and finally the real GDP growth rate (-0.097). As for the positive correlation, it was with the inflation variable (0.375). These correlations give a preliminary indication of the nature of the expected relationship between credit risks and independent variables, which paves the way for a deeper analysis of the impact of family credit risks within a standard methodology and to come up with appropriate recommendations for policy makers.

TABLE II: BIS. SUMMARY STATISTICS OF THE VARIABLES

Variable	OMA	PAL	KUW	EGP	MOR	Whole Panel
<i>NPL</i>						
Mean	2.62	2.98	1.93	5.05	6.25	5.22
Std. Dev.	1.01	0.96	0.34	1.25	0.34	3.66
<i>SIZ</i>						
Mean	4.45	2.75	4.29	5.82	4.98	4.79
Std. Dev.	0.09	0.14	0.14	0.18	0.09	1.39
<i>CREDIT</i>						
Mean	38.92	40.64	31.85	56.37	27.51	32.05
Std. Dev.	0.72	3.68	3.68	1.81	3.52	10.69
<i>ROA</i>						
Mean	1.45	1.37	1.08	1.57	0.82	1.25
Std. Dev.	0.28	0.26	0.26	0.29	0.23	0.39
<i>INTR</i>						
Mean	1.93	6.51	0.87	13.93	0.08	3.41
Std. Dev.	0.36	0.59	0.59	3.64	0.11	4.08
<i>GDP</i>						
Mean	2.12	-4.70	0.12	4.56	2.23	1.32
Std. Dev.	10.34	8.63	8.63	0.74	2.47	4.62
<i>INF</i>						
Mean	-0.05	0.32	1.99	9.63	2.45	2.00
Std. Dev.	0.74	0.99	0.99	4.65	0.63	2.90

TABLE IV: CORRELATIONS BETWEEN THE CREDIT RISK AND THE OTHER VARIABLES

Country	JOR	UAE	BAH	TUN	KSA
SIZ	0.688	0.804	-0.857	0.663	0.840
CREDIT	-0.368	-0.723	-0.437	0.305	-0.735
ROA	-0.533	-0.774	-0.541	-0.414	-0.621
INTR	0.268	0.570	-0.417	-0.927	0.377
GDP	-0.635	-0.880	-0.864	0.220	-0.697
INF	-0.140	-0.909	0.904	-0.837	0.198

TABLE IV: BIS. CORRELATIONS BETWEEN THE CREDIT RISK AND THE OTHER VARIABLES

Country	OMA	PAL	KAW	EGP	MOR	Whole Panel
SIZ	0.970	0.868	-0.120	-0.011	0.430	-0.112
CREDIT	-0.263	-0.984	0.027	-0.857	-0.384	-0.241
ROA	-0.789	-0.819	-0.343	0.350	-0.942	-0.437
INTR	0.353	-0.744	-0.723	-0.277	0.957	-0.057
GDP	-0.788	-0.952	-0.273	-0.236	-0.906	-0.097
INF	-0.729	-0.120	0.926	0.462	-0.348	0.375

VI. STUDY METHODOLOGY

To assess the dynamics of credit risk response to fluctuations in the micro factors specific to the Arab banking sector, as well as the macroeconomic factors, and the role of monetary and macroprudential policies in controlling credit risk, the difference generalized method of Moments GMM was used. that have been used by Holtz-Eakin *et al.* (1988), Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998) and Bond *et al.* (2001). According to the standard form shown below:

$$NPL_{i,t} = \alpha + \gamma NPL_{i,t-1} + X_{i,t}\beta + \psi_i + \varepsilon_{i,t} \quad (1)$$

$$i = 1, 2, \dots, N, \quad t = 2, \dots, T$$

where NPL (dependent variable) refers to credit risk (bank default risk), and X represents a set of explanatory variables: bank size, household credit ratio to total credit granted by the bank, rate of return on assets, interbank interest rate, and LTV (dummy variable, so that a value of 1 is given if the tool is activated or tightened, and a value of zero otherwise), and the ratio of DTI (dummy variable, so that a value of 1 is given if the tool is activated or tightened, and a value of zero

Otherwise), the real GDP growth rate, and the inflation rate. The $\varepsilon_{i,t}$ is the independent error term where:

$$E(\varepsilon_{i,t}) = 0 \quad (2)$$

where i represents the country, and t represents the time period in years. Concerning the term ψ_i , it indicates an effect specific to each country, bearing in mind that the value of the term $(\psi_i + \varepsilon_{i,t})$ has a composite standard deviation, where $E(\psi_i) = 0$, $E(\varepsilon_{i,t}) = 0$ and $E(\psi_i + \varepsilon_{i,t}) = 0$ for $i = 1, \dots, N$ and $t = 2, \dots, T$.

Taking the first difference to remove the country-specific effects, equation (1) becomes:

$$NPL_{i,t} - NPL_{i,t-1} = \alpha + \gamma(NPL_{i,t-1} - NPL_{i,t-2}) + (X_{i,t} - X_{i,t-1})\beta' + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (3)$$

For the term $NPL_{i,t} - NPL_{i,t-1}$, according to equation 3 it is related to the random term $\varepsilon_{i,t} - \varepsilon_{i,t-1}$, indicating that the variants may become endogenous. This requires the use of tools to deal with equation (3), since there is no autocorrelation in the error term and the regression variables are not exogenous, then dynamic models can be used (GMM estimator) depending on the first difference estimated in equation (2) so that (see Hayashi, 2000):

$$E[NPL_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } t=3, \dots, T, s \geq 2 \quad (4)$$

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } t=3, \dots, T, s \geq 2 \quad (5)$$

Equations (4) and (5) can be represented by a matrix as follows:

$$M_i = \begin{pmatrix} y_{i1} & 0 & 0 & \dots & 0 & \dots & 0 \\ 0 & y_{i1} & y_{i2} & \dots & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & y_{i1} & \dots & y_{i,T-1} \end{pmatrix}$$

where M is the Matrix Instruments corresponding to the endogenous variables, $y_{i,t-s}$ represents the correlation between $NPL_{i,t-s}$ and the random error in equation (4). On the other hand, some literature criticized the first difference estimator in terms of bias and inaccuracy. The same tool mentioned in equation (4) is used, but the difference in the new method is assuming that there is no correlation between the regression factors and the country-specific effect so that (see Hayashi, 2000):

$$E[NPL_{i,t+p}\psi_i] = E[NPL_{i,t+q}\psi_i]$$

$$E[X_{i,t+p}\psi_i] = E[X_{i,t+q}\psi_i] \quad \forall \quad p \neq q$$

The new additional condition is the momentary application of the level, so that the following is achieved:

$$E[\Delta NPL_{i,t-s}(\psi_i + \varepsilon_{i,t})] = 0 \quad \text{for } s=1 \quad (6)$$

$$E[\Delta X_{i,t-s}(\psi_i + \varepsilon_{i,t})] = 0 \quad \text{for } s=1 \quad (7)$$

In light of the foregoing, the GMM technique for both

models for parameter estimation is now consistent and efficient, by using the instantaneous conditions given in equations (4), (5), (6) and (7). On the other hand, to verify the validity of the tools in the system GMM estimator, some tests will be conducted that measure the reliability of the methodology used in the study, which were suggested by: Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), where the Hansen J. tests will be conducted to assess the validity of the tools used in the estimation, as well as the "Diff-in Hansen" test to verify the validity of the additional moment application condition needed to build the GMM system, and the "Wald" test to assess the extent of the estimation and validity of the tools used (not weak tools), and finally the "Arellano-Bond" test will be used to verify the hypothesis that the error is not sequentially related.

VII. ECONOMETRIC MODEL ESTIMATION RESULTS

Table V shows the results of estimating the GMM model, which showed the existence of a negative statistically significant relationship between the size of the bank (assets) and credit risk, and this can be explained by the efficiency of large-sized banks in managing their assets in a prudent and more efficient manner compared to with small-sized banks, in addition to assessing creditworthiness and pricing loans based on customer risk, small-sized banks may be rushing to grant loans in order to attract customers and gain market share, as well as Basel III requirements related to domestic systemically important banks (DSIBs). It included quantitative and qualitative control requirements on them, intensive supervision of these banks, and intensive stress tests that take into account the size of the banks. The higher the customer risk, the higher capital adequacy requirements. This result is consistent with the findings of the study (Curak *et al.*, 2013).

The results also showed the existence of an inverse relationship with statistical significance between the rate of return on assets and credit risk, and this indicates that the decline in the profitability of banks may push them to increase the degree of risk appetite. It may lead to an increase in directing credit to customers with low creditworthiness, which may raise the bank's default rates. In addition, it must be noted that the rate of return on assets is one of the most important measures of operational efficiency. The higher this rate, the more this indicates the bank's efficiency in Managing its assets (Dimitrios *et al.*, 2016).

Regarding the NPLs ratio for the previous year, the results of the dynamic model showed a positive statistically significant relationship between it and the ratio for the following year, as the increase in the ratio indicates the high credit risk of the bank, bearing in mind that the bank needs to build provisions from its profits to meet these risks. It is necessary to reduce this ratio for a period of time if it was high. It should be noted that the measurement of credit risk in the macro stress testing (the satellite model) requires building an econometric model that includes the NPLs ratio with one lagged period. As for the variable under study, which is the ratio of household credit to the total credit provided by the bank, the results showed a positive statistically significant

relationship with credit risk (the ratio of non-performing facilities to the total facilities), as the increase of this ratio by one unit leads to higher rates defaulting by about 0.013 units, and this result indicates the importance of continuous assessment of the credit risks granted to the household sector, as many factors may play in increasing the credit risks resulting from the household sector, such as high inflation rates, unemployment, decline in disposable income, high taxes, a decline in lending activity, and the rush to grant loans by the bank without adequate evaluation. There is also a responsibility on central banks to assess the systemic risks that may arise from the household sector, and to use appropriate prudential tools to mitigate these risks as much as possible, in order to ensure that customers are not burdened with loans.

As for the monetary and macroprudential policy tools, the results of the dynamic model showed a positive relationship between the interest rate of interbank lending (targeted by monetary policy according to the corridor system) with the ratio of non-performing facilities to total credit facilities, but the relationship was not statistically significant. As the rise in monetary policy tools (such as the interest rate of repurchase agreements “REPO”) leads to an increase in costs on banks, thus raising the interbank interest rate, which leads to charging costs to the received interest from customers, which in turn may lead to an increase in burdens on customers, which may raise default rates, especially if the monthly installment value of customer loans is raised instead of increasing the credit maturity period (Jouini & Obeid, 2021). As for the macroprudential policy tools, the results showed an inverse relationship between the debt-to-income ratio and credit risk, as placing ceilings on this ratio leads to controlling credit risks, by setting limits on borrowing that depend on the solvency of the client, which leads to promoting responsible financing, the result emphasized the important role of this tool in controlling systemic risks arising from the household sector (Luis *et al.*, 2015). In the same context, the results also showed that placing a ceiling on the loan-to-value ratio was associated with a negative relationship with default rates, as placing a specific ceiling on the mentioned ratio reduces the risk of real estate credit, by requiring the customer to provide a down payment to the bank and granting the customer a loan that is less than the value of the property, taking into account the occurrence of a price boom or bubble in the value of the property. This result is consistent with many studies that indicated the effectiveness of the LTV ratio in reducing the risk of default, especially in the event of a price bubble in the real estate market.

Finally, regarding the economic variables, the results of estimating the dynamic model showed a statistically significant negative relationship between the growth of GDP and the NPLs ratio. It is known that the decline in economic activity leads to a negative impact on the cash flows of companies and individuals, and consequently a decline in disposable income and an increase in the probability of their default (Nkusu, 2011). About the rate of inflation, there was no statistically significant relationship between it and the ratio of non-performing facilities to the total credit facilities.

TABLE V: DIFFERENCE DYNAMIC PANEL ESTIMATION RESULTS
(ARELLANO AND BOND 1991 DIFFERENCE GMM APPROACH)

Variable	Coefficients	Standard errors
NPL (-1)	0.109392***	0.031403
SIZ	-0.025354*	0.014265
INTR	0.025735	0.027928
ROA	-0.04253**	0.021564
CREDIT	0.015370***	0.001991
LTV	-0.168146***	0.087551
DTI	-0.350225***	0.067293
GDP	-0.051573**	0.022182
INF	0.002297	0.005522
Wald Test		2682.52*** (0.0000)
Hansen J TEST (p value)		0.2062
A-B test AR(1) (p value)		0.021
A-B test AR (2) (p value)		0.382
Observations		50
Number of countries		10

Dependent variable is NPL.

***Significant @ 1%, **Significant @ 5%, * Significant @ 10%.

VIII. DIAGNOSTIC CHECKS

The Hansen, diff-in-Hansen, Wald, and Arellano-Bond tests demonstrated the robustness of the GMM model (Table V), as the results did not indicate a bias problem, serial correlation, and autocorrelation in the first-differenced disturbance term. Therefore, based on the results of the mentioned tests, it can be concluded that the parameters estimated in the GMM model are reliable, and the instruments used in the estimation are acceptable (the overall validity of the instruments). The results also revealed the validity of the additional instantaneous (moment) application condition needed to build the GMM system.

IX. CONCLUSION AND RECOMMENDATIONS

The paper examined the potential relationship between household credit risk and its impact on the NPLs ratio for ten Arab countries during the period (2015-2020), using the Generalized Method of Moments (GMM), where the household credit risk was measured through the household credit to total credit ratio, in a manner that takes into account the existence of macroprudential tools that mitigate these risks and reduce the systemic risks that may arise from this sector, as variables were used to measure the extent to which there are the DTI and the LTV ratio. The results showed that household credit has a positive relationship with the bank default rate, and the results showed that the macroprudential policy tools play an important role in reducing these risks. While there was a negative relationship between the rate of return on assets and the size of the bank on the one hand, and the default rate (NPLs ratio) on the other. While there was no statistically significant relationship between the interbank interest rate and the default rate, as well as with the inflation rate, but with regard to the GDP growth, the results showed a negative relationship between it and credit risk, the study recommends the following:

1. Continuous assessment of the systemic risks arising from the household sector, and the use of appropriate macroprudential tools to mitigate these risks when it

necessary.

2. The use of periodic micro and macro stress tests that measure the credit risks arising from the individual sector (the household sector), in addition to the exposure of the household sector to the asset markets, especially in the event of a rise in their prices.

3. Studying the possibility of issuing supervisory instructions that limit the ability of banks to change interest rates so that market interest rates are linked to interbank rates (the overnight lending rate between banks), thus enhancing the effectiveness of monetary policy in influencing market interest rates at the desired level.

4. Enhancing risk management and a culture of responsible finance in banks, and licensing credit information companies, leading to an accurate risk-based assessment of clients.

5. Studying the possibility of applying the countercyclical capital buffer (CCyB) in the sector, which leads to enhancing the ability of banks to absorb the shocks that may arise due to household credit.

6. Urging central banks to issue instructions directed to the banking sector regarding the application of International Financial Reporting Standard No. 9 (IFRS9), for countries that have not yet implemented the standard, as the application of the standard will lead to allocating the necessary provisions to face the risks of clients' default based on their credit risks, according to the expected credit loss (ECL) model.

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