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The relationship between non-performing loans, banking system stability and economic activity: The case of Tunisia

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ABSTRACT

This study seeks to determine the relation between non-performing loans (NPLs) and bank profitability in Tunisia. This relation appears non-linear. We estimate a threshold of NPLs using an econometric framework. We examine the determinants affecting profitability over the Q4 2010 - Q4 2019 period for 10 Tunisian banks by estimating a model showing the impact of NPLs on bank profitability. The results indicate that banks with lower non-performing loan tend to have higher profitability.

Keywords: NPLS; banking profitability

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INTRODUCTION

The non-performing loan (NPL) and banking system stability nexus continues to gain more research attention, especially after the 2008-2009 global financial crisis (GFC) that led to a credit crisis in most economies. The GFC led central banks to adopt more stringent and prudent provisions on impaired debts, which weighed heavily on some banks and negatively impacted their profits.

Some countries are conservative in their lending policies to maintain the integrity of credit portfolios. The high rate of non-performing loans in the banking sector negatively affects the performance of banks and consequently the general economic situation.

The banking sector has an impact on most economic and financial activity, and the banking sector's success and progress depend on several criteria—the most important of which is the growth of profitability relative to economic growth and financial development in each country. Although bank credit is usually governed by policies and standards aimed at reducing potential credit risks and ensuring financial stability and economic activity, lending is always accompanied by risks, whatever the nature of guaranties.

Non-performing loans can be defined as defaulted loans, from which banks are unable to profit. Loans usually go into default if no interest is paid in 90 days, but this may vary by country and depends on regulators. Defaulted loans force banks to take certain measures in order to recover and securitize them in the best way. Loans become "non-performing" when they cannot be recovered within a certain stipulated time period that is governed by law; therefore, NPLs are defined from an institutional viewpoint.

Growth in NPLs negatively affects both the stability of the banking sector and the national economy. If the harmful effects of these problems cannot be remedied, they will create a new crisis. Thus, it causes a financial « doom-loop »

in the country. NPLs raise interest rates for bank loans that adversely affect the profitability of banks, which leads to an increase in cost inflation.

Banks exposed to problems in real credit could undermine confidence in the banking sector. High NPLs directly affect the performance of banks, limiting their ability to lend and carry out their role in the development process, negatively impacting the economy.

To prevent these economic problems in the real sector, it is important to keep NPLs under control in the banking sector. This project seeks to determine the relation between NPLS and banking profitability.

SOME INSIGHTS ON THE BANKING SYSTEM IN TUNISIA

The banking system remains well capitalized, but several banks do not comply with the regulatory liquidity requirements.

The implementation of the CBT's 2016-2020 five-year plan to align the prudential framework with Basel 2 and 3 standards is at a highly advanced stage.

By the end of 2018, achievements include:

- the establishment of capital requirements to cover operational risk,
- the publication of a circular charging banks and financial institutions
- the development of internal counterparty rating systems, and
- setting up capital requirements to cover market risk.

The prudential system conforms with the first pillar of Basel II minimum capital requirements on a general basis.

The process of convergence towards the Basel standards has been established as a priority project in the CBT's 2019-2021 three-year strategic plan.

2019 was devoted to the completion of Pillar 1 through progress on two projects:

- revising the standard approach to credit risk to comply with the new Basel standards published in December 2017 entitled "Basel III: finalization of post-crisis reforms "; and
- moving the prudential framework for *own funds* from a social base to a consolidated base.
- from the second half of 2020, the CBT started work to ensure the completion of Pillar 2 of Basel II with a particular focus on:
    - the establishment of an internal process for the evaluation and allocation of economic capital "ICAAP: Internal Capital Adequacy Assessment Process",
    - the establishment of a process for measuring and managing overall interest rate risk in the banking portfolio “IRRBB: Interest Rate Risk in the Banking Book”, and
    - revising the supervision process in order to fully comply with the 29 principles in the Basel fundamentals for effective supervision.

Given the interconnection between Basel requirements and IFRS accounting standards, since 2017 the CBT has relaunched the project for the adoption of IFRS standards by BEF in a related process.

The system-wide capital adequacy ratio remained stable at 11.7 in December 2018.

NPLs decreased to 13.4 percent of total loans in December 2018 from 14.2 in September as public banks achieved progress with the reduction of NPLs in their portfolios.

By contrast, the system-wide ratio of liquid assets to total assets decreased to 4.5 percent at the end of 2018 from 5.7 percent at the end of 2017, and the ratio of liquid assets to short-term liabilities decreased to 75.2 percent from 91.7 percent.

In particular, the outstanding balance of loans granted by banks were characterized, in 2019, by a sharp deceleration in financing in portfolio discount (753 MTD vs. 4,354 MTD) and to a lesser degree in debit current accounts (246 MTD vs. 1,058 MTD), along with the deterioration of their claims' quality as shown by the acceleration of the outstanding balance of fixed and non-performing loans (1,656 MTD vs. 1,349 MTD).

Solvency Ratio

Over 2017, the banking activity was marked by a sharp progress in lending activity with a double-digit increase of 12%, a rate that has not been recorded since 2010. This was in a context of ongoing economic difficulty, a virtual stand-still in the effort to raise deposits in dinar (8.3%) and a sharp tightening of bank liquidity.

Concurrently, the sector's financial soundness indicators firmed up as shown by the 2-percentage point decrease in non-performing loans, coming at below 14%, stabilization of these claims' provisioning rate at around 57% and the increase in the banking sector's overall solvency ratio by 0.6 percentage point, coming in at around 12% thanks to the sector's better profitability.

The CBT circular No. 2018-06 published in June 2018 maintained the minimum level of the solvency ratio should be below 10% and the Tier 1 ratio at 7%. However, the risk-weighted assets include market risks, determined by multiplying by 12.5 the capital requirement for these risks, which are assessed in accordance with the provisions of Chapter III of Title II of the circular.

These new capital requirements relate to interest rate risk, title risk, change risk and settlement risk.

‘Credit / Deposit’ Ratio

To bridge the resource gap needed to accompany additional financing, banks increasingly relied on funds from the Central Bank of Tunisia, leading to high exposure of banks to transformation risk, as shown through the ongoing deterioration of the « Credit/Deposit » ratio which was around 138% at the end of 2018 and 130% at the end of 2017 compared to 122% at the end of 2016 and 110% at the end of 2013.

The CBT published in November 2018 circular No. 2018-10 on « Credit/Deposit » ratio with a view to better mastering their transformation risk and improving assets-liability management. The new macro-prudential norm is justified by the observed increase in risk for maturity transformation to which banks are exposed. In 2017 and 2018, this took on worrying dimensions capable of impacting the financial balances of individual banks and the stability of the banking system as a whole.

This instrument is inspired by the practices adopted by certain countries (New Zealand (133%), Ireland (122,5%), Portugal (120%), Australia (110%), South Korea (100%) and Saudi Arabia(85%)) with the aim of controlling transformation risk and getting the banks to establish dynamic asset-liability management. The approach adopted for the introduction of this new ratio is based on a gradual and smooth implementation to avoid impairing the ability of banks to finance the economy and mitigate the impact on the stability of the banking sector. A floor level of the « Credit/Deposit » ratio of 120% from which banks are no longer required to reduce their ratio by 2%.

LITERATURE REVIEW

The last financial crisis and recession have made NPLs one of the major concerns for both bank managers and regulatory authorities. At this point, it is worth mentioning the main studies on NPLs in the literature. Various authors such

as Anjom and Karim (2016), Turan and Koskija (2014), Çeliku and Luçi (2003), Clichici and Colesnicova (2014), Kurumi and Bushpupa (2017), and Hanifan Fajar and Umanto (2017), have studied the impact of macroeconomic factors on NPL levels. They reveal a relationship between macroeconomic factors and specific bank factors for NPLs in transition countries.

Hanifan Fajar and Umanto, (2017), in a study of 20 banks listed on the Indonesia Stock Exchange (IDX) between Q1 2005 and Q4 2014, using dynamic panel data GMM, reveal that NPLs in the previous period, GDP growth, and inflation, have a significant negative impact on NPLs and that Operations Expenses to Operations Income ratio (BOPO) and Return on Equity (ROE) have a significant positive relationship with NPLs.

Rossi et al. (2005), considered a sample of 278 banks in nine transition countries, between the period 1995 to 2002, employing the Granger-causality techniques to test the relationships between NPLs, loan quality, cost efficiency, and bank capital. They found that increases in NPLs are usually followed by decreasing cost efficiency.

In their study on the banks operating in the Central, Eastern and Southeast European countries, Jakubik and Reininger (2013) found that the leading economic variable that affects non-performing loan ratios of banks was economic growth and that there was a negative correlation between non-performing loan ratios and economic growth.

Erdogdu (2015) carried out a survey to determine the relationship between the non-performing loans and bank's balance sheet effects and revealed that in most cases banking profitability preceded or emerged in parallel with public debt crises. Banks must continue their operations under the pressure of higher credit risk and the ratio of non-performing loans shows an increasing trend.

Credit growth is a good indicator of banking sector stability. So, investors, academics, and central banks alike are interested in credit growth rates (Jakubik and Moinescu, 2015).

In some studies, a positive relationship has been observed between NPLs and bank lending (Salas and Saurina 2002; Beck et al., 2015; Djiogap and Ngomsi, 2012; Amador et al., 2013; Kashif et al., 2016). At the same time, a negative relationship between NPLs and bank lending has been observed by other researchers (Awdeh 2017; Shingjergj and Hyseni 2015; Rabab'ah 2015). Finally, some could not find any relationship between NPLs and bank lending (Accornero et al., 2017).

Furthermore, NPLs represent ex input risk at an aggregate level. It is also accepted as a signal for forthcoming losses of the banking system (Vouldis and Lousiz, 2016). From this point of view, the reduction of non-performing loans is a necessary condition to improve the economic situation. If non-performing loans are kept and continuously rolled over, resources are locked up in unprofitable sectors thus hindering economic growth and impairing the economic efficiency (Jolevska and Andovski, 2015).

Trends in bank credit enable us to predict future economic conditions, where a rapid growth of credit supply could precipitate subsequent financial or economic crises, whereas a significant decline in credit could result in a cession of economic activities (Awdeh, 2017).

Erdinç and Gurov (2016) examine the significance of regulatory and risk management methods in reducing NPLs. In a panel dataset of banks from Euro-zone and emerging European countries concerning the period 2000-2011, they apply GMM estimation methods in order to investigate compliance with the Basel Accord, Internal Ratings Based Approach. Their research indicates that the application of the IRB according to the Basel Accord directives had a significant impact in the reduction of NPLs. In addition, the authors state that the Eurozone countries adopted the IRB approach to a greater extent than the emerging European countries and therefore the increase of the NPLs level was considerable.

METHODOLOGY

An econometric model for the determinants of loan default in the banking sector was created. The model is estimated using a panel data regression. The advantage of panel data is that is allows us to control for heterogeneity in the cross section, i.e. between banks, and over time.

The analysis follows a dynamic specification for the model. The dynamic model includes the lagged dependent variable as an explanatory variable in order to capture the persistence of NPL growth over time.

Also, the introduction of the lagged dependent variable into the model makes it inappropriate to estimate the model using a fixed effect least square regression approach. Arellano and Bond (1991) derive a consistent Generalised-Method of Moments GMM, estimation which accounts for endogeneity. The GMM estimator uses the lagged values of the dependent variable in levels and in differences as instruments, as well as lagged values of other regressors, which could potentially suffer from endogeneity; therefore, it is called 'difference GMM'. This method is inefficient when the instruments are weak, as argued by Arellano and Bover (1995) and Blundell and Bond (1998).

Hence, another 'system GMM' estimator was developed that includes lagged levels as well as lagged differences. Roodman (2006) argues that the problems of endogeneity, unobserved heterogeneity, autocorrelation and profit persistence can be solved by system GMM estimation. Bond (2002), however, argues that the difference GMM estimator will be biased if a unit root exists while the system GMM estimator yields a more precise result.

The methodology essentially regresses levels and changes in NPLs on the lags of the same variable as well as other explanatory variables using lagged levels as instruments. This reduces potential biases in finite samples and any asymptotic imprecision associated with the difference estimator.

The system GMM estimator substantially improves the estimate of the impact of NPLs on profitability relative to the models which focus on within-bank changes in NPLs, as it adds information from the variation of NPLs across banks in levels.

MODEL

We estimate the impact of NPLs on banking profitability and the impact of the CAMELS indicator (Capital Adequacy-Asset Quality-Management quality-Earnings-Liquidity-Sensitivity), Solvency ratio, and Liquidity ratio over the period Q4 2010 - Q4 2019, for 10 banks operating in Tunisia.

The model:

$$ROA_{it} = \alpha + \beta_1 ROA_{it-1} + \beta_2 NPLS_{it-1} + \beta_3 NPLS_{it} + \beta_4 NPLS_{it_i}^2 + \beta_5 NPLS_{it_i}^3 + \beta_6 C/D_{it} + \beta_7 SOlv_{it} + \varepsilon_{it} (1)$$

$$i: bank, t: quarter$$

i= 10 banks (Tunisian banking sector)

t= Q4 2010 - Q4 2019

ROA: Return on Assets (ROA)

NPLS: Non-performing loan to total loan ratio for bank i at time t

C/D: Credit to deposits

Solv: Solvency Ratio

ε_{it}: The error terms

RESULTS

Table 1 show the empirical results of the estimation of equation (1) with the system GMM method[2].

2 Economic analysis is based on GMM system results which provide more efficient estimates.

Table 1. Regression results

Dependent variable=ROA	Model 1	Model 2
$\mathbf{ROA_{it-1}}$	0.103	0.319***
	(0.468)	(0.001)
$\mathbf{NPLS_{it-1}}$	-0.101*	-1.22**
	(0.064)	(0.051)
$\mathbf{NPLS_{it}}$	-0.488***	-1.182*
	(0.000)	(0.061)
$\mathbf{NPLS^2_{it}}$	0.017***	0.083**
	(0.001)	(0.045)
$\mathbf{NPLS^3_{it}}$		-0.0013*
		(0.000)
$\mathbf{C/D_{it}}$	-2.351*	-0.729*
	(0.097)	(0.091)
$\mathbf{Solv_{it}}$	0.011	0.006
	(0.154)	(0.869)
NPLS Threshold	27	30.7
F-statistic (p-value)	0.000	0.000
Test of the second order (p-value)	0.244	0.157
Sargan test (p-value)	0.052	0.080
Hansen test (p-value)	0.999	0.999

Numbers in parentheses are the p-values. (***), (**) and (*) correspond respectively to the statistical significance of 1%, 5% and 10%.

In the model (1), we introduce the lagged NPLs, the NPLs and the NPLs² to test the presence of a quadratic relation between Banks profitability and non-performing loans. We also added some control variables, including the Credit/Deposit ratio and the Solvency ratio.

We conclude that non-performing loan ratios (NPLS) has a significant impact on banks profitability ratios. In addition, there is a significant and positive effect on ROA for the previous period.

The results show that the correlation between the ROA and the ratio of NPLs is non-linear and we have a threshold for NPLs. A one percentage point increase in NPLS decreases the ROA by an estimated 0.48. A one percentage point increase in lag NPLS decreases the ROA by an estimated at 0.1. The previous period ROA has a positive impact on ROA.

The marginal impact of the NPLS on banks profitability in model (1) is expressed as follows:

$$\frac{\partial ROA_{it}}{\partial NPLS_{it}} = -0.488 + 0.017\mathrm{NPLS}_{\mathrm{it}} \quad (2)$$

To ensure the robustness of the model, we estimate model (2) and then we added NPLS³ to the regression to confirm the nonlinear relation. The results show that the correlation between the ROA and the ratio of NPLs is statistically significant. The NPLS³ is statistically significant and negative. This result confirms the concave relationship between NPLS and the ROA.

The marginal impact of the NPLS on banks profitability in model (2) is expressed as follows:

$$\frac{\partial \mathrm{ROA}_{\mathrm{it}}}{\partial \mathrm{NPLS}_{\mathrm{it}}} = -1.182 + 0.083\mathrm{NPLS}_{\mathrm{it}} - 0{,}0013NPLS_{it}^{2} \quad (3)$$

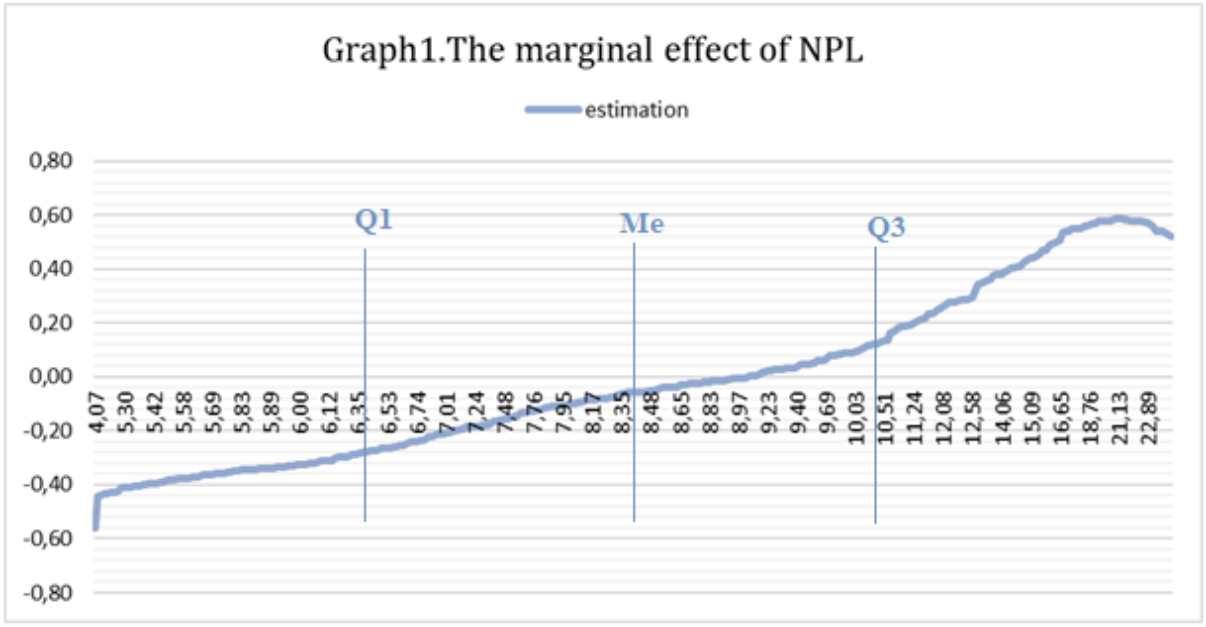
We estimated the threshold NPLS of the two models. In our case, the threshold for NPLS is around 27 and 30 percent. Banking profitability is

associated with low levels of NPLS and when NPLS attains the threshold level, bank profitability becomes null. Below this threshold NPLS, banks are profitable.

The analysis includes banking indicators: bank liquidity measured by Credit to Deposit ratio and the bank solvability measured by solvency ratio. For these indicators, the results show that the signs conform to economic intuition. The Credit/Deposit ratio is statistically significant but not the Solvency ratio.

The two specifications are globally significant. Indeed, the Sargan test of over-identification confirms the validity of all the instruments used in the regressions. Moreover, a test of residual autocorrelation of order 2 indicates the absence of autocorrelation.

To better view the extent of the nonlinearity, we will add a graph showing the marginal effect of NPLS in function of NPLS according to the estimated coefficients of our regression.



Q1	Me	Q3
6.36	8.43	11.16

The decreasing marginal effect of NPL can be explained by different mechanisms:

1- The damage is already done: Once the ROA has gone down with initial NPLS, the bank is in distress and the additional NPLS arrive in an already desperate situation.

2- Measurement bias: The bank underestimates NPLS in communicating to regulators, hoping the problem will resolve itself. On the other hand, if there is a lot of NPLs, the bank understands that it is hopeless and reports them adequately. Let us assume that the effect of NPL is non-linear and equal to (-5 * NPL). When there are few NPLs (for example 15) the bank indicates only 10. The effect (-5 * 15) is then estimated on 10 NPLS which gives a coefficient of -7.5 (= - 5 * 15/10). When there are a lot of NPLs, for example 30, the bank has valued them and the margin is -5.

3- Heterogeneity of customers: There are risky clients who earn good margins, and secure clients who earn lower margins. If necessary, the first NPLs come from risky clients and therefore represent a substantial loss of profits. As NPLs increase, secure clients account for a larger and larger share of additional NPLs, and since these loans report little effect on ROA is lower.

CONCLUSION AND PERSPECTIVE

This article uses unbalanced panel data to investigate the impact of non-performing loans on profitability for 10 Tunisian banks over the period 2010-2019. The results indicate that banks with lower non-performing loans tend to have higher profitability. In addition, this relation seems to be non-linear.

Furthermore, we find that there is an NPL threshold. When the NPL ratio reaches around 27 percent, the bank profitability becomes nil. The profitability is significantly affected by the level of NPLs. The results imply that profitability in the Tunisian banking sector can be improved by increasing the quality of the assets.

For future research, we could add a Dummy variable of bank type to see if there is a difference between public and private banks.

We could also include the interaction term between non-performing loans and profitability, which should absorb the effect and make NPL^2 insignificant.

It would be of interest to see if the NPL and bank profitability relationship holds following the Covid-19 crisis.

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Appendix 1. Descriptive statistics

Variable	Obs	Mean	Std.Dev	Min	Max
ROA	300	1.217	0.616	0	3.5
NPLS	370	9.791	4.723	4.07	25.27
C/D Ratio	370	1.242	0.237	0.79	1.90
Solvency Ratio	240	11.913	6.38	4.4	100

Appendix 2. Correlation Matrix

	ROA	NPLS	C/D Ratio	Solvency Ratio
ROA	1			
NPLS	-0.303	1		
C/D Ratio	-0.076	0.212	1	
Solvency Ratio	0.149	-0.150	0.058	1