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Variability of macroeconomic variables and their implications on the Commercial Banks' Profit Sustainability in Morocco

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Abstract

This study examined the macroeconomic variables impact on the Sustainable profitability of commercial Banks in Morocco. The three profitability indicators (ROA, ROE, and NIM) were utilized as the dependent variable in this study, while consumer price index (CPI), GDP, total government debt (TGD), total revenue (TR), and total government expenditure (TGE) were macroeconomic variables employed as independent variables. Annual data covering the period from 2004 to 2018 was utilized and sourced from Federal Reserve Bank of St. Louis. The ARDL Bound testing approach was employed to investigate the cointegration, as well as the short and long-run causal relationship between the dependent variable and independent variables. Our finding reveals that GDP and TGD were found to have long-run causal relationship with ROA; GDP, TGD, and TR influences ROE at the long-run; while, CPI, TGD, TR, and TGE shows a long-run causal relationship with NIM. As for the short-run causal relationship, CPI, TGD, TR shows influence on ROA in the short-run; influence of CPI, TGD, TR and TGE were found on the ROE in the short-run; while, CPI, GDP, TGD, and TR had a short-run causal influence on NIM. Meanwhile, our research also found that there is stable long-run relationship between the three profitability indicators and the variables that has a significant long-run relationship with them. This implies that the model can converge back to equilibrium in case of any shock to the system. Conclusively, the study suggests some implications for the policy makers.

Keywords: Banking and Finance; Bank profitability; Sustainability; Macroeconomic factors; Morocco.

1. Introduction

It is not a gainsaying that over the last century, economic development has on one hand led to prosperity, while on the other contributes to the abuse of society and environment, hence, the need to set the society on a sustainable path (Ditkaew, Pitchayatheeranart, & Jermsittiparsert, 2020a, 2020b; Jermsittiparsert, Pamornmast, & Sriyakul, 2020). Meanwhile, involvement of Banks is significant at a macro level, because of their function as the intermediaries around the world; couple with their impact on development of economics and its sustainability (Banerjee & Majumdar, 2014; Caldarelli et al. 2016; Chang et al. 2017; Gharaibeh, Alown, & Al-Eitan, 2017). Some studies observed that the last financial crisis resulted to the failure of some banks that made available irresponsible loans (Costa-Climent & Martinez-Climent, 2018; Gikombo & Mbugua, 2018), showing little transparency in their operations (Islantine, 2015; Phuong, Fisher, & Mujtaba, 2014; Sheefeni, 2015; Sriyakul et al. 2019), and went beyond ethical boundaries (Costa-Climent & Martinez-Climent, 2018). According to Karyotis and Onochie (2016), the 2008 financial crisis questioned the whole banking model by revealing the crisis to be structural than cyclical, and in addition revealed a significant defect with the existing financial and economic model (Junevio et al. 2018; Sriyakul et al. 2019). Thus, the banks become more conscious of the risks they face. Meanwhile, Bing, Yan, & Jun (2011); Nandy & Lodh (2012); and, Shen et al. (2017) observed that financial, social, and environmental risks presents in bank's operations with customers and investments.

The importance of the banking and financial

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sector has become the cornerstone of all economic activities in various industries, and the commercial and agricultural fields for various States. Where, Commercial banks play an important and vital role in providing financial resources to all countries, lending various investors to all sectors providing the opportunity to increase the rate of economic growth Edna & Mbugua, 2018; Djalilov & Piesse, 2016). Commercial banks always seek to achieve certain objectives, such as profitability, liquidity, and safety (Sriyakul et al. 2019), therefore, if the management of the bank has made large and rapid profits, it means that it is working according to the plan, which is moving in the right direction. Liquidity means that it can be converted into cash in a very short time and with minimal effort, as for safety, all commercial banks are always able to avoid high-risk projects, in order to avoid financial crises. All of these objectives are often related to macro-economic factors, which are among the irregular risks, which may affect the performance and profitability of commercial banks (BMM, 2018).

The Moroccan banking sector is witnessing a remarkable development along the lines of the French system. Moroccan commercial banks are among the largest banks in Africa, There are 19 banks operating in Morocco between the public and private sectors, the banking sector accounts for 82.3 percent of Morocco's industrial assets (MBS, 2018). Commercial banks significantly affect the financial sector. The more efficient and profitable banks are, the greater the GDP (Almaqtari et al. 2019; Gharaibeh et al. 2017; Jureviciene & Doftartaine, 2013). It is very important that the banking and financial institutions interact strongly with the modern global financial and monetary policies, which has the potential of contributing to the sustainable development in general. Therefore, it is necessary to study the various economic fluctuations and indicators by trying to determine the macroeconomic factors that require more time and effort to see their potential effects on the banks and commercial companies in achieving their sustainability (Alper, Ddger, & Anbar, 2011; Simiyu, 2015). In the study of Singh (2016) on the analysis of financial periodically on macroeconomic time variables, which was aimed at predicting the performance index and profitability of the banking sector, the findings from the study suggested that macroeconomic variables have a very large turn on the banking and financial sector as a whole.

Several studies have alluded to the significant influence of banking sector to a region/country financial development. In order to harness this advantage, a country requires a sound structural framework in respect of the macroeconomic performance and strong economic institutions (Bittencourt, 2012; Djalilov & Piesse, 2016; Gemar et al. 2019; Sheefeni, 2015; Zimmemann, 2019). Thus, Shen et al. (2016) opined that there is need for policies that will contribute to the achievement of sustainable development through the sustainability of banks' profitability. Otherwise, the bank activities would contribute to the unsustainable development of the environment, with its attendant consequences because financial markets are globally connected and the manner they perform their role can have impact on the surroundings. However, no research has investigates the macroeconomic variables variability implications on the achievement of banks' profit sustainability. Therefore, gap exists with regards to the banks' profitability within the Morocco economy context. It is in view of these that this study will focus on macroeconomic indicators and, their impact on the profitability sustainability of Commercial banks in Morocco. The main objective of macroeconomic policy analysis is to try to reach uncertainty and to predict the risks that result from financial and economic decision-making processes (Debali, 2011; Islantice, 2015; MP, 2014). To fill the study gap, this study adopted the usual non-conventional macroeconomic factors as an independent variables such as, (total government expenditure, total government revenue, total general debt, GDP, inflation),while the sustainable profitability performance of commercial banks will be measured, as a dependent variable, including the rate of return on assets (ROA), the rate of return on equity (ROE) and net interest margin (NIM).

The research paper is formatted as follows: section 2 will contain a summary of previous literature relevant to the subject of the study, section 3 contains the methodology for this study, and section 4 will address the analysis and presentation of the data, followed by section 5, which will present the findings and recommendations.

2. Literature Review

The study of the content of the relationship between macroeconomic factors and the profitability of commercial banks in China, Based on a trial analysis of a sample of 10 commercial banks over the period from 1998 to 2012, The results of this study found that macroeconomic factors have a direct and positive impact on the profitability of commercial banks in China, especially after China's accession to the World Trade Organization (WTO),

(Pan & Pan, 2014). A study entitled Determination of Profits of Commercial Banks in Africa was conducted, with 389 banks being used as samples from 41 countries in South Africa. The result of this study is that the commercial banks' returns are clearly influenced by macro-economic variables. The results also indicate a stable rate of profitability on return on assets and equity (Flamini, 2009). There is a study concerned with the economic factors affecting the profitability of the Jordanian banking sector, during the period 1993 to 2014. This study concluded that the external economic factors have a strong impact on the profitability of the banking sector, through the remarkable increase in return on assets and return on equity (Omar, 2017).

Another study explains the determinants of macroeconomics and their relation to the profitability of commercial banks in Namibia, and the study adopted by the techniques of unit root analysis and error variance analysis in the main data during the period from 2001 to 2014. The study found that all macroeconomic factors, including GDP, inflation and interest rates, have no positive impact on all profitability rates resulting from the operations of commercial banks in Namibia (Johannes, 2015). There was a study that evaluates the effectiveness of commercial banks and their relation to macroeconomic impacts in Baltic countries. The correlation and regression analysis were used for all dependent variables, which included return on assets (ROA), return on equity (ROE) and profit margin (NIM); Independent variables analyzed, includes GDP growth, FDI, government debt, inflation, and unemployment. The results of the study revealed that all operations of commercial banks operating in the Baltic countries rely heavily on the movement and effects of the macroeconomic during the study period (Jureviciene & Doftartaite, 2013).

The study of Alper and Anbar (2011) entitled Macroeconomic determinants of the profitability of commercial banks in Turkey utilized a yearly data that spanned from years 2002 to 2010. The profitability of commercial banks was represented by the dependent variables which includes the (ROA) and (ROE). Macroeconomic determinants were represented by independent variables such as real interest rate, inflation, and GDP. The result of the study is that the macroeconomic variables have no effect, except for one variable only, which had a significant and positive impact on the profitability of commercial banks in Turkey, which is the real interest rate. Moreover, another study by Flamini et al. (2009) investigates determination of profits of Commercial Banks in Africa using 389 banks as samples from 41 countries in South Africa. The result of this study revealed that the commercial banks' returns are clearly influenced by macro-economic variables. The results also indicate a stable rate of profitability on return on assets and equity.

The study of Guorong Jiang (2003) on the implications of the profitability of the commercial banking sector in Hong Kong, where all data used was from the financial statements of commercial banks during the period from 1993 to 2003, and the study concluded that most macroeconomic factors, such as GDP, inflation and real interest rates, had a positive and direct effect on the profitability of commercial banks. Similarly, another study that investigates the profitability of the Korean banking sector and its relation to the macroeconomic determinants concluded that inflation has a positive effect on profitability rates in commercial banks. In addition, the effect on the banking industry in the Korean banking system positively affected the efficiency of banks, thus the study opined that it became clear that the Korean banking financial sector had a significant negative impact during the period of the Asian crisis (He & Fayman, 2014).

From the literature reviewed, the findings from these studies differ significantly, which could be attributed to the geographical differences, data and method of estimation employed in those studies. However, the specific macroeconomic variables impact on the Morocco’s bank profitability both at the short and long-run terms seems not to be available in the literature. Thus, this study aimed to fill the gap by empirically determines the long and short-run causal relationship running from macroeconomic variables to bank profitability in Morocco. Also from the literature reviewed, most of the study employed Augmented Dickey-Fuller (ADF) test for the test of stationarity properties of the variable, whereas, according to Zivot and Andrews (1992), who opined that is the presence of structural break, there is possibility for the ADF to be inefficient in testing for the unit root in a variable. In view of this, both ADF and Zivot Andrew test were applied to test the unit root of our variable so as to ensure the appropriateness of the variable for our estimation. In addition, the Auto Regressive Distributive lags (ARDL) approach as developed by Pesaran et al. (2001) was adopted for our study.

3. Data and Method

In this section, we discussed the types of data and identify the variables employed in this study,

describe and present the data, illustrate the method of estimation employed in determining the causal relationship of the macroeconomic variables on the bank profitability in Morocco.

3.1 Data

In line with the findings from the literature reviewed, and the research problem of this study, we selected some significant macroeconomic variables that could determine bank profitability in Morocco for the analysis. The data utilized in this study are annual data covering the period from 2004 to 2018, which were all sourced from the Federal Reserve Bank of St. Louis (2018). Meanwhile, in order to enhance the efficiency of the variables, the data was converted to quarterly data using *Eviews*, this was as a result of the short time span of our data. For measurement of bank performance, return on assets (ROA), return on equity (ROE), and net interest margin (NIM) were used for this study (see Table 1 for description). While, macroeconomics variables used are consumer price index (CPI), gross domestic product (GDP), total government debt (TGD), total revenue (TR), and total government expenditure (TGE), these variables all defined in Table 1.

Table1. **Variable measurement and sources**

Variable	Measure	Source	Expected Result
	Dependent variable		
Rate of assets (ROA)	Net income after tax before unusual items as percentage of total assets(%)	Federal Reserve Bank of St. Louis	
Rate of equity (ROE)	Net income after tax before unusual items as percentage of shareholders' equity (%)	Federal Reserve Bank of St. Louis	
Net interest margin (NIM)	Alteration amid interest revenue and interest expense relative to the amount of assets(%)	Federal Reserve Bank of St. Louis	
	Independent variable		
Total Government expenditure	Including expenditures on goods, services, wages, salaries, benefits, subsidies, compensation, and social benefits	Federal Reserve Bank of St. Louis	+/–
Total government revenues	Including flows from taxes, social participation, fines, rents and income from government property	Federal Reserve Bank of St. Louis	+/–
Total debt	Includes a full balance of local and foreign liabilities	Federal Reserve Bank of St. Louis	+/–
GDP	Is the total value added by all employees and producers in the economy	Federal Reserve Bank of St. Louis	+/–
Consumer Price Index	Is the high proportion of prices traded because of the excessive demand for goods and services	Federal Reserve Bank of St. Louis	+/–

In this study, the bank profitability indicators are used as the dependent variable, while macroeconomic variables are regressors. The descriptive statistics of the variables are presented in Table 2.

Table 2. **Descriptive statistic**

	MEAN	MAXIMUM	MINIMUM	STD.DEV
ROA	1.04	1.44	0.28	0.25
ROE	11.67	18.30	3.51	4.04
NIM	3.33	4.23	2.79	0.43
CPI	1.33	2.83	0.51	0.61
GDP (IN BILLION)	91.81	110.37	62.34	16.10
TGD	57.88	64.69	45.44	6.79
TR	26.66	30.92	24.76	1.58
TGE	3.43	3.56	3.34	0.06

3.2 Unit root test

In the ARDL procedure, the first step is to examine the stationary property of the variables employed in the study. This is to ensure that none of the variable is integrated on order (2) so as not to violate the assumptions of ARDL by Pesaran et al., (2001). Meanwhile, according to Zivot and Andrews (1992), the traditional test for unit root; augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) were found to be biased towards the failure to reject the null hypothesis of unit root in a situation where there is structural break. Their study opined that the conventional unit root tests are efficient in the time series with the presence of structural break, and concluded that ADF and PP could possibly failed to make known if the variable is first-difference stationary. In literature, certain factors like government or policy changes, environmental issues, and economic or political crisis were found to make structural break to occur in a time series.

Peron's (1989) was extended by Zivot and Andrews (1992) to enable structural changes at a period that is unknown. In their study, the following null hypothesis for the series (y_t) in the model was considered:

$y_t = \alpha + y_{t-1} + \varepsilon_t$…(1)

It was opined by Zivot and Andrews (1992) that with the null hypothesis in this form, the dummy variable DT_B is not required. While the alternative hypothesis states that a trend non-unit root series with possible structural break that could happen at an unknown point in time could represent y, as it is been presented in equations (2, 3, 4):

$y_t = \alpha^a + \theta^a DU_t(Tb) + \theta^a t + \pi^a y_{t-1} + \sum_{j=1}^{k} \sigma_j^a \Delta_{yt-j} + e_t$ (2)

$y_t = \alpha^b + \beta t + \gamma^b DT_t(Tb) + \pi^b y_{t-1} + \sum_{j=1}^{k} \sigma_j^b \Delta_{yt-j} + e_t$ (3)

$y_t = \alpha^c + \theta^c DU_t(TB) + \theta^c t + \mu^c DU_t(Tb) + \pi^c y_{t-1} + \sum_{j=1}^{k} \sigma_j^c \Delta_{yt-j} + e_t$ (4)

In the equations (2, 4, 4), *DUt(Tb) = 1ift > T_B, 0 otherwise, and $DT_t(Tb) = t-T_B$ if t > T_B.* The k in the left side is included to remove possible nuisance-parameter dependencies in the limit distributions of the test statistic which was as a result of the temporal dependence in the residuals.

3.3 ARDL approach

In line with Pesaran and Shin (2002), the ARDL method involves analyzing the conditional error corrected version of the model for the variables in our model. The general ARDL ($p, q_1, q_2, \ldots q_k$) is specified as:

$Y_t = \gamma_{01} + \sum_{i=1}^{p} \delta Y_{t-1} + \sum_{i=0}^{q} \beta_i X_{t-I} + \varepsilon_{it}$ (4)

Where Y_t is a dependent variable and could be a vector variable in $(X'_t)'$ are allowed to be purely I(0) or I(1) or cointegrated; β and δ are coefficient; γ is the constant; $i=1, \ldots k$; p, q are optimal lag orders; $\varepsilon_{it}$is a vector of the error terms, i.e unobservable zero mean white noise (serially correlated or independent).

Two steps are involved in the ARDL approach in estimating long-run relationship. First is to examine if there is cointegration among the variables in the model. This is carried out with the Bound test for cointegration, where the hypothesis is stated as follows: $H_0: b_{1i} = b_{2i} = b_n = 0$, and the alternative is stated as $H_1: b_{1i} \neq b_{2i} \neq b_{3n} \neq 0$ (where $i=1, 2, n$). We failed to reject the null hypothesis if the F-statistic is lower than the upper I(1) bound, but if the F-statistics is greater than the upper I(1) bound we accept the null hypothesis and conclude that there is presence of cointegration among the variable. If the cointegration is established in our model, the model could be re-written from equation 4 as:

$Y_t = \gamma oi + \sum_{i=1}^{p} \delta_i Y_{t-i} + \sum_{i=0}^{q} \beta_i X_{t-i} + \lambda ECT_{t-1} \varepsilon_{it}$ (5)

Where λ = speed of adjustment, ECT = the error correction term.

In line with Pesaran et al., (2001), we employ the ARDL techniques in our study to estimate the existence of cointegration in among our variables. The equation is re-written from equation (4) as for the three models in our study as:

$\Delta ROA_t + \alpha_{01} + b_{11} ROA_{t-i} + b_{21} lnCPI_{t-i} + b_{31} lnGDP_{t-I} + b_{41} lnTGD_{t-I} + b_{51} lnTR_{t-I} + b_{61} lnTGE_{t-I} + \sum_{i=1}^{p} a_{1i} \Delta ROA_{t-I} + \sum_{i=1}^{q} a_{21} \Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{31} \Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{41} \Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{51} \Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{61} \Delta lnTGE_{t-I} + e_{1t}$ (6)

$\Delta ROE_t + \alpha_{01} + b_{11} ROE_{t-i} + b_{21} lnCPI_{t-i} + b_{31} lnGDP_{t-I} + b_{41} lnTGD_{t-I} + b_{51} lnTR_{t-I} + b_{61} lnTGE_{t-I} + \sum_{i=1}^{p} a_{1i} \Delta ROE_{t-I} + \sum_{i=1}^{q} a_{21} \Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{31} \Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{41} \Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{51} \Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{61} \Delta lnTGE_{t-I} + e_{1t}$ (7)

$\Delta NIM_t + \alpha_{01} + b_{11} NIM_{t-i} + b_{21} lnCPI_{t-i} + b_{31} lnGDP_{t-I} + b_{41} lnTGD_{t-I} + b_{51} lnTR_{t-I} + b_{61} lnTGE_{t-I} + \sum_{i=1}^{p} a_{1i} \Delta NIM_{t-I} + \sum_{i=1}^{q} a_{21} \Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{31} \Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{41} \Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{51} \Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{61} \Delta lnTGE_{t-I} + e_{1t}$ (8)

Where ROA is the returns on assets, ROE is the returns on equity, NIM is the net interest margin, CPI is the consumer purchase index, GDP is the gross domestic product, TGD is the total government debt, TR is the total revenue, and TGE which is total government expenditure. In addition, from equation (8), t is the time trend, while *e*is the error term in the models. The first parts of this equation with $b_{11} - b_{61}$ are the short-run dynamic coefficients of the model's adjustment long-run equilibrium, while the second parts with $\alpha_{21} - \alpha_{61}$

are the long-run parameters. The null hypothesis in Equation (8) is $b_{11} = b_{61} = 0$, which indicate no cointegration, and the alternative hypothesis is $b_{11} \neq b_{61} \neq 0$.

Based on Pesaran et al., (2001), and in line with Equation (5), the error correction model (ECM) representation for our study is specified as:

$$\Delta ROA_t + \alpha_{01} + \sum_{i=1}^{p} a_{1i}\Delta ROA_{t-I} + \sum_{i=1}^{q} a_{2i}\Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{3i}\Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{4i}\Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{5i}\Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{6i}\Delta lnTGE_{t-I} + \lambda ECT_{t-I} + e_t \quad (10)$$

$$\Delta ROE_t + \alpha_{01} + \sum_{i=1}^{p} a_{1i}\Delta ROE_{t-I} + \sum_{i=1}^{q} a_{2i}\Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{3i}\Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{4i}\Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{5i}\Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{6i}\Delta lnTGE_{t-I} + \lambda ECT_{t-I} + e_{1t} \quad (11)$$

$$\Delta NIM_t + \alpha_{01} + \sum_{i=1}^{p} a_{1i}\Delta NIM_{t-I} + \sum_{i=1}^{q} a_{2i}\Delta lnCPI_{t-i} + \sum_{i=1}^{q} a_{3i}\Delta lnGDP_{t-I} + \sum_{i=1}^{q} a_{4i}\Delta lnTGD_{t-I} + \sum_{i=1}^{q} a_{5i}\Delta lnTRt\text{-}I + \sum_{i=1}^{q} a_{6i}\Delta lnTGE_{t-I} + \lambda ECT_{t-I} + e_{1t} \quad (12)$$

To ensure the robustness of our study, the goodness of fit of our ARDL model, diagnostic and stability test was conducted. In the diagnostic test, serial correlation and heteroskedasticity problem in the model were examined. While cumulative sum of recursive residuals (CUSUM) was employed in testing the stability of the model.

4. Empirical findings

4.1 Unit root Test

In testing for the stationarity of our variables, both ADF and Zivot-Andrew tests were applied. This was applied by the author based on the argument of Zivot and Andrew (1992) that in case of structural break, the conventional unit root test is likely to be biased. From our analysis as presented in Table 3, only ROE and CPI are stationary at level, while other variables are found to be stationary at first difference. The Zivot-Andrew test as presented in Table 3 demonstrates that in the presence of structural break, most of the variables that are considered to be stationary at level, are actually stationary at level. The application of the two test shows that the assertion of Zivot and Andrew (1992) could actually be true in terms of biasness. However, the two unit root applied in our study reveal that all the variables in our model are of mixed order of integration (0 & 1). In a nutshell, none of the variables in integrated of order (2). Thus, it is safe to proceed with the ARDL methodology.

Table 3. **Unit root test**

	AUGMENTED DICKEY-FULLER		ZIVOT-ANDREW		
VARIABLE	**LEVELS**	**1ST DIFF.**	**LEVELS**	**1ST DIFF.**	**STRUCTURAL BREAK**
ROA	-1.36	-2.68***	-5.63***	-	2007Q2
ROE	-2.36**	-2.93***	-6.34***	-	2011Q1
NIM	-1.27	-2.35**	-4.36***	-	2013Q4
LNCPI	-2.09**	-3.17***	-3.53	-5.50***	2014Q3
LNGDP	1.30	-2.57**	-2.76	-4.85**	2008Q3
LNTGD	-0.17	-2.28**	-3.44**	-	2012Q2
LNTR	0.69	-10.69***	-3.89	-5.27***	2008Q3
LNTGE	0.63	-4.25***	-2.80***	-	2014Q2

4.2 Cointegration test

In line with Pesaran et al., (2001), ARDL framework requires a prior test for the cointegration of the variables in the model. Thus the test was carried out with the use of both Johansen cointegration test and bound testing for cointegration. The two tests were combined to examine the sensitivity of each of the model to cointegration between the dependent and regressor variables. The result of the Johansen cointegration test as presented in Table 4 indicate that the first model which is the ROA as dependent variable and other variables as independent variable shows that in the model there are 5 numbers of cointegration equations in the model. This is as a result of the trace statistics that that were found to be significant for each of the hypothesis, and as such the null hypothesis is rejected. Meanwhile, the bound testing for cointegration result for *Model 1* shows no cointegration. This is as a result of the non-significance of the f-statistic. The statistic was found to be lower that the I(1) upper bound at 10%, 5% and 1% significance level, therefore, the bound test for cointegration suggests that there is no cointegration in the model 1. As for *Model 2*, the result as presented in Table 4 indicates by Johansen cointegration test suggests there are cointegration between the *ROE* and independent variables. The cointegration was also established by the Bound test for cointegration which shows an f-statistic (3.96) which was found to be higher than the I(1) upper bound at 5% significance level. Similarly, the Johansen and Bound test for cointegration suggests

a cointegration between *NIM* as a dependent variable, and *lnCPI, lnGDP, lnTGD, lnTR*, and *lnTGE*. The f-statistic (4.78) for Bound test was found to be higher than the I(1) upper bound at 1% significance level, therefore rejecting the null hypothesis of no cointegration.

Table 4. **Cointegration test**

	ROA, LNCPI, LNGDP, LNTGD, LNTR, LNTGE	**ROE, LNCPI, LNGDP, LNTGD, LNTR, LNTGE**	**NIM, LNCPI, LNGDP, LNTGD, LNTR, LNTGE**
HYPOTHESIZED NO. OF CE(S)	TRACE STATISTICS	TRACE STATISTICS	TRACE STATISTICS
NONE*	480.80***	486.28***	471.06***
AT MOST 1*	96.93***	69.82***	101.07***
AT MOST 2*	63.67***	47.86***	58.49***
AT MOST 3*	39.34***	29.79***	29.77**
AT MOST 4*	15.49***	19.52**	10.07
AT MOST 5*	4.44**	4.29**	4.12**
BOUNDS TEST(F-STATISTIC)	2.82	3.96*	4.78***

4.3 Short and long-run causal relationship

As a result of the existence of cointegration among the dependent and independent variables for Model 1, 2, & 3, equations 10, 11, and 12 was estimated and the results summarized and presented in Table 5. The results as presented in Table 5 show that there is a long-run causal relationship between *lnGDP, lnTGD* and *ROA*. The results suggest that the *lnGDP* will at the long-run influence the return on asset (*ROA*), and the impact is statistically significant at 5% confidence level. Similarly, the total government debt (*lnTGD*) was found to have a significant influence on the bank profitability (*ROA*) at the long-run. Meanwhile, the significance of *lnCPI*, *lnTR*, and *lnTGE* could not be established. However, in the short-run estimates as presented in Table 5, *lnCPI, lnTGD*, and *lnTR*were found to have a short-run causal relationship with ROA. This implies that the *ROA* is more sensitive to the *lnCPI* which makes the variable to have an influence in the short-run. It's worthy to also note that *lnTGD* has a strong causal relationship with *ROA*, this was a result of the coefficient of the variable that was found to be significant at the short and long-run. The error correction term for the model as presented in Table 5 shows that the coefficient is negative and significant at 10% confidence level. This suggests that in case of a shock, the model will converge back to the equilibrium at the speed of 12%. The outcome of the speed of adjustment is in line with Pesaran et al., (2001) cited in Odugbesan and Rjoub (2019; 2020) who noted that for a model to converge back to equilibrium in case of disequilibrium, the *ECT* coefficient must be negative (-) and statistically significance.

The estimation of Model 2 as presented in Table 5 shows that similar to Model 1 where economic growth (*lnGDP*) and government debt (*lnTGD*) were found to have a long-run causal relationship with returns on assets (*ROA*), the two variables were also found to have a significant long-run causal relationship with returns on equity, in addition with total revenue (*lnTR*) which is also found to have a long-run causal relationship with returns on equity (*ROE*). Furthermore, Table 5 shows that while consumer price inflation (*lnCPI*), government debt (*lnTGD*), total revenue (*lnTR*), and total government expenditure were found to have a significant short-run causal relationship with *ROE*, *lnGDP* was found not to be significance. This result implies that the bank returns on equity is more sensitive to consumer price inflation, total government debt, total revenue, and total government expenditure in the short-run. The result also indicate that there is a strong causal relationship between bank returns on equity (*ROE*) and total government debt (*lnTGD*); and bank's returns on equity (*ROE*) and total revenue (*lnTR*), this is because both *lnTGD* and *lnTR* were found to have significant causal relationship with *ROE* both in the short and long-run. In addition, the *ECT* for the Model 2 as presented in Table 5 show that the coefficient is negative and statistically significant. This is expected because the negative coefficient and its significance will ensure convergence back to the equilibrium of the model in case of disequilibrium. The *ECT* shows that in case of a shock, the model will have a slow rate of adjustment of about 12% back to equilibrium. Moreover, the significance of the *ECT* indicates a stable long-run relationship and suggests a long-run cointegration between those independent variables that are significant and the dependent variable.

Table 5 also present the Model 3 estimation for both short and long-run causal relationship. The results as presented in the table show that there is existence of long-run causal relationship between

consumer price inflation (*lnCPI*) and Bank net interest margin (NIM); total government debt (*lnTGD*) and Bank interest margin (*NIM*); total revenue (*lnTR*) and *NIM*; and, total government expenditure and *NIM*. Meanwhile, the long-run causal relationship between *lnGDP* and *NIM* could not be established due to the non-significance of the *lnGDP* coefficient. Moreover, the short-run causal estimation results as presented in Table 5 shows that lnCPI, *lnGDP*, *lnTGD*, and *lnTR* has a short-run causal relationship with *NIM*. The results from the estimation of Model 3 suggest further that there is strong causal relationship between *NIM* and *lnCPI*; *NIM* and *lnTGD*; and, *NIM* and *lnTR*. This is because the coefficients of the three regressors were found to be statistically significant at both short and long-run. In addition, Table 5 present further on Model 3 estimation that the ECT coefficient is negative (-) and statistically significant at 1% confidence level. This implies that in case of a shock, the model can return back to equilibrium at the speed rate of 44%. The significant of the negative and significance of ECT coefficient further suggests an existence of stable long-run relationship and also suggests that there is a long-run cointegration between the dependent variable (*NIM*) and those independents variables (*lnCPI, lnTGD, lnTR, lnTGE*) that were found to have a significant coefficients.

To ensure the robustness of our estimation, we performed diagnostic test on the three model using Breush-Godfrey serial correlation LM test serial correlation issue, Breusch-Pagan-Godfrey test for heteroskedasticity, and cumulative sum of recursive residuals (CUSUM) to determine the stability of the models. The results of the tests are presented in Table 5. It shows that for the serial correlation test, the three models have *p-values* (*.97, .98, .20*) that are higher than .05. Therefore, we failed to reject the null hypothesis that there is no serial correlation. Similarly, the heteroskedasticity test for the models shows that the *p-values* (.10, .54, .12) are all greater than .05. Thus, we failed to reject the null hypothesis of homoscedasticity.Lastly, the stability test results were presented in Table 5 and Figure 1. The results as depicted in Figure 1 shows clearly that the *CUSUM* value falls within the 5% significance boundary. This implies the stability of our models. Conclusively, the results from our models estimations seems to be perfectly good for decision making due to the outcome of the diagnostic tests which saw our models performed creditably with the tests.

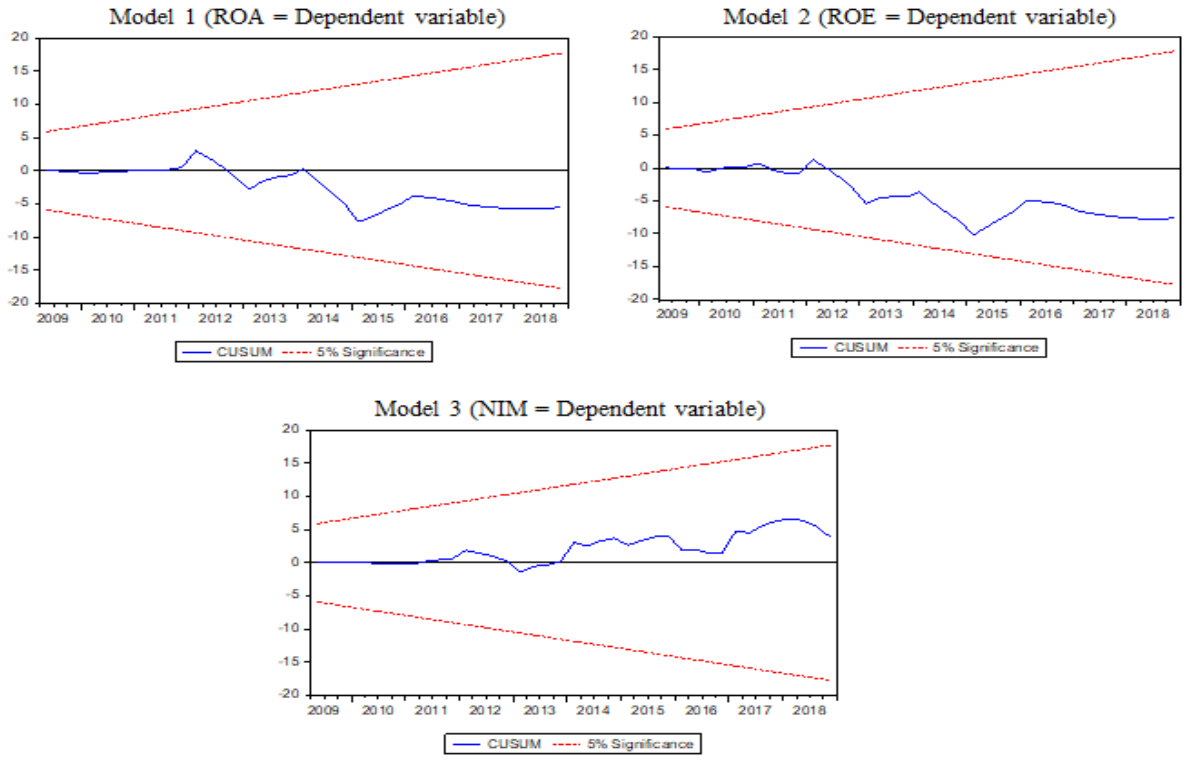

Figure 1. Model stability (CUSUM)

Table 5. **Long and Short-run causal relationship**

DEPENDENT VARIABLE	ROA (2,2,1,0,1,1)	ROE (2,2,1,0,1,1)	NIM (2,2,1,0,1,1)
LONG-RUN			
LNCPI	0.23	2.67	.49***
LNGDP	-2.25**	12.83*	-.28
LNTGD	-8.24*	-87.28**	-2.18***
LNTR	-14.19	-146.85*	-5.08***
LNTGE	7.77	88.17	2.12*
SHORT-RUN			
ECT	-.12*	-.12**	-.44***
ΔLNCPI	0.28***	2.62***	-.22**
ΔLNGDP	0.05	-.68	.40***
ΔLNTGD	-5.76***	-63.84***	-6.94***
ΔLNTR	-1.64***	-16.95***	-2.23***
ΔLNTGE	-3.15	-29.93***	-1.04
SER. CORR (X^2)	.13	.978	.20
HETERO.	0.10	.541	.12
STABILITY	STABLE	STABLE	STABLE

4.4 Discussion

The results from the empirical estimation for both short and long-run causal relationship for our models are presented in Table 5. Our study performed estimation of three models where each of the bank profitability indicators (ROA, ROE & NIM) is substituted as the dependent variable. As it is reveals in the Table 5, in model 1, the significance of lnGDP in both short and long-run causal relationship with ROA is an indication that the economic growth in Morocco has a strong negative causal influence on the commercial banks returns on assets. The result is in agreement with some previous studies (Alper et al. 2011; Banerjee & Majumdar, 2014) that did similar studies on the influence of GDP on the bank's returns on assets (ROA) and found negative influences in their various studies. The negative influence of GDP on bank returns on assets in Morocco commercial banks is an indications that businesses in the country collects more loans to augment their improved businesses which could be attributed to the economic growth of the country, thereby causing a significant amount of loan defaulters. The result is however in contrast to some studies that found positive influence of GDP on the bank returns on assets (Gharaibeh et al. 2017; Gikombo & Mbugua, 2018; Jureviciene & Doftartaine, 2013), and those studies that found no significance influence (Almaqtari et al. 2019; Alper et al. 2011; He & Fayman, 2014; Sheefeni, 2015).

The negative significance of government debt both at the short and long-run on the commercial bank returns on assets in Morocco implies that the total debt accumulated by the government is taking its tolls negatively on the bank profitability in Morocco. The result is in consistent with some previous studies that conducted similar studies (Ashraf et al. 2016; Lee & Iqbal, 2018), while our result is in contrast to some studies that found positive influence of government debt on the bank profitability (Jureviciene & Doftartaine, 2013). Meanwhile, the significance of other macroeconomic such as the consumer price index (CPI), total government revenue (TR), and total government expenditure (TGE) variables in the model 1 could not be established.

Model 2 was estimated by substituting the dependent variable (ROA) in model 1 with ROE, so as to examine the influence of the macroeconomic variables in our model on another bank profitability indicator (ROE). The result as presented in Table 5 shows that while total government debt (TGD) and total revenue (TR) are found to have strong negative influence on commercial bank returns on equity (ROE) because they are significant at both short and long-run estimation, the GDP was found to have positive influence on the bank's returns on equity, and total government expenditure if found to have short-run causal impact on the bank's returns on equity. The positive significance of the impact of GDP on the returns on equity found in this study is in agreement with the studies of Gharaibeh, Alown & Al-Eitan (2017); Gikombo & Mbugua (2018); Jureviciene & Doftartaite (2013); Ashraf, Haider & Sarwar (2016). Meanwhile, our study disagree with some previous studies that found the negative influence of GDP on returns on equity (Almaqtari et al. 2019; Alper et al. 2011; Ashraf et al. 2016; Banerjee & Majumdar, 2014; Lee & Iqbal, 2018), and those that could not found a significant relationship between GDP and ROE (Islantine, 2015;

Junevio et al. 2018; Lee & Iqbal, 2018; Sheefeni, 2015). Our negative significance of total government debt (TGD) on bank's returns on equity found in this study is in agreement with Goodhart (2012), whereas our findings is in contrast with some previous studies that found positive influence of government debt on the returns on equity (Banerjee & Majumdar, 2014; Jureviciene & Doftartaite, 2013). However, the negative short-run causal influence of total government expenditure on the returns on equity is an indication that the bank profitability in Morocco is sensitive to the government expenditure and it's in agreement with the work of Djalilov & Piese (Djalilov & Piesse, 2016) who did similar study in transition countries and found negative significance of government expenditure on bank profitability.

As for the model three, net interest margin was the dependent variable with other five macroeconomic variables (CPI, GDP, TGD, TR, & TGE). CPI, TGD and TR were found to have significance long-run causal relationship with net interest margin respectively, while CPI, GDP, TGD and TR were found to have significant short-run causality to net interest margin (NIM) respectively. Our positive long-run causality of CPI on NIM was not different from previous studies (Debali, 2011; He & Fayman, 2014; Pan & Pan, 2014; Flamini, 2009) who found similar result in their respective studies. The negative coefficient of total government debt is in line with Goodhart (2012). Our study findings is found to be in contrast to the study of Ashrafa et al. [38] who found negative influence of consumer price inflation (CPI) on bank profitability, and those studies that found no relationship between the consumer price index and bank profitability (Banerjee & Majumdar, 2014; Islantice, 2015; Johannes, 2015; Junevio et al. 2018; Sheefeni, 2015. The implication of the significance positive findings of CPI influence on the bank profitability is that the banks in Morocco must have anticipate the inflation and adjust their interest rate to earn higher profits.

5. Conclusion

This paper examined the influence of five macroeconomic variables on the bank profit sustainability in Morocco. Thus, in the case of Morocco, consumer price index, economic growth, total government debt, total revenue and total government expenditure were found to have a significant influence of the sustainability of commercial bank profitability in Morocco. An interesting implication of our study is that while empirical studies on the determinant of macroeconomic variable on bank profit sustainability abound for mostly developed countries and few developing countries, and in most cases, panel studies, our study to provides an empirical insight into the case of Morocco to fill the gap of dearth literature on the influence of macroeconomic variables on the sustainability of bank profitability in Morocco. Another interesting contribution of our study is the error correction term that was found to be significant which implies that the model will converge back to equilibrium in case of shock to the system. However, it is worthy to note that the speed of adjustment back to equilibrium is very low, and as such adequate measure should be put in place to cushion the effect of the shock on the bank profitability. Meanwhile, the consumer price index and total government expenditure were found not to matter in the case of ROA and ROE.

As for the policy recommendation, the various stakeholders in Morocco should collaborate to formulate sound monetary policies that will protect the interest of the commercial banks, so that that when they are sustainable, the effect will spread to the sustainable development of the country as a whole. The government as a matter of fact should sufficiently give support to various sectors of the economy in tandem with the economy growth of the country, so that the loan taken by the businesses will not affect the sustainability of the bank profits. A more conducive economic environment should be provided. The government should also ensure good governance in the country, because this will prevent any shock that could affect the bank profitability. More so, proper fiscal and monetary policies should be in place to continue the monitoring of the level of inflation in Morocco economy. And lastly, the management of commercial banks in Morocco should base the determination of their profitability on net interest margin (NIM) in comparison to returns on assets (ROA) and returns on equity (ROE) as reveals by our result. In conclusion, this study suggests an expansion of the period in this study and deepens the analysis in our future research.

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