

# Financial Performance Modelling Case of the Banking Sector

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**Abstract:** The search for performance is the main objective of a company and its measurement represents one of the only possible fields of evaluation, comparison and choice that can reduce both arbitrariness and ultimately inform on the relevance of organisations and their programmes. In the banking sector, it cannot be otherwise. Through our paper, and based on previous research, we will try to clarify the notion of corporate performance by focusing on financial performance and on one of the key indicators that allows us to judge it reliably in banks and to guarantee, consequently, their survival, their sustainability and the creation of value for their shareholders. This indicator is the ROE. Thus, we attempt to explain the factors and parameters that influence ROE in one way or another by means of an econometric analysis. This analysis relates variables that reflect asset management, costs and debt levels to financial profitability. Finally, we propose share price forecasts for the banks studied, taking into consideration the current situation in Morocco and the sector in question due to COVID-19.

**Keywords:** ROE, Financial performance, neural networks, Profitability.

## 1. INTRODUCTION

Performance is one of the major concerns of individuals, groups and companies. It is present in almost all spheres of human activity (Yaya and Hachimi Sanni, 2003) and has become a recurring theme over the years. It is a concept that interests all disciplines, like economics, such as production sciences, administration, accounting sciences, finance, management, information systems and behavioral sciences. It is, however, a requirement that conditions the survival and sustainability of any organization (Bouamama Mohamed, 2015) and also ensures a competitive advantage, especially in an era particularly characterized by the intensification of competition, globalization and internationalization of markets (Yaya and Hachimi Sanni, 2003). Indeed, any organization aims to be successful as evidenced by Demeestere in 2002.

On the other hand, the notion of performance is of interest to the majority of authors, researchers and practitioners, and because of the importance it has within companies, it is currently at the heart of all their evaluation processes (Hemmi and Marghich, 2016). It is a concept that is omnipresent in the literature and is the subject of much debate, given that its content is variable and leads to different practices, particularly with regard to its measurement.

In this paper, we seek to explain one of the main indicators of performance measurement "ROE" in the context of Moroccan banks.

## 2. LITERATURE REVIEW

There is a large body of research on the concept of performance and it has become a "catch-all word" as it has many meanings (Saulquin and Maupetit, 2004). The existence of a large number of studies and perceptions show a difference in the authors' views on this concept (Bouamama, 2015).

### 2.1. Theoretical Framework of Performance

Performance is an all-encompassing and integrative concept, which is difficult to define precisely. According to the majority of the literature consulted, there are several conceptually acceptable but distinctive definitions of performance depending on the domain affected and the context of use. As Saucier points out: "The notion of performance must therefore also be clarified each time it is used" (Voyer, 2000).

Presuming an operational definition of performance leads us to first surround this concept and to look for its origins. Performance is a word whose root is Latin 'performare', but it was the English language that first gave it its own meaning. It is a notion that does not exist in classical French. Indeed, the French term performance has its origins in the English verb "to perform", which means the accomplishment of a task or process with regularity and in a suitable manner. In

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other words, the way in which we are able to achieve the set objectives with the best possible results.

The term performance has undergone continuous semantic changes. Among the earliest definitions is that of the French dictionary of the late 17th century, where the term performance meant the actual achievement or result (Tchankam, 1998).

Historically, the term performance, in 1867, referred first to a specific field, that of sport. In the field of sport, the term means the exceptional result of a competition. Then, in a second place, at the beginning of the 20th century, the term began to be used in the field of railways to designate the optimal technical capacities of a machine (Bouamama Mohamed, 2015) as well as the exceptional performance of a technology (Berland and Dohou-Renaud, 2007). Immediately afterwards, the word marks its presence in a new language, that of psychology. And during this period, the term evolved to extend to the field of management science and this time to refer to the outstanding performance of companies, administrations, health institutions and the capacity to meet the needs of their users. Therefore, talking about performance for an organisation is almost like using a sports or mechanical metaphor in the first place (Bourguignon, 1995).

In management science, the word 'performance' is widely used, especially in management control, where it is used to refer to the measurement, evaluation, assessment or steering of performance.

For a long time, individuals, managers and organisations have been asking the question "what does it mean to be successful? The answer to this question differs from one person to another, but as Bouquin and Kuzla pointed out in 2013, "to be effective is ideally to do better than others [...]" (Bouquin and Kuzla, 2013). Admittedly, this is not a complete answer but it does give a small part of the meaning of the word performance. Thus, in order to try to better define the notion of performance, it is essential to take a look at the words associated with it in order to have a clearer vision of this term, which is so valuable and important for all organisations and individuals.

Marion et al in 2012, link performance to the first four notions mentioned in the previous paragraph. Whichever interpretation is used to define performance, it is associated with four fundamental principles:

- Efficiency, which reflects the company's ability to achieve its objectives or the degree to which it achieves the desired results. It is the adequacy of the results and the objectives;
- Efficiency which relates results to means, i.e., it is linked to the use of resources;
- La cohérence qui traduit l'harmonie des composants de base de l'organisation pour mesurer la performance organisationnelle en rapportant les objectifs aux moyens (Ecosip, Cohendet, P, Jacot J.H et Louriou Ph, 1995);
- Relevance, which relates objectives or means to environmental constraints (Salgado, 2013). It is a subjective notion and globally means the effective and efficient achievement of the objective set.

And according to Payette in 2011, "performance is the reason for management positions, it involves efficiency and effectiveness".

Performance for the company can be understood as the requirement to achieve its goals by giving its best. It is, of course, to exceed the level at which the company was previously situated (Maire and Dubost, 2004). Emmanuel MAIRE and Matthieu DUBOST, in 2004, proposed a fundamental performance equation in which they demonstrate that performance is the result of a combination of different factors. This equation is as follows.

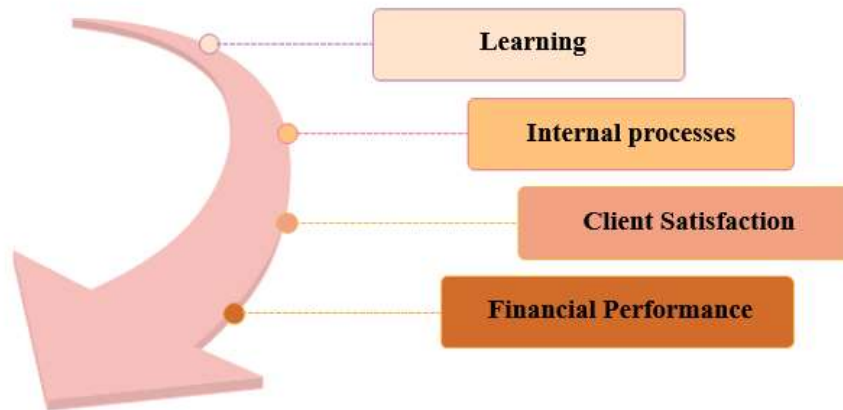
*Performance = Competence Motivation x Goal setting*

Thus, in the field of management and finance, performance is generally linked to one or other of the three primary meanings below (Bourguignon, 1995):

1. Thus, in the field of management and finance, performance is generally linked to one or other of the three primary meanings below (Bourguignon, 1995);
2. Performance is the result of action. In contrast to the previous one, this meaning does not contain any value judgement. Performance measurement is understood as the ex post evaluation of the results obtained (Bouquin, 1998), and this is the basis on which we will develop our paper.
3. Performance is action. In this sense, performance is a process and not a result that appears at one moment in time. It is the implementation of a competence, which is only a potentiality.

The evolution of this famous notion, with its multiple facets, with the difficulty of defining and describing it, gives rise to the complexity of this concept. However, from the different definitions found in the management literature, we can deduce a set of characteristics shared by authors and practitioners on the notion of performance:

- It is objective and depends on a referent. As Lorino points out: "anything, and only anything, that contributes to achieving the objectives is effective" (Lorino, 2003);
- It has a multidimensional character since we generally see a multiplicity of goals (El Yanboiy, 2022);
- It is characterised by subjectivity since it depends on the perception of the actor who defines it;
- Its measurement is difficult as it is not unidimensional and cannot be measured with a single indicator but rather by combining and mobilising several indicators at once (Saulquin et Maupetit, 2004);
- It is reflected in a comparison between the achievements and the objectives set through numerical or qualitative indicators;
- It is translated into an achievement. Hence we are talking about the result of coordinated and coherent actions, which have mobilised human and material resources (Benchikh et El Zanati, 2020) ;
- Thus, it reflects the degree of success of a given action.



**Fig. (1).** Causal chain in the Balanced Scorecard.<sup>1</sup>

For a long time, therefore, performance has long been reduced to its financial dimension. This performance consisted of achieving the profitability desired by the shareholders with the turnover and market share that preserved the company's sustainability. But in recent years, we have moved from a financial representation of performance to more global approaches including social, environmental and ethical dimensions. Other actors, called stakeholders, and a new type of capital of an immaterial nature have appeared. As a result, the notion of performance has been revived.

The sustainability of companies now depends not only on the financial aspect of their activities, but also on the way they conduct themselves. Consequently, corporate responsibility is expanding, no longer limited to shareholders alone, but also including other stakeholders (associations, NGOs, trade unions, customers, suppliers, etc.).

Indeed, the pioneering work in the field of global performance goes back to 1997, to the working group of the General Planning Commission, in which MARCEL LEPETIT (1997) defines global performance: "As a multidimensional, economic, social and societal, financial and environmental objective, which concerns companies as well as human societies, employees as well as citizens".

Performance is therefore no longer only a maximisation of economic value but a maximisation of all economic value, ecological, social, cultural and human requirements.

## 2.2. Measuring Financial Performance

Performance measurement is one of the only possible areas of evaluation, comparison and choice that can reduce arbitrariness and ultimately inform on the relevance of organisations and their programmes.

In this work, we have chosen to explain one of the financial indicators for measuring performance. Our choice was based on the causal link between the different axes of the Balanced Scorecard, which is a multidimensional dashboard considered as a tool strongly oriented towards the evaluation of the

company's performance and based on financial and non-financial indicators. This tool is composed of four types of indicators grouped into axes: Financial axis, customer axis, internal process axis and organisational learning axis.

As this dashboard for steering or measuring performance shows, performance is based on financial and non-material elements and targets a set of stakeholders. But by linking these different elements or axes, we deduce that the final destination is indeed the shareholders, and the final indicators that reflect the level of performance of a company are financial in nature (Fig. 1).

The four perspectives are not in conflict, they condition each other. And the causal link between the categories clearly shows the ultimate dominance of financial indicators.

Thus, for the measurement of financial performance, we distinguish between different types of indicators. The first type of indicators are traditional and are based on the profit and loss account and the intermediate balances: turnover, gross margin, added value, gross operating surplus, operating result, self-financing capacity and profitability rate. The second type of indicators, on the other hand, aims for profitability and are linked to each other. These indicators are presented as follows:

- **ROI** : The rate of return on capital employed is the ratio between an accounting valuation of the result and an accounting valuation of the equity.
- **ROE (Return on Equity) or financial profitability ratio**: Which makes it possible to compare the company's performance with the profitability expected by the shareholders, and thus to assess its financial attractiveness.

$$ROE = \frac{Net\ Profit}{Equity} \quad (1)$$

- **ROA (Return On Assets)** : or the return on assets which presents the contribution / operating assets.

## 2.3. Importance of ROE in the Banking Sector

It is clear that banks' representation of the optimal level of capital and their performance objectives has changed little since the 2008 crisis (Moussu, C., 2018). Yet, many research

<sup>1</sup> Source : Kaplan.R.S et Norton.D.P, « Le tableau de bord prospectif », Éditions d'organisation, 1998

studies have been able to evaluate the level of performance of banks, through ROE, by showing that the most capitalised and valued banks are those that are highly resilient to shocks, and consequently take large market shares. This focus on ROE is associated with the risk management approach of banks. This makes ROE a key indicator for judging the performance of banks in a reliable way while ensuring value creation for the shareholders of these organisations.

### 3. METHODOLOGY

Our study seeks to contribute to the explanation of ROE in a specific sector by combining it with other explanatory parameters and by developing our own model. Subsequently, a forecast of the share prices of the companies in the sector in question will be presented, taking into consideration the current situation in Morocco following the "COVID-19".

#### 3.1. Data

Our study focuses mainly on the case of Morocco, and more precisely the case of Moroccan banks listed on the stock exchange. Indeed, the data of our analysis were collected from the balance sheets of 5 commercial banks for a period ranging from the end of 2004 to the end of 2019, in order to highlight and calculate the ratios that will serve as variables in our model.

Thus, our model is based on econometric models for the analysis of panel data with two dimensions: individual "i" and time "t" in order to estimate the different parameters that contribute to the explanation of financial profitability.

This study uses the following variables as the main determinants for the estimation of financial profitability: financial profitability [ROE], commercial profitability [RCOM], asset turnover [ROT] and the equity ratio [CFP], where:

- **ROE:** represents the financial performance that reflects the ability to remunerate the holders of capital;
- **RCOM:** represents profitability which means the ability to make high profits through cost control;
- **ROT:** represents asset management, which means the ability to achieve high turnover based on assets;
- **CFP:** represents the level of debt, or the ability to improve profitability following an increase in the level of debt

#### 3.2. Modelling

The choice of specification (homogeneity, heterogeneity) is of crucial importance in the case of two-dimensional data. To this end, the determination of the structure of the panel goes through the sequential procedure of Hsiao (1986) allowing to define the case in which we are situated.

The hypothesis tests are constructed from Fisher statistics (Wald test of restrictions on the coefficients). Using the Python 3.8.2 language, we were able to estimate these equations, perform these different tests and arrive at the following results:

**Table 1: Estimation of the Hsiao Procedure.**

Homogeneity Test	Estimations		Model Selected
	F-Stat	P-value	
Test 1 : $H_0^1$	11.276	0.000	-
Test 2 : $H_0^2$	12.628	0.000	Total Heterogeneity
Test 3 : $H_0^3$	-	-	-

According to the P-value of Test 2 associated with the Fisher statistic of the latter ( $F_2 = 12.628$ ), we reject once again our null hypothesis because the P-value is strictly lower than the conventional threshold of 5%. Thus, we can conclude from these results that our database is totally heterogeneous. The constants and coefficients are all different for all values of "i", the panel structure is rejected. The model must be estimated for each of the N equations (one equation per bank) on an equation-by-equation basis by OLS (Bourbonnais, 2015).

Subsequently, we estimate the case of the different banks (case by case). In this framework, multiple regression is one of the most answered and used models in modelling. This importance stems from the fact that it remains a very relevant tool for econometric analysis, when all assumptions are verified. The proposed model is formulated as follows:

$$ROE_t = \alpha_0 + \alpha_1 RCOM_t + \alpha_2 ROT_t + \alpha_3 CFP_t + \varepsilon_t \quad (2)$$

## 4. RESULTS AND DISCUSSION

### 4.1. Model Estimation

The model is estimated using Python 3.8.2. The model exhibits overall significance in the relationship between financial performance [ROE] and the exogenous variables namely profitability [RCOM], asset management [ROT] and debt level [CFP]. Furthermore, all banks show a significant relationship (at the 5% level) between them according to the Wald statistics. Furthermore, all variables that contribute to the explanation of the banks' performance are positive and have the expected sign. All these estimates are reported in the following table:

**Table 2. Estimation of the N equations.**

	$\alpha_0$	RCOM	ROT	CFP	R <sup>2</sup> adj
ATW Bank	-26.46	0.520	0.285	1.169	0.97
BMCE	-16.41	0.454	0.243	0.601	0.96
BCP	-5.54	0.064	0.096	0.753	0.81
BMCI	-22.78	0.400	0.269	1.212	0.98
CDM	-22.18	0.509	0.283	0.858	0.97
* All coefficients are significant					

The estimation results show that the adjusted coefficient of determination is very high for all banks, i.e. around 97%, this shows that profitability, asset management and the level of indebtedness, explain their financial performance. Thus, the validation of the regression hypotheses and the absence of a possible co-integration support the reliability of this coefficient. In addition, we notice a positive sign in the coefficient except for the constant, which represents the average of the financial performance of the banks when the effects of the commercial profitability, the management of the assets and the level of indebtedness are absent.

One can believe that Moroccan banks seem to have a negative average financial performance. This is explained by the strong correlation between the latter and the explanatory variables that play a key role in achieving a better performance. However, the estimation results show that the coefficient of the level of indebtedness is the one that explains the most the financial performance of Moroccan banks. This is due to the fact that Moroccan banks try to use leverage positively. Clearly, banks are trying to improve their profitability by increasing the level of debt and better management of their operations, and thus achieving high net margin rates.

#### 4.2. Interpretation of results

At the level of commercial profitability, the results show that Moroccan banks are better managing operating expenses (personnel costs, depreciation, etc.), which will result in an increase in net income in relation to net banking income (NBI), and consequently lead to an increase in financial performance.

Finally, the results of the impact study of the variables retained in the modelling are as follows:

- The 10% increase in commercial profitability (RCOM) leads to an average increase of 4.8% in the level of financial profitability. This result shows the concomitant relationship between the financial performance of banks and the capacity to achieve high profiles thanks to better cost management in the case of Morocco. The results of the analysis of some financial aggregates such as deposits, credits and bank NBI, show that the most productive bank is Attijariwafa bank whether in terms of productivity or staff, while BMCI presents the lowest productivity. The result of this analysis goes hand in hand with the estimation of the coefficient [RCOM], insofar as Attijariwafa bank is the one that presents the highest coefficient, while BMCI presents the lowest coefficient<sup>2</sup>. It should also be noted that the popular bank presents a coefficient of a little-loan 0.6%, largely lower than the coefficients of the other banks. This disparity is mainly explained by reasons of commercial strategy. The Banque Populaire (BCP) is oriented towards a customer base wishing to have access to basic services charged at satisfactory and relatively low prices, while other banks continue to charge higher prices in order to select

wealthier customers with larger deposits (Omar, 2009)<sup>3</sup>.

- As for asset management [ROT], the result shows that a significant increase in ROT of 10% will have a positive impact on financial profitability of on average 2.7%. Indeed, the efficiency in asset management is crucial as it complements the commercial profitability in the diagnosis of financial performance. Achieving high commercial profitability can cause low financial profitability if it uses too many assets to achieve profits (St-Cyr, Pinsonneault, & Allard, 1997). Banks therefore have an interest in finding reliable forecasting techniques to anticipate management scenarios, and it is in this sense that volatility measurement methods such as ARCH-GARCH models, or the application of neural networks in forecasting future risks.
- Finally, an increase in equity of 10% will lead to a very significant increase in financial performance of 9% on average, this is explained by the increase in profits obtained through debt while minimising the costs of the latter. This is known as positive leverage. The latter is a powerful means of achieving high financial returns for shareholders.

Financial performance modelling treats all variables in the model symmetrically. For this reason, it is important to explore the causal relationships between the different variables in the model.

Causality analysis in the Granger sense aims to explore the causal relationships between the different variables in the model by testing the significance of the coefficients of the lags of the causal variable in the equation of the variable of interest. The objective is to see to what extent knowledge of one or two variables taken together contributes to the explanation of the third variable.

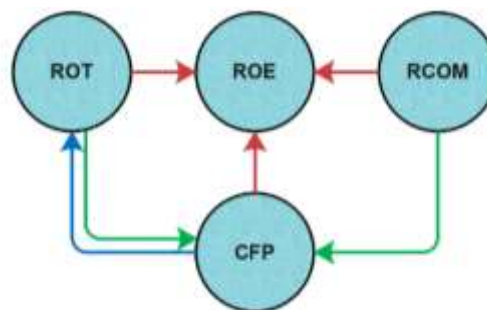


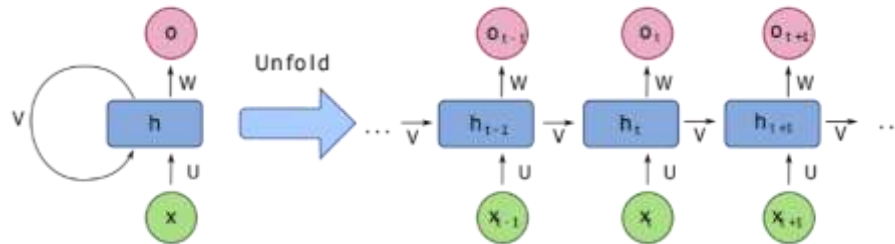
Fig. (2). Causal relationship between variables

Indeed, with regard to the causality analysis on financial profitability [ROE], the tests suggest that the latter is significantly influenced by commercial profitability [RCOM], asset management [ROT], as well as the equity ratio [CFP]. This result indicates a causal relationship between financial performance and the management and capital ratios.

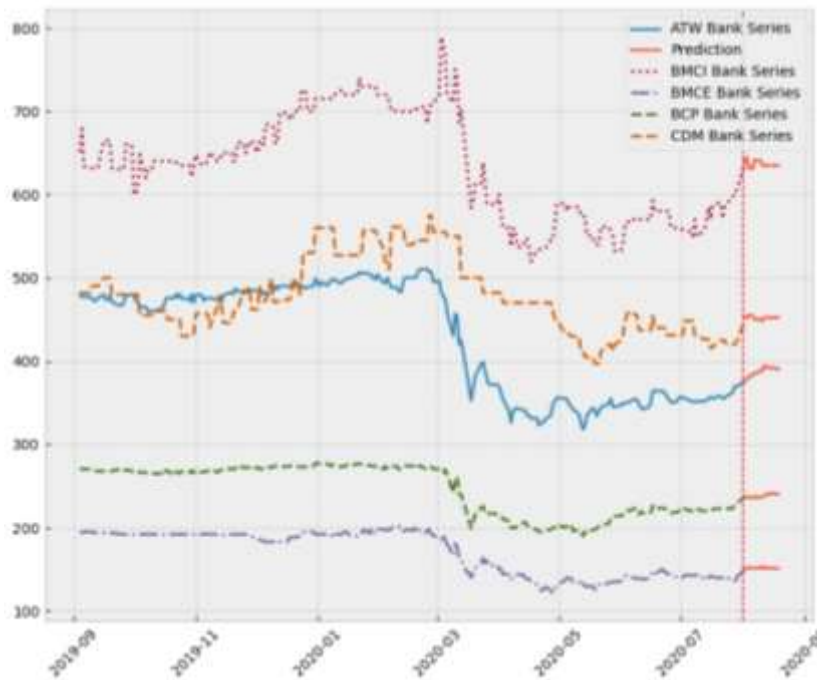
#### 4.3. Forecasting the Return on Assets

<sup>2</sup> <https://cutt.ly/xfhKcYN>

<sup>3</sup> <https://cutt.ly/dfhKb68>



**Fig. (3).** Diagram of a recurrent neural network.



**Fig. (4).** Forecast of bank share prices.

The use of forecasting methods is of crucial importance, as it allows companies to anticipate the future and determine the impact of a strategy on the company's financial health. It is in this context that forecasting methods have undergone a remarkable evolution.

In finance, the use of neural networks is of crucial importance, especially in the forecasting of financial series and the choice of strategies, since they do not require any hypothesis on the distribution of data, in addition to the execution of tasks without a well-defined algorithm (Sangalli, 2001).

A recurrent neural network (RNN) is an artificial neural network in which the connections are recurrent. In plain language, the connections between the nodes of the network allow keeping a number of past states, it is in this sense that this type of network is adapted to applications that present an interdependence, notably time series. Fig. (3) below shows a diagram of a recurrent neural network (RNN).

The objective is to predict the future values of stock prices for each bank (ATW, BCP, BMCI, BMCE, CDM), these series will be modelled by recurrent networks so that the cost function is minimized. Each network has a single input vector (the asset price) and a single output vector (the estimated

price). In total, we estimate several networks with different numbers of hidden layers and we choose the one that achieves the best performance, i.e. a model with 3 hidden layers. The price forecast for August 2020 (20 days ahead) is given in Fig. (4).

The analysis of Fig. (4) shows that the share prices of banks falls in March 2020, mainly due to the effect of the "COVID-19" coronavirus, which occurred in Morocco for the first time on 2 March 2020. The banks had to face a very important shock, which affected their performance through a loss of share value of 18% on average. This is why banks had to manage their liquidity efficiently.

Among all the listed banks that constitute the Moroccan banking sector, only Attijariwafa Bank and BMCI were able to resume a significant upward trend. We can therefore conclude that, these 2 banks have been able to adapt a better management of assets, which has caused an increase in financial profitability [ROE], and subsequently an increase in share price. The forecasts show that this upward trend will continue to increase during the month of August despite the health crisis. In addition, we can see a modest improvement at the level of the Banque Populaire (BCP), which is catching up, and stability at the level of the other banks. As a re-

sult, we are witnessing a notable improvement in profitability indicators in the banking sector.

## 5. CONCLUSION

The determinants of the financial performance of banks have been studied for the case of Morocco on a panel of 5 banks from 2004 to 2019. We have compiled a literature review based on previous studies to model the financial performance of Moroccan banks.

We have chosen ROE as the key indicator to explain the financial performance of banks. Then, we were able to perform an econometric analysis with the aim of explaining ROE through a number of parameters that can influence it positively or negatively. These explanatory parameters reflect the management of assets, costs and the level of indebtedness.

Finally, the results obtained also allowed us to deduce that the capital adequacy ratio (CAR) is inseparable from the net margin ratio and that it is important for all banks to focus on the management of this ratio in order to achieve a high level of profitability and consequently improve their financial performance.

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