African Scientific Journal
ISSN : 2658-9311
Vol : 3, Numéro 7, Août 2021

# Development of the banking sector and economic growth in Morocco: Econometric modeling with the ARDL model

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**Pour citer cet article : EL BOURKI.M, AKHSAS.O (2021) «Development of the banking sector and economic growth in Morocco: Econometric modeling with the ARDL model », African Scientific Journal « Volume 03, Numéro 7 » pp: 243-267.**

**Date de soumission : Juillet 2021**

**Date de publication : Août 2021**

**DOI : 10.5281/zenodo.5651899**

**Résumé**

L'objectif du présent article est d'étudier la relation entre le développement du système bancaire marocain et la croissance économique. Pour ceci, nous avons adopté une démarche économétrique basée sur l'estimation d'un modèle autorégressif à retards distribués. Ce modèle, qui fait partie de la classe des modèles dynamiques, permet de capter les effets temporels dans l'explication d'une variable endogène. Les résultats issus des estimations des coefficients des modèles montrent que l'effet du développement du secteur bancaire sur la croissance économique au Maroc est un effet positif et significatif à court terme. Toutefois, et à long terme, les effets du développement du secteur bancaire sur la croissance économique au Maroc affichent des signes négatifs et significatifs. Des résultats qui restent valable quel que soit la variable retenue pour capter le développement du système bancaire.

**Mots clés**

Développement financier, secteur bancaire, croissance économique, crédit, investissement privé, taille bancaire, causalité

**Abstract**

The objective of this article is to study the relationship between the development of the Moroccan banking system and economic growth. For this, we adopted an econometric approach based on the estimation of an autoregressive model with distributed delays. This model, which belongs to the class of dynamic models, makes it possible to capture the temporal effects in the explanation of an endogenous variable. The results from the estimates of the coefficients of the models show that the effect of the development of the banking sector on economic growth in Morocco is a positive and significant effect in the short term. However, and in the long term, the effects of the development of the banking sector on economic growth in Morocco show negative and significant signs. Results that remain valid regardless of the variable used to capture the development of the banking system.

**Keywords**

Financial development, banking sector, economic growth, credit, private investment, bank size, causality...

## Introduction

The idea of a relationship between economic growth and financial development is not new. Bagehot (1873), Schumpeter (1911) and Gurley and Shaw (1955) are among the first to highlight it. Indeed, in 1873 Walter Bagehot underlined the critical role the financial system had played in the rise of industrialization in England by facilitating the mobilization of capital for productive investment. In 1911, Schumpeter emphasized the role of banks in economic growth. He asserted that credit, as the main function of the banker, is the only factor in economic development and therefore the source of growth. The author emphasizes that when banks fully perform their function, they encourage technological innovation by identifying and financing entrepreneurs with greater innovative potential.

Moreover, the various financial crises, including the last one in 2008, have demonstrated the existence of a strong relationship between the financial sector and the real sector. There has been a significant slowdown in global growth since 2008. The state of the world economy is uncertain and is at serious risk of deteriorating. ***Placed in this context and after more than 30 years of the implementation of the reform of the Moroccan financial sector, we find it legitimate to ask the question on the relationship between the development of the banking sector and economic growth in Morocco.***

A review of the theoretical and empirical literature suggests that the analysis of the relationship between financial development and economic growth varies according to the structure of the financial system. This observation has been the subject of several studies. The work of Arestis and Demetriades (1997), Demirguç-Kunt and Levine (1995), Levine and Zervos (1998), Beck and Levine (2004) and several other researchers have been able to justify that the nature and meaning of the relationship between financial development and economic growth are determined primarily through the degree of development of the banking sector.

The objective of this article is to assess the impact of the development of the banking sector on economic growth in Morocco. For this, we adopted an econometric approach based on the estimation of an autoregressive model with distributed delays. This model, which belongs to the class of dynamic models, makes it possible to capture the temporal effects in the explanation of an endogenous variable.

This work is composed of two parts. First, we will present the theoretical elements and empirical work that link the development of the banking sector and economic growth. Then, the second part will be devoted to the empirical study aimed at quantifying the impact of the development of the banking sector on Morocco's economic growth through the specification of an ARDL-type econometric model.

**I. Banking Sector Development and Economic Growth: A Literature Review.**

The theoretical and empirical literature on the relationship between financial development and economic growth is very varied. There is considerable debate about the potential relationship between financial system development and economic growth. These debates admit the existence of a relationship between the degree of development of the financial sphere and the growth of the real economy. However, researchers still diverge on the meaning and mechanisms of this relationship.

On a theoretical level, Schumpeter (1911) in 1911 already made the link between the financial sector and economic growth by defending an approach, which assumes that the financial system plays a primordial role in economic growth. He pointed out that a well-functioning financial system (banks) promotes technological innovation. The latter is seen as a catalyst for economic development. Financial development also generates a process of innovation within the financial system. A process that stimulates savings and reduces the risks associated with investing according to Gurley and Shaw (Gurley and Shaw, 1955).

However, for the financial system to fully play its role, full confidence in the invisible hand must be given to ensure the balance of the financial system and therefore the most optimal allocation of financial resources to the economy. The proponents of this approach find in the policies of financial repression a major obstacle to the efforts of financial development and subsequently to economic development.

Indeed, McKinnon (1973) and Shaw (1973) were among the first economists to fiercely criticize the policies of financial repression. They recommended lifting all kinds of restrictions that can weigh on the financial system and allowing market mechanisms to operate freely. This is the central hypothesis of the school of financial liberalization. The simplicity of the approach adopted methodologically, but also in practice, made the theory of McKinnon and Shaw quickly found its place among the theories of development economics.

Thus, the end of the seventies was marked by the rise of financial liberalization policies; several countries launched vast programs to liberalize their financial systems (Chile, Argentina, etc.). However, it turns out that these policies have led these countries to situations of unprecedented recession (collapse of the financial system, balance of payments crisis, currency crisis, unemployment, inflation, etc.).

Supporters of the theory of financial liberalization quickly tried to understand the causes of this failure. McKinnon (1973), Gibson and Tsakalotos (1994) insist that the shift from a policy of financial repression to a policy of financial liberalization must be a gradual shift or what Béji (2009) called gradualism in the move towards financial liberalization. This gradual integration plays the role of a safety net and a guarantee against the effects of this shift towards total liberalism.

If the proponents of the theory of liberalization cling in their explanations of the failures of the experiments of liberalization to the principle of the superiority of the financial aspect in the relation between the financial sphere and the real sphere, other studies place themselves on the demand side and argue for reverse causation. They assume that the level of economic growth is the main catalyst for financial deepening. Thus, the financial system only responds to the demand for services placed on it. This hypothesis defended by Minsky (1964), which finds its origins in the developments of the general theory of Keynes (1936), has been consolidated by several empirical works like those of Raffinot and Venet (1998) and many others.

Empirically, the results of studies suggest that the relationship between financial development and economic growth is very complex. This complexity could make this relationship less general than what is postulated by the theoretical literature. Indeed, this work has tried to examine this relationship on different samples, using different tools and integrating several variables.

Empirical work on the relationship between the development of the financial system and economic growth finds its origins in the work developed by Gerschankron in 1962, Patrick in 1966, Goldsmith in 1969 and Cameron in 1972. These authors have tried to justify the existence a relationship between the real economy and the financial environment.

Recent research addressing this issue confirms a positive relationship between the indicators of these two variables. We cite, among others, the work of Levine (1997, 1998, 2002, 2003), King and Levine (1992, 1993a, 1993b), Levine and Zervos (1998). These authors, through more advanced econometric models and techniques, confirmed the existence of a clear and definite relationship between the development of the financial system and economic growth.

However, these results, although they allow us to decide on the question of the existence or not of this relationship, do not allow us to judge the direction of causality of the relationship between financial development and economic growth. Determining the direction of causality requires more in-depth studies and also requires taking into account the specificities of each country. In this context, several authors such as, Jung (1986), Demetriades and Hussein (1996), Al Youssif (2002) and many others, have opted for studies and analyzes in time series. Three currents are opposed: The first believes that the causality goes from economic growth to financial development. The second believes that the causality goes from financial development to economic growth, that is, the development of the financial sphere leads to economic growth. While the third and last believe that the causal relationship is a two-way relationship where the two variables influence and influence each other.

Chen (2006) examined how the development of financial intermediation affects China's economic growth after the 1978 reform. The econometric results showed that the development of financial intermediation in China contributes to its rapid economic growth in two ways: first, the substitution of loans for a state budget allocation and, second, the mobilization of savings from the government households.

Ben Jedidia et al (2014) tried to examine the relationship between financial development and economic growth in Tunisia. They opted for an autoregressive distributed lag method to model this relationship using private debt securities, traded securities and securities issued in the financial market as indicators of financial development. Empirical results have shown that domestic credit to the private sector has a positive effect on long-term economic growth. This effect remains, according to Ben Jedidia, et al (2014), subject to short-term financial fragility. In addition, this study confirmed a two-way relationship between credit and economic growth. However, Ben Jedidia et al (2014) found that neither stock market development nor bank intervention in the stock market had strong and positive effects on economic growth.

The failure of experiences of financial liberalization (Chile, Mexico, etc.), the instability and fragility of financial systems as well as the appearance of financial crises, have led several authors to rethink the question of the relationship between financial development and economic growth. Indeed, Kpodar (2006) and Kpodar and Guillaumont (2006) have justified that the relationship between financial development and growth is influenced by the effect of financial instability. For Eggoh (2009), this relationship is influenced by another parameter that is added to the effect of instability and financial crises, namely that of institutional quality. Herwartz et al (2014) attempted to examine these conditions using a flexible semi-parametric approach. Using annual data from 73 economies covering the period 1975-2011, they found that the impact of finance on economic development is generally stronger in high-income economies than in low-income economies. However, taking into account intra-group variations reveals the importance of other factor variables in explaining this relationship. Moreover, this relationship could even be negative if low- and middle-income economies have strong governments or are extremely open to international trade. Sagarika (2015) using a non-parametric panel data model to estimate the financial system-economic growth relationship, showed that domestic credit and private credit are above their cross-sectional value, they have a positive effect on the GDP growth. They also showed that market capitalization has a positive and significant impact on GDP growth, while traded stocks (except in OECD countries) have a statistically insignificant effect on GDP growth. More recently, Ünal et al (2016) attempted to examine the relationship between finance and growth in low, middle and high income countries based on panel data from 1991 to 2011.

Through a panel regression, they tried to examine whether the relationship between banks, stock markets, and economic growth differed across income levels and to identify the channels through which financial development affected economic Growth. Empirical results have shown that in low- and middle-income countries, banking development has a positive impact on economic growth. However, unlike conventional findings, the impact is negative in high-income countries. In addition, the development of stock markets and economic growth are positively associated in middle and high income countries.

The variety of estimation approaches, methods, techniques and results reveal the importance and complexity of the relationship between financial system development and economic growth.

## II. Development of the banking sector and economic growth in Morocco: an econometric modeling with the ARDL model

### 2.1. Model specification.

Our study is part of a continuation of research to examine the relationship between financial development and economic growth. Our objective is to analyze the effect (short and long term) of the development of the banking sector on economic growth in Morocco.

To do this, we estimate an autoregressive step-lag model from Pesaran et al. (2001). The use of this model is justified by the particularity of combining the characteristics of autoregressive (AR) models and those of staggered delay or distributed lag (DL) models. These models make it possible to estimate the short-term dynamics and the long-term effects for series cointegrated or even integrated at different orders. As a result, when several integrated variables of different orders (I (0), I (1)) are available, we can use the cointegration test of Pesaran et al (2001) called the "cointegration test with terminals".

Thus, to study the effect of the development of the banking sector on economic growth in Morocco, we use annual data covering the period (1980, 2018). These data are collected in full in the database of the World Bank. The following model is used for empirical testing:

$$Y = \alpha_0 + \alpha_1 \ X + \alpha_2 \ DF + \varepsilon_t$$

With:

*$Y_t$ : is the logarithm of real GDP in year t:*

By definition, the growth rate of gross domestic product per capita is the annual percentage growth of GDP per capita based on constant local currencies.

*$F_t$: is the matrix of the development variables of the banking sector, namely:*

- The size of the banking sector (TAILLESB): For the World Bank, this indicator refers to the sum of currencies outside banks, sight deposits other than those of the central government, and fixed-term deposits, savings and in foreign currencies of resident sectors other than the central government.

- Credits granted to the private sector reported (CSPR): this indicator refers to the financial resources provided to the private sector. This ratio shows the orientation of the banking system - particularly through loans, the purchase of securities other than shares, trade credits and other accounts receivable, which constitute outstanding debts - towards the private sector and its sector weight in the financing of private sector activities.

*$X_t$ : is the matrix of control variables that are likely to explain economic growth according to the theory of endogenous growth:*

- We will try in this work to take into account the influence of the variables which are likely to influence the rate of economic growth. Through this control, we will try to neutralize the parameters that can influence our results. So, the control variables retained for this research are: the rate of inflation, the rate of economic openness, the rate of investments, gross domestic savings and expenditure on education.

*$\varepsilon_{it}$ : is the model error term.*

The model which serves as the basis for the test of cointegration by the staggered delays (test of Pesaran et al. (2001) is the following cointegrated ARDL specification:

$$\Delta logPIBH_t = \alpha_0 + \sum_{i=0}^{n} \alpha 1i\Delta logPIBH_{t-i} + \sum_{i=0}^{n} \alpha 2i\Delta logDB_{t-i} + \sum_{i=0}^{n} \alpha 3i\Delta logEPAR_{t-i} + \sum_{i=0}^{n} \alpha 4i\Delta logINF_{t-i} + \sum_{i=0}^{n} \alpha 5i\Delta logINV_{t-i} + \sum_{i=0}^{n} \alpha 6i\Delta logENSUP_{t-i} + \sum_{i=0}^{n} \alpha 7i\Delta logOUV_{t-i} + \beta_1 logPIBH_{t-i} + \beta_2 logDB_{t-1} + \beta_3 logEPAR_{t-1} + \beta_4 logINF_{t-1} + \beta_5 logINV_{t-1} + \beta_6 logENSUP_{t-1} + \beta_7 logOUV_{t-1} + \varepsilon_t$$

With:

Δ: Designates the operator of first difference.

$\alpha_0$: Represents the constant.

$\varepsilon_t$ : The error term which is white noise.

The expressions, which go from $\alpha_1$ to $\alpha_7$, represent the short-term dynamics of the economic growth function and those associated with the parameters β_1 represent the long-term dynamics of the model.

To test the cointegration relationship among these variables we resort to the procedure used by Pesaran et al (2001). This procedure is based on the Fisher test. This test is a test of hypotheses of non-presence of cointegration among variables (H0) against the existence or presence of cointegration among variables (H1).

We compare the Fisher values obtained with the critical values (limits) simulated for several cases and different thresholds by Pesaran et al (2001), Thus:

- *If Fisher calculated> upper bound: the existence of cointegration exists*
- *If Fisher calculated <lower bound: the absence of cointegration*
- *If lower bound <If Fisher calculated <upper bound: no decision*

### 2.2. Nature and source of data

The data that is the subject of our study are annual and taken from the databases of the World Bank. These annual data cover the period from 1980 to 2018. The table below provides information on the variables used:

**Table N ° 1: variables, indicators and sources**

| Nature of variables | Variables | Measuring indicator | Expected effect | Source |
|---|---|---|---|---|
| Endogenous variable | Economic Growth | GDP | | WORLD BANK |
| Exogenous variables | The size of the banking sector | M3 | + | WORLD BANK |
| | The financing of the investment | Credit granted to the private sector | + | WORLD BANK |
| Control variables | Inflation | the rate of inflation | - | WORLD BANK |
| | Economic openness | the economic openness rate, | + | WORLD BANK |
| | The investment | the investment rate | + | WORLD BANK |
| | Domestic savings | The gross domestic savings rate | + | WORLD BANK |
| | Human capital | education spending | + | WORLD BANK |

**Source : Personal development**

### 2.3. Empirical results

Note that modeling time series requires prior examination of the stationary problem to avoid spurious regressions based on non-stationary data Granger and Newbold (1974).

**a. *Stationarity of series***

Modeling a non-stationary series shows biased and sometimes erroneous results. To avoid such a spurious regression, modeling time series requires examining the stationarity of the variables in our study. By definition, a series is considered stationary if its mean remains invariant or constant over time and its variance does not increase over time.

We use as a stationarity test, the Dickey Fuller Augmented test (noted ADF). Indeed, if the probability of this test is strictly less than 5%, we accept the hypothesis of stationarity. To do this, we have adopted a four-step sequential strategy. We start by applying the Dickey Fuller Augmented test on the level series:

- The first model to be tested is a model with trend, if the probability of the presence of a unit root is invalidated; we go to the second model.
- The second is with tendency and errors, if the assumption of the presence of a unit root is invalidated we will go to the last model.

➢ The third is a model without trends or errors. We admit that the series is stationary in level if and only if the assumption of the presence of a unit root is invalidated for the three models.

If the hypothesis of the presence of a unit root is confirmed for one of these three models, this scenario prompts us to differentiate the series and start the procedure again on the series in first difference.

We run this test on Eviews9 and we proceed to check the stationarity of each variable. We retain the t-statistic of the ADF and its probability. To avoid redundancy, we have grouped all the variables in Table 2 below:

**Table N ° 2: Stationarity test of the variables**

| | En Niveau | | | La 1ère différence | | |
|---|---|---|---|---|---|---|
| | Intercept | Trend et Intercept | None | Intercept | Trend et Intercept | None |
| Log(PIBH) | 0,049 | -3,370 | 1,878 | -5,147 | -5,017 | -4,588 |
| | 0,957 | 0,071 | 0,984 | **0,000*** ** | **0,001*** ** | **0,000*** ** |
| Log(CSP) | -0,506 | -2,461 | 3,802 | -3,979 | -3,879 | -3,089 |
| | 0,879 | 0,344 | 0,999 | **0,004*** ** | **0,023** ** | **0,003*** ** |
| Log(TAILLE) | 0,088 | -2,723 | 2,791 | -4,011 | -3,918 | -2,604 |
| | 0,960 | 0,234 | 0,998 | **0,004*** ** | **0,021** ** | **0,011** ** |
| Log(EPAR) | -1,150 | -3,226 | 2,236 | -7,258 | -7,115 | -6,040 |
| | 0,936 | 0,095 | 0,992 | **0,000*** ** | **0,000*** ** | **0,000*** ** |
| Log(INFL) | -1,899 | -5,140 | -1,934 | -11,774 | -11,668 | -11,779 |
| | 0,329 | 0,000 | 0,052 | **0,000*** ** | **0,000*** ** | **0,000*** ** |
| Log(INV) | 0,075 | -2,919 | 2,251 | -5,835 | -5,767 | -5,104 |
| | 0,960 | 0,168 | 0,993 | **0,000*** ** | **0,000*** ** | **0,000*** ** |
| Log(ENSUP) | -2,065 | -3,133 | 2,036 | -8,354 | -8,202 | -4,241 |
| | 0,259 | 0,113 | 0,988 | **0,000*** ** | **0,000*** ** | **0,000*** ** |
| Log(OUV) | -0,965 | -2,269 | 1,135 | -7,865 | -7,923 | -7,764 |
| | 0,756 | 0,440 | 0,931 | **0,000*** ** | **0,000*** ** | **0,000*** ** |

**Source :** Personal development

It emerges from the analysis of the ADF test that the variables in our study are not stationary in level. This finding prompts us to test stationarity at the level of the first and second difference. The results show that the variables of our study are stationary in first difference at the thresholds of 1% and 5%. Therefore, to validate the use of these variables, it is necessary to transform them into their differential of order 1.

Based on the unit root test above, we apply the autoregressive cointegration test to determine if there is a linear combination of the model variables that is cointegrated. Beforehand, the operationalization of this test requires the specification of the optimal delay.

***b. Optimal offset***

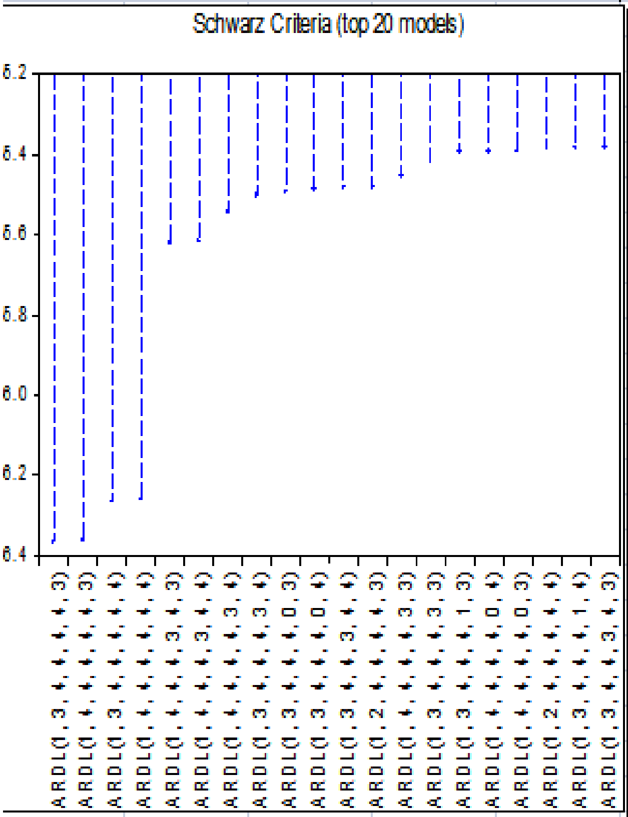
For the determination of the optimal offset and as we mentioned above, we will use the Schwarz Information Criterion (SIC) to select the optimal ARDL model. By definition, an optimal ARDL model is one that offers statistically significant results with the fewest parameters.

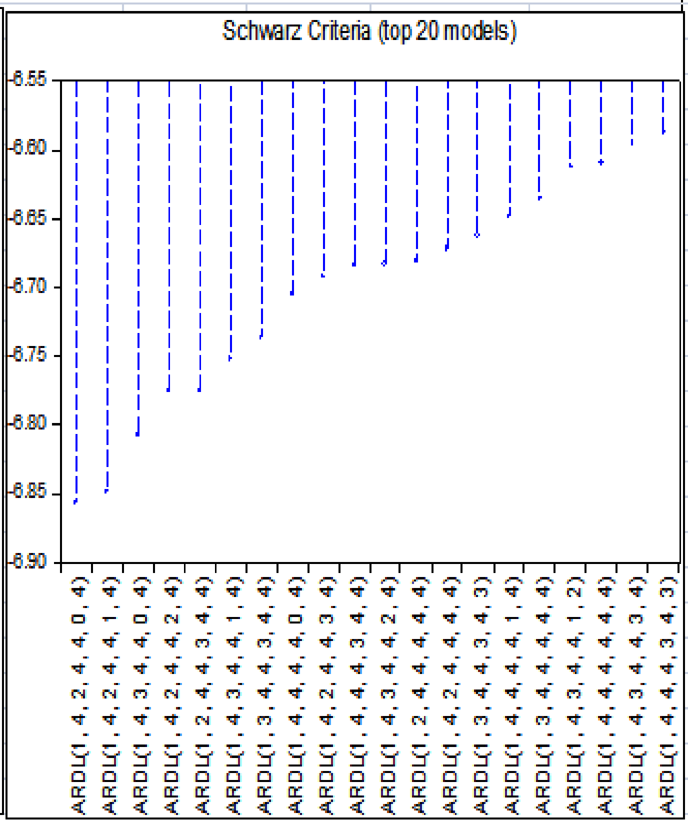
We run this test on Eviews9 and we proceed to the verification of the Schwarz information criterion (SIC) for the two models (the model with CSP as an indicator of the development of the SB and the one with M3 as a measure of the DSB). Table 3 (next page) summarizes these results. These show that:

- For the model with CSP as an indicator of the development of the SB: the ARDL model (1, 3, 4, 4, 4, 4, 3) is the most optimal among the 19 others presented, because it presents the smallest value of the SIC.
- For the model with M3 as an indicator of the development of SB: the ARDL model (1, 4, 2, 4, 4, 0, 3) is the most optimal among the 19 others presented, because it offers the smallest value of the SIC.

### Table N ° 3: Optimal shift of the studied models

| Modèle avec CSP | Modèle avec M3 |
|---|---|
| Dependent Variable: D(LOGPIBH) | Dependent Variable: D(LOGPIBH) |
| Method: ARDL | Method: ARDL |
| Number of models evaluated: 15625 | Number of models evaluated: 15625 |
| Selected Model: ARDL(1, 3, 4, 4, 4, 4, 3) | Selected Model: ARDL(1, 4, 2, 4, 4, 0, 4) |
| Sample (adjusted): 1985 2018 | Sample (adjusted): 1985 2018 |
| Included observations: 34 after adjustments | Included observations: 34 after adjustments |




**Source:** Author's estimate

### *C. Estimation of the optimal ARDL model and Terminal cointegration test*

Table 4 (next page) summarizes the results of the estimation of the two ARDL models, namely: ARDL (1, 3, 4, 4, 4, 4, 3) and ARDL (1, 4, 2.4, 4,0,4). It is more precisely:

- The ARDL model (1, 3, 4, 4, 4, 4.3) with as an indicator of the development of the banking sector "the amount of loans granted to the private sector".
- The ARDL model (1, 4, 2, 4, 4, 0.4) with as indicator of the development of the banking sector "the size of the banking sector".

**Table N ° 4: Estimation of the ARDL model**

| Modèle avec CSP | | | | | Modèle avec M3 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dependent Variable: D(LOGPIBH) | | | | | Dependent Variable: D(LOGPIBH) | | | | |
| Method: ARDL | | | | | Method: ARDL | | | | |
| Number of models evaluated: 15625 | | | | | Number of models evaluated: 15625 | | | | |
| Selected Model: ARDL(1, 3, 4, 4, 4, 4, 3) | | | | | Selected Model: ARDL(1, 4, 2, 4, 4, 0, 4) | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.* | Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
| D(LOGPIBH(-1)) | 0482304 | 0065195 | 7397845 | 00018 | D(LOGPIBH(-1)) | 0363473 | 0078124 | 4652529 | 00016 |
| D(LOGCSP) | 0156055 | 0019575 | 7972213 | 00013 | D(LOGTAILL) | 0484982 | 0025780 | 1881103 | 00000 |
| D(LOGCSP(-1)) | -0091885 | 0029346 | -3131049 | 00351 | D(LOGTAILL(-1)) | -0357237 | 0050008 | -7144380 | 00001 |
| D(LOGCSP(-2)) | -0110756 | 0021647 | -5116581 | 00069 | D(LOGTAILL(-2)) | -0219578 | 0021182 | -1037094 | 00000 |
| D(LOGCSP(-3)) | -0222027 | 0029340 | -7567276 | 00016 | D(LOGTAILL(-3)) | -0083716 | 0029224 | -2864646 | 00210 |
| D(LOGEPAR) | -0057243 | 0035346 | -1619480 | 01807 | D(LOGTAILL(-4)) | -0094081 | 0021963 | -4277489 | 00027 |
| D(LOGEPAR(-1)) | -0478959 | 0046613 | -1027534 | 00005 | D(LOGEPAR) | 0060226 | 0018769 | 3208878 | 00124 |
| D(LOGEPAR(-2)) | -0508371 | 0028665 | -1773508 | 00001 | D(LOGEPAR(-1)) | -0246348 | 0024414 | -1009055 | 00000 |
| D(LOGEPAR(-3)) | 0163468 | 0024642 | 6633796 | 00027 | D(LOGEPAR(-2)) | -0244760 | 0018296 | -1337764 | 00000 |
| D(LOGEPAR(-4)) | 0336180 | 0022105 | 1520822 | 00001 | D(LOGINFL) | 0012639 | 0002765 | 4571506 | 00018 |
| D(LOGINFL) | -0002942 | 0002946 | -0998876 | 03744 | D(LOGINFL(-1)) | 0027009 | 0002505 | 1078107 | 00000 |
| D(LOGINFL(-1)) | -0019459 | 0005760 | -3378360 | 00278 | D(LOGINFL(-2)) | -0011354 | 0002641 | -4299387 | 00026 |
| D(LOGINFL(-2)) | -0080959 | 0005819 | -1391309 | 00002 | D(LOGINFL(-3)) | -0014419 | 0002625 | -5492412 | 00006 |
| D(LOGINFL(-3)) | -0029830 | 0003822 | -7805527 | 00015 | D(LOGINFL(-4)) | 0014707 | 0002602 | 5651642 | 00005 |
| D(LOGINFL(-4)) | 0037899 | 0003367 | 1125652 | 00004 | D(LOGINV) | 0396225 | 0023220 | 1706389 | 00000 |
| D(LOGINV) | 0650874 | 0035105 | 1854071 | 00000 | D(LOGINV(-1)) | 0220078 | 0025430 | 8654130 | 00000 |
| D(LOGINV(-1)) | 0187628 | 0039814 | 4712658 | 00092 | D(LOGINV(-2)) | 0411906 | 0023344 | 1764518 | 00000 |
| D(LOGINV(-2)) | 0366239 | 0030863 | 1186663 | 00003 | D(LOGINV(-3)) | -0088862 | 0018168 | -4891199 | 00012 |
| D(LOGINV(-3)) | -0322026 | 0028602 | -1125897 | 00004 | D(LOGINV(-4)) | 0116742 | 0015183 | 7689206 | 00001 |
| D(LOGINV(-4)) | -0195606 | 0023921 | -8177254 | 00012 | D(LOGENSUP) | -0116422 | 0017622 | -6606614 | 00002 |
| D(LOGENSUP) | 0031562 | 0012508 | 2524371 | 00651 | D(LOGOUV) | -0257467 | 0017616 | -1461516 | 00000 |
| D(LOGENSUP(-1)) | -0066861 | 0015230 | -4390199 | 00118 | D(LOGOUV(-1)) | -0213943 | 0024149 | -8859161 | 00000 |
| D(LOGENSUP(-2)) | 0039900 | 0016217 | 2460321 | 00697 | D(LOGOUV(-2)) | -0290644 | 0019025 | -1527733 | 00000 |
| D(LOGENSUP(-3)) | 0071492 | 0026417 | 2706327 | 00537 | D(LOGOUV(-3)) | 0090640 | 0020531 | 4414901 | 00022 |
| D(LOGENSUP(-4)) | 0139388 | 0017521 | 7955291 | 00014 | D(LOGOUV(-4)) | 0086348 | 0019605 | 4404451 | 00023 |
| D(LOGOUV) | -0322506 | 0029726 | -1084915 | 00004 | C | 0012543 | 0001358 | 9236571 | 00000 |
| D(LOGOUV(-1)) | 0002363 | 0030042 | 0078665 | 09411 | | | | | |
| D(LOGOUV(-2)) | -0144104 | 0030112 | -4785565 | 00087 | | | | | |
| D(LOGOUV(-3)) | 0417986 | 0034069 | 1226739 | 00003 | | | | | |
| C | 0012838 | 0001677 | 7655693 | 00016 | | | | | |
| R-squared | 0996244 | Akaike info criterion | | -7712200 | R-squared | 0996519 | Akaike info criterion | | -8023794 |
| Adjusted R-squared | 0969017 | Schwarz criterion | | -6365911 | Adjusted R-squared | 0985639 | Schwarz criterion | | -6855577 |
| F-statistic | 3658922 | Durbin-Watson stat | | 2569451 | F-statistic | 9159650 | Durbin-Watson stat | | 2651322 |
| Prob(F-statistic) | 0001532 | | | | Prob(F-statistic) | 0000000 | | | |

**Source:** Author's estimate

The validity of the estimated models depends on the results of three fundamental tests corroborating the tangibility of the results obtained and the robustness of the estimates, in this case, the test for heteroskedasticity, autocorrelation and the normality of errors.

### *d. Estimated ARDL model diagnostic test results*

The following table summarizes the results of these three tests (the Breusch-Godfrey test, the Breusch-Pagan-Godfrey test and the Jarque Bera test) for the two models:

**Table N ° 5: Validity test of the estimated models**

| | | | | |
|---|---|---|---|---|
| **Model with CSP** | | | | |
| Dependent Variable: D(LOGPIBH) | | | | |
| Method: ARDL | | | | |
| Number of models evalulated: 15625 | | | | |
| Selected Model: ARDL(1, 3, 4, 4, 4, 4, 3) | | | | |
| Sample (adjusted): 1985 2018 | | | | |
| Included observations: 34 after adjustments | | | | |
| Hypothèses | Tests | Résultats | Proba | Confirmé e |
| Correlation LM Test | Test Breusch-Godfrey | 0,4891 | 0, 671 5 | NON |
| Heteroskedasticity | Breusch-Pagan-Godfrey | 2,827 | 0,1606 | NON |
| Normality Test | Test Jarque Bera | 0,0614 | 0,969 | OUI |
| **Model with M3** | | | | |
| Dependent Variable: D(LOGPIBH) | | | | |
| Method: ARDL | | | | |
| Number of models evalulated: 15625 | | | | |
| Selected Model: ARDL(1, 4, 2, 4, 4, 0, 4) | | | | |
| Sample (adjusted): 1985 2018 | | | | |
| Included observations: 34 after adjustments | | | | |
| Hypothèses | Tests | Résultats | Proba | Confirmé e |
| Correlation LM Test | Test Breusch-Godfrey | 1,2757 | 0,3454 | NON |
| Heteroskedasticity | Breusch-Pagan-Godfrey | 0,9613 | 0,5664 | NON |
| Normality Test | Test Jarque Bera | 1,008 | 0,6039 | OUI |

**Source :** Author's estimate

With regard to these tests, we conclude on the confirmation of the null hypothesis for all these tests, therefore, we can argue that both estimates are thus statistically validated.

***Cointegration test at terminals***

The calculated test statistic, i.e. Fisher's F value, will be compared to the critical values (which form bounds) as follows:

- If Fisher calculated> upper bound: the existence of cointegration exists
- If Fisher calculated <lower bound: the absence of cointegration
- If lower bound <If Fisher calculated <upper bound: no decision

The results of the cointegration test at the bounds summarized in Table N ° 7 confirm the existence of a cointegration relation between the series studied (the value of F-stat is> that of the upper bound), which gives the possibility of estimating long-term effects.

**Table n ° 7: results of the terminal co-integration test**

| | | |
|---|---|---|
| **Model with CSP** | | |
| ARDL Bounds Test | | |
| Date: 08/27/19 Time: 17:09 | | |
| Sample: 1985 2018 | | |
| Included observations: 34 | | |
| Null Hypothesis: No long-run relationships exist | | |
| Test Statistic | Value | K |
| F-statistic | 5.523010 | 6 |
| Critical Value Bounds | | |
| Significance | I0 Bound | I1 Bound |
| 10% | 2.12 | 3.23 |
| 5% | 2.45 | 3.61 |
| 2.5% | 2.75 | 3.99 |
| 1% | 3.15 | 4.43 |
| **Model with M3** | | |
| ARDL Bounds Test | | |
| Date: 08/27/19 Time: 22:14 | | |
| Sample: 1985 2018 | | |
| Included observations: 34 | | |
| Null Hypothesis: No long-run relationships exist | | |
| Test Statistic | Value | K |
| F-statistic | 11.48482 | 6 |
| Critical Value Bounds | | |
| Significance | I0 Bound | I1 Bound |
| 10% | 2.12 | 3.23 |
| 5% | 2.45 | 3.61 |
| 2.5% | 2.75 | 3.99 |
| 0,01 | 3.15 | 4.43 |

**Source :** Author's estimate

### *e. Long-term coefficients and short-term dynamics*

#### - Short-term dynamics

We have summarized the results of the estimates of the short-term coefficients for the two models in Table 8 (next page). We find that the adjustment coefficients of the two estimates are statistically significant. Note also that the absolute value of these coefficients is between zero and one, which guarantees an error correction mechanism, and therefore the existence of a long-term relationship between variables.

The results of these estimates allow the following conclusions to be drawn:

- The development of the banking sector has a positive and significant effect on short-term economic growth: the increase in the amounts of bank loans granted to the private sector by 1% accelerates economic growth by 0.15% at CT. We confirm the same result when the development of the banking sector is measured by the M3, estimates show that the evolution of M3 by 1% accelerates economic growth by 0.48% at CT.
- The other control variables did not show the expected effects (in terms of weight and in terms of sign) in the short term. Thus, the economic openness rate, savings, inflation and investment show negative and significant signs, something that escapes theoretical predictions.

**Table 8: models with short-term dynamics**

| **Model with CSP** | | | | | **Model with M3** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ARDL Cointegrating And Long Run Form | | | | | ARDL Cointegrating And Long Run Form | | | | |
| Dependent Variable: D(LOGPIBH) | | | | | Dependent Variable: D(LOGPIBH) | | | | |
| Selected Model: ARDL(1, 3, 4, 4, 4, 4, 3) | | | | | Selected Model: ARDL(1, 4, 2, 4, 4, 0, 4) | | | | |
| Date: 08/27/19 Time: 17:09 | | | | | Date: 08/27/19 Time: 22:29 | | | | |
| Sample: 1980 2018 | | | | | Sample: 1980 2018 | | | | |
| Included observations: 34 | | | | | Included observations: 34 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. | Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LOGCSP, 2) | 0.156055 | 0.019575 | 7.972213 | 0.0013 | D(LOGTAILL, 2) | 0.484952 | 0.025780 | 18.811034 | 0.0000 |
| D(LOGCSP(-1), 2) | 0.110756 | 0.021647 | 5.116531 | 0.0069 | D(LOGTAILL(-1), 2) | 0.219678 | 0.021182 | 10.370937 | 0.0000 |
| D(LOGCSP(-2), 2) | 0.222027 | 0.029340 | 7.567276 | 0.0016 | D(LOGTAILL(-2), 2) | 0.083716 | 0.029224 | 2.864646 | 0.0210 |
| D(LOGEPAR, 2) | -0.057243 | 0.035346 | -1.619480 | 0.1807 | D(LOGTAILL(-3), 2) | 0.094031 | 0.021983 | 4.277489 | 0.0027 |
| D(LOGEPAR(-1), 2) | 0.508371 | 0.028665 | 17.735078 | 0.0001 | D(LOGEPAR, 2) | 0.060226 | 0.018769 | 3.208878 | 0.0124 |
| D(LOGEPAR(-2), 2) | -0.163468 | 0.024642 | -6.633796 | 0.0027 | D(LOGEPAR(-1), 2) | 0.244760 | 0.018296 | 13.377642 | 0.0000 |
| D(LOGEPAR(-3), 2) | -0.336180 | 0.022105 | -15.208224 | 0.0001 | D(LOGINFL, 2) | 0.012639 | 0.002765 | 4.571506 | 0.0018 |
| D(LOGINFL, 2) | -0.002942 | 0.002946 | -0.998876 | 0.3744 | D(LOGINFL(-1), 2) | 0.011354 | 0.002641 | 4.299387 | 0.0026 |
| D(LOGINFL(-1), 2) | 0.080959 | 0.005819 | 13.913092 | 0.0002 | D(LOGINFL(-2), 2) | 0.014419 | 0.002625 | 5.492412 | 0.0006 |
| D(LOGINFL(-2), 2) | 0.029830 | 0.003822 | 7.805527 | 0.0015 | D(LOGINFL(-3), 2) | -0.014707 | 0.002602 | -5.651642 | 0.0005 |
| D(LOGINFL(-3), 2) | -0.037899 | 0.003367 | -11.256521 | 0.0004 | D(LOGINV, 2) | 0.396225 | 0.023220 | 17.063895 | 0.0000 |
| D(LOGINV, 2) | 0.650874 | 0.035105 | 18.540707 | 0.0000 | D(LOGINV(-1), 2) | -0.411906 | 0.023344 | -17.645179 | 0.0000 |
| D(LOGINV(-1), 2) | -0.366239 | 0.030863 | -11.866631 | 0.0003 | D(LOGINV(-2), 2) | 0.088862 | 0.018168 | 4.891199 | 0.0012 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D(LOGINV(-2), 2) | 0.322026 | 0.028602 | 11.258967 | 0.0004 | D(LOGINV(-3), 2) | -0.116742 | 0.015183 | -7.689206 | 0.0001 |
| D(LOGINV(-3), 2) | 0.195606 | 0.023921 | 8.177254 | 0.0012 | D(LOGENSUP, 2) | -0.116422 | 0.017622 | -6.606614 | 0.0002 |
| D(LOGENSUP, 2) | 0.031562 | 0.012503 | 2.524371 | 0.0651 | D(LOGOUV, 2) | -0.257467 | 0.017616 | -14.615158 | 0.0000 |
| D(LOGENSUP(-1), 2) | -0.039900 | 0.016217 | -2.460321 | 0.0697 | D(LOGOUV(-1), 2) | 0.290644 | 0.019025 | 15.277326 | 0.0000 |
| D(LOGENSUP(-2), 2) | -0.071492 | 0.026417 | -2.706327 | 0.0537 | D(LOGOUV(-2), 2) | -0.090640 | 0.020531 | -4.414901 | 0.0022 |
| D(LOGENSUP(-3), 2) | -0.139388 | 0.017521 | -7.955291 | 0.0014 | D(LOGOUV(-3), 2) | -0.086348 | 0.019605 | -4.404451 | 0.0023 |
| D(LOGOUV, 2) | -0.322506 | 0.029726 | -10.849148 | 0.0004 | CointEq(-1) | -0.636527 | 0.078124 | -8.147673 | 0.0000 |
| D(LOGOUV(-1), 2) | 0.144104 | 0.030112 | 4.785565 | 0.0087 | [redacted] | | | | |
| D(LOGOUV(-2), 2) | -0.417936 | 0.034069 | -12.267394 | 0.0003 | | | | | |
| CointEq(-1) | -0.517696 | 0.065195 | -7.940700 | 0.0014 | | | | | |
| Cointeq = D(LOGPIBH) - (-0.5189*D(LOGCSP) - 1.0526*D(LOGEPAR) -0.1841*D(LOGINFL) + 1.3272*D(LOGINV) + 0.4162*D(LOGENSUP) - 0.0895*D(LOGOUV) + 0.0248 ) | | | | | Cointeq = D(LOGPIBH) - (-0.4237*D(LOGTAILL) - 0.6769*D(LOGEPAR) +0.0449*D(LOGINFL) + 1.6591*D(LOGINV) - 0.1829*D(LOGENSUP) - 0,9192*D(LOGOUV) + 0.0197) | | | | |

**Source :** Author's estimate

**- Long term coefficients**

Table N ° 9 below (next page) provides us with the estimated long-term coefficients or elasticities. In the long term, the effects of the development of the banking sector on economic growth in Morocco show negative and significant signs and are rather more than proportional: the change in the amounts of bank loans granted to the private sector by 1% will have the opposite effect. On long-term economic growth of -0.51% we confirm the same result for the model where the development of the banking sector is measured by size, the estimates show that the evolution of M3 by 1% will slow down economic growth by -0.42% in LT.

With the exception of the variable Edu and Inv, the other control variables showed negative signs at LT, constituting factors which slow down economic growth. Remember, this counterintuitive result is dependent on absent or less effective economic policies, political instabilities, etc.

**Tableau N°9 : models with long-term dynamics**

| **Model with CSP** | | | | | **Model with M3** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ARDL Cointegrating And Long Run Form | | | | | ARDL Cointegrating And Long Run Form | | | | |
| Dependent Variable: D(LOGPIBH) | | | | | Dependent Variable: D(LOGPIBH) | | | | |
| Selected Model: ARDL(1, 3, 4, 4, 4, 4, 3) | | | | | Selected Model: ARDL(1, 4, 2, 4, 4, 0, 4) | | | | |
| Date: 08/27/19 Time: 17:09 | | | | | Date: 08/27/19 Time: 22:29 | | | | |
| Sample: 1980 2018 | | | | | Sample: 1980 2018 | | | | |
| Included observations: 34 | | | | | Included observations: 34 | | | | |
| Long Run Coefficients | | | | | Long Run Coefficients | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. | Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LOGCSP) | -0.518863 | 0.112060 | -4.630233 | 0.0098 | D(LOGTAILL) | -0.423720 | 0.121631 | -3.483653 | 0.0083 |
| D(LOGEPAR) | -1.052600 | 0.218838 | -4.809960 | 0.0086 | D(LOGEPAR) | -0.676928 | 0.100001 | -6.769227 | 0.0001 |
| D(LOGINFL) | -0.184067 | 0.044811 | -4.107624 | 0.0148 | D(LOGINFL) | 0.044904 | 0.011670 | 3.847918 | 0.0049 |
| D(LOGINV) | 1.327244 | 0.198400 | 6.689745 | 0.0026 | D(LOGINV) | 1.659142 | 0.170972 | 9.704194 | 0.0000 |
| D(LOGENSUP) | 0.416230 | 0.084562 | 4.922180 | 0.0079 | D(LOGENSUP) | -0.182901 | 0.047700 | -3.834395 | 0.0050 |
| D(LOGOUV) | -0.089455 | 0.146415 | -0.610969 | 0.5742 | D(LOGOUV) | -0.919152 | 0.094480 | -9.728556 | 0.0000 |
| C | 0.024799 | 0.004257 | 5.825856 | 0.0043 | C | 0.019705 | 0.003744 | 5.263350 | 0.0008 |

**Source :** Author's estimate

## 2.4 Discussion of the results

Analysis of these results shows that the two estimates are generally good and explain 99% of the dynamics of GDP per capita in Morocco, between 1980 and 2018, supported by the high significance of the Fisher test.

Indeed, the analysis of the results of the estimates of the models in our study allows us to draw the following conclusions:

- The development of the banking system measured by the CSPs positively and significantly influences the achievements of the real economy. However, lagged values of this variable have a negative and significant effect on economic growth.
- We confirm the same result when we use the size as an explanatory variable of banking development; the results show a positive and significant effect while the lagged values have a negative and significant effect.
- Lagged GDP has a positive and significant effect. There is a confirmed result for the two estimated models.
- Concerning the other control variables, we can advance that overall they respected the expected signs except for a few exceptions.

**Table N ° 10: coefficients and signs of the control variables**

| | Model with CSP (1,3,4,4,4,4,3) | | | | | Model with M3((1, 4, 2,4,4,0,3) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | R=0 | R=-1 | R=-2 | R=-3 | R=-4 | R=0 | R=-1 | R=-2 | R=-3 | R=-4 | Effet att |
| Inflation | - | -* | -* | -* | -* | +* | +* | -* | -* | -* | - |
| Economic openness | -* | +* | -* | -* | | -* | -* | -* | +* | +* | + |
| Investment | +* | +* | +* | -* | -* | +* | +* | +* | -* | +* | + |
| Domestic savings | - | -* | -* | +* | +* | +* | -* | -* | | | + |
| Human capital | +* | -* | +* | +* | +* | -* | | | | | + |

**Source :** Author's estimate

The estimation of the long-term coefficients and the short-term dynamics allows us to conclude on two conclusions:

- First, the development of the banking sector has a positive and significant effect on short-term economic growth regardless of the variable used to measure the development of this sector.
- Second, in the long term, the effects of the development of the banking sector on economic growth in Morocco show negative and significant signs whatever the variable used to capture the development of this sector.

## Conclusion

The objective of this article is to study the relationship between the development of the Moroccan banking system and economic growth. To deal with this problem, we first tried to mobilize a theoretical and empirical framework inherent to this question, a work that allowed us to specify our frame of reference.

While most of the work leans towards a positive relationship between the development of the financial apparatus and economic growth, controversies over the meaning and determining factors of this relationship lead to mixed results. This variability is due on the one hand to individual specificities and on the other hand to the econometric methods used. This result is confirmed throughout our first part.

The results from the estimates of the coefficients of the models show that the effect of the development of the banking sector on economic growth in Morocco is a positive and significant effect in the short term. Ultimately, when we measure banking development by bank credit as well as when we measure it by the size variable, we find a positive and significant link between banking development and economic growth. However, and in the long term, the effects of the development of the banking sector on economic growth in Morocco show negative and significant signs. A result that remains valid regardless of the variable used to capture the development of the banking system.

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**African Scientific Journal**
**ISSN : 2658-9311**
**Vol : 3, Numéro 7, Août 2021**

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