

## Financial Development and Economic Growth Nexus: Evidence From Algeria

### Lien entre développement financier et croissance économique: témoignages de l'Algérie

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**Abstract:** This research paper represents a brief summary of both the theoretical and the empirical frameworks of the most important researches related to the study of the relationship between financial development and economic growth. A standard study was conducted to investigate the nature of the relationship and to determine the role of the Algerian banking system in promoting the economic activity during the period (1990 – 2014) relying on a set of tests, including the test of cointegration of variables, and vector error-correction model. In addition to Granger's causality, using only the financial variables, and then applying the model using macro variables (financial and real variables) as to identify the most influential factors on economic growth .

The study concluded that there is a one-way long-term causal relationship between banking system and economic growth. While the Granger's causality test indicates a one-way causal relationship between economic growth and investments.

**Key words:** Financial Development, Economic Growth, Algerian Financial System, Causality, Vector Error-Correction Model.

**(JEL) Classification :** A14, D83, M21

**ملخص:** تقدم هذه الورقة البحثية عرض موجز للاطار النظري والتجريبي لأهم الأبحاث المتعلقة بدراسة العلاقة بين التطور المالي والنمو الاقتصادي، ليتم بعدها اجراء دراسة قياسية للبحث عن طبيعة العلاقة وتحديد دور النظام المصرفي الجزائري في تعزيز النشاط الاقتصادي خلال الفترة الممتدة من (1990- 2014)، وذلك بالاعتماد على مجموعة من الاختبارات من ضمنها اختبار التكامل المشترك بين المتغيرات، ونموذج متجه تصحيح الخطأ. بالإضافة إلى سببية جرانجر وذلك باستخدام المتغيرات المالية فقط معرجين بعد ذلك إلى تطبيق النموذج باستعمال المتغيرات الكلية (المتغيرات المالية والحقيقية) بغية منا معرفة العوامل الأكثر تأثيراً على النمو الاقتصادي وقد توصلت الدراسة إلى وجود علاقة سببية طويلة الأجل في اتجاه واحد بين النظام البنكي والنمو الاقتصادي، في حين بين اختبار السببية لجرانجر وجود علاقة سببية في اتجاه واحد بين النمو الاقتصادي والاستثمار. **الكلمات المفتاحية:** التطور المالي؛ النمو الاقتصادي؛ النظام المالي الجزائري، السببية، نموذج متجه تصحيح الخطأ. رموز: A14, D83, M21: jel

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## **1. Introduction:**

Economic growth was the center of attention of politicians and economist over time. This indicator has an impact on the well-being of the individual and the society. Differences in economic growth's levels between countries was always the real motive for research on its determinants and the factors affecting it, and to build the necessary frameworks to make the economic growth sustainable to include non-economic aspects in both developing and developed countries.

The role of finance in economic activity was the subject of interest of many researchers and public authorities. It was one of the factors affecting the various economic activities. The financial system occupies a vital position in mobilizing savings, financing the economy and various investment activities in the productive and service sectors. Therefore, it is necessary to address the future of the financial system and its role in financing development. The role of the financial system is fundamental and central, it is the heart of the economic system in the developed countries through its contribution to its progress and development. The establishment of an effective financial system is now a priority for long-term economic growth.

Within this role, the relationship between financial development and economic growth received much attention in the economic literature over the past few decades by many economists. The theoretical interest of this relationship refers to the writings of Bagehot (1873) and Hicks (1969), who argued that the financial innovations in Great Britain, such as the IPO of the company per share and the limited liability company favored the first industrial revolution by facilitating the efficient mobilization and use of the savings needed for the large-scale financing of investments in its industrial activities. Similarly, Schumpeter (1934) argues that the financial development stimulates economic growth not only to make capital accumulation easier, but also to finance innovations. On the other hand, some economists have attributed a negative role to the financial system, which they believe economic growth depends on a combination of factors such as the amount of capital, labor, productivity and innovation without the impact of Financial system. In particular, Lucas (1988) rejects the existence of a relationship

between finance and growth, arguing that economists place a great deal of importance on financial factors as determinants of economic growth. On the other hand, some economists believe that economic growth leads to financial development; Finance does not precede but follows economic development "where the enterprise leads, finance follows" (*Robinson, 1952*).

Under these conditions, and as a result of the significant role played by the financial sector in the transition to a market economy, the Algerian financial system witnessed a number of reforms, after being subjected to decades of central management and continuous interference by the state both in its structures and institutions or in its working mechanisms, where Algeria become under the influence of market-oriented mechanisms to develop programs and strategies that allow it to increase the efficiency of financial system, since Algeria was and continuous to give the banking sector great importance through the reforms listed, in order to move the economic wheel and achieve economic growth.

We decided to study the relationship that can combine the banking institution with the economic growth in Algeria; therefore, we raise the following problem:

**What is the nature and direction of the relationship that can combine banks and economic growth in Algeria and what is the degree of their impact? What is the nature of the impact for the other variables that explain economic growth?**

To answer the problem, the following hypotheses were formulated:

- The banking system in Algeria has a large and effective role in influencing economic activity and thus has a significant relationship to economic growth.
- The economic growth in Algeria depends heavily on the banking variables.

This part of the study aims at measuring the impact of financial development on the real economic growth in Algeria and indicating the strength and direction of the long and short-term relationship between them, especially in light of the lack of availability of standard studies on the situation of Algeria in this field, as well as participating in the ongoing debate about the impact of the variables that reflect the financial development of the real sectors, and the compatibility of the situation of the Algerian financial system with the assumptions made regarding this

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relationship. Therefore, we will work on the employment of variables that reflect the financial development. In addition, we will employ a number of real variables, which are considered as explanatory variables for the part of the economic growth achieved.

## **THE REVIEW OF THE LITERATURE:**

The crucial role of the financial development in all economic development processes is much debated in both economic and financial literature. For decades, many theoretical and empirical studies have tried to explain the relationship between the financial and economic growth.

Most economists consider that the financial development is favorable to the economic growth. This view is based on a theoretical reflection and on many empirical studies.

### **1. The Theoretical Links**

The theoretical foundations of the relationship between the financial system and the economic growth and its implication in different development steps have been widely discussed during the last few years. These theoretical foundations dated back to Bagehot's work (1973) on his book "A Description of the Money Market" which emphasizes on the idea of the financial development as well as its major role on the economic growth. Bagehot has promoted the British development which is also due to the superiority of its financial market; the latter has arrived to mobilize the savings towards financing multiple long term investment projects, besides the implementation of new technologies in England depends on the easy access of the entrepreneur to the external financing.

However, the most important contribution to the financial and economic development came from Schumpeter (1912) on his book "The theory of Economic Development". Schumpeter considered that the entrepreneur and the banker are the two complementary players in the innovation process. According to him, banks' functioning stimulates the technological innovation by identifying and funding entrepreneurs with the best chances of success in their innovative activities. And for him, the financial development stimulates the economic growth through the efficient allocation of resources. However, it should be noted that in

Schumpeter's approach the emphasis is not made on saving mobilization process but rather on the granting credit process, which he called debt creation or "the essential credit" as opposed to the non-essential credit fed by saving

During the 60's, the positive relationship between the financial development and the economic growth was demonstrated by certain authors including: Gurley & Shaw (1955, 1967), Goldsmith (1969), Shaw and Mc Kinnon (1973), etc.

The theoretical contribution of the relationship between the financial and economic growth can be classified into three hypotheses:

### **1.1. The Structural Approach**

The structural theory's view is that the existence of a vast financial institutions network, as well as a variety of financial instruments, in addition to the expansion of these institutions activities having a significant positive impact on savings and investment; thus, on the economic growth.

Gurley & Shaw (1960) argument is based on the importance of financial innovations in the economic development. According to these authors, financial assets, with the new features, are compared with the existing assets, equal to interest rates, a higher expected benefit; because the risks attached to their detention or to their management fees are lower. The market introduction of these new assets causes a "substitution effect" that is to say a decrease in the demand of old assets in favor of new assets "a wealth effect" that is to say an increase in the total demand for financial assets by increasing savings. The increased saving increases the capacity of financial intermediaries so as to fund projects that will help increase the product.

Other authors like Patrick (1966) resumed the ideas of Gurley & Shaw to show that the presence of a more efficient financial system allows to increase the mobilized savings and leads to a better allocation of resources towards investments' projects. In fact, without financial intermediary, the investors must own their resources. This self-financing is inefficient, mainly for projects that require an important financial resource.

The link "finance-economic growth" was studied in more details, particularly with the works of Gold Smith (1969). Gold Smith confirmed the positive effect of financial intermediary on the economic growth through the

efficiency and the volume of the investments. Goldsmith suggests that the financial structure can be measured by financial interrelation ratio (FIR). The FIR is defined as the quotient of the global market value of all financial instruments that exist in a country at a given date in the value of its tangible net national wealth; this ratio has a tendency to increase during the economic development. A higher value of the latter signifies that the financial interrelation network compared to the size of national wealth or national product is high. Thus, the FIR can provide a good measure of the level of financial development.

### **1.2. The Financial Repression Approach**

The works on the role of the financial system in the economic development were dominated by the neoclassic approach of financial liberalization initiated by McKinnon & Show (1973). These two authors present the liberalization of the financial sector as an effective and simple way to accelerate the economic growth of the developing countries.

McKinnon (1973) and Show (1973) search to substitute the financial liberalization to the financial repression characterized essentially by fixing the nominal interest rates below the level that would allow the balance between supply and demand for loanable funds, unremunerated reserve requirements with banks, a policy of coaching and credit selectivity and finally an exchange control. These regulatory constraints have led economic agents to hold non-monetary assets rather than bank deposits. This led to a financial savings reduction that should have been channeled towards investment. In addition, an interest rate regulates caused a misallocation of resources.

Relatively low interest rates can promote investment in the least productive sectors to the detriment of the very productive investment. In this context release the financial sector, that is to say the enlargement of the savings instruments and the increase of real interest rates' level on deposits (by an increase in nominal rates or by a decline in inflation) will stimulate the accumulation of cash holding (savings). This should allow increasing bank intermediation and financial markets development; thus, reducing intermediation fees between lender and borrower,

better risk diversification and easy access to loanable funds borrowers. This will favor investment and economic growth.

### 1.3. The Endogenous Growth Approach

The development of the endogenous growth theory over the 80's revived interest in the studies in this area and allowed to show that the financial factor may have effects not only on the level of capital stock or on the level of productivity but also on their growth rate.

According to the neoclassic theory, the output growth is determined by the demographic factor (population's growth rate) and technical progress. But as these latter two variables are exogenous, the model doesn't permit to explain the mechanisms that generate growth in the steady state.

The endogenous growth theory allows overcoming this problem of the neoclassic model by offering several channels (among other financial development) by which the growth in the steady state is produced endogenously.

Among endogenous growth models enabling to formulate the interactions between financial factors and growth, we find that of Pagano (1993) Based on the model developed by Rebelo (1991) in which aggregate output is in function of capital stock:

$$[1] \quad Y_t = AK_t$$

Pagano introduces a relative equation to the gross investment  $I_t$ :

$$[2] \quad I_t = K_{t+1} - (1 - \delta) k_t$$

Or the coefficient  $\delta$  represents the rate of depreciation of capital over a period

It assumes that a fraction  $(1 - \phi)$  of the total saving is lost in the process of financial intermediation (it is the cost of intermediation and prudential rules such as reserve requirements)

$$[3] \quad I_t = \phi S_t$$

Overall, the theoretical works showed that the financial intermediation level is a good economic growth estimator and that the financial development is an important determinant of economic growth.



## 2. Empirical Evidence

Apart from the theoretical researches, several empirical studies were conducted concerning the report between finance and economic growth.

Most of these studies focused on the test of contemporary correlation and the test of causality, which will be discussed in the following two paragraphs:

### 2.1. The Contemporaneous Correlation

During the last years, there has been a considerable effort and a numerous studies to measure the contemporaneous correlation between financial intermediation and economic growth; however, these studies are often faced with the problem of measuring the financial development indicators.

Goldsmith (1969) was among the first economists to study the relationship between economic growth and financial development indicators. He dealt with data for 35 countries between 1860 and 1963. The selected financial development indicator was the value of assets of financial intermediaries in relation to PIB. He concluded the existence of a form of synergy between financial development and economic growth.

N. Roubini & X. Sala-i-Martin (1992) tried "to analyze the effects of distortions on capital market (especially financial repression) on economic growth rate". By registering into the logic of R. McKinnon (1973) & E. Shaw (1973), N. Roubini & X. Sala-i-Martin (1992) consider that when the functioning of the financial sector is impeded by distortions, such as the financial repression, the economy doesn't benefit from the set of financial services available. The financial repression is measured, in their study, by a Dummy dependent variable of the range of real interest rates. Working on a sample of 53 countries, N. Roubini & X. Sala-i-Martin (1992) conclude that: "a high degree of financial repression drive to a low economic growth."

R.G King & R. Levine (1993) thereafter, deepened the works of R. Goldsmith (1969), at a time expanding the number of countries to 77, over a period from 1960 to 1989; they studied the financial factors likely to affect long-term economic growth. They were able to identify, at the end of this study, a set of indicators serve to quantify the financial development:



- The liquidity ratio: it measures the size of the financial intermediates through The volume of liquid liabilities of financial institutions in relation to PIB (Currency, Demand deposits and time deposits)
- The share of bank credits granted by commercial banks in relation to the entire domestic credits.
- The share of bank credits granted to private enterprises in relation to the entire domestic credits (Excluding loans to banks)
- The share of credits granted to private enterprises in relation to PIB.

R.G. King & R. Levine (1993) found later that about one-third of the growth gap between countries can be eliminated by increasing the size of financial sector.

J. Atje & B. Jovanovic (1993) were interested on the development of financial markets. They conclude, Based on a study of a sample of 75 countries, that the development of financial markets has a positive influence on the growth. However, the development of financial markets implies a positive effect only if the variance of stock market prices is mitigated

J. de Gregorio & P.E. Guidotti (1995) studied a sample of 100 countries for the period between 1960 and 1985 in order to apply regressions of the type R.J Barro (1991). They concluded that the financial development is associated with improved growth performances, especially in the case of high income countries. However, when they applied a regression in panel data on 12 Latin American countries, on the period 1950 - 1985, they found that 1970 and 1980's decade were marked by a reversal of the relationship, since financial sector's drifts have provoked acceleration in these countries' growth. This result led them to advocate caution in the processes of financial openness and the need to establish a regulatory structure for financial liberalization capable of avoiding financial crises. J. De Gregory & P. Guidotti (1995) found that from an empirical point of view, the principle channel of transmission between the financial development and economic growth is improving the efficiency and the quality of investments, rather than increasing their volume.

J.C. Berthélemy & A. Varoudakis (1995) worked on a sample of 91 countries between 1960 and 1985. Using the tests on convergence clubs to detect

possible poverty traps; they found that the level of schooling is the main factor affecting growth, although the financial factor also affects the level of economic development. Nevertheless, their empirical results also show that unfavorable financial conditions prevented countries with an important human capital to have the economic development level they should have.

R. Levine & S. Zervos (1998) used relative data to 47 countries covering the period from 1976 to 1993, with the objective of exploring the existing links between indicators of banking development and financial markets, with economic development indicators. Their results show that, apart from the other determinants of long-term growth, there is a strong relationship between the current development of banks and financial markets and the future values of the growth rate, of stock productivity and capital stock. Another important result of R. Levine & S. Zervos (1998) is that the two indicators measure banking development and development of capital markets are positively and significantly correlated with the majority of three variables of real nature. This indicates the complementary nature of the impact of banks and financial markets on real variables.

## 2.2. The Causality Sense

The problem often encountered in the empirical analysis of the link between these two types of development that concerns the simultaneity. In fact, we do not know if it is the financial development that triggers the growth or if it is the opposite. We can also doubt the existence of double causality between these two variables.

R. G. Frits (1984) took the example of Philippines to apply tests of causality, on quarterly data from 1969 to 1981. He found that for the early steps of the development process, the causality sense ranged from financial development to economic growth. On the other hand, the causality sense is reserved for the final steps of development, since the economic growth results in the development of financial services. By using annual data for 56 countries including 19 industrialized economies.

M.O. Odedokun (1996) analyzes a sample of 71 developing countries over the period 1960 - 1980, in order to study the problem of causality sense. By using

regressions on time series. He deduces that the financial intermediation explains the rate of growth of the economy for 85% of the studied countries. Then, the financial intermediation also plays an important role in promoting growth, like with other factors, as the ratio of capital formation or the export expansion variable. The financial intermediation variable was also more important to explain the economic development in relation to the rate of growth of the labor force. Finally, M. O. Odedokun (1996) found that the scheme of financial intermediation influencing growth is independent of countries and regions.

P. L. Rousseau & P. Wachtel (1998) were interested in historical data concerning five industrialized countries, which are the United States, Great Britain, Canada, Sweden and Norway during the period 1870 - 1929. They found that these countries have experienced a fast movement of guided industrialization, primarily, by financial factors. The error correction model and the VAR model used detected the played role of financial development variables in promoting the activity of the real sector, without the presence of significant return effects (feedback effects).

D. Christopoulos & E. Tsionas (2004) worked on a sample of 10 developing countries for the period 1970-2000, proceeding by a panel cointegration analysis. Their results argue in favor of causality going, over a long period, of financial development to growth (There exists a single cointegration vector), and in favor of the lack of a short-term relationship between the two phenomena.

However, other empirical studies reached different conclusions regarding in relation to the causality sense between financial development and economic development.

This is the case of the study of P. Demetriades & K. Hussein (1996), which led to causality tests on time series between financial development and real PIB for the 16 least developed countries. They did not find any results proving that the financial factors play an important role in the economic development process for these countries. They found, in the other hand, more evidence in the opposite direction (The economic development which acts or financial development) as well as for bidirectional causality. Another important conclusion of their work is that models of interaction between the financial and economic differ between

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countries. This suggests, according to the authors, more attention to the studies of the case of countries and for the analysis of time series.

P. Demetriades & K. Luintel (1996) found empirical links between the regulation of banking sector and financial deepening process, as well as between financial deepening and growth in the case of India. They measured the regulation of the banking sector by the interest rate controls, the coaching programs and credit orientation, as well as the requirements for liquidity and reserve requirements. For the study period, from 1961 to 1991, the empirical results show that apart from the ceiling on interest rates, these controls had a negative impact on financial development in India. In addition, the authors found a two-way causal relationship between financial development and economic activity.

B.K Luintel & Khan (1999) highlighted a double causality between financial development and economic development, for a sample of 10 developing countries. R.ham (1999) didn't find a positive and significant relationship between liquidity rates and growth, for the nine developed countries on a sample of 95 countries over the period 1960-1989.

P.Harrison & al (1999) used macroeconomic data on the United States for the period 1965 - 1995 to show that there are feedback effects between finance and growth. In fact, the economic growth reduces the cost of financial intermediation by attracting new entrants in the financial markets, but also through the reduction of monitoring costs and the promotion of industrial specialization. This is likely to encourage and promote investment and growth.

T. Beck & al. (2000) tried to bring a solution to the problem of simultaneity by taking into account the endogeneity of the variable of financial development. To do this, they used two estimation methods on a sample of 74 developed and developing countries. The first method is a transversal analysis over the period 1960 - 1995, by instrumentalizing financial development by legal origin, whether Anglo-Saxon, Germanic, French or Scandinavian. For the second method, the authors used the GMM estimator (Generalized Method-of-Moments) estimator using the same instrumental variable of the first method. They conducted a dynamic panel analysis, with a division into seven five-year sub-periods. This

method allows solving the problems of simultaneity bias, inverse causality and omitted variables that weaken the results of previous studies. They conclude by the existence of a positive relationship between the exogenous component of financial development and economic development. Moreover, they also draw attention to the fact that this effect takes place on the overall productivity of factors rather than on the volume of savings and the accumulation of capital.

### **THE FIELD STUDY: Measuring the Impact of Financial Development on Economic Growth in Algeria Between 1990 – 2014**

This part of the study aims to measure the impact of the financial development on the real economic growth in Algeria and it shows the direction of long and short-term relationship between them. To realize the study, a real GDP rate was used as an indicator to express the economic growth, in addition to a set of financial variables that reflect the financial system and some other real variables represented in: investment, inflation and government spending.

In this regard, we indicate that the used financial variables express only the banking system and do not include any indicator that expresses stock exchange in Algeria because of the absence of the role of latter in financing the economic activity. Since the financial development is led entirely by the banking development in Algeria, which is dominated by financing activities and the provision of services.

On this basis, and to clarify the relationship between the banking institution and the economic growth during the study period, we applied the model using banking variables only then we applied the model with macro variables (financial and real variables) in order to find out the most influential factors on the economic growth.

According to what was provided, in order to determine the impact and the direction of the relationship between the economic variables under the study, it will resort to modern statistical methods that include Johansson test and Vector Error Correction Model.

➤ **Description of Variables:**

**Table 01 : Description of Variables**

	Variable name	Description
Dependent variable	<b>GDP</b>	Gross domestic product rate: Represents GDP rate growth for Algeria at constant prices.
Financial variables	<b>MASS</b>	Money supply rate (the liquidity rate of the economy) M2 / GDP
	<b>CRED</b>	The rate of total credit to GDP
	<b>PRIVATE</b>	The credit ratio devoted to the private sector to GDP
Real variables	<b>INV</b>	<b>Gross Domestic InvestmentRatio (GDI)</b> It represents a ratio of gross fixed capital formation plus changes in inventories to GDP
	<b>GOV</b>	Government spending ratio: Calculated by the total government consumption to GDP
	<b>INF</b>	Ratio of inflation

**Source: Done by the researchers**

**1. The Study of The Relationship Between Financial Development and Economic Growth Using Bank Indicators**

**1.1. Unit Root Test**

To test the stationarity of four series, we used the Augmented Dickey–Fuller test. The results of the test are summarized in Table 02 below. It shows that they are stationary at the first difference I (1).

**Table 02: Augmented Dickey-Fuller Test (ADF) Unit Root Test**

Variables	Level		1 <sup>st</sup> Difference		Integration order
	t-Statistic	Critical value	t-Statistic	Critical value	
<b>GDP</b>	-3,30***	4,39	-8,48(0) ***	-3,75	I (1)
<b>MASS</b>	-2,96***	4,41	-4,66 (0) ***	-2,66	I (1)
<b>PRIVATE</b>	-2,23***	4,41	-4,48 (0) ***	-2,66	I (1)
<b>PRIVY</b>	-3,54***	4,39	-4,43 (0) ***	-2,66	I (1)

\*\*\*: Presents that the ADF test is managed according to the third model. The threshold of the critical value of significance is 1%. The values in parentheses show the P-value

**Source: Done by the researchers relying on EVIEWS 8.1 program**

### 1.2. Selection for Optimal Lag Length

The next step is to determine the optimal lag length for variables in VAR model, the lag length of variables is set according to Akaike information Criterion (AIC), that indicates is 1 (k=1) according to table 03

**Table 03: Lag Length Selection**

Lag	LR	FPE	AIC	SC	HQ
0	NA	4,37 <sup>e</sup> -12	-14,80430	-14,60796	-14,75221
1	61,74458*	6,59e -13*	-16,72058*	-15,73897*	-16,46023*

Source: Done by the researchers relying on EVIEWS 8.1 program

### 1.3. Johansen Cointegration Test

According to the results of the unit root test which asserted that all variables are stationary at the first difference: I (1). We will now apply a Johansen test. The results of the test are summarized in Table 04 below. They confirm the hypothesis of cointegration between variables therefore the presence of a long-term relationship between them. This leads us to assume that we can move to Vector Error Correction Model (VECM)

**Table04: Johansen Cointegration Test**

H0 : Rank : r	Traces	Critical 5%	value Max-Eigen value	Critical 5%	value
r = 0*	59,09996*	47.85613 (0.0031)	34,24645*	27.58434	(0.006)
r = 1	24,85351	29.79707 (0.1667)	18,57579	21.13162	(0.1098)
r = 2	6,277715	15.49471 (0.6627)	6,267876	14.26460	(0.5791)
r = 3	0,009839	3.841466	0,009839	3.841466	(0.9207)

Source: Done by the researcher relying on EVIEWS 8.1 program



#### 1.4. Vector Error Correction Model (VECM)

The first cointegration vector can be written as an equation to describe the long-run equilibrium relationship between the variables of the study starting from the following table:

**Table 05: The Parameters of the Cointegration Vector**

Vector Error Correction Estimates  
 Date: 06/29/16 Time: 13:23  
 Sample (adjusted): 1992 2014  
 Included observations: 23 after adjustments  
 Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
PIB(-1)	1.000000
FINANCE(-1)	-1.097001 (0.15681) [-6.99577]
PRIVATE(-1)	2.722949 (0.42225) [ 6.44864]
PRIVY(-1)	0.599331 (0.15161) [ 3.95323]
C	0.168314

**Source: Done by the researcher relying on EViews 8.1 program**

The long-run equilibrium relationship between financial development and economic growth in Algeria, taking into consideration a signal delay, takes the following form:

$$\text{GDP} = -0,168 + 1,097 \text{ MASS} - 2,792 \text{ PRIVATE} - 0,599 \text{ PRIVY}$$

The equation shows that: In the long-run, the relationship between economic growth indicator and the one of the money supply to GDP is significantly positive, the higher the ratio of the money supply at 1% plus the economic growth is slightly high at 1.097%

While the relationship between the ratio of total credit to GDP (PRIVY) and that of private sector credit to GDP (PRIVATE) and economic growth is negative; The higher the ratios are at 1% plus the economic growth is low at 2.792% and 0.599% by order. However, this result goes against the general idea that banking

activity (collection of deposits and lending) reflects the importance of their role in financing the economy.

This is mainly due to the functions of resource allocation and credit distribution more than to those related to the efficient allocation of resources and the stimulation of technological innovation due to a lack of credit destined to for productive value-added investments and channeling resources to the most productive activities and projects, as well as concentrating on consumer credit despite reforms and opening up to private and foreign banks, this weak credit intermediation is a brake on Algerian economic performance.

According to results, we found that the value of coefficient of determination reached  $R^2 = 0.32$  meaning that the changes in GDP are explained by 32% by the included variables in the model. The remaining rate is interpreted by other variables that are not included in the model. Such as the economic variables of investment, inflation, Openness to trade, the population growth and the importance of oil revenues' contribution to the financing of the economy.

On the other hand, we found that Prob t-Fisher = 0.03 is less than 0.05 which means that the model as a whole is statistically significant. In addition, the value of Durbin-Watson test stat is 2.04, which means that it is very close to the standard value of the latter  $DW = 2$  indicating that the model has no autocorrelation of residues and this is what the following table shows:

**Table 06: The Properties of the Estimated Model**

Dependent Variable: D(PIB)  
Method: Least Squares  
Date: 06/29/16 Time: 13:29  
Sample (adjusted): 1992 2014  
Included observations: 23 after adjustments  
D(PIB) = C(1)\*( PIB(-1) - 1.09700068325\*FINANCE(-1) + 2.72294905579  
\*PRIVATE(-1) + 0.599330930099\*PRIVY(-1) + 0.168314245378 ) +  
C(2)\*D(PIB(-1)) + C(3)\*D(FINANCE(-1)) + C(4)\*D(PRIVATE(-1)) + C(5)  
\*D(PRIVY(-1)) + C(6)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.240057	0.100212	-2.395498	0.0284
C(2)	-0.506240	0.202220	-2.503407	0.0228
C(3)	-0.084192	0.086435	-0.974043	0.3437
C(4)	0.182332	0.329642	0.553121	0.5874
C(5)	0.104762	0.100994	1.037310	0.3141
C(6)	0.002649	0.004373	0.605729	0.5527
R-squared	0.475941	Mean dependent var		0.002174
Adjusted R-squared	0.321806	S.D. dependent var		0.023288
S.E. of regression	0.019178	Akaike info criterion		-4.850619
Sum squared resid	0.006253	Schwarz criterion		-4.554403
Log likelihood	61.78211	Hannan-Quinn criter.		-4.776121
F-statistic	3.087819	Durbin-Watson stat		2.047393
Prob(F-statistic)	0.036594			

Source: Done by the researchers relying on EViews 8.1 program

### 1.5. Causality :

The results of causality between the variables included in this study can be summarized as follows:

- **Long-term VEC Model Estimation Results:**

The results in **Table 6** show that the error-correction term takes advantage of an acceptable statistical significance and a negative sign for the GDP variable, confirming the presence of a long-term causal relationship between the indicator of economic growth and endogenous indicators during the study period.

Through the model obtained, the value of the error-correction term reaches 0.24, which means that there is a long-term equilibrium relationship that corrects the short-term imbalances by 24% over the long term.

- **Short-term VMC Model Estimation Results:**

To determine the causality between the short-term variables, we perform an analysis of causality. The test used will be based on the Vector Error Correction Model (VECM). The results of the test are shown in the following table:

**Table 7: Granger causality tests in the context of a vector model with error correction**

The independent variables					
The dependent variables	Chi-square [p-value]	D GDP	D FINANCE	D PRIVATE	D PRIVY
		D GDP	--	0,84 [0,359]	0,24 [0,623]
D FINANCE	1,93 [0,164]	--	0,05 [0,829]	1,71 [0,191]	
D PRIVATE	1,18 [0,277]	0,00 [0,953]	--	0,69 [0,410]	
D PRIVY	0,14 [0,707]	0,81 [0,368]	5,61 [0,018]	--	

Source: summary of results given by statistical programming Eviews 8.1

From **Table 7**, we find that all the parameters of the model, with the exception of the credit ratio relationship parameter granted to the private sector to GDP (PRIVATE) to the ratio of total credits to GDP (PRIVY) are not significant because the value of p-value is higher than the expected values at the significant level of 5%. This shows that the variables of the study which are the indicators of financial development are not statistically significant in the short term and that there is a single unidirectional short-term causality of credit ratio given to the private sector on GDP (PRIVATE) towards the ratio of total credits to GDP (PRIVY).

## **2. Measuring the Effect of Financial Development on Economic Growth by Using the Full Form:**

On this part of the research, we will study the relationship between financial development and economic growth between 1990 and 2014 using the real variables (INF, GOV, INV) as well as the financial variables (CRED, MASS, PRIVATE)

### **1. Construction of a Composite Index of Financial Development**

Using a method of Principal Components Analysis, the index of the financial development will be constructed (INDIC) due to the relatively large number of variables used in this part, so as to avoid the multi-link problem between the financial indicators given because of the strong link between them, this method allows the extraction of unrelated variables which is called the basic compounds.

The results of the analysis are illustrated in the following table:

**Table 07 : Results of Principal Components Analysis of the Financial Development Index**

Principal Components Analysis

Date: 10/29/16 Time: 08:52

Sample: 1990 2014

Included observations: 25

Computed using: Ordinary correlations

Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.207592	1.137681	0.5519	2.207592	0.5519
2	1.069911	0.438523	0.2675	3.277504	0.8194
3	0.631388	0.540280	0.1578	3.908892	0.9772

**Source: Done by the researcher relying on EVIEWS 8.1 program**

The eigenvalues show that the first principal compound explains 2.55% of the total variation of the original data; thus, the composite index of the financial development extracted from the first basic compound is considered very convenient to measure the financial development.

### 2.1. The Unit Root Test:

The results of the test are summarized in Table 08 below, they show that the variables are stationary at the first difference I (1)

**Table 08: Augmented Dickey-Fuller Test (ADF) Unit Root Test**

Variables	Level		1 <sup>st</sup> Difference		Integration order
	t-Statistic	Critical value	t-Statistic	Critical value	
<b>GDP</b>	-3,30***	4,39	-8,48(0) ***	-3,75	I (1)
<b>INDIC</b>	-3,16	4,41	-4,47(0,01)	-4,44	I (1)
<b>INV</b>	-2,04***	4,39	-4,66 (0) ***	-2,66	I (1)
<b>PGOV</b>	-2,23***	4,41	-4,48 (0) ***	-2,66	I (1)
<b>INF</b>	-3,54***	4,39	-4,43 (0) ***	-2,66	I(1)

**Source: Done by the researchers relying on EVIEWS 8.1 program**

## 2.2. Selection for Optimal Lag Length:

According to table 09 the lag length is 1 ( $k=1$ ):

**Table 09: Lag Length Selection**

Lag	LR	FPE	AIC	SC	HQ
0	NA	4,37 <sup>c</sup> -12	-14,80430	-14,60796	-14,75221

Source: Done by the researcher relying on EViews 8.1 program

## 2.3. Johansen Cointegration Test

According to Table10 below, a long-term relationship is confirmed between variables

**Table 10: Johansen Cointegration Test**

H0 : Rank :r	Traces	Critical value 5%	Max-Eigen value	Critical value 5%
<b>r = 0*</b>	89,14*	69,81	39,96*	33,87
<b>r = 1</b>	49,18	47,85	27,22	27,58
<b>r = 2</b>	21,95	29,79	15,16	21,13
<b>r = 3</b>	6,79	15,49	5,67	14,26
<b>r = 4</b>	1,11	3,84	1,11	3,84

Source: Done by the researchers relying on EViews 8.1 program

## 2.4. Vector Error Correction Model (VECM)

The first cointegration vector can be written as an equation to describe the long-run equilibrium relationship between the variables of the study starting from the following table:

**Table 11: The Parameters of The Cointegration Vector**

Vector Error Correction Estimates	
Date: 10/29/16 Time: 08:26	
Sample (adjusted): 1992 2014	
Included observations: 23 after adjustments	
Standard errors in ( ) & t-statistics in [ ]	
Cointegrating Eq:	CoIntEq1
GDP(-1)	1.000000
INDIC(-1)	-0.037321 (0.01000) [-3.73209]
INV(-1)	1.326737 (0.17093) [7.76180]
GOV(-1)	-1.636846 (0.25072) [-6.52865]
INF(-1)	0.000899 (0.00114) [0.79184]
C	-0.206998

**Source: Done by the researchers relying on EViews 8.1 program**

The long-run equilibrium relationship between financial development and economic growth in Algeria, taking into consideration a signal delay, takes the following form:

$$\text{GDP} = 0,207 + 0,037 \text{ INDIC} -1,326 \text{ INV} + +1,636 \text{ GOV} -0,001 \text{ INF}$$

**The equation shows that:**

In the long-term, the relationship between the indicator of the economic growth and that of the financial development (INDIC) and the government spending is significantly positive. The higher the rates are at 1% plus the economic growth is slightly high at 0.037% and 1, 326.

While the relationship between the rate of investment and that of inflation and the economic growth is negative, the higher the rate are at 1% plus the economic growth is low at 1.326% and 0.001% per order.

According to the results, we found that the value of the coefficient of determination reached  $R^2 = 0.38$  meaning that the changes in GDP are explained by 38% by the included variables in the model. The remaining rate is interpreted by other variables that are not included in the model.

On the other hand, we found that Prob t-Fisher = 0.03 is less than 0.05 which means that the model as a whole is statistically significant. In addition, the value of Durbin-Watson test stat test is 1.93, which means that it is very close to



the standard value of the latter DW = 2 indicating that the model has no autocorrelation of residues and this is what the following table shows:

Dependent Variable: D(GDP)  
Method: Least Squares  
Date: 10/29/16 Time: 08:27  
Sample (adjusted): 1992 2014  
Included observations: 23 after adjustments

$$D(GDP) = C(1)*(GDP(-1) - 0.0373206081506*INDIC(-1) + 1.32673708797*INV(-1) - 1.63684600989*GOV(-1) + 0.000899160382442*INF(-1) - 0.206998027041) + C(2)*D(GDP(-1)) + C(3)*D(INDIC(-1)) + C(4)*D(INV(-1)) + C(5)*D(GOV(-1)) + C(6)*D(INF(-1)) + C(7)$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.185672	0.086475	-2.147102	0.0475
C(2)	-0.342997	0.223067	-1.537638	0.1437
C(3)	-0.018883	0.010367	-1.821419	0.0873
C(4)	0.488298	0.185049	2.638753	0.0179
C(5)	0.264774	0.287257	0.921731	0.3704
C(6)	-0.000606	0.001035	-0.586011	0.5660
C(7)	0.001290	0.003965	0.325227	0.7492

  

R-squared	0.551244	Mean dependent var	0.002174
Adjusted R-squared	0.382961	S.D. dependent var	0.023288
S.E. of regression	0.018293	Akaike info criterion	-4.918788
Sum squared resid	0.005354	Schwarz criterion	-4.573203
Log likelihood	63.56606	Hannan-Quinn criter.	-4.831874
F-statistic	3.275690	Durbin-Watson stat	1.935200
Prob(F-statistic)	0.026889		

### tableau 12: The Properties of the Estimated Model

Source: Done by the researcher relying on EVIEWS 8.1 program

#### 1.1. Causality :

##### Causality 2:

- Long-term VEC Model Estimation Results:

The results in **Table 12** show that the error-corrected term takes advantage of an acceptable statistical significance and a negative sign for the GDP variable. This confirms the presence of a long-term causal relationship between the indicator of economic growth and endogenous indicators during the study period.

Through the model obtained, the value of the error-correction term reaches 0.18, which means that there is a long-term equilibrium relationship that corrects the short-term imbalances by 18% over the long term.

• **Short-term VMC Model Estimation Results**

The test used will be based on the Vector Error Correction Model (VECM). The results of the test are shown in the following table:

**Table 13: Granger causality tests in the context of a vector model with error correction.**

Dependents variables	Independent variables				
	Chi-square [p-value]	DGDP	DINDIC	DINV	DGOV
DGDP	--	1,64 [0,19]	1,86 [0,17]	1,34 [0,24]	3,6 [0,06]
DINDIC	3,31 [0,07]	--	0,10 [0,74]	2,53 [0,11]	0,01 [0,93]
DINV	6,96 [0,01]	0,25 [0,61]		3,7 [0,06]	0,42 [0,51]
DGOV	0,84 [0,36]	0,17 [0,67]	0,00 [0,93]	--	0,18 [0,66]
DINF	0,34 [0,56]	0,00 [0,96]	0,33 [0,56]	0,9 [0,34]	--

**Source: summary of results given by statistical programming Eviews 8.1**

From **Table 13**, we find that all the parameters of the model, with the exception of the ratio of gross domestic product (GDP) to investment (INV), are not significant because the value of p-value is greater than the expected values at the significant level of 5%. This shows that there is a single unidirectional short-term causality from GDP to INV.

The results of the joint analysis showed a long-term one-to-one relationship between bank development and economic growth. In the short term, there is a single causal relationship between the economic growth index and the investment index

➤ **Diagnostic checking for Two Models**

In order to test the validity of the estimation of MVCE model, we performed some diagnostic test: Errors Normality Test, Heteroskedasticity Test and Errors Autocorrelation Test.

**a. Errors Normality Test**

The test of Jarque-Bera (1987) verifies that the errors are distributed according to a normal distribution. The results of this hypothesis can be presented as follow:

**Tableau 13: Results  
of the Residue  
Normalization Test**

Series: Residuals	
Sample 1992 2014	
Observations 23	
Mean	-2.34e-18
Median	-0.003197
Maximum	0.034487
Minimum	-0.031595
Std. Dev.	0.016972
Skewness	0.026243
Kurtosis	2.445373
Jarque-Bera	0.297434
Probability	0.861813

**Tableau 14: Results of the  
Residue Normalization Test  
Model 2**

Series: Residuals	
Sample 1992 2014	
Observations 23	
Mean	-1.36e-18
Median	0.003547
Maximum	0.025271
Minimum	-0.028033
Std. Dev.	0.015600
Skewness	-0.141402
Kurtosis	1.956313
Jarque-Bera	1.120541
Probability	0.571055

**Source: Done by the researcher relying on EVIEWS 8.1 program**

It is found that the probability that correspond to the statistic of Jarque-Bera for the two models is higher than 5%, this means that the errors are normally distributed. We can therefore rely on the results obtained.

**b. Heteroskedasticity Test**

For the second hypothesis, the test results can be presented as follow

**Table 15: Results of Heteroskedasticity Test Model**

1

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.478671	Prob. F(8,14)	0.8517
Obs*R-squared	4.939909	Prob. Chi-Square(8)	0.7640
Scaled explained SS	1.950343	Prob. Chi-Square(8)	0.9825

**Source: Done by the researcher relying on EVIEWS 8.1 program**

**Table 16: Results of Heteroskedasticity Test Model 2**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.478671	Prob. F(8,14)	0.8517
Obs*R-squared	4.939909	Prob. Chi-Square(8)	0.7640
Scaled explained SS	1.950343	Prob. Chi-Square(8)	0.9825

**Source: Done by the researcher relying on EVIEWS 8.1 program**

Breusch-Pagan-Godfrey test for the two models demonstrates that the equation does not show any sign of heteroskedasticity. The null hypothesis is retained (probability 5%)

### **c. Autocorrelation Test of Residues**

As for the third hypothesis, the Durbin-Waston statistic rejects the hypothesis of errors autocorrelation, so we accept the null hypothesis that indicates the absence of a serial correlation of residues. Also, the Breusch-Godfrey test which illustrates the following results:

**Table 17: results of Autocorrelation Test of Residues Model 1**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.060649	Prob. F(1,16)	0.8086
Obs*R-squared	0.086853	Prob. Chi-Square(1)	0.7682

Source: Done by the researcher relying on EViews 8.1 program

**Table 18: results of Autocorrelation Test of Residues Model 2**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.008011	Prob. F(1,15)	0.9299
Obs*R-squared	0.012278	Prob. Chi-Square(1)	0.9118

Source: Done by the researcher relying on EViews 8.1 program

We note that the probability that corresponds to Fisher's statistics and the LM test is higher than 5%, so we accept the null hypothesis that indicates the absence of autocorrelation of residues.

In general, we can accept the results of previous estimates, the diagnostic tests confirm the absence of the problems of heteroscedasticity and errors autocorrelation. The latter are distributed according to a normal distribution.

## Results

From the research study, the main results are summarized as follow:

### 1. Theoretical Results

- The cointegration analysis results have revealed the existence of single unidirectional long-term causal relationship between the banking system and the economic growth. Whereas, in the short term, there is a single unidirectional short-term causal relationship between the economic growth index and the investment index
- Due to the importance of the financial institutions through their sensitive function, in addition to the technical and technological development, many researchers integrated the financial system (especially banking) into theories of

economic growth so as to clarify the significant role that banks can play in the economy. Numerous theoretical works showed that the banking institutions, as a financial intermediary, has a positive impact on economic growth because it allows the provision of the necessary capital for investment. It also helps economic agents to obtain project related information and thus reduce the risks they may face.

- Researchers and thinkers have not only made theoretical conclusions in this area, but rather to confirm them, many of them have studied empirical models to show what effect banks may have on economic growth.
- These empirical studies have different results, a part of it showed that the bank institution plays a positive role in the economic activity and thus positively affect economic growth, while other studies showed that the bank can play a negative role on the economic growth. On the other hand, there are studies that believed the effect is reversed where economic growth effects financial development or the effect is reciprocal.
- The difference between the intellectual schools in their vision of financial development and their adoption to different political tendencies to achieve the economic growth does not deny the existence of an integration between the hypotheses posed by these schools, and these directorates agree on the importance of financing as a crucial element for the economic growth, similarly the existence of a free and active financial sector is one of the main demands for the activation of economic growth while the theoretical and practical controversy is still on the direction of this relationship.

## **2. Practical Results**

- By examining the variables of the two models, we note that they represent the most important economic variables, from investment, inflation, Government spending, in addition to financial variables. However, the results showed that the Algerian economy during the period of study depends on another variable to achieve economic growth. What led us to make this judgment is the variable related to the basic function of the banking institution, namely the loans (PRIVY). Our applied study showed that this variable has a negative relation with economic

growth, where banks can have a negative impact on economic growth. In the case if the main function of banks is granting loans, that are unthought and uncontrolled, and is the Feature of Algerian banks, largely due to the fact that it is heavily dependent on short-term loans in addition to its focus on financing foreign trade, without risking funding for long-term and creative projects of value and wealth because we know that the most dangerous project is the most profitable project.

- As for the relationship between the real variables used in the full model of the economic growth, it did not produce good results, but showed that the basic variable, which is investment, has an inverse relationship to economic growth. The weakness of investment due to the small size of the productive industries and the frequency of the private sector to establish investment projects and preference for trade activities and import activities against the decline in the productivity of the public-sector units, which is already suffering from imbalances, has led to a negative impact on national industrial sectors and put it in the face of unequal competition that led to the decay of many of its institutions.
- On the other hand, investments in Algeria have a long-term difficulty in maintaining their profitability which tend to fall under the constraints of the poor investment environment. As these investments do not have the potential to develop their profitability and maintain their ability to develop value added, especially in light of the openness to foreign competition. They also tend to activities that do not serve future growth and reflect weakness in finding areas that allow the growth of new industries to come.

### **Conclusion**

In the end, it can be said that the financial system, especially the banking system, in Algeria, and despite the unceasing reforms, did not reach the level to keep pace with the development in the world's economies. Where the export of fuel remains the only source of growth in Algeria despite the different economic systems adopted. It leads us to say that the problem does not lie in the quality of the economic system adopted, but in the extent to which investments are implemented on the ground and pursued, in addition to the quality of the



economic reforms applied and their impact on the desired goal. This leads us to think about how to introduce new reforms that will push the banking system to be the main source of economic growth by encouraging it to finance long-term investments that create value-added and wealth, because we cannot rely solely on one supplier of fuel, so it is necessary to think about how to exploit the resources accumulated by banks in financing large projects

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