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Cointegration and Causality between Financial Development and Economic Growth: Evidence from Morocco

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The debate on the relationship between economic growth and financial development has been steadily growing in these recent years. However, the existing theoretical and empirical literature provides conflicting views in this respect. This paper proposes an empirical investigation of the nature of this relationship in the Moroccan context. More precisely, it explores the cointegrating and the causality issue between economic growth and financial development. The latter is measured by largely used indicators. In particular, we use capital market proxy, in addition to the traditional indicators of financial intermediation. The findings show that financial development explains significantly the growth, but the direction of causality depends on the indicator used to measure the financial deepening and the time horizon of analysis (short or long terms).

Keywords: *Financial development, Economic growth, Cointegration, Causality, VECM*

Introduction

The international financial crisis of 2008 is a seizing phenomenon in several respects. It is striking by its scope, its rapid contagion to the global financial system, but also according to the intervention of public authorities, by the unprecedented measures and new modalities, in order to break the spiral of distrust in the financial system. Moreover, it is appealing by its cost and its duration, as five years later, its effects and repercussions on the real economy continue to be drastically felt.

Throughout this crisis, which is one of the most impressive and undeniably unparalleled since World War II, there has been an abundance of researches on the nexus between the financial sector and the real economy[1]. Various long-time conventional ideas have been tested on this occasion.

Indeed, it is nowadays recognized that the instability due to the financial innovation process development can likely penalize in return the economic growth and annihilate, consequently, the positive effects of financial development. The dramatic decline of the potential growth of OECD countries by nearly three points (OCDE (2010) p.243), under the influence of the last financial crisis is the eloquent proof.

The positive impact of financial development on economic growth (McKinnon, 1973; Shaw, 1973) is not a systematic. It is true that most studies conclude that there is a positive relationship between these two sectors (King and Levine,1993, p.718; Levine, Loayza and Beck, 2000, p.31; Benhabib and Spiegel, 2000,

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[1]The analysis of Bagehot (1873) and Schumpeter (1911) are often considered as precursors in this respect.

p.341; Christopoulos and Tsionas, 2004, p.55; Giuliano and Ruiz-Arranz, 2009, p.144). However, some studies show that this relationship can be negative (Kaminsky and Reinhart, 1999, p.494; Demirgüc-kunt and Detragiache,1999, p.35), and a non-lineardue to the presence of threshold effect (Greenwood and Jovanovich, 1990, p.1076; Berthélemy and Varoudakis, 1996, p.11; Deidda and Fattouh, 2002, p.339), or also inexistent (Robinson (1952), Lucas (1988)). Besides, some studies have explored the interaction between those sectors, with even there ambivalent results (Agbetsiafa, 2003; Waqabaca, 2004; Odhiambo, 2004; Fowowe, 2010).

Considering these diverse and contradictory proposals, this paper aims to provide an empirical evidence on the relation between financial development and economic growth in the Moroccan context.The importance of this paper stems from the following elements.

Firstly, it concerns the particular case of Morocco, where the financial sector is considered as a model on the regional area.Thus, the reforms undertaken to deepen and modernize the financial sector, were not only worth wiping out successfully the international financial crisis (Chatri, Maarouf et Zouiri, 2013, p.178), but also leading to have a financial sector enough diversified and endowed with all the attributes of a modern financial sector (IMF, 2008, p.5). Consequently, the case of Morocco is an excellent example to approach the nature and the extent of the relationship between financial development and economic growth.

Secondly, if the majority of the similar works have examined this relationship within the context of the panel data (Yoke-Kee et Muzafar, 2011; Rachdi et Ben Mbarek, 2011; Abu-Bader et Abu-Qarn, 2008; Ben Naceur et Ghazouani, 2005; Bernard, 2000; Turunc, 1999), the present work focuses deliberately on the specific and isolated case of Morocco. This permits to avoid biased results related to specific political, institutional and economic factors of each country.

Thirdly, it uses the homogeneous data without apparent structural bias, contrary to several similar works on Moroccan case (Solhi, 2006; Abouch et Ezzahid, 2006; Alaoui, 2004). From our point of view, investigating the financial development and economic growth relationship makes sense, only when the direct regulations are removed. That is why we have taken as a starting point of our analysis the year 1998, which marks the achievement of the financial liberalization process in Morocco and coincides also with the new base year of national accounts.

The last but not the least contribution of this paper lies in the fact that it goes above the study of the link between financial and economic sectors, but aims to approach the question of their causality.

The rest of the paper is organized as follows. The first section presents a brief review of the literature. The second one exposes our model. The third presents and discusses the results.

Literature Review

The arguments supporting the importance of the financial system in stimulating economic growth are not new. Schumpeter (1911) highlighted at the beginning of the 20th century the role of banks in the financing innovations. During the 50's, Gurley and Shaw (1955) stressed the importance of financial intermediation in economic growth. Inspired by these ideas, Patrick (1966) shows that efficient financial system increase saving and its allocation to productive investments.

It was not until the early 70's when the link "finance- economic growth "started to be treated in a detail, through the school of financial repression developed by Goldsmith (1973), McKinnon (1973) and Shaw (1973). According to these authors, the reduction by monetary authorities of the nominal interest rates discourages savings and fixes investment below the equilibrium level that would be necessary for the economic growth. They suggest liberalizing the financial sector in order to increase savings and investment and improve capital efficiency.

With the development of the endogenous growth theory in the 80's[2] the debate on the

[2] In order to overcome inadequacies of the neoclassical growth model which cannot explain the mechanisms those gener-

link between financial development and growth has known a considerable revival. Within this framework, the models developed show that financial development is an important channel through which growth in the stationary state occurs endogenously.

In this regard, one of the first models which established a theoretical framework of positive relationship between financial intermediation and economic growth is developed by Bencivenga and Smith (1991). Based on the theoretical analysis of financial intermediation of Gurley Show, the aforementioned authors have developed an overlapping-generations model in which the banking system plays an important role. The latter provides funds for long term productive investment and allows, by providing liquidity, investors to hold bank deposits rather than liquid and unproductive assets[3].

This article is deepened by several other works (De Gregorio, 1992; Roubini-I-Martin, 1992; Saint-Paul, 1992; King et Levine, 1993), each of which focused on a very particular aspect of finance-growth relationship. A more complete analysis was presented by Pagano (1993), who has identified three main channels through which financial system can influence growth, starting from the following model developed by Rebelo (1991):

$$Y_t = AK_t \qquad 1)$$

where Y, A, K are respectively the production, the marginal productivity of capital and the capital stock. He introduced for this purpose the conventional model of the gross investment (I_t):

$$I_t = K_{t+1} - (1-\delta)K_t \qquad 2)$$

where the coefficient (δ) denotes the capital depreciation. It assumes also that the fraction ($1-ø$) of capital is absorbed by financial intermediation (cost of intermediation and prudential rules):

$$I_t = \phi S_t \qquad 3)$$

Taking into account (1), the growth rate in year $t+1$ can be expressed as:

$$g_{t+1} = \frac{K_{t+1}}{K_t} \qquad 4)$$

Equations (2) and (3) allow to deduce the steady growth rate g:

$$g = \frac{1+(1-\delta)K}{K} - 1 = \frac{\varphi S + (1-\delta)Y/A}{Y/A} - 1$$
$$= A\varphi\frac{S}{Y} + (1-\delta) - 1 = A\varphi s - \delta \qquad 5)$$

where $s = S/Y$ denotes the gross saving rate.

The equation (5) shows that financial development can affect growth through three channels: i) increasing the proportion of savings (ø) allocated to investment productive, ii) improving the marginal productivity of capital (A) iii) and increasing savings rate of the economy (s).

In parallel to this theoretical framework, a rich empirical literature demonstrating how inefficient financial system can positively influence the long term growth rate has been emerged (among others Greenwood and Jovanovic (1990), Levine (1991), Bencivenga and Smith (1991). The empirical work of King and Levine (1993) is highly important to mention here. Its importance lies in the fact that it confirms the existence of a strong relationship between growth and financial development for a broad sample composed of 80 countries. In addition, it is based on various relevant indicators of financial development on growth.

Levine (1991), Bencivenga, Smith and Starr (1996) have based their works on financial market indicators. They demonstrate that the liquidity of stock market is crucial as it facilitates investment in long term projects and thus stimulates economic growth. In the same line, Greenwood and Smith (1997) demonstrate that

ate the growth in stationary state.According to this model, developed by Solow (1956), economic growth is explained by two exogenous variables: demographic factors and technology. For more details on the theories of growth, see for example Aghion, P. and Howitt, P (2010), "l'économie de la croissance" Economica.

[3] We find here the findings of Diamond and Dybvig who have shown that banks are relevant according to their "endogenous response" to the divergence on time horizons consumption. Cf, Diamond, D.W. Dybvig, P.H. « Bank runs, deposit insurance and liquidity », Journal of Political Economy, Vol. 91, No. 3, 1983, pp. 401-419.

a developed stock market can reduce the cost of mobilizing savings and facilitate productive investment. Taking into account the global market, Rousseau and Wachtel (2000) have also stressed the benefits of deep and liquid financial markets.

While these different studies have confirmed the general idea of the existence of a positive relationship between financial development and economic growth, they did not however detect the direction of this relationship and whether the financial development leads or follows the real output growth. Patrick (1966) who has investigated this problem, was the first to identify two-way causality depending on the level of economic development. The first one, called "demand following", is from "financial" sector to the "real" one and characterizes the early stages of development. The second causal relationship between financial development and economic growth is termed "supply leading". It is from the "real" sector to the "financial" one and marks the mature stage of economic development.

Otherwise, the nature of indicators measuring financial development influences significantly the intensity and the sense of its relationship with economic growth. The ambivalent findings of Gupta (1984) and Jung (1986) are very eloquent at this level. While Gupta confirms Patrick's findings using M2/GDP as an indicator of financial development, the results obtained by Jung differ depending on the indicator chosen. Indeed, the use of M1/GDP supports this result whilethe use of M2/GDP does not.

Similarly, because of the institutional and political features of each country, the direction of causality differs from one system to another, as observed by Demetriades and Hussein (1996) and Demetriades and Aristis (1997). Besides that, other studies have highlighted the fundamental difference between the short-term dynamics and the long-term economic growth and financial development relationship (Fowowe, 2010; Darart, 1999).

In contrast with the previous literature, some authors remain skeptical to the role of financial systems in economic growth. Thus, Robinson (1952) considers that financial sector is not relevant on economic development. Lucas (1989) suggests also that the role of financial factors in economic growth is exaggerated. In the same line, some authors (Mayer, 1988; Stiglitz, 1993) have even shown that competition between banks can be harmful to financial stability and that a developed stock market is not really important for financing the economic growth.

Moreover, the failure of financial liberalization process in some countries (Rabemananjara, 1998, p.18), and the inconclusive results of some studies (Ben Naceur and Ghazouani, 2005, p.219; Andersen and Trap, 2003, p.190 question the positive relationship between financial development and economic growth. Meanwhile, some works have demonstrated that the relationship between financial development and economic growth can be non-linear (Greenwood and Jovanovich, 1990, p.1076; Berthélemy and Varoudakis, 1996, p.11; Deidda and Fattouh, 2002, p.339. In particular, it was shown that this relationship can be circular or characterized by the presence of threshold effects.

More recently, several empirical studies have focused on "too much finance" issue in order to show the "Dark Side" of financial development. In particular, they have investigated if there is a threshold above which financialization starts to have a negative impact on growth. In this respect, Cecchetti and Kharroubi (2012) have examined how financial development affects aggregate productivity growth based on a sample of 50 advanced and emerging economies during the period 1980-2009. They have found that, in the case of advanced countries, when private credit grows to the point where it exceeds GDP, it becomes a drag on productivity growth (Cecchetti and Kharroubi, 2012, p.2). More generally, they have demonstrated that when the financial sector represents more than 3.5% of total employment, further increases in financial sector size tend to be detrimental to growth. Arcand, Berkes and Panizza (2012), focusing on the non-monotone relationship between financial and economic development highlighted especially by Deidda and Fattouh

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(2002) and Rioja and Valev (2004), have found comparable results, using different data sets and empirical approaches. In particular, their results suggest that finance starts having a negative effect on output growth when credit to the private sector reaches 80-100% of GDP (Arcand, Berkes and Panizza, 2012, p. 6).

This non-monotonic relationship between the size and growth of the financial sector is consistent with the vanishing effect highlighted by Rousseau and Wachtel (2011). Indeed, these authors have demonstrated that finance is not always good for growth. "Too much Finance" could conversely produce a "leakage effect" of financial depth on the real economy. In this respect, they have demonstrated that credit to the private sector has no statistically significant impact on GDP growth over the 1965-2004 period. Moreover, according to these authors, the excessive financial deepening or too rapid credit growth could weaken banking system and cause financial crisis and thereby could have major negative implications for the real economy.

In the same vein, De la Torre and al. (2011) focus also on the finance-crisis nexus. In this respect, they have provided numerous insights on the dangers of excessive financial development. In particular, they have pointed out that the "Too much finance" result may be consistent with positive but decreasing returns of financial depth which, at some point, become smaller than the cost of instability brought about by the dark side (De la Torre and al., 2011, p.2).

These recent works presented above (among others) as well as the painful experience of the financial crisis of 2008 has led both academics and policymakers to reconsider their prior conclusions. It is nowadays largely admitted that financial development has also dark side. In particular a bloated financial system can become a drag on the rest of the economy.

It is for this reason that some authors believe that the debate should focus not on the size of the financial sector and its impact on economic growth, but rather on the benefits of financial services and more specifically, financial intermediation function (Beck, 2011, p. 50). From this point of view, financial regulation and policy should focus on the improvement of various services provided by the financial system to the real economy (payment, savings, credit and risk management) that may positively impact growth.

Research Method

Data

The common problem faced by the majority of empirical works is to find appropriate indicators to gauge the extent of financial development. In this paper, we opt for the traditional indicators, largely inspired by the synthesis of Pagano (1993), which demonstrated that the financial sector can affect economic growth via three channels: i) improving the Savings rate, ii) increasing savings allocated to productive investment and iii) reducing the cost financial resources as a result of the rise of the productivity of capital and reduction of risks[4]. We will add, as well**,** an indicator reflecting the depth of financial markets. Finally, insofar as the sources of economic growth are not exclusively financial, the model discussed above also includes a real variable control (investment).
Our general model is written as follows:

$$GDPc_t = \alpha_0 + \alpha_1 Z_{it} + \alpha_2 I_t + \varepsilon_t \qquad 6)$$

with:

- $GDPc_t$ represents the Gross Domestic Product per capita in constant prices as endogenous variable, reflecting the development of the real economy;
- Z_{it} denotes a vector of financial variables:
  - The credit to private sector to GDP ratio (denoted *CREDSP_GDP*), measuring efficiency of the banking system in the allocation of financial resources, as the most of the funding of productive activities is allowed by banks[5];

[4] This function of risk reduction is considered by some authors as rationale for financial intermediaries. Cf Allen, F.A. and Santomero,A, (1996), "The Theory of Financial Intermediation" Working paper, Wharton Financial Institutions Center.
[5] The annual average bank credit to nominal GDP has increased from 49% in 2008 to 81% in 2011.

- The liquidity ratio (denoted *M3_GDP*), calculated as the ratio of average aggregate broad money (M3) to GDP. This indicator provides information on the size and the depth of the financial sector and reflects also the banks efficiency in the mobilizing financial savings;
- The ratio of market capitalization, which is equal to the values of listed securities stock exchange divided by GDP (denoted *CAP_GDP*). It is assumed that since the financial market reform of 1993, the stock market could be an additional source of financing the economy;
- The interest rates on Treasury bonds 5 years (denoted $rBDT_{5Yrs}$), chosen as reference for capturing the evolution of interest rate. In fact, this maturity is considered as benchmark line on the Moroccan market and therefore able to reflect the evolution of financial market conditions;

- I_t denotes the ratio of investment to GDP (denoted *INVST_GDP*). It is used as a control variable. We assume that the volume of investment is positively correlated with economic growth.
- ε_t is the error term.

Although each individual financial indicator has its limits. Nevertheless, using this table of indicators provides an insightful picture of financial development. The variables are considered in logarithmic forms: *L*(*GDPc*), *L*(*M3_GDP*), *L*(*CREDSP_GDP*), *L*(*CAP_GDP*), $L(rBDT_{5Yrs})$ and *L*(*INVST_GDP*). They are quarterly and cover the period from 1998 to 2011. It should be noted in this regard that given the absence of quarterly data on investment covering the entire period, we used the interpolation procedure highlighted by Goldstein and Khan (1976) to generate quarterly data missing.

Econometric Methodology

Given the foregoing, the model (6) above can be written as follows:

$$\begin{aligned} L(GDPc)t = {} & \alpha_0 + \alpha_1 L(M_3 - GDP)_t \\ & + \alpha_2 L(CREDSP - GDP)_t \\ & + \alpha_3 L(rBDT_{5Yrs})_t \\ & + \alpha_4 L(CAP - GDP)_t \\ & + \alpha_5 L(INVEST - GDP)_t + \varepsilon_t \qquad 7) \end{aligned}$$

Remember that our aim in this paper is to test empirically the long-term relationship and the causality relationship between financial development and economic growth in the particular context of Morocco. For this purpose, we use the Vector Error Correction Model (VECM), which has the advantage of incorporating the concept of cointegration and distinguishes between the short-term and long-term dynamics. This method involves the following three steps:

The unit root test in order to estimate the order of integration of the series, knowing that most economic and financial series are non-stationary.

The cointegration test for checking the existence of a long-term stable relationship between non-stationary variables integrated of the same order. There are several tests for cointegration, the most known is Johansen test (1988), which is based on the maximum likelihood method.

The causality test as any cointegrated system implies the existence of an error correction mechanism that prevents variables to deviate too much from their long-run equilibrium. Empirically, the causal relationship can be analyzed using the error correction model (ECM) or the vector error correction model (VECM). The estimation of these models will be completed by the Granger causality test (1988), which assumes that the knowledge of the history of one variable improves the estimate of another variable.

Result and Discussion

Unit Root Test

A long-term relationship between several variables requires two conditions. First, the variables must be non-stationary and integrated on the same order for avoiding spurious regression problems. Secondly, their stochastic trends must be related, that is to say, there must be one or more linear combinations of these non stationary variables that are stationary.

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Table1. Unit root test

Variables		Gap P	Trend	Intercept	ADF	Order of integration
L(GDPc)	Level	1	No	Yes	0.162545	I(1)
		1	Yes	Yes	-3.712132	I(1)
	1st difference	1	No	Yes	-10.18110*	I(0)
		1	Yes	Yes	-10.11346*	I(0)
L(M 3_GDP)	Level	1	No	Yes	-2.012681	I(1)
		1	Yes	Yes	-0.577684	I(1)
	1stdifference	1	No	Yes	-10.50971*	I(0)
		1	Yes	Yes	-10.95825*	I(0)
L(CREDSP_ GDP)	Level	1	No	Yes	0.151848	I(1)
		1	Yes	Yes	-0.865875	I(1)
	1stdifference	1	No	Yes	-6.396589*	I(0)
		1	Yes	Yes	-6.460597*	I(0)
L(CAP_GDP)	Level	1	No	Yes	-0.756912	I(1)
		1	Yes	Yes	-1.240580	I(1)
	1stdifference	1	No	Yes	-7.601933*	I(0)
		1	Yes	Yes	-7.553538*	I(0)
L($rBDT_{5Year}$)	Level	1	No	Yes	-2.326369	I(1)
		1	Yes	Yes	-1.848286	I(1)
	1stdifference	1	No	Yes	-7.658119*	I(0)
		1	Yes	Yes	-7.858560*	I(0)
L(INVEST _GDP)	Level	1	No	Yes	-1.782685	I(1)
		1	Yes	Yes	-0.842862	I(1)
	1stdifference	1	No	Yes	-3.940943*	I(0)
		1	Yes	Yes	-4.159870*	I(0)

Notes : Tests ADF: *** reject of the unit rootat 1%, ** reject of the unit root at 5%, * reject of the unit root at 10%.

Table 2. Akaike and Schwarz criteria (VAR models)

Gap	Akaike	Schwarz
1	-23.48145	-21.94858
2	-22.99382	-20.12085
3	-22.64413	-18.40615
4	-23.17941	-17.55082
5	-23.60140	-16.55592

Therefore, first, we determine the order of integration of the different series through the standard unit root tests. We use for this purpose the Augmented Dickey Fuller, with the null hypothesis of the nonstationarity. The following table gives the results, which show that all series are non-stationary and first order integrated, denoted *I* (1) at 1%. This result suggests a stable long-term relationship between the used variables.

Johansen Cointegration Test

The previous results show that there is a high probability of cointegration between selected variables and permit subsequently to apply the vector error correction representation. Thus, in order to ensure proper specification of these models, it is necessary to determine the number of lags (*p*) optimizing the provision of information according to the criteria of Akaike and Schwarz.

As it turns out most often Akaike criterion gives contradictory results to Schwarz ones. The suggested lags are respectively 5 and 1. However, the results of the estimation models led us to adopt 5 lags on level. Therefore, the Johanson test was made on stationary series with a 4 lags. The results (Table 3) show that at 5%, there are three long term relationships, at least in one direction between the explanatory variables and the endogenous variable, which exhibit similar behavior over time.

Error Vector Correction Model and Granger Causality

The error vector correction model includes two relationships that link the financial sector and economic growth. The long term station-

Table 3. Johansen test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.668825	157.693400	95.75366	0.0000	56.36052	40.07757	0.0003
At most 1	0.583427	101.332900	69.81889	0.0000	44.66032	33.87687	0.0018
At most 2	0.474622	56.672580	47.85613	0.0060	32.82553	27.58434	0.0096
At most 3	0.277373	23.847050	29.79707	0.2070	16.56800	21.13162	0.1934
At most 4	0.124883	7.279054	15.49471	0.5454	6.803284	14.26460	0.5127

Table 4. Long-term relationship between economic growth and financial development

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.168996	0.214018	24.152180	0.000000
M3_ GDP	0.527651	0.050696	10.408220	0.000000
CREDSP_GDP	0.119183	0.032587	3.657371	0.000600
CAP_GDP	0.036007	0.008403	4.284904	0.000100
$rBDT_{5YrS}$	-0.071948	0.028701	-2.506854	0.015500
INVEST_GDP	-0.239943	0.043425	-5.525450	0.000000
R-squared	0.984743	Mean dependent var		8.173374
Adjusted R-squared	0.983218	S.D. dependent var		0.133541
S.E. of regression	0.017300	Akaike info criterion		-5.175296
Sum squared resid	0.014964	Schwarz criterion		-4.958294
Log likelihood	150.908300	F-statistic		645.455700
Durbin-Watson stat	1.495963	Prob(F-statistic)		0.000000

ary relationship and the short-term relationship. The later takes into account the self-correcting mechanisms leading to the convergence to the steady state.

Long-term Equilibrium Relationship

The simplest way to estimate the long-term relationship between economic growth and financial indicators is to apply the ordinary least squares (OLS) regression to the equation (7) above.

Before discussing the results given in Table 4 above, it is necessary to ensure its statistical and therefore operational quality.

The adjustment quality of the model, as measured by the coefficient of determination (adjusted R^2), is significant. This high level may nevertheless be related to the presence of collinearity between the explanatory variables in the model, especially since it includes different financial variables, which may be highly correlated. However, the high significance of all regression coefficients at 1% lead us to believe that collinearity is not strong and, therefore, to not "drop"some variables, particularly since our goal is to "capture" simultaneously the three channels transmission from finance to growth highlighted by Pagano (1993). Furthermore, the tests on residuals show that it is sufficiently robust, as evidenced by their independance, normality, stationarity and homoscedasticity (see Table A1 in Appendix).

Therefore, the results obtained using the OLS estimation are robust and confirm the long term equilibrium relationship between financial variables and real variables, especially since all selected explanatory variables seem explain significantly economic growth. More specifically, the signs of variables "capturing" the financial development are those expected. This corroborates the theoretical assumption under which the financial sector plays an active role in economic growth, through its ability to mobilize saving and it allocation more efficiently, and to reduce the cost of resources and diversify funding for private operators.

Indeed, the liquidity ratio, measured by the ratio of broad money to GDP, affects significantly and positively economic growth, with an elasticity of 0.5. This means that a long term economic growth is expected to increase by 5% when the liquidity ratio increases by 10%. Similarly, the increase in funding provided to private sector has a positive and significant influence on economic growth. The elasticity between these two variables is 0.12 and means that the long term economic growth is expected

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to increase by nearly 1.2% when the credit distributed to private sector increases by 10%. In addition, the development of direct funding, another important indicator of financial development seems also affect significantly and positively economic growth. However, in this case, the elasticity is very low not exceeding 0.04. More specifically, the improvement of market capitalization of 10% would raise the long term economic growth by 0.4%. Finally, with regard to the link between interest rates and economic growth, it seems that it is significant and negative and in accordance to what is expected. The results show that an increase of interest rate of 10% would reduce the long term economic growth by around 0.7%. This result confirms the active role in the development of financial sector in economic growth, so it reduces the cost of resources, and thereby improves the long-term growth potential**.**

All these results, consistent with the theoretical literature, mean that the financial system, in particular financial intermediation, influences significantly the Moroccan economic growth. This positive role attests that the improvement of the productive and allocative efficiencies of the financial sector is verified in the Moroccan context.

In contrast, the results show that the increase of investment by 10% would affect negatively the long-term economic growth (2.4%).This unexpected finding may nevertheless be explained by the following complementary features. First, on a general level, several studies on the effectiveness of investment in Morocco show that is non-productive (World Bank, 2006; Sekkat, 2004; Abouch and Ezzahid, 2004; Ministry of economy and Finance, 2002). More recently, the IMF in its Article IV consultations report of 2011, underlines clearly the persistence of low efficiency of investment projects (IMF, 2011, p.16). Furthermore, the analysis of the national investment behavior on the period studied shows that it was supported in particular by public investment, along with the policy of the major projects undertaken by Morocco to catch the recorded deficit in basic infrastructure[6]. The potential benefits of this kind of investment cannot be felt only in the long term (Agénor, 2006). However, the model chosen covers a relatively short period (1998-2011) and thus is not able to capture entirely those effects. Moreover, the effort provided in term of investment in infrastructure has benefited mainly to the rest of the world and not to the domestic productive sectors. Indeed, the imports to GDP ratio have increased from 28% in 1998 to nearly 49% in 2011.

After analyzing the results of the Johansen cointegration test and highlighted the long-term relationship between the growth and the financial variables, we turn to estimate the error correction model. This model permits to analyze, on the one hand, the speed of convergence of growth rate to its long term equilibrium level and, on the other hand, the contribution of financial sector in the short-term dynamics of economic growth.

Short-term Relationship

Given the optimal lag of our cointegration relationship, the basic model to estimate takes the form below. It should be noted that we can in the same way specify and estimate models in which the endogenous variable is represented by one of financial variables of our model.

$$\begin{aligned}\Delta L(GDPc)_t = & \sum_{i=1}^{3} \alpha_i (ECMi)_{t-1} \\ & + \sum_{i=1}^{4} \beta_i \Delta L(GDP) i_{t-i} \\ & + \sum_{i=1}^{4} \gamma_i \Delta L(M_3 - GDP) i_{t-i} \\ & + \sum_{i=1}^{4} \gamma_i \Delta L(CREDSP - GDP) i_{t-i} \\ & + \sum_{i=1}^{4} \rho_i \Delta L(CAP - GDP) i_{t-i} \\ & + \sum_{i=1}^{4} \tau_i \Delta L(rBDT_{5Yrs}) i_{t-i} \\ & + \sum_{i=1}^{4} \varphi_i \Delta L(INVEST - GDP) i_{t-i} \\ & + \omega + \varepsilon_t \end{aligned} \quad 8)$$

[6] Public investment has multiplied by more than seven from 1998 to 2011.

Table 5. Error correction model-Wald test

	Test Stat	D_L(GDPc) Value (P-value)	D_L(M3_GDP) Value (P-value)	D_L(CREDSP_GDP) Value (P-value)	D_L(CAP_GDP) Value (P-value)	D_L($rBDT_{5Yrs}$) Value (P-value)
D_L(GDPc)	F-statistic	0.3212 (0.8608)	0.9106 (0.4743)	1.4776 (0.2415)	2.5812 (0.0642)	0.4625 (0.7624)
	Chi-square	1.2851 (0.8639)	3.6425 (0.4565)	5.9107 (0.2059)	10.324 (0.0353)	1.8503 (0.7633)
D_L(M3_GDP)	F-statistic	0.6060 (0.6623)	0.7181 (0.5882)	0.1993 (0.9361)	0.8179 (0.5269)	1.9959 (0.1288)
	Chi-square	2.4240 (0.6583)	2.8726 (0.5794)	0.7972 (0.9388)	3.2718 (0.5134)	7.9837 (0.0922)
D_L(CREDSP_GDP)	F-statistic	0.3131 (0.8662)	1.4684 (0.2442)	1.4091 (0.2624)	2.3101 (0.0884)	0.5165 (0.7243)
	Chi-square	1.2525 (0.8694)	5.8739 (0.2088)	5.6364 (0.2280)	9.2407 (0.0554)	2.0660 (0.7236)
D_L(CAP_GDP)	F-statistic	2.0770 (0.1168)	1.3209 (0.2919)	0.8283 (0.5208)	0.7520 (0.5668)	1.1333 (0.3655)
	Chi-square	8.3081 (0.0809)	5.2837 (0.2594)	3.3133 (0.5068)	3.0083 (0.5564)	4.5334 (0.3386)
D_L($rBDT_{5YrS}$)	F-statistic	0.0710 (0.9902)	0.5625 (0.6922)	0.2899 (0.8815)	3.3540 (0.0265)	0.4221 (0.7910)
	Chi-square	0.2841 (0.9908)	2.2502 (0.6898)	1.1598 (0.8847)	13.416 (0.0094)	1.6887 (0.7928)
D_L(INVEST_GDP)	F-statistic	1.3451 (0.2835)	1.7773 (0.1678)	0.4059 (0.8024)	1.6278 (0.2012)	0.7453 (0.5711)
	Chi-square	5.3805 (0.2504)	7.1093 (0.1302)	1.6238 (0.8045)	6.5114 (0.1641)	2.9813 (0.5609)

with:

ECM_{t-1}: represents the error correction term of each cointegrating relationship lagged one time period. It is estimated from long term equilibrium. This term is denoted by Eviews by "CointEq."

ε_t: Random variable identically and independently distributed.

The results provided in Appendix (Table A2), which presents five different models, according to the variable taken as endogenous variable. The error correction term has a fundamental importance. It measures the speed of adjustment of the dependent variable to its long run equilibrium level. More specifically, the coefficient should be negative, but less than -1 for long-term stable relationship.

The results show that for each model there is at least one negative and statistically significant error term, which validates the existence of a long-term relationship between financial deepening and economic growth. More precisely, this result indicates that there is a restoring force and error correction mechanism that brings financial and real variables to the same long-term expansion path. It also means that selected financial variables cause long-term economic growth.

The estimation of the first model, which retains the GDP per capita as the dependent variable revealed that this adjustment coefficient is -0.63 which means that the system corrects at long term 63% of GDP per capita deviation. In other words, after any shock, the rate growth returns to its long term equilibrium level in less than 6 months on average. Contrary to what is usually seen in underdeveloped countries, the value of the speed adjustment appears relatively low suggesting that after a shock, growth tends to return rapidly towards its stationary long term equilibrium. From a financial stability point of view, this result reflects the fact that a temporary financial sector dysfunction is not very troublesome in term of economic performance because the return of the national economy at its potential level should be quick. This result may be related to the fact that the stable relationship cointegration contains only market capitalization and interest rates that are known for their volatility and may therefore quickly return to their fundamental behavior.

Otherwise, the long-term financial deepening seems to be "caused" by real variables, except where it is measured by the volume of loans to the private sector. Indeed, the results show that in this case the error term is not between -1 and 0 (model 3). In contrast, at least one error term is negative and statistically significant for the other measures. Thus, nearly 76% deviation of the liquidity of the economy compared to its long-run equilibrium is corrected by the system (model 2). This rate drops to 23% if the cointegrating vector contains loans (model 3). Similarly, the model corrects 73% of the deviation of the market capitalization relative to its long-term equilibrium level (model 4). Finally, with regard to the interest rate, the system corrects 67% of its deviation from its long-term equilibrium level (model 5).

In addition, the Wald test (Table 5) shows that short-term causality between economic development and financial deepening is true

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Table 6. Information criteria Akaike and Schwarz: VAR models for different lags

Lag	Akaike	Schwarz
1	-22.54222	-20.99523
2	-21.60086	-18.70118
3	-21.88063	-17.60290
4	-21.92114	-16.23930

Table 7. Granger Test

Null Hypothesis:	Obs	F-Statistic	Probability
D_L(GDPc) does not Granger Cause D_L(M3_GDP)	54	3.21607	0.07885
D_L(M3_GDP) does not Granger Cause D_L(GDPc)		1.34304	0.25190
D_L(GDPc) does not Granger Cause D_L(CREDSP_ GDP)	54	3.40074	0.07098
D_L(CREDSP_ GDP) does not Granger Cause D_L(GDPc)		1.93094	0.17069
D_L(GDPc) does not Granger Cause D_L(CAP_ GDP)	54	2.48943	0.12080
D_L(CAP_ GDP) does not Granger Cause D_L(GDPc)		4.19721	0.04565
D_L(GDPc) does not Granger Cause D_L($rBDT_{5YrS}$)	54	0.68266	0.41252
D_L($rBDT_{5YrS}$) does not Granger Cause D_L(GDPc)		0.17532	0.67718
D_L(GDPc) does not Granger Cause D_L(INVEST_ GDP)	54	5.15132	0.02749
D_L(INVEST_ GDP) does not Granger Cause D_L(GDPc)		0.02170	0.88347
D_L(M3_ GDP) does not Granger Cause D_L(CREDSP_ GDP)	54	10.6958	0.00193
D_L(CREDSP_ GDP) does not Granger Cause D_L(M3_ GDP)		0.28244	0.59741
D_L(M3_ GDP) does not Granger Cause D_L(CAP_ GDP)	54	0.57291	0.45259
D_L(CAP_ GDP) does not Granger Cause D_L(M3_ GDP)		0.32205	0.57287
D_L(M3_ GDP) does not Granger Cause D_L($rBDT_{5YrS}$)	54	0.21287	0.64649
D_L($rBDT_{5YrS}$) does not Granger Cause D_L(M3 _ GDP)		3.73205	0.05894
D_L(M3_ GDP) does not Granger Cause D_L(INVEST_ GDP)	54	5.80552	0.01962
D_L(INVEST _ GDP) does not Granger Cause D_L(M3_ GDP)		2.02325	0.16100
D_L(CREDSP_ GDP) does not Granger Cause D_L(CAP_ GDP)	54	0.16339	0.68775
D_L(CAP_ GDP) does not Granger Cause D_L(CREDSP_ GDP)		0.41185	0.52391
D_L(CREDSP_ GDP) does not Granger Cause D_L($rBDT_{5YrS}$)	54	0.60292	0.44105
D_L($rBDT_{5YrS}$) does not Granger Cause D_L(CREDSP_ GDP)		1.02792	0.31543
D_L(CREDSP_ GDP) does not Granger Cause D_L(INVEST_ GDP)	54	3.52533	0.06616
D_L(INVEST_ GDP) does not Granger Cause D_L(CREDSP_ GDP)		0.40292	0.52842
D_L(CAP_ GDP) does not Granger Cause D_L($rBDT_{5YrS}$)	54	5.6E-07	0.99940
D_L($rBDT_{5YrS}$) does not Granger Cause D_L(CAP_ GDP)		2.79090	0.10093
D_L(INVEST _ GDP) does not Granger Cause D_L($rBDT_{5YrS}$)	54	0.21201	0.64715
D_L($rBDT_{5YrS}$) does not Granger Cause D_L(INVEST_ GDP)		1.13261	0.29223
D_L(INVEST_ GDP) does not Granger Cause D_L(CAP_ GDP)	54	0.00461	0.94616
D_L(CAP_ GDP) does not Granger Cause D_L(INVEST_ GDP)		0.59012	0.44592

only when the latter is measured by the market capitalization. Moreover, the causality seems to be bidirectional in this case. In fact, market capitalization "cause" economic growth, while all other variables seem to have no short-term effect on it. Conversely, the economic growth does not "cause" any short-term financial variable, except market capitalization. This result is not surprising that other variables (In particular, liquidity of the economy, loans to private sector) may exert their effects on growth on long term perspective.

We note simply that this difference in the nature of causality between the two sectors according to the time horizon (short and long term) has already been implemented by Loayza and Ranciere (2002, p.15), who present it as an explanation for the apparent contradiction between the literature on crises and the literature on endogenous growth.

From the econometric point of view, the results of different specifications adopted are here also significant (Table A3 in Appendix). Tests on the residuals validate their independence, normality and homoscedasticity hypothesis. Otherwise, the R^2 is at a reasonable level (ranging from 58% to 76%) with respect to the specificity of the model. Indeed, in the short-term perspective, growth rate is a function of several variables that cannot all be identified properly by an econometric representation.

Granger Causality Test

To better understand the link between financial development and economic growth, it is important to complete this work by a test of causality in the Granger sense between the financial variables and real variables. To do this, we have first estimated different VAR models in order to determine the optimal number of lags (Table 6).

The results of the Granger test (Table 7), made on the basis of the series in first difference, show the absence of any feedback loop, ie bidirectional causality between the variables of our model.

Otherwise, the unidirectional sense of causality between economic performance and financial development depends on the indicator used to identify the financial deepening. Thus, if financial development is measured by traditional indicators of intermediation – liquidity ratio or funding to private sector- the Granger causality is from the "real" to the "financial" sector. The financial deepening does not granger cause economic growth in a statistical sense. It is the opposite. But, it is the economic performance that has indeed a causal relationship with both the liquidity ratio and the funding allocated to the private sector at a threshold of 10%.

However, once the financial sector development is measured by capitalization market, the results are quite opposite to the previous. More specifically, the unidirectional causality goes from the "financial" to the "real" sector. Thus, at the threshold of 5 %, the market capitalization "causes" in the Granger sense the economic growth, this seems in line with the general idea that the stock market is a barometer of future economic performance.

Ultimately, it seems that the unidirectional causality going from the "real" to the "financial" when the financial development is measured more by the development of financial intermediation, and the other one going from the "financial" to the "real" when the financial development is rather "captured" by the development of the direct finance. These both links support from our point of view the thesis of demand following and "threshold effect", which suggest that the financial system reacts a passively to the needs expressed by the real sector. In other words, there should be a minimum level of growth of the GDP per capita before observing really its benefits on the financial activity. By crossing this threshold, it leads to modernize financial sector, in particular through creation of an integrated financial market, which will not fail to exert its effects on economic growth.

This result is in line with the findings of several theoretical works including Robinson (1952), who considers that the financial sector simply follows economic dynamic. It is also comparable to the findings of some empirical works (among others Rioja and Valev, 2004, p.127; Deidda and Fattough, 2002, p.339; Berthelemy and Varoudakis, 1996, p.11) which show that it takes to reach a certain level of income per capita, so that it is possible to develop the various types of intermediation and to benefit from their positive effect on the growth.

Finally, the results show the existence of a unidirectional causality between the real growth and the investment rate. In other words, more growth attracts and incites to investment, but investment does not cause economic performance.

Conclusion

Our focus in this paper is to shed light on the nature of the relationship between financial sector and real economy in the particular context of Morocco. To reach this goal, we have attempted to test empirically the cointegration between economic growth and financial development. The results allow us to bring several interesting findings.

First, and in accordance with theoretical literature, the OLS model shows clearly that financial development, in particular financial intermediation, is significant explanation of economic growth in Morocco. This result corroborates the large empirical literature on the subject and confirms the choice of Morocco, which has made significant efforts since the early 90's for modernizing its financial sector.

In addition, the long-term relationship between the real economy and the financial sector

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seems stable over time. At 5%, the selected financial and real indicators cannot permanently deviate from their long-run equilibrium. This highlights a restoring force, which in the long term brings both financial and real spheres on the same expansion path. Thus, the results confirm not only the positive relationship between economic growth and financial development, but also that financial variables used "cause" long-term economic growth. More specifically, after any shock, the growth rate will return to its equilibrium level in less than six months on average. On the other hand, it seems that financial deepening is "caused" by long-term economic growth, except where it is measured by the volume of loan to the private sector.

Finally, Granger causality tests specify more our results. Indeed, the unidirectional causality between economic performance and financial development depends on financial indicator used to identify it. Thus, if it is measured by traditional indicators of financial intermediation (liquidity ratio, bank funding to the private sector), the Granger causality is from the "real" area to the "financial" one. In other words, it is the country's economic performance, which has a cause and effect relationship with both the liquidity ratio and the volume of funding allocated to the private sector. However, once the financial development is measured by market capitalization, the results are quite opposite to the previous ones. In this case, the causality is from the financial sector to the real one. Thus, at the threshold of 5%, the market capitalization does granger cause the economic growth, which seems in line with the general idea that the stock exchange is a real barometer of the economic performance. Moreover, the Wald test shows that in the short term, all the financial variables do not affect the economic growth, except the market capitalization.

However, we should not draw hasty conclusions about the inefficiency of the financial sector on the basis of its short-term influence on economic growth. The long term effect verified has a strong implication. Thus, policy makers should focus on the financial sector structural problems whose effects cannot be felt in the long term perspective. In particular, they should focus their attention on creating modern financial institutions both in the banking sector and financial market. As result, it would allow the financial sector to fully exercise its effects on economic growth.

This policy is highly recommended given that our results support both thesis of "demand following" and "threshold effect". Initially, the financial system would react passively to the needs expressed by investors and savers in the real economy. We have demonstrated in this respect that the demand for financial services is dependent upon the growth when the financial development is measured by the financial intermediation indicators. Thereafter, when the financial development is more captured by the expansion of direct finance, the sense of causality become from the financial sphere to the real one. This means that the financial development causes real economic growth and not the opposite.

These two unequivocally causality between financial development and economic growth imply that there should be a minimum level of GDP per capita before observing really its benefits on the financial activity.

This result is in line with the findings of several theoretical works including that Robinson (1952), who considers that the financial sector simply follows economic dynamic. It is also comparable to the findings of some empirical work ((among others Rioja and Valev (2004); Deidda and Fattough, (2002); Berthelemy and Varoudakis (1996) which show that it takes to reach a certain level of income per capita, so that it is possible to develop the various types of intermediation and to benefit from their positive effect on the growth.

Finally, from the financial stability point of view, our results reflect the fact that provisional dysfunction in the financial sector is not worrying in term of economic performance, in the sense that the return of the economy to its potential level needs a fewmonths. This result is not surprising, as the stable relationship cointegration contains only market capitalization and interest rates that are known for their volatility and may therefore quickly return to their fundamental behavior.

Appendix

Table A1. Tests on residuals (long term equilibrium relationship)

Breusch-Godfrey Serial Correlation LM Test		ARCH Test		Jarque-Bera
F-statistic	Probability	F-statistic	Probability	F-statistic
1.876767	0.164146	1.217340	0.304472	0.083007
Obs*R-squared	Probability	Obs*R-squared	Probability	Probability
4.061517	0.131236	2.460439	0.292228	0.959346

Table A2. Vector error correction models (VECM)

	Model 1 D_L(GDPc)	Model 2 D_L(M3_GDP)	Model 3 D_L(CREDSP_GDP)	Model 4 D_L(CBOURS_GDP)	Model 5 D_L($rBDT_{5Yrs}$)
CointEq1	-0.631058	1.129255	0.229347	2.840221	-3.127351
	0.089700	0.014800	0.751900	0.221700	0.095600
CointEq2	0.366736	-0.756997	-0.529436	-0.917461	0.652033
	0.044200	0.001300	0.140600	0.410300	0.461500
CointEq3	0.138993	-0.234394	0.040515	-0.735957	-0.672040
	0.146600	0.046300	0.829700	0.000600	0.012500
D_L(GDPc)t-1	-0.100782	-0.343548	-0.232680	0.199958	3.301764
	0.771900	0.414500	0.739600	0.927800	0.069800
D_L(GDPc)t-2	-0.038614	-0.503007	0.006521	-0.256647	1.200357
	0.886900	0.133200	0.990500	0.881700	0.385600
D_L(GDPc)t-3	-0.247052	-0.017218	-0.273297	1.389552	3.029681
	0.282100	0.949700	0.550900	0.339300	0.013600
D_L(GDPc)t-4	-0.039239	-0.127539	0.251973	1.781763	1.327813
	0.882100	0.689100	0.636900	0.294600	0.325700
D_L(M3_GDPt-1)	-0.270050	0.239337	-0.696964	0.592824	0.754820
	0.208300	0.350200	0.110600	0.658600	0.481200
D_L(M3_GDP)t-2	-0.080107	0.186177	0.309643	1.363540	-0.643952
	0.665200	0.405800	0.408700	0.252000	0.492600
D_L(M3_GDP)t-3	-0.197959	0.365949	0.416162	3.591247	-0.800379
	0.323100	0.134400	0.302600	0.008400	0.427400
D_L(M3_GDP)t-4	-0.053596	0.386673	-0.034362	1.244758	0.247568
	0.839400	0.231400	0.948500	0.460900	0.853000
D_L(CREDSP_GDP)t-1	-0.001198	-0.006124	0.175873	1.701225	-1.438022
	0.994100	0.974800	0.588400	0.105800	0.087000
D_L(CREDSP_GDP)t-2	-0.066708	0.140040	-0.375864	0.851141	-0.384495
	0.661200	0.446400	0.226500	0.381500	0.617400
D_L(CREDSP_GDP)t-3	0.003950	-0.129412	-0.213712	0.580694	-0.300591
	0.975700	0.409600	0.415700	0.482300	0.646700
D_L(CREDSP_GDP)t-4	0.093737	-0.222411	-0.352370	0.274520	-0.777388
	0.423800	0.121900	0.142000	0.710700	0.194500
D_L(CAP_GDP)t-1	0.036619	0.008877	-0.029392	-0.270479	0.136284
	0.169700	0.777700	0.577400	0.112700	0.307300
D_L(CAP_GDP)t-2	0.029349	-0.042210	0.033922	0.017981	0.100184
	0.248500	0.170400	0.503500	0.910000	0.432000
D_L(CAP_GDP)t-3	0.033860	-0.038466	-0.017374	0.199656	0.062339
	0.169400	0.193400	0.720900	0.200600	0.610200
D_L(CAP_GDP)t-4	0.043743	-0.054251	0.079044	0.433759	0.016057
	0.079900	0.071500	0.113600	0.008800	0.895300
D_L($rBDT_{5Yrs}$)t-1	-0.023095	-0.030923	0.064244	-0.876174	0.129615
	0.612700	0.573500	0.485400	0.005500	0.574300
D_L($rBDT_{5Yrs}$)t-2	-0.008291	-0.038118	-0.027158	-0.204393	0.307363
	0.865800	0.520200	0.783500	0.513600	0.222600
D_L($rBDT_{5Yrs}$)t-3	-0.004715	-0.065350	-0.005273	-0.384230	0.108560
	0.901500	0.163000	0.945200	0.122000	0.574300
D_L($rBDT_{5Yrs}$)t-4	-0.000010	-0.004147	-0.034531	-0.446451	-0.029671
	0.999800	0.931000	0.667100	0.087300	0.882700
D_L(INVEST-GDP)t-1	0.198983	-0.237269	-0.149176	-1.577523	0.029392
	0.125700	0.128900	0.559800	0.059300	0.963300
D_L(INVEST-GDP)t-2	0.215069	-0.296004	-0.019931	-1.602139	-0.172021
	0.075300	0.044000	0.932400	0.039300	0.770800
D_L(INVEST-GDP)t-3	0.240593	-0.370929	-0.278731	-2.022401	0.669787
	0.087000	0.031400	0.314300	0.026700	0.334900
D_L(INVEST-GDP)t-4	-0.092354	-0.432917	0.079756	-0.916577	0.491985
	0.718200	0.168000	0.876800	0.573400	0.703600
C	0.013062	0.014085	0.018802	-0.122930	-0.052544
	0.046500	0.071900	0.146000	0.004800	0.107400
R-squared	0.588840	0.736982	0.672826	0.764996	0.577692
Adj. R-squared	0.106174	0.428222	0.288751	0.489121	0.181939

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Table A3. Tests on residuals (VECM)

	Model 1	Model 2	Model 3	Model 4	Model 5
Jarque_Bera Test:					
Statistique	0,012923	1,759471	1,829426	2,512445	3,496913
Probability	0,993559	0,414893	0,400632	0,284728	0,174042
ARCH Test:					
F-statistic (Prob)	0.3788 (0.8602)	0.3671 (0.8680)	0.5813 (0.7140)	0.4523 (0.8090)	0.6021 (0.6985)
Obs*R-squared(Prob)	2.0796 (0.8380)	2.0185 (0.8465)	3.1161 (0.6820)	2.4618 (0.7822)	3.2199 (0.6661)
Breusch-Godfrey Serial Correlation LM Test:					
F-statistic (Prob)	0.7673 (0.5852)	1.0999 (0.3945)	1.1259 (0.3820)	1.0729 (0.4078)	1.5066 (0.2370)
Obs*R-squared(Prob)	8.9609 (0.1106)	11.935 (0.0356)	12.150 (0.0327)	11.710 (0.0389)	15.047 (0.0101)

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