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FINANCIAL LIBERALIZATION AND ECONOMIC GROWTH: EVIDENCE FROM TUNISIA

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ABSTRACT

The objective of this paper is to build an index of financial liberalization in Tunisia using the Principal Component Analysis method over a period of 36 years from 1980 to 2015. In addition, this paper also includes econometric estimates terms of cointegration and causality between financial liberalization policy and economic growth in Tunisia. To do this, we adopt a methodology which is based on an analysis in terms of causality. This approach requires passing through three stages. The first step is to check the properties of time series (stationary and integration order) of the financial liberalization index and economic growth through the use of unit root Dickey-Fuller tests. The second step seeks to examine the long-term relationship between the two variables by using a multivariate analysis Johansen. Finally, the third step seeks to determine the direction of causality between the financial liberalization index and economic growth by applying a vector error correction model. The results show that the two series are integrated of order one (I (1)), the existence of a long-term relationship between the financial liberalization index and economic growth and the presence of causality Granger unidirectional of financial liberalization index to economic growth.

1. INTRODUCTION

The process of financial liberalization in Tunisia began in 1987. Since then, various liberalization measures have been implemented to broaden and deepen the financial system. Some instruments were designed to increase competition and efficiency in the financial market. These instruments included the removal of barriers to entry, the commercial banks and the privatization of public banks. The monetary policy instruments such as the

deregulation of interest rates, reducing reserve requirements and the change in the position of direct or indirect monetary policy were implemented. Similarly, the introduction of prudential norms , the establishment of finance companies and investment Banking revision of laws and the enactment of the law of debt collection aimed at ensuring the integrity of banks and maintaining Tunisian financial system stability. All these instruments were expected to achieve the overall objectives of the competition and the functioning of money markets and capital.

Financial liberalization is adopted worldwide through several elements reflecting the variety of restrictions has been previously taxed.

The most important are:

- ❖ Elimination of the interest rate and other price controls,
- ❖ The privatization of state-owned intermediaries and reducing management
- ❖ Administrative appropriations by public agencies,
- ❖ The administration of new entrants in all service industries financial and removal of legal protection for the cartel of financial markets,
- ❖ Reductions in trade regulations on intermediate financial and
- ❖ The tax reduction, explicit and implicit financial intermediaries.

The remaining of the paper is organized in the following way. Section 1 presents the methodology adopted for the construction of financial liberalization index. Section 2 dwells the empirical literature review. Section 3 presents the econometric methodology, contains empirical results and discussion, and finally, concludes are drawn in section 4.

2. CONSTRUCTION OF FINANCIAL LIBERALIZATION INDEX

Financial liberalization is a process that involves the implementation of a number of policies as dictated above. To show the degree or level of financial liberalization at any given time, a financial liberalization index (FLI) for Tunisia is constructed according to the method of principal components.

Bandiera, Caprio et al. (2000) and Laeven (2000) constructed an index of financial liberalization for eight developing countries including eight major components of financial liberalization in their index, which are (1) interest rates , (2) measures competitiveness, (3) reserve requirements, (4) credit control, (5) ownership of banks, (6) prudential regulation, (7) the financial market stock, and (8) the international financial liberalization.

 Laeven (2000) constructed a similar index for 13 developing countries. It takes six financial liberalization measures but does not take measures related to stock markets and the external sector in its index.

Previously, *Demetriades and Luintel (1997)* constructed an index of financial repression for India using the method of principal components. They include nine different political repressions in their index.

Referring to the same optical *Laurenceson and Chai (2003)* constructed an index of financial repression similar to China.

With reference to our work, we build an index for Tunisia fiscal policy. In addition, we check the relationship between financial development indicators and the index. This variable is used as a proxy for financial liberalization. The calculation of this index is a qualitative exercise based on the type and year of liberalization. Thus, the construction of our index includes six different elements used in the process of financial liberalization, which are:

- ❖ Liberalization of interest rates;
- ❖ Introduction of mandatory reserves;
- ❖ Establishment of prudential regulation;
- ❖ Removal of barriers to entry in the banking and financial system;
- ❖ Remove the sectoral allocation of credit;
- ❖ Privatization of state banks.

The following table shows for the Tunisian banking and financial system the sequence of enforcement.

Table 1: *The sequence of financial liberalization in Tunisia*

Year of measurement	1980	1987	1989	1992	1993	1996	1997
Interest rate		x					
Barrier to entry						x	
Reserve requirements			x				
Credit control					x		
Privatization							x
Prudential regulation				x			
Total measures implemented	0	1	2	3	4	5	6

Source: IMF various reports and working papers , various reports of the World Bank, working papers and debate papers, Demirguc -Kunt and Detragiache (1998) and Luc Laeven (2000).

This table shows the sequence of financial liberalization with respect to each of six different measures. The crosses in the boxes indicate the year and the type of liberalization measures in question happens to effect. The number 2 indicates the implementation of two measures in 1989, and when we reach the number six (6) indicates that six (6) steps.

To take the index of financial liberalization, some arbitrary value is assigned to each financial liberalization policy (Table 2). Each liberalization variable can have a value between 0 and 6. When a sector is fully liberalized, this variable takes a value of 1 and when the sector is regulated, it takes a value of 0.

The description of the variables used in the construction of financial liberalization index and the date of implementation are presented below.

DTI: Deregulation of Interest Rates - 1987.

SBE: Removing Barriers to Entry - 1993.

RRR: reduction in compulsory reserve requirements - 1989.

RCC Relaxation in credit checks - 1993.

RBS: Regulation and Banking Supervision - 1992.

PSB: Privatization of State-owned Banks - 1997.

Table 2: *Standard financial liberalization index*

Années	DTI	SBE	RRR	RCC	RBS	PSB	FLI
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	1	0	0	0	0	0	1
1988	1	0	0	0	0	0	1
1989	1	0	1	0	0	0	2
1990	1	0	1	0	0	0	2
1991	1	0	1	0	0	0	2
1992	1	0	1	0	1	0	3
1993	1	1	1	1	1	0	5
1994	1	1	1	1	1	0	5
1995	1	1	1	1	1	0	5
1996	1	1	1	1	1	0	5
1997	1	1	1	1	1	1	6
1998	1	1	1	1	1	1	6
1999	1	1	1	1	1	1	6
2000	1	1	1	1	1	1	6
2001	1	1	1	1	1	1	6
2002	1	1	1	1	1	1	6
2003	1	1	1	1	1	1	6
2004	1	1	1	1	1	1	6
2005	1	1	1	1	1	1	6
2006	1	1	1	1	1	1	6
2007	1	1	1	1	1	1	6
2008	1	1	1	1	1	1	6
2009	1	1	1	1	1	1	6
2010	1	1	1	1	1	1	6
2011	1	1	1	1	1	1	6
2012	1	1	1	1	1	1	6
2013	1	1	1	1	1	1	6
2014	1	1	1	1	1	1	6
2015	1	1	1	1	1	1	6

Figure 1: *Indicator of financial policy for Tunisia*
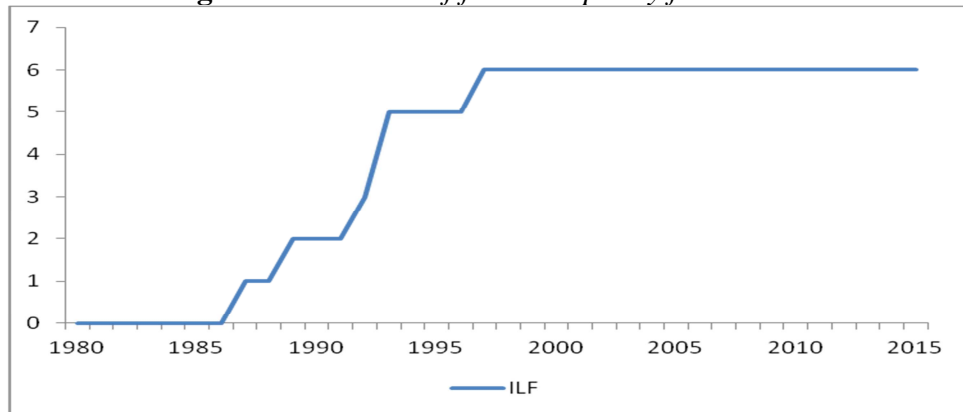
Whereas some weaknesses of this indicator of fiscal policy, including zero for the years before the implementation of the financial reform values , it is necessary to improve the quality of this indicator and to better capture the effect on performance economic Tunisia. I therefore propose that the difference in our work (2003), an improved fiscal policy index.

From the values shown in Table 1, the financial liberalization index (FLI) for Tunisia is achieved. For this purpose, the weight of each component is calculated using the method of principal components. The ILF of the composition can be expressed as follows:

$$FLI_t = \alpha_1 DTI_t + \alpha_2 SBE_t + \alpha_3 RRR_t + \alpha_4 RCC_t + \alpha_5 RBS_t + \alpha_6 PSB_t \qquad (1)$$

In the above equation, α_i is the weight of the component given by the eigenvector corresponding to the selected main component. The eigenvalues and eigenvectors of the correlation matrix of the variables of financial liberalization policy are:

Table 3: *Principal Component Analysis Results*

Matrix components

	Component 1
RCC	,961
DTI	,801
PSB	,826
RRR	,888
RBS	,957
SBE	,961

Total variance explained

Components	Initial values			Extraction Sums of squares of the factors identified		
	Total	% of the variance	% cumulative	Total	% of the variance	% cumulative
1	4,875	81,251	81,251	4,875	81,251	81,251
2	,643	10,711	91,963			
3	,285	4,744	96,707			
4	,130	2,173	98,880			
5	,067	1,120	100,000			
6	-1,322E-16	-2,203E-15	100,000			

Méthode d'extraction : Analyse en composantes principales.

Take the first principal component which accounts for 80 percent of the total variance in all financial variables. Thus, the FLI is given by the following equation:

$$FLI_t = 0.796\ DTI_t + 0.959\ SBE_t + 0.884\ RRR_t + 0.959\ RCC_t + 0.955\ RBS_t + 0.816\ PSB_t \qquad (2)$$

The index for the individual components of the financial liberalization policy is calculated by substituting the values DTI_t , RCC_t, PSB_t, RRR_t, RBS_t and SBE_t equation (2) in Table 2 and multiplying by the respective values of α_i . The financial liberalization index for each year is calculated by adding the calculated values of all elements of the policy for the year concerned. The individual and total index is calculated and presented in Table 4.

Table 4: *Improved financial liberalization index for Tunisia*

Years	DTI	SBE	RRR	RCC	RBS	PSB	FLI
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0,801	0	0	0	0	0,801
1988	0	0,801	0	0	0	0	0,801
1989	0	0,801	0	0,888	0	0	1,689
1990	0	0,801	0	0,888	0	0	1,689
1991	0	0,801	0	0,888	0	0	1,689
1992	0	0,801	0	0,888	0,957	0	2,646
1993	0,961	0,801	0	0,888	0,957	0,961	4,568
1994	0,961	0,801	0	0,888	0,957	0,961	4,568
1995	0,961	0,801	0	0,888	0,957	0,961	4,568
1996	0,961	0,801	0	0,888	0,957	0,961	4,568
1997	0,961	0,801	0,826	0,888	0,957	0,961	5,394
1998	0,961	0,801	0,826	0,888	0,957	0,961	5,394
1999	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2000	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2001	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2002	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2003	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2004	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2005	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2006	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2007	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2008	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2009	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2010	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2011	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2012	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2013	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2014	0,961	0,801	0,826	0,888	0,957	0,961	5,394
2015	0,961	0,801	0,826	0,888	0,957	0,961	5,394

The figure of the financial liberalization index (FLI) given in the last column of the table above is shown in Figure 2.

Figure 2*: Financial liberalization index in Tunisia*
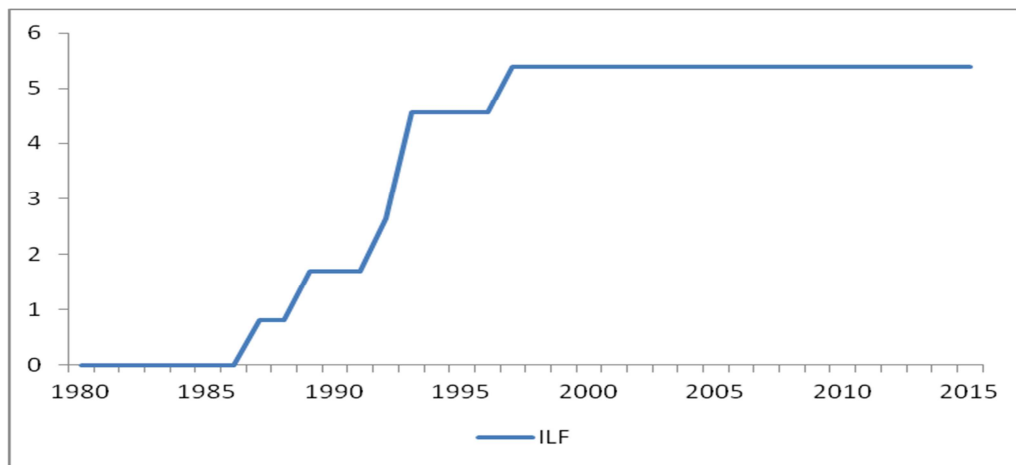
The improved financial liberalization index is a composite index calculated from the regression of financial and monetary reforms, including the interest rates, reserve requirements, credit control, the bank privatization, elimination of barriers to entry and prudential regulation it is less interested in its value at its trend over time. The FLI is interpreted as follows: when the financial system is subject to measures of financial policy given the index of financial liberalization has a downward trend. By cons, when monetary authorities put in place a policy of financial liberalization, the trend of the FLI will be on the rise.

The chart above shows the index of financial liberalization evolution. Two main conclusions emerge: first, the evolution of the ILF reflects the impact of measures implemented by the monetary authorities. Indeed, over the period 1980-1986, the evolution of the index corresponds to the years during which the Tunisian monetary authorities pursued a policy of funding administered. Then, the level has risen since 1987, the year when the first financial liberalization measures were applied in Tunisia.

3. FINANCIAL SECTOR AND ECONOMIC GROWTH: EMPIRICAL APPROACH

Through recent studies, a large divergence persists on the importance of the financial sector and the policies adopted in terms of economic growth. This situation is rather inexplicable because empirical evidence, from several studies is available in favor of the thesis of the positive impact exerted finance on economic growth.

Due to the multitude of this work and the inability to realize a complete way, we will present the synthesis of some studies that seem most interesting in terms of results and conclusions. The objective of this work is mainly to interpret the empirical results obtained in this chapter.

3.1. Financial variables and economic growth: an ambiguous relationship

Empirical studies on the links between the financial sphere and the real economy experienced a rise in the years 1980 and 1990. These studies are part of the research perspective of long-term determinants of economic growth.

The importance of the findings of the work, with the objective to determine the role of financial variables in all of the factors behind economic growth comes from the methodology used by the authors of this research. Thus, the authors of this work monitor the impact of each factor in the influence of other factors on economic growth.

Criticism of the work De Gregorio and Guidotti by Laroche and al. show that "the tested econometric relationships almost always raise economic growth as a variable explained by financial variables. However, the conventional linear specification of these models, although it translates assumptions about the direction of causality studied, allows to show that the correlations between financial development and growth "(Laroche A. and al. 1995, p. 46). For this reason, Laroche and al. offer a dual approach to seize the links between finance and growth. The first proceeds by applying Granger causality tests; while the second uses data from R. Barro and his approach to study the type of relationships between financial indicators and the pace of economic growth.

The Granger causality test is performed to see the profile of existing relationships between real variables, which are the investment rate (I), the GDP growth rate noted g, and a set of twelve financial variables denoted generically f. "The countries considered mainly belong to the OECD and the study period is 1976-1992. The results show that causality does exist and that are conducted primarily in the sense → finance growth. Reverse causality is found for some countries, but much more rarely "(Laroche A. and al., 1995, p. 39). Also, sometimes no link is established between the two phenomena. Table 4.3 summarizes some results obtained by Laroche A. and al.

Table 5: *Some results of causality tests*

Growth rate of real GDP (g) and financial development variables (f)							
	Japan	USA	Italy	France	Spain	South Korea	Mexico
$\Delta Credit_t/GDP_t$	f→g	f→g			g→f	f→g	
$Credit_t/GDP_t$	f→g	f→g		g→f	g→f	g→f	
Real interest rate		f→g	g→f	g→f	g→f	f→g	g→f
Investment rate (I) and financial development variables (f)							
$\Delta Credit_t/GDP_t$		f→I		f→I	f→I		
$Credit_t/GDP_t$	I→f		f→I		f→I		
Real interest rate	f→I	f→I	f→I				f→I

Source: *A. Laroche et al. (1995), pp: 55-56*
→: because Granger at the 5%

From these results, it appears that there are "causal links in the short term, but with significant regional differences, and some ambiguity in the direction of causality" (Laroche A. and al., 1995, p.54).

According to Leahy M. and al. (2001), "the OECD studies have failed to find a significant relationship between financial development and economic growth" (*Leahy M. and al., 2001, p. 15*). According to these authors, "the uses of methods similar to those used in previous studies for a large sample of countries do not provide evidence concerning the finance contribution to economic growth" (*Leahy M. and al., 2001, p. 15*). A likely

explanation for the failure of empirical studies to detect links between the financial sector and economic growth is the fact that the opening of financial markets, on top of each other, in developed countries disconnects economic growth of financial development in each country. This, perhaps, overshadowed the positive contribution of finance to economic growth. Despite this obstacle, other studies have provided results that show the positive contribution of finance on economic growth.

The main results obtained by R. Rajan and Zingales L. (1998), and JC Berthélemy A. Varoudakis (1996), J. Thornton and Darrat A.F aim to broaden the scope of empirical studies considered to establish lessons relevant.

For his part Darrat A. (1999) sought in its contribution to sit empirically the different hypotheses about the relationship between financial development and economic growth. The author starts with the distinction proposed by Patrick H. (1966) between the hypothesis of growth driven by the supply of financial services (supply leading) and that where it is simply the result of incentives from the real sector (Following demand). The author aims to see how is the situation in three countries are Saudi Arabia, United Arab Emirates and Turkey. He believes the level of financial deepening by two indicators. The first is the relationship between fiat money and the stock of narrow money, M1 and nominal GDP, M1/GDP. The second indicator is the ratio between the stock of broad money and nominal GDP, M2/GDP. The first indicator is supposed to capture the level of sophistication of the domestic financial sector, while the second captures the size or financial depth of the economy. The real sector is represented by a single indicator which is the annual GDP growth rate noted g. The available data cover the period from 1964 to 1993.

The author aims to check the direction of the existing causality between financial deepening and economic growth by using an error correction model (ECM) that can analyze the short and long term relationship between two phenomena. To do this, he performed in advance, the ADF tests, the PP and WS to determine the order of integration of the series. In addition, it introduced inflation as an explanatory variable to make its multivariate model. The table below summarizes the results it has achieved.

Table 6: *The short and long-term causality between finance and growth*

		Supply-leading		Demand-following	
		M_1/GDP$\rightarrow$ g	M_2/GDP$\rightarrow$g	g$\rightarrow$$M_1$/GDP	g$\rightarrow$$M_2$/GDP
Turkey	Short-term Relationship	No	Yes	No	No
	Long-term Relationship	Yes	Yes	No	No
United Arab Emirates	Short-term Relationship	No	Yes	No	No
	Long-term Relationship	No	No	Yes	No
Saudi Arabia	Short-term Relationship	No	No	No	No
	Long-term Relationship	Yes	No	Yes	No

Source: Darrat AF (1999), the author presented his findings in a more formalized way, this presentation was preferred as it allows better illustrate.
Yes: indicates that there is a causal relationship and no: means that this relationship does not hold.

Thus, "*the calculations provide evidence to support the hypothesis of the leading supply even if their strength and clarity vary between countries*" (Darrat, 1999, p. 31). In fact,

of the seven cases where a relationship is identified between financial variables and the rate of economic growth, five are in favor of the hypothesis of leading supply and two in favor of the hypothesis of demand Following.

As Mr. Habibullah and Darrat A., J. Thornton aims to study the direction of causality between financial deepening and economic growth in a sample of Asian countries. It uses, for this, the technique uses the cointegration and Granger causality test to see if relationships exist and which way between the two phenomena. Two indicators are used to measure the degree of financial deepening: M_2/GDP and total deposits to nominal GDP. The author uses the real rate of economic growth as the proxy variable for characterizing the real sector.

The results obtained show that the real GDP growth rate and financial deepening, measured by two indicators used are not cointegrated, and that in all the sample countries. Thus, no long-term relationship is established between the two phenomena. Regarding the short-term bonds, "the results of Granger causality tests suggest that financial deepening has little economic growth. Unidirectional causality from financial deepening to economic growth is found in only three cases of nine "(J. Thornton, 1994, p.47). The following table summarizes the results of the author as regards the short term of causality.

Table 7: *Causal results between financial development and economic growth*

	Unidirectional relationship of financial development to growth	Unidirectional relationship of growth to financial development	Bidirectionnel Relationship	No causal
Inde	No	No	No	Yes
Corée du Sud	No	Yes	No	No
Malaisie	No	No	Yes	No
Myanmar	No	Yes	No	No
Népal	Yes	No	No	No
Philippines	Yes	No	No	No
Singapore	No	No	No	Yes
Sri Lanka	No	Yes	No	No
Thaïlande	Yes	No	No	No

Source: *Thornton J., (1994), p. 49*

Yes: there causality Granger short term and no: means that this relationship does not hold.

These results obtained by different empirical studies are important but they are not systematic. Thus, to better understand the type of links between the financial sector and the real sector, it is to present further results that are likely to illuminate other aspects of the relationship between the two sectors.

Before reviewing the work that examined the empirical assessment of the impact of financial liberalization policies on economic growth, it is first of all to present the results of the fundamental work A. Levine and Zervos S (1998). The latter two authors used data from a panel of 47 countries and a 18-year period (1976-1993). Their goal is to "assess empirically whether the indicators of the activity of banks and financial markets, both at once, robustly correlated with current and future economic growth rates, capital accumulation rate, the rate of productivity growth and private savings rate "(Levine and Zervos R. S., 1998, p.538). Both authors took into consideration "control by the impact of other economic and political factors

that may influence growth," (*Levine and Zervos R. S., 1998, p.539*) and three dependent variables.

It follows from the last work that the indicators of liquidity and the size of the stock market are positively and significantly correlated with current and future rates of economic growth, capital accumulation and productivity improvement. Furthermore, the level of banking development, measured by the share of bank credits to the private sector in GDP positively affects the growth, accumulation and productivity growth. Further, the two authors show that indicators capturing the level of development of banking and trading activities simultaneously and positively affect economic growth, capital accumulation and productivity improvement.

Finally, the study developed by *Levine and Zervos S. R. (1998)* shows that none of the financial indicators is closely linked with the saving rate. They also found that stock market volatility is a non-correlated significantly with economic growth, capital accumulation and productivity improvement.

3.2. Financial liberalization and economic growth: some empirical results

After more than three decades of the first experiences of financial liberalization and the accumulation of empirical literature increasingly rigorous empirically to place the relevance of studies, several evidences have been informed. Thus, it appears that "the paradigm of financial liberalization is a kernel of truth and a vast exaggeration" (*Dornbusch R. and A. Reynoso, 1989, p.205*). The empirical literature focusing on assessing the impact of financial liberalization policies made it possible to review the content of its recommendations and the conditions under which they positively affect economic growth.

In this sense, Morisset J. (1993) tried to test one of the basic assumptions of the paradigm of financial liberalization. For this reason, the heart of its contribution consists of a structural investment model in which are introduced the "factors can influence the relationship between real interest rates, the domestic credit supply and private investment" (p.133). In this sense, ingenuity model Morisset J. stems from the fact that it introduces multiple interactions that better reflect the complexity of reality and the real impact of financial liberalization policies.

"The model is simulated for Argentina for the period 1961-1982 that the country has been subject to different interest rate policy" (J. Morisset, 1993, p. 134). One of the main results emerged is that "the increase in real interest rates do not necessarily induces a positive effect on private investment" (J. Morisset, 1993, p.134). Furthermore, the positive effect of the increase in domestic credit, as suggested by McKinnon and Shaw, cannot take place because of the substitution of the acquisition of productive assets by the monetary and financial assets.

Regarding the impact of financial liberalization on public sector financing needs from the domestic banking system, it appears that these requirements are increasing limited funds available for the private sector. The author shows, moreover, that "the effect of the policies of interest rates on demand for capital goods is low although the overall impact may be higher on the quality of the investment on its quantity" (Morisset J., 1993, p. 148).

Overall, Morisset J. (1993) concluded that the competent authorities must ensure three conditions to ensure that the increase in real interest rates affect private investment positively. Indeed, "bank deposits to be close substitutes for nonperforming assets (cash, gold, etc.) and external assets as capital goods, the financial sector should ensure an efficient allocation of

domestic credit and domestic credit flows should not be absorbed by the public sector needs "(pp: 148-149).

The contribution of N. Roubini and Sala-i-Martin X. fits, such as Morisset J., as part of work trying to empirically test the assumptions of neoliberal theory of financial liberalization. Both authors developed a model of financial repression, inflationary finance and endogenous growth to detect the impact exerted by the financial liberalization policies on growth and other real variables. The data relate to 60 countries and a period from 1960 to 1985.

"Roubini and Sala-i-Martin resumed remedial Barro equations tested by maintaining the same explanatory variables of growth and adding financial variables. Financial repression is quite summarily represented by a dummy variable when the real interest rate means the estimation period is negative, or the rate of compulsory reserves. The coefficients on variables prove significant and negative, leading to the conclusion that the country is exerted financial repression generally grow more slowly than others "(B. *Amable and JB Chatelain, 1995, p. 121*). The results of these two authors show that "countries that repress their financial systems tend to grow less quickly than others; This result holds even after controlling for other determinants of economic growth "(N. Roubini and Sala-i-Martin X., 1992, p. 7).

According to *Hasan Khan and A. L. (1998)*, "the essential message of the thesis of McKinnon and Shaw is as low or negative interest rates discourage savings and, consequently, reduce the loanable funds available at the investment which negatively affects the economic growth rate "(p. 582). In this context, financial liberalization policies induce an increase in the level of investment in two ways. The first results from the increased volume of domestic credit distributed following the increase in intermediated savings stimulated by encouraging earnings reflected high interest rates. The second path is constituted by the duct effect McKinnon. Indeed, it states that due to the indivisibility of investment projects and the predominance of internal financing of projects, the creation of money balances is a prerequisite for the realization of such projects. This reasoning shows the positive relationship between the accumulation of monetary balances and the investment rate.

The working *Hasan Khan and A. L. (1998)* deals with the Pakistanis cases using data covering the period 1959-1995. The objective of the authors is to test the basic relationships of the paradigm of financial repression. To do this, they took care to study the stochastic properties of the variables before testing cointegration - static formulation of long-term between the variables. After this step, they estimated an error correction model, if its validation, in order to capture the dynamic relationships between variables.

The tests show the existence of cointegration relationships in favor of McKinnon complementarity hypothesis. Moreover, "the coefficients attached to savings of S/GDP rate in the money demand function M/P, and real money balances in the savings function, are statistically significant. This result remains valid when the currency and savings demand functions are estimated as part of a static formulation of long-term -relation cointégration- or in a dynamic formulation using an error correction model "(A. Hasan Khan and L., 1998, p. 116).

In the same context, MS Habibullah (1999) wanted to test the hypothesis led growth finance in the early stages of economic development as foreseen by H. Patrick. He used as A. Khan and L. Hasan, techniques provided by the co-integration and error correction models. In addition, the technique adopted by the author allows him to decide on the direction of causality between the financial sector and the real sector without any prior restriction. This work concerns the data for seven Asian countries and takes as indicators of financial

development the M$_2$/GDP ratio and the monetary indicator Divisia. As for the real sector, the author uses as an indicator the real GDP level.

After studying the stationary series using the DF and ADF tests, the author wanted to test whether long-term relationships are not checked between financial variables and real GDP in each of the seven countries. The cointegration test between financial development and economic growth rate was made by adopting the two-step procedure of Engel and Granger of testing the null hypothesis of no cointegration. In cases where cointegration holds, then the deviation where the error term is added to the regression used for the test of causation to account for long-term bonds. Finally, this model becomes error correction is estimated to see the links that are established between each of the two financial variables and level of economic development. Table 4.8 summarizes the results obtained by MS Habibullah for the seven Asian countries.

Table 8: *The results of the working MS Habibullah*

Countries	M$_2$/GDP			Indicateur monétaire de Divisia		
	Supply leading DF→GY	Demand following GY→DF	Bidirectionnel DF↔GY	Supply leading DF→GY	Demand following GY→DF	Bi-directional DF↔GY
Indonesia	No	No	Yes	No	No	Yes
Malaysia	No	Yes	No	No	Yes	No
Myanmar	No	Yes	No	No	Yes	No
Nepal	No	Yes	No	No	Yes	No
Philippine	Yes	No	No	oui	No	No
Sri Lanka	No	No	Yes	No	No	Yes
Thailand	No	No	No	No	No	Yes

Source: *Habibullah MS, (1999), "Financial development and economic growth in Asian countries: testing the financial-led growth hypothesis", saving and development, t. XXIII, No. 3, p. 286*
Note: DF and GY represent financial development and economic growth.
Yes: means the existence of causality and no: means no causation.

4. FINANCIAL LIBERALIZATION AND ECONOMIC GROWTH IN TUNISIA: EMPIRICAL EVIDENCE

Before causality test Granger (1969), it is necessary to carry out preliminary tests. These are stationary test variables and no cointegration between the variables in pairs to avoid spurious regression. The presence of a cointegration relationship between the variables leads us to estimate the vector error correction model dedicated to adjust the estimation bias induced by the cointegrating relationship.

Stationary series and order of integration

The stationarity of the series is an underlying assumption for the operation, for statistical inference needs, estimators (Student t, Fisher statistics, etc.). However, the majority of macroeconomic series are not stationary. For this reason, it is essential to conduct the study of stochastic properties of the series.

A time series X$_t$ is called stationary if the following three conditions are satisfied:

1. *E (X$_t$) = μ*
2. *Var (X$_t$) = σ^2*
3. *Cov(X$_{t-s}$, X$_t$) = γ$_s$*

These conditions stipulate that the first two moments of the variable and its covariance with its past values are invariant with respect to time. When a series checks these properties, it is said to be integrated of order 0 and we note that: $X_t \sim I(0)$

A seriated not I(0), that is to say not checking 1, 2 and 3, is called non-stationary. Granger C. (1969) has shown that any set may be stationnarisée if it is differentiated a sufficient number of times. Thus, when it is necessary to differentiate d times to make I(0), then this series is said integrated sequence of notes that can $X_t \sim I(d)$. Econometricians have a set of instruments to check whether a series is stationary or not and determine, where appropriate, the order of integration.

The test most commonly used to determine the stationary or not a series X_t is the Augmented Dickey and Fuller test (ADF). This test is based on the estimation of the following regression:

$$\Delta X_t = \beta_0 + \beta_1 T + \beta_2 X_{t-1} + \sum_{i=1}^{k} \theta_i \Delta X_{t-i} + \varepsilon_t \tag{3}$$

In this equation: Δ is the first difference operator, T is the trend and is a normally distributed error term. If no difference X_t is introduced into the right side of the equation (4-2), then this is the test of Dickey and Fuller (DF) is used. Otherwise, it is its enhanced version is used. In equation (3), the null hypothesis H_0: = 0; it is tested against the alternative hypothesis H_1: $\neq$ 0. If the t-ratio calculated is less than the critical value of t, then the null hypothesis of the existence of unit roots is rejected. In this case the time-series level is I (0). In this work, we will use the ADF test to determine the nature of the series used and their integration orders.

From the table below, it emerges that for degrees of significance 99%, 95% and 90% of financial liberalization and economic growth are non-stationary in level in some countries (the null hypothesis is accepted). Thus, it is necessary to stationnariser both series by a differentiation process.

The use of the ADF test, we found that the calculated values of the ADF statistics, in almost all are below the critical values for the first differences of the variables (the null hypothesis is rejected). Therefore, the two variables (FLI and LNGDP) become stationary in the first difference.

The first step is to check the stationarity properties of our series with this test. The results are reported in the following table. These results below assume that all variables used in the estimates, in particular, GDP and ILF are stationary in first difference.

The results of the stationarity test are summarized in the table below.

Table 9: *Stationarity tests (ADF): 1980-2014*

Country	Variables	Constant	Trend	ADF test value	Critical Value 5%	Decision
Tunisia	GDP	No	No	3.830	-1.951	-
	DGDP	No	No	-1.912	-1.610	I(1)
	ILF	No	No	0.603	-1.951	-
	DILF	No	No	-3.192	-1.951	I(1)
	GDP	Yes	Yes	-2.757	-3.552	-
	DGDP	Yes	Yes	-3.857	-3.557	I(1)
	ILF	Yes	Yes	-0.814	-3.552	-
	DILF	Yes	Yes	-4.053	-3.557	I(1)
	GDP	Yes	No	0.732	-2.954	-
	DGDP	Yes	No	-3.931	-2.957	I(1)
	ILF	Yes	No	-1.500	-2.954	-
	DILF	Yes	No	-3.710	-2.957	I(1)

Source: *Our calculations*

In general, results of the ADF tests indicate that the two time series are not stationary in level. However, the ADF test applied to the first differences reject the null hypothesis of unit root. Thus, LNGDP and FLI variables were included in the order one (I (1)), which is an important first step for the application of the approach VAR and cointegration tests.

Before estimating the model, we had to determine the optimal number of delay. To do this we used the method information criterion because of its accessibility on Eviews. We selected the number of late that minimizes information criteria, is 1.

Table 10: *Choice of number VAR lags*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-46.99158	NA	0.089851	3.266106	3.359519	3.295989
1	**56.28884**	**185.9048***	**0.000120***	**-3.352590***	**-3.072350***	**-3.262939***
2	57.73210	2.405424	0.000143	-3.182140	-2.715074	-3.032722
3	60.68534	4.528305	0.000155	-3.112356	-2.458464	-2.903170
4	61.35337	0.935239	0.000198	-2.890225	-2.049506	-2.621272
5	67.30664	7.540806	0.000180	-3.020442	-1.992898	-2.691722

 * indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion

4.1. Cointegration and error correction model

If we find unit roots in X_t and Y_t then the causal relationship between the two variables will be estimated in adequate delays levels and not to remove their non-stationary character. Relating the levels of the two series, in turn, will be investigated by the technique of cointegration. This reasoning stems from a simple observation. Thus, two economic phenomena may diverge in the short term and long term converges. This means that the forces binding the long term with the possibility of removal of the equilibrium path in the short term.

X_t and Y_t are cointegrated say if they are integrated of the same order and the residue obtained from their co-integration equation is stationary. The stationarity is tested using the test DF increased called ADF test. In cases where the residue is stationary, then the two sets are called cointegrated. According to the representation of Engel's theorem and Granger

(1987), error correction models (ECM) possible to capture with a single specification of the long-term and short-term bonds that exist between the two variables.

However, the representation of Engel and Granger (1987) is restrictive because it identifies only one cointegration relationship. Also it has been criticized especially at the results found (biased). So, to avoid problems in terms of our results, we apply the Johansen method.

Table 11 presents the cointegration test indicates a long-term equilibrium relationship between the index of financial liberalization and economic growth.

Table 11: *Johansen Cointegration Test*

Unrestricted Cointegration Rank Test (Trace)

Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
0.465004	24.96637	20.26184	0.0104
0.122836	4.325012	9.164546	0.3659

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.465004	20.64136	15.89210	0.0083
At most 1	0.122836	4.325012	9.164546	0.3659

Source: *Our calculations*

The normalized relationship is:

DLNGDP = -0,156DFLI - 7,722

This model means that a 1% increase in the index of financial liberalization in Tunisia generate long-term 0.15% decrease in real GDP per capita.

At the end of this table, the hypothesis of no cointegration between economic growth (LNGDP) and financial liberalization (FLI) is accepted for Tunisia. In other words, the analysis of the trace and the maximum eigenvalue leaves appear a cointegration relationship in the confidence interval of 5% of probability test.

The existence of the cointegration relationship justifies the adoption of an error correction model according to the following representation of the model:

$$\Delta \ln pib_t = \beta_1 \Delta ilf_t + \beta_2 (\ln pib_{t-1} - ilf_{t-1}) \qquad (4)$$

The coefficient means the force of a return to equilibrium which must be negative and significant to accept the specification of the Vector Model Error Correction (VECM) presented, from our calculations, in the following table.

Table 12*: Estimated VECM model*

Cointegrating Eq:	CointEq1	
LNGDP(-1)	1.000000	
FLI(-1)	-0.191019	
	(0.03627)	
	[-5.26725]	
C	-7.165830	
Error Correction:	**D(LNGDP)**	**D(FLI)**
CointEq1	-0.047256	0.319134
	(0.01755)	(0.31848)
	[-2.69323]	[1.00204]
D(LNGDP(-1))	-0.168489	0.299180
	(0.17309)	(3.14187)
	[-0.97340]	[0.09522]
D(FLI(-1))	-0.010774	0.195958
	(0.01007)	(0.18273)
	[-1.07021]	[1.07242]
C	0.027713	0.124697
	(0.00592)	(0.10753)
	[4.67788]	[1.15960]
R-squared	0.210238	0.060825
Adj. R-squared	0.128539	-0.036331
Sum sq. resids	0.016649	5.485419
S.E. equation	0.023961	0.434917
F-statistic	2.573314	0.626058
Log likelihood	78.44140	-17.21714
Akaike AIC	-4.511600	1.285887
Schwarz SC	-4.330205	1.467282
Mean dependent	0.022163	0.163455
S.D. dependent	0.025667	0.427225
Determinant resid covariance (dof adj.)		0.000105
Determinant resid covariance		8.08E-05
Log likelihood		61.84345
Akaike information criterion		-3.142027
Schwarz criterion		-2.688540

Moreover, in our study and in the estimation of economic growth on the composite index of financial liberalization, it seems that the coefficient of the restoring force was very negative, which allows relatively confirm the validity of the model vector error correction. It is noted that in case of short-term imbalance, economic growth in Tunisia fits with convergence rate of 4.7%.

4.2. Determination of granger causality

In its contribution in 1969, C. Granger developed the idea of the causal concept by using the criterion of predictability. So if you have two time series Xt and Yt, then Xt cause Yt because if the future values of the latter are better predicted from past values of Xt. The criterion chosen to decide the quality of the forecast is the variance of the squared error associated with the regression of Yt on Xt. Causality from Yt to Xt is defined in a similar manner.

Practically, C. Granger proposes to compare the quality of the forecast Xt taking only its own past values and that when we introduce past values of Yt next to those of Xt. In this work, we will try to see the causality between real variables and financial variables which makes that every time Xt and Yt are a real variable (economic growth) and a financial

variable (financial liberalization). VAR representation used to test the causality between financial liberalization index (FLIt) and economic growth (LNGDPt) is as follows:

$$FLI_t = \sum_{i=1}^{n} \alpha_i FLI_{t-i} + \sum_{i=1}^{n} \beta_i LNGDP_{t-i} + \varepsilon_{1t} \qquad (5)$$

$$LNGDP_t = \sum_{i=1}^{n} \lambda_i FLI_{t-i} + \sum_{i=1}^{n} \theta_i LNGDP_{t-i} + \varepsilon_{2t} \qquad (6)$$

n: the number of lags

With ε_{1t} and ε_{2t} : uncorrelated white noise. The test of the null hypothesis Ho: = 0 for j = 0, 1, 2, ... n, against the alternative hypothesis H1: 0 for at least some values of (i) is evidence of some causality between the series Xt and Yt series.

Granger causality test assumes stationarity Xt and Yt. No stationarity of the series, when not corrected, will lead to spurious regressions as demonstrated by Granger and Newbold (1974). Another more serious problem of the non-stationary series is the irrelevance of t-Student statistics, t-Fisher and R2 for statistical inference needs. For both these reasons, if the series are not stationary, ie contain unit roots, it is necessary to determine the order of integration and use an appropriate filter to make them stationary.

The corresponding results are given in Table 13. Reading this table shows that the causality between financial liberalization and domestic production is not systematic. First, the results of this test reveal the one hand, an unambiguous causal link between FLI and LNGDP variables.

In 1966 Patrick are two of a country economic development phases. In the first phase, the development of the financial sector promotes and influences economic activity. That said, we are in the presence of a phenomenon "resulting supply" (supply leading) where financial deepening moves the resources of a traditional sector into a modern and dynamic sector (Schumpeter, 1912). In the second phase, when the financial markets become more liquid and less risky, then the direction of causality is reversed and it is made of production to finance (Gurley and Shaw, 1960). That said, we are in the presence of a phenomenon "demand driven" (Following demand). Tunisia is in the first phase and the direction of causality is realized the financial sector to the real sector.

Table 13: *causality test results with one lag, 1980-2014*

Null Hypothesis:	Obs	F-Statistic	Prob.
FLI does not Granger Cause LNGDP	34	4.67514	0.0384
LNGDP does not Granger Cause FLI		0.63553	0.4314

Source: Our calculations

Thus, the direction of causality between the real economy and the financial sphere depends on the structure and specificity of the studied economies. The tests show that for some countries the causal relationship is non-existent, this is explained by a rudimentary financial system, administered and suffers from embryonic and almost missing the stock market. These results can be explained by the fact that the mechanisms of current financial systems are still unable to direct and allocate savings into efficient and profitable investments.

5. CONCLUSION

In this study, we sought to examine the causal relationship between financial liberalization and economic growth in Tunisia during the period 1980-2014 and on the basis of data from the World Bank, the causality test Granger has been done. Indeed, the starting point that guided our research was to verify whether there is a causal link between financial liberalization and economic growth and expiring case whether this causality is unidirectional or bidirectional. To do this, the index of financial liberalization in Tunisia was built in six steps involving different policies implemented during the liberalization process. The liberalization index is based on the factorial method. . The financial liberalization index in Tunisia shows that the 1987-1997 decade was the period in which most of the financial liberalization measures were implemented in Tunisia.

Exploring this thread led us to ask the assumptions that there would be a causal relationship between the two spheres; it would go to one direction or both directions between pairs of variables.

To achieve the objective of our research, three types of tests are performed in order to investigate the causal sources. This is the stationarity test, cointegration test of Johansen, and Granger causality tests.

The main results of our research are:

- ❖ Both variables (LNGDP and FLI) are stationary in first differences;
- ❖ For Tunisia, the pair of variables (LNGDP and FLI) is cointegrated; it evolves together and therefore shows a long-term relationship at least in one direction;
- ❖ We estimated the correction model d4erreur which aims to account in the same equation of a possible deviation from a long-term balance and short-term adjustment process that balance;
- ❖ The Johansen cointegration test reveals that long-term financial liberalization has a negative impact on economic growth in Tunisia, showing that a 1% increase in the index of financial liberalization would lead to a reduction in growth of 0.15 %;
- ❖ In the case of Tunisia, the Granger causality test indicates a unidirectional causality between the pair of variables (the financial liberalization index and real GDP per capita).

The causality test in the error correction model, mainly in Tunisia shows that the financial sector "causes" the real sector.

Ultimately, the relative predominance of as casual relationship from financial liberalization on growth "supply leading" in the terminology of Patrick is partly explained by the fact that the Tunisian banking system is still underdeveloped, unable to meet requirements of financial intermediation and the preponderance of informal financial mechanisms.

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