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Financial Development and Economic Growth An Empirical Analysis for Greece

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Abstract: Problem statement: This study investigated the causal relationship between financial development and economic growth for Greece for the period 1978-2007 using a Vector Error Correction Model (VECM). Questions were raised whether financial development causes economic growth or reversely taking into account the positive effect of industrial production index. Financial market development is estimated by the effect of credit market development and stock market development on economic growth. The objective of this study was to examine the causal relationships between these variables using Granger causality tests based on a Vector Error Correction Model (VECM). **Approach:** To achieve this objective unit root tests were carried out for all time series data in their levels and their first differences according to Dickey-Fuller (1979). Johansen co-integration analysis was applied to examine whether the variables are co-integrated of the same order taking into account the maximum eigenvalues and trace statistics tests. A vector error correction model was selected to investigate the long-run relationship between financial development and economic growth. Finally, Granger causality test was applied in order to find the direction of causality between the examined variables of the estimated model. **Results**: A short-run increase of stock market index per 1% leaded to an increase of economic growth per 0.06% in Greece, also an increase of bank lending per 1% leaded to an increase of economic growth per 0.14% in Greece, while an increase of productivity per 1% leaded to an increase of economic growth per 0.32% in Greece. The estimated coefficient of error correction term found statistically significant with a negative sign, which confirmed that there was not any problem in the long-run equilibrium between the examined variables. The results of Granger causality tests indicated that economic growth causes stock market development and industrial production index, while industrial production index causes credit market development for Greece. **Conclusions:** Therefore, it can be inferred that economic growth has a positive effect on stock market development and credit market development through industrial production growth in Greece.

Key words: Financial development, economic growth, Granger causality

INTRODUCTION

The relationship between economic growth and financial development has been an extensive subject of empirical research. The question is whether financial development causes economic growth or reversely. The main objective of this paper was to investigate the causal relationship between economic growth and financial development taking into account the positive effect of industrial production index.

The theoretical relationship between financial development and economic growth goes back to the study of[1] who focuses on the services provided by financial intermediaries and argues that these are essential for innovation and development.

Schumpeter[1] view is that a well functioning financial system would induce technological innovation by identifying, selecting and funding those entrepreneurs who would be expected to successfully implement their products and productive processes. Robinson[2] claims that “where enterprise leads, finance follows”-it is the economic development which creates the demand for financial services and not vice versa. Financial development follows economic growth as a result of increased demand for financial services. This explanation was originally advanced by[3].

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Theory provides conflicting aspects for the impact of financial development on economic growth. The most empirical studies are based on those theoretical approaches proposed by some different economic school of thoughts which can be divided into three categories: (i) Structuralists, (ii) the repressionists, (iii) endogenous growth theory supporters.

The structuralists contend that the quantity and composition of financial variables induces economic growth by directly increasing saving in the form of financial assets, thereby, encouraging capital formation and hence, economic growth[4,5].

Patrick[4] identified two possible causal relationships between financial development and economic growth. The first causal relationship-called 'demand following'-views the demand for financial services as dependent upon the growth of real output and upon the commercialization and modernization of agriculture and other subsistence sectors. Thus, the creation of modern financial institutions, their financial assets and liabilities and related financial services are a response to the demand for these services by investors and savers in the real economy.

The second causal relationship between financial development and economic growth is termed 'supply leading' by Patrick[4]. 'Supply leading' has two functions: To transfer resources from the traditional, low-growth sectors to the modern high-growth sectors and to promote and stimulate an entrepreneurial response in these modern sectors.

This implies that the creation of financial institutions and their services occurs in advance of demand for them. Thus, the availability of financial services stimulates the demand for these services by the entrepreneurs in the modern, growth-inducing sectors. Therefore, the supply- leading hypothesis contends that financial development causes real economic growth, while in contrary to the demand-following hypothesis argues for a reverse causality from real economic growth to financial development.

The financial repressionists, led by[6,7] often referred to as the "McKinnon-Shaw" hypothesis contend that financial liberalization in the form of an appropriate rate of return on real cash balances is a vehicle of promoting economic growth. The essential tenet of this hypothesis is that a low or negative real interest rate will discourage saving. This will reduce the availability of loanable funds for investment which in turn, will lower the rate of economic growth. Thus, the "McKinnon-Shaw" model posits that a more liberalized financial system will induce an increase in saving and investment and therefore, promote economic growth. The Mckinnon-Shaw school examines the impact of government intervention on the development of the financial system. Their main proposition is that government restrictions on the banking system such as interest rate ceilings and direct credit programs have negative effects on the development of the financial sector and, consequently, reduce economic growth.

The two different schools of thought are agreed to the transmission channels effect on the relationship between financial development and economic growth. Most of the theoretical models followed the emergence of endogenous growth theory.

The endogenous growth theory has reached to similar conclusions with the McKinnon-Shaw hypothesis by explicitly modeling the services provided by financial intermediaries such as risk-sharing and liquidity provision.

King[8] employ an endogenous growth model in which the financial intermediaries obtain information about the quality of individual projects that is not readily available to private investors and public markets. Levine[9] proposed that financial development promotes economic growth through the two 'channels' of capital accumulation and technological innovation. Financial markets evaluate the potential innovative projects, and finance the most promising ones through efficient resource allocation.

The model hypothesis predicts that economic growth facilitates financial market development taking into account the positive effect of industrial production index on economic growth.

This paper has two objectives:

- To apply Granger causality test based on a vector error correction model in order to examine the causal relationships between the examined variables taking into Johansen co-integration analysis
- To examine the effect of stock and credit market development on economic growth taking into account the positive effect of industrial production index on economic growth

The remainder of the paper proceeds as follows: Initially the data and the specification of the multivariate VAR model are described. For this purpose stationarity test and Johansen co-integration analysis are examined taking into account the estimation of vector error correction model.

Finally, Granger causality test is applied in order to find the direction of causality between the examined variables of the estimated model. The empirical results are presented analytically and some discussion issues resulted from this empirical study are developed shortly, while the final conclusions are summarized relatively.

MATERIALS AND METHODS

Data and specification model: In this study the method of Vector Autoregressive Model (VAR) is adopted to estimate the effects of stock and credit market development on economic growth through the effect of industrial production. The use of this methodology predicts the cumulative effects taking into account the dynamic response among economic growth and the other examined variables[10, 13].

In order to test the causal relationships, the following multivariate model is to be estimated:

$$GDP = f(SM, BC, IND) \tag{1}$$

Where:
GDP = The gross domestic product
SM = The general stock market index
BC = The domestic bank credits to private sector
IND = The industrial production index

Following the empirical study of[11] the variable of economic growth (GDP) is measured by the rate of change of real GDP, while the credit market development is expressed by the domestic bank credits to private sector (BC) as a percentage of GDP.

This measure has a basic advantage from any other monetary aggregate as a proxy for credit market development. Although it excludes bank credits to the public sector, it represents more accurately the role of financial intermediaries in channeling funds to private market participants[12]. The general stock market index is used as a proxy for the stock market development The general stock market index (SM) expresses better the stock exchange market, while the Industrial Production Index (IND) measures the growth of industrial sector and its effect on economic growth[14, 15, 16].

The data that are used in this analysis are annual covering the period 1978-2007 for Greece, regarding 2000 as a base year. All time series data are expressed in their levels and are obtained from international financial statistics yearbook[17] and estimated by using econometric computer software Eviews 5.0.

Unit root tests: Time series analysis involving stochastic trends, Augmented Dickey-Fuller unit root tests are calculated for individual series to provide evidence as to whether the variables are integrated. This is followed by a multivariate co-integration analysis. Economic theory does not often provide guidance in determining which variables have stochastic trends, and when such trends are common among variables. If these variables share a common stochastic trend, their first differences are stationary and the variables may be jointly co-integrated.

Augmented Dickey-Fuller (ADF) test involves the estimation one of the following equations respectively:

$$\Delta X_t = \beta X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t \tag{2}$$

$$\Delta X_t = \alpha_0 + \beta X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t \tag{3}$$

$$\Delta X_t = \alpha_0 + \alpha_1 t + \beta X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t \tag{4}$$

Seddighi [21].

The additional lagged terms are included to ensure that the errors are uncorrelated. The maximum lag length begins with 3 lags and proceeds down to the appropriate lag by examining the AIC and SC information criteria.

The null hypothesis is that the variable X_t is a non-stationary series (H_0: $\beta = 0$) and is rejected when β is significantly negative (Ha: $\beta<0$). If the calculated ADF statistic is higher than McKinnon's critical values, then the null hypothesis (H_0) is not rejected and the series is non-stationary or not integrated of order zero I(0). Alternatively, rejection of the null hypothesis implies stationarity. Failure to reject the null hypothesis leads to conducting the test on the difference of the series, so further differencing is conducted until stationarity is reached and the null hypothesis is rejected[18].

In order to find the proper structure of the ADF equations, in terms of the inclusion in the equations of an intercept (α_0) and a trend (t) and in terms of how many extra augmented lagged terms to include in the ADF equations, for eliminating possible autocorrelation in the disturbances, the minimum values of[19] information criterion (AIC) and[20] criterion (SC) based on the usual Lagrange Multiplier LM(1) test were employed.

The econometric software Eviews which is used to conduct the ADF tests, reports the simulated critical values based on response surfaces. The results of the Dickey-Fuller (DF) and Augmented' Dickey-Fuller (ADF) tests for each variable appear in Table 1.

If the time series (variables) are non-stationary in their levels, they can be integrated with integration of order 1, when their first differences are stationary.

Johansen co-integration analysis: Since it has been determined that the variables under examination are integrated of order 1, then the co-integrated test is performed. The testing hypothesis is the null of non-co-integration against the alternative that is the existence of co-integrated using the Johansen maximum likelihood procedure[23, 24,31].

Table 1: DF/ADF unit root tests

In levels						
Variables	lag	eq_f	adf_test stat	cr_val	SBC AIC	LM [prob]
GDPGRE	(p = 0)	(1)	13.45 [1.00]	-2.64 -1.95 -1.61	-4.66 -4.71	0.58 [0.56]
BCGRE	(p = 0)	(2)	-1.65 [0.44]	-3.67 -2.96 -2.62	-2.22 -2.32	0.87 [0.43]
SMGRE	(p = 1)	(3)	-3.64 [0.04]	-4.32 -3.88 -3.72	-1.20 -1.39	0.19 [0.82]
INDGRE	(p = 0)	(1)	1.33 [0.95]	-2.64 -1.95 -1.61	-4.55 -4.60	0.12 [0.88]

Eq_f: Equation form, cr_val: critical values (1, 5, 10%)
AIC: Akaike criterion, SBC: Schwarz Bayesian criterion;
LM: Langrage multiplier test

Table 1: DF/ADF unit root tests

In 1rst differences						
Variables	lag	eq_f	adf_test stat	cr_val	SBC AIC	LM [prob]
GDPGRE	(p = 0)	(3)	-3.98 [0.02]	-3.72 -3.58 -3.22	-4.38	0.47 [0.62]
BCGRE	(p = 0)	(1)	-4.38 [0.00]	-2.65 -1.95 -1.60	-2.19	0.56 [0.57]
SMGRE	(p = 0)	(1)	-3.02 [0.00]	-2.65 -1.95 -1.60	-1.04	1.89 [0.17]
INDGRE	(p = 0)	(1)	-5.84 [0.00]	-2.65 -1.95 -1.60	-4.61	0.21 [0.81]

Eq_f: Equation form, cr_val: critical values (1, 5, 10%)
AIC: Akaike criterion, SBC: Schwarz Bayesian criterion;
LM: Langrage multiplier test

Once a unit root has been confirmed for a data series, the question is whether there exists a long-run equilibrium relationship among variables. According to[25], a set of variables, Y_t is said to be co-integrated of order (d, b)-denoted CI(d, b)-if Y_t is integrated of order d and there exists a vector, β, such that $\beta' Y_t$ is integrated of order (d-b).

Co-integration tests in this paper are conducted using the method developed by[23,26,31]. The multivariate co-integration techniques developed by[23,24] using a maximum likelihood estimation procedure allows researchers to estimate simultaneously models involving two or more variables to circumvent the problems associated with the traditional regression methods used in previous studies on this issue. Therefore, the Johansen method applies the maximum likelihood procedure to determine the presence of co-integrated vectors in non-stationary time series.

Following the studies of Chang[31], Chang and Caudill[30], Johansen[26] and Osterwald-Lenum[27] propose two test statistics for testing the number of co-integrated vectors (or the rank of Π): The trace (λ_{trace}) and the maximum eigenvalue (λ_{max}) statistics.

The Likelihood Ratio statistic (LR) for the trace test (λ_{trace}) as suggested by[26] is:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{p}\ln(1-\hat{\lambda}_i) \quad (5)$$

Where:

$\hat{\lambda}_i$ = The largest estimated value of ith characteristic root (eigenvalue) obtained from the estimated Π matrix
r = 0, 1, 2, …p-1
T = The number of usable observations

The λ_{trace} statistic tests the null hypothesis that the number of distinct characteristic roots is less than or equal to r, (where r is 0, 1, or 2) against the general alternative. In this statistic λ_{trace} will be small when the values of the characteristic roots are closer to zero (and its value will be large in relation to the values of the characteristic roots which are further from zero).

Alternatively, the maximum eigenvalue (λ_{max}) statistic as suggested by Johansen is:

-1.61

$$\lambda_{max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+1}) \quad (6)$$

The λ_{max} statistic tests the null hypothesis that the number of r co-integrated vectors is r against the alternative of (r + 1) co-integrated vectors. Thus, the null hypothesis r = 0 is tested against the alternative that r = 1, r = 1 against the alternative r = 2 and so forth. If the estimated value of the characteristic root is close to zero, then the λ_{max} will be small.

It is well known that Johansen‘s co-integration tests are very sensitive to the choice of lag length. Firstly, a VAR model is fitted to the time series data in order to find an appropriate lag structure. The Schwarz Criterion (SC) and the Likelihood Ratio (LR) test are used to select the number of lags required in the co-integration test. The Schwarz Criterion (SC) and the Likelihood Ratio (LR) test suggested that the value p = 3 is the appropriate specification for the order of VAR model for Greece. Table 2 shows the results from the Johansen co-integration test.

Vector error correction model: Since the variables included in the VAR model are found to be co-integrated, the next step is to specify and estimate a Vector Error Correction Model (VECM) including the error correction term to investigate dynamic behavior of the model. Once the equilibrium conditions are imposed, the VEC model describes how the examined model is adjusting in each time period towards its long-run equilibrium state.

Table 2: Johansen Co-integration tests (GDP, BC, SM, IND)

Country (Greece)				
Johansen test statistics				
Testing Hypothesis	λ_{trace}	Cr_v 5 and 1%	λ_{max}	Cr_v 5 and 1%
H_0: r = 0 and r = 1	46.18	39.89 45.58	25.85	23.80 28.82
H_0: r ≤ 1 and r = 2	20.32	24.31 29.75	13.02	17.89 22.99
H_0: r ≤ 2 and r = 3	7.3	12.53 16.31	7.30	11.44 15.69
Co-integrated vectors	1		1 (only for 5%)	

Notes: Cr_v = Critical values

According to the study of Chang and Caudill[30], since the variables are supposed to be co-integrated, then in the short run, deviations from this long-run equilibrium will feed back on the changes in the dependent variables in order to force their movements towards the long-run equilibrium state. Hence, the co-integrated vectors from which the error correction terms are derived are each indicating an independent direction where a stable meaningful long-run equilibrium state exists. The VEC specification forces the long-run behavior of the endogenous variables to converge to their co-integrated relationships, while accommodates short-run dynamics. The dynamic specification of the model allows the deletion of the insignificant variables, while the error correction term is retained. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state[25,31]. The error-correction model with the computed t-values of the regression coefficients in parentheses is reported in Table 3.

The final form of the Error-Correction Model (ECM) was selected according to the approach suggested by Hendry[28]. The general form of the Vector Error Correction Model (VECM) is the following one:

$$\Delta GDP_t = \beta_0 + \beta_1 \sum_i^n \Delta GDP_{t-i} + \beta_2 \sum_i^n \Delta BC_{t-i} + \beta_3 \sum_i^n \Delta SM_{t-i} + \beta_4 \sum_i^n \Delta IND_{t-i} + \lambda EC_{t-i} + \varepsilon_t \quad (7)$$

Where:

Δ = The first difference operator
EC_{t-1} = The error correction term lagged one period
λ = The short-run coefficient of the error correction term ($-1<\lambda<0$)
ε_t = The white noise term

Granger causality tests: Granger causality is used for testing the long-run relationship between financial development and economic growth. The Granger procedure is selected because it consists the more powerful and simpler way of testing causal relationship[22].

The following bivariate model is estimated:

$$Y_t = a_{10} + \sum_{j=1}^k a_{1j} Y_{t-j} + \sum_{j=1}^k b_{1j} X_{t-j} + u_t \quad (8)$$

$$X_t = a_{20} + \sum_{j=1}^k a_{2j} X_{t-j} + \sum_{j=1}^k b_{2j} Y_{t-j} + u_t \quad (9)$$

Where:

Y_t = The dependent
X_t = The explanatory variable
u_t = A zero mean white noise error term in Eq. 8 while
X_t = The dependent
Y_t = The explanatory variable in Eq. 9

In order to test the above hypotheses the usual Wald F-statistic test is utilized, which has the following form:

$$F = \frac{(RSS_R - RSS_U)/q}{RSS_U/(T-2q-1)}$$

Where:

RSS_U = The sum of squared residuals from the complete (unrestricted) equation
RSS_R = The sum of squared residuals from the equation under the assumption that a set of variables is redundant, when the restrictions are imposed, (restricted equation)
T = The sample size
q = The lag length

The hypotheses in this test are the following:

$$\begin{aligned} &H_0: \text{X does not Granger cause Y, i.e.,} \\ &\quad \{\alpha_{11}, \alpha_{12}, \ldots\ldots\alpha_{1k}\} = 0, \text{if } F_c < \text{critical value of F} \\ &H_a: \text{X does Granger cause Y, i.e.,} \\ &\quad \{\alpha_{11}, \alpha_{12}, \ldots\ldots\alpha_{1k}\} \neq 0, \text{if } F_c > \text{critical value of F} \end{aligned} \quad (10)$$

and

$$\begin{aligned} &H_0: \text{Y does not Granger cause X, i.e.,} \\ &\quad \{\beta_{21}, \beta_{22}, \ldots\beta_{2k}\} = 0, \text{if } F_c < \text{critical value of F} \\ &H_a: \text{Y does Granger cause X, i.e.,} \\ &\quad \{\beta_{21}, \beta_{22}, \ldots\beta_{2k}\} \neq 0, \text{ if } F_c > \text{critical value of F} \end{aligned} \quad (11)$$

Katos[29] and Seddighi [18].

The results related to the existence of Granger causal relationships among economic growth, stock market development, credit market development and productivity appear in Table 4.

RESULTS

The observed t-statistics fail to reject the null hypothesis of the presence of a unit root for all variables in their levels confirming that they are non-stationary at 1% and 5% levels of significance (Table 1). However, the results of the DF and ADF tests show that the null hypothesis of the presence of a unit root is rejected for all variables when they are transformed into their first differences (Table 1).

Therefore, all series that are used for the estimation of ADF equations are non-stationary in their levels, but stationary and integrated of order one I(1), in their first differences. Moreover, the LM(1) test shows that there is no correlation in the disturbance terms for all variables in their first differences. These variables can be co-integrated as well, if there are one or more linear combinations among the variables that are stationary.

The number of statistically significant co-integrated vectors for Greece is equal to 1 (Table 2) and is the following:

$$GDP = 0.99 *SM + 0.19 *BC + 0.15 *IND \qquad (12)$$

The co-integration vector of the model of Greece has rank r<n (n = 3). The process of estimating the rank r is related with the assessment of eigenvalues, which are the following for Greece: $\hat{\lambda}_1 = 0.61$, $\hat{\lambda}_2 = 0.38$, $\hat{\lambda}_3 = 0.23$, $\hat{\lambda}_4 = 0.002$ (Table 2).

For Greece, critical values for the trace statistic defined by Eq. 5 are 39.89 and 45.58 for Ho: r = 0 and 24.31 and 29.75 for Ho: r≤1, 12.53 and 16.31 for Ho: r≤2 at the significance level 5 and 1% respectively as reported by[27], while critical values for the maximum eigenvalue test statistic defined by Eq. 6 are 23.80 and 28.82 for Ho: r = 0, 17.89 and 22.99 for Ho: r≤1, 11.44 and 15.69 for Ho: r≤2 (Table 2).

Then an error-correction model with the computed t-values of the regression coefficients in parentheses is estimated (Table 3). The dynamic specification of the model allows the deletion of the insignificant variables, while the error correction term is retained.

A short-run increase of stock market index per 1% induces an increase of economic growth per 0.06% in Greece, also an increase of bank lending per 1% induces an increase of economic growth per 0.14% in Greece, while an increase of productivity per 1% induces an increase of economic growth per 0.32% in Greece (Table 3).

The estimated coefficient of EC_{t-1} is statistically significant and has a negative sign, which confirms that there is not any a problem in the long-run equilibrium relation between the independent and dependent variables in 5% level of significance, but its relatively value (-0.03) for Greece shows a satisfactory rate of convergence to the equilibrium state per period (Table 3).

Table 3: Vector error correction model

Independent variable	Estimated coefficients
Constant	-0.01
ΔGDP_{t-3}	0.12 [0.56]
ΔSM_t	0.06 [0.11]
ΔBC_{t-3}	0.14 [0.04]
ΔIND_{t-3}	0.32 [0.17]
ECT_{t-1}	-0.03 [0.001]
R^2	0.68
DW	1.74
Diagnostics tests:	
Serial Correlation	0.15 [0.69]
Functional Form	0.72 [0.39]
Normality	0.47 [0.78]
Heteroscedasticity	3.25 [0.07]

Notes: [ ]: I denote the probability levels; Δ: Denotes the first differences of the variables; R^2: Coefficient of multiple determinations adjusted for the degrees of freedom (d. f); DW: Durbin-Watson statistic

Table 4: Granger causality tests

Countries	Dependent Variable	Independent variable	F1	F2	Causal relations
Greece	GDP	SM	0, 04	19, 19	GDP ⇒ SM
		BC	0, 40	2, 91	No causality
		IND	1, 46	3, 92	GDP ⇒ IND
	SM	BC	0, 84	1, 81	No causality
		IND	6, 29	6, 80	SM ⇒ IND
	BC	IND	4, 15	0, 28	IND ⇒ BC

Critical values: 3.34 for Greece

According to Granger causality tests there is a bilateral causality between stock market development and productivity, a unidirectional causal relationship between economic growth and productivity with direction from economic growth to productivity, a unidirectional causal relationship between economic growth and stock market development with direction from economic growth to stock market development, and a unidirectional causal relationship between productivity and credit market development with direction from productivity to credit market development (Table 4).

DISCUSSION

The model of financial system is mainly characterized by the effect of stock market development and credit market development. However, credit market development is determined by the banking growth through the size of bank lending directed to private sector at times of low inflation rates. Stock market development is determined by the trend of general stock market index. The significance of the empirical results is dependent on the variables under estimation.

Theory provides conflicting aspects for the impact of financial development on economic growth or reversely. Less empirical studies have concentrated on examining the reverse relationship between economic growth and financial development taking into account the effect of industrial production.

Most empirical studies examine the relationship between economic growth and financial development using different estimation measures of financial development such as money supply, bank lending, stock market index, stock market capitalization. The most representative estimation measures are the bank lending for credit market development and the general stock market index for stock market development. The general stock market index expresses the trend of stock market development in conjunction with the investment growth, the low inflation rate and industrial production growth.

Financial development follows economic growth as a result of increased demand for financial services. The demand for financial services is dependent upon the growth of real output and upon the commercialization and modernization of agriculture and other subsistence sectors. Thus, the creation of modern financial institutions, their financial assets and liabilities and related financial services are a response to the demand for these services by investors and savers in the real economy. Businesses make new investments to innovative products through bank lending in more developed countries.

The results of this paper are agreed with the studies of Robinson[2] and Friedman[3]. However, more interest should be focused on the comparative analysis of empirical results for the rest of European Union members-states. The direction of causal relationship between financial development and economic growth is regarded as an important issue under consideration in future empirical studies.

CONCLUSION

This study employs with the relationship between financial development and economic growth for Greece, using annually data for the period 1978-2007. The empirical analysis suggested that the variables that determine economic growth present a unit root. Once a co-integrated relationship among relevant economic variables is established, the next issue is how these variables adjust in response to a random shock. This is an issue of the short-run disequilibrium dynamics.

The short run dynamics of the model is studied by analyzing how each variable in a co-integrated system responds or corrects itself to the residual or error from the co-integrating vector. This justifies the use of the term error correction mechanism. The Error Correction (EC) term, picks up the speed of adjustment of each variable in response to a deviation from the steady state equilibrium. The dynamic specification of the model suggests deletion of the insignificant variables while the error correction term is retained. The VEC specification forces the long-run behaviour of the endogenous variables to converge to their co-integrating relationships, while accommodates the short-run dynamics.

A short-run increase of stock market index per 1% leaded to an increase of economic growth per 0.06% in Greece, also an increase of bank lending per 1% leaded to an increase of economic growth per 0.14% in Greece, while an increase of productivity per 1% leaded to an increase of economic growth per 0.32% in Greece. So, economic growth spurs financial market development taking into account the positive effect of industrial production on economic growth. Furthermore, Granger causality tests indicated that economic growth causes stock market development and industrial production index, while industrial production index causes credit market development for Greece. Therefore, it can be inferred that economic growth has a positive effect on stock market development and credit market development through industrial production growth in Greece.

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