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Stock Market Development And Economic Growth

Athanasios Vazakidis and Antonios Adamopoulos
Department of Applied Informatics, University of Macedonia,
156 Egnatias Street, P.O. Box 1591, 540 06, Thessaloniki, Greece

Abstract: Problem statement: This study investigated the causal relationship between stock market development and economic growth for France for the period 1965-2007 using a Vector Error Correction Model (VECM). Questions were raised whether stock market development causes economic growth or reversely taking into account the negative effect of interest rate. Stock market development is estimated by the general stock market index. 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. 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 stock market 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 economic growth of per 1% leaded to an increase of stock market index per 0.24% in France, while an increase of interest rate per 1% leaded to a decrease of stock market index per 0.64% in France. 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 in France. **Conclusion:** Therefore, it can be inferred that economic growth has a positive effect on stock market development, while interest rate has a negative effect on stock market development in France.

Key words: Stock market development, economic growth, granger causality

INTRODUCTION

The relationship between economic growth and stock market development has been the subject of intensive theoretical and empirical studies. The question is whether stock market development causes economic growth or reversely. The main objective of this study was to investigate the causal relationship between economic growth and stock market development taking into account the negative effect of interest rate.

Stock market development has played a crucial role in some economies in promoting economic growth [1,2]. Stock markets contribute to the mobilization of domestic savings by enhancing the set of financial instruments available to savers to diversify their portfolios. In doing so they provide an important source of investment capital at relatively low cost.

Efficient stock markets provide guidelines as a mean to keep appropriate monetary policy through the issuance and repurchase of government securities in the liquid market, which is an important step towards financial liberalization. Similarly, well-organized and active stock markets could modify the pattern of demand for money and would help create liquidity that eventually enhances economic growth[3]. A well functioning and liquid stock market, that allows investors to diversify away unsystematic risk, will increase the marginal productivity of capital[4].

Another important aspect through which stock market development may influence economic growth is risk diversification. Obstfeld[5] suggests that international risk sharing through internationally integrated stock markets improves the allocation of

Corresponding Author: Athanasios Vazakidis, Department of Applied Informatics, University of Macedonia, 156 Egnatias Street, P.O. Box 1591, 540 06, Thessaloniki, Greece

resources and accelerates the process of economic growth.

In the models of Levine[6], Bencivenga and Smith[7] and Saint-Paul[8] stock markets improve firm efficiency by eliminating the premature liquidation of firm capital, enhancing the quality of investments and therefore increasing enhance economic growth. Enhanced stock market liquidity reduces the disincentives for investing in long-duration and higher-return projects, since investors can easily sell their stake in the project before it matures and is expected to boost productivity growth[9].

During liquidity shocks, investors can sell their shares to another agent. Stock markets may also promote growth by increasing the proportion of resources allocated to firms. Through the diversification of productivity risk, even risk-averse investors can invest in firms. Portfolio diversification, through the stock market, may have an additional growth effect by encouraging specialization of production[8].

The model hypothesis predicts that economic growth facilitates stock market development taking into account the negative effect of interest rate on stock market development and economic growth.

This study has two objectives:

- To examine the long run relationship among economic growth, interest rate and stock market development
- 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 account Johansen co-integration analysis

The remainder of the study 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 economic growth and interest rate on stock market development. The use of this methodology predicts the cumulative effects taking into account the dynamic response among stock market development and the other examined variables[10, 13].

In order to test the causal relationships, the following multivariate model is to be estimated Eq. 1:

$$\mathrm{LSM} = f\left(\mathrm{LGDP},\ \mathrm{LR}\right) \tag{1}$$

Where:

GDP = The gross domestic product
SM = The general stock market index
R = The interest rate
L = The symbol of logarithm

Following the empirical study of[11] the variable of economic Growth (GDP) is measured by the rate of change of real GDP. 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 taking into account the effect of interest Rate (R)[12, 14-16].

The data that are used in this analysis are annual covering the period 1965-2007 for France, regarding 2000 as a base year and are obtained from international financial statistics yearbook[17]. All data are expressed in their logarithms in order to include the proliferative effect of time series and are symbolized with the letter L preceding each variable name. The econometric computer software Eviews 5.0 is used for the estimation of the model.

Unit Root Tests: For univariate time series analysis involving stochastic trends, Phillips-Perron (PP) and Kwiatkowski *et al.*[21] (KPSS) 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.

Phillips and Perron (PP)[18] test is an extension of the Dickey-Fuller (DF) test[19], which makes the semi-parametric correction for autocorrelation and is more robust in the case of weakly autocorrelation and heteroskedastic regression residuals. According to Choi[20], the Phillips-Perron test appears to be more powerful than the ADF test for the aggregate data.

Although the Phillips-Perron (PP) test gives different lag profiles for the examined variables (time series) and sometimes in lower levels of significance, the main conclusion is qualitatively the same as reported by the Dickey-Fuller (DF) test. Since the null hypothesis in the Augmented Dickey-Fuller test is that a time series contains a unit root, this hypothesis is accepted unless there is strong evidence against it. However, this approach may have low power against stationary near unit root processes.

The Phillips-Perron as cited in Laopodis and Sawhney[35] unit root test is very general and can be used in the presence of heteroscedastic and autocorrelated innovations is specified as follows Eq. 2:

$$\ln(1+r)=\alpha+\beta\left(\frac{t\text{-}T}{2}\right)+\delta\ln(1+r_{t-1})+\zeta_t \qquad (2)$$

For t = 1,2,…..,T where r_t denotes interest rate at time t, (t-T/2) is a time trend and T is the sample size.

Equation 2 Tests Three Hypotheses: The first hypothesis is that the series contains a unit root with a drift with a drift and a time trend: H_0^1: δ = 1. The second hypothesis is that the series contains a unit root but without a time trend: H_0^2: β = 0, δ = 1. The third hypothesis is that the series contains a unit root but without a drift or a time trend: H_0^3: a = 0, β = 0, δ = 1. The statistics that are used to test each hypothesis are $Z(t_\delta)$, $Z(\Phi_2)$, $Z(\Phi_3)$, respectively and their corresponding equations are as follows as cited in Laopodis and Sawhney[35] Eq. 2a-e:

$$Z(t_\delta)=\left(\frac{\sigma_0}{\sigma_{Tl}}\right)t_\sigma-\left(\frac{T^3}{3^{1/2}4D^{1/2}_{xx\sigma Tl}}\right)\left(\sigma^2_{Tl}\text{-}\sigma^2_0\right) \qquad (2a)$$

$$\begin{aligned}Z(\Phi_3)=&\left(\frac{\sigma_0^2}{\sigma_{Tl}^2}\right)\Phi_3-\left(\frac{1}{2\sigma^2_{Tl}}\right)\left(\sigma^2_{Tl}-\sigma^2_0\right)\times\\&\left[T(\delta-1)-\left(\frac{T^6}{48D_{xx}}\right)\left(\sigma^2_{Tl}-\sigma^2_0\right)\right]\end{aligned} \qquad (2b)$$

$$\begin{aligned}Z(\Phi_2)=&\left(\frac{\sigma_0^2}{\sigma_{Tl}^2}\right)\Phi_2-\left(\frac{1}{3\sigma^2_{Tl}}\right)\left(\sigma^2_{Tl}-\sigma^2_0\right)\times\\&\left[T(\delta-1)-\left(\frac{T^6}{48D_{xx}}\right)\left(\sigma^2_{Tl}-\sigma^2_0\right)\right]\end{aligned} \qquad (2c)$$

Where:

$$\Phi_3=\frac{T\left(\sigma_0^2-\left(\bar{r}\text{-}\bar{r}_{t-1}\right)^2-\sigma^2\right)}{2\sigma^2} \qquad (2d)$$

$$\Phi_2=\frac{T\left(\sigma_0^2-\sigma^2\right)}{3\sigma^2} \qquad (2e)$$

And σ^2 is the OLS residual variance, σ_0^2 is the variance under the particular hypothesis for the standard t-test for δ = 1. D_{xx} is the determinant of the (X'X), where X is the T_3 matrix of explanatory variables in Eq. 2.

Finally, σ_{Tl} is a consistent estimator of the variance of ζ and is computed as follows Eq. 2f:

$$\sigma^2_{Tl}=\sum_{t=1}^{T}\frac{\zeta_t^2}{T}+\frac{\left(2\sum_{t=1}^{1}\sum_{t=s=1}^{T}\left(1-s/(l+1)\right)\zeta_t\zeta_{t-s}\right)}{T} \qquad (2f)$$

where, s and l are the lag truncation numbers and s<l. The estimator σ_{Tl} is consistent under general conditions because it allows for effects of serially correlated and heterogeneously distributed innovations. The three statistics are evaluated under various lags (l = 0 to 12).

Following the study of Chang[36], Kwiatkowski *et al*.[21] present a test where the null hypothesis states that the series is stationary. The KPSS test complements the Augmented Dickey-Fuller test in that concerns regarding the power of either test can be addressed by comparing the significance of statistics from both tests. A stationary series has significant Augmented Dickey-Fuller statistics and insignificant KPSS statistics.

According to Kwiatkowski *et al*.[21], the test of KPSS assumes that a time series can be composed into three components, a deterministic time trend, a random walk and a stationary error Eq. 3:

$$y_t = \delta t + r_t + \varepsilon_t \qquad (3)$$

where, r_t is a random walk $r_t = r_{t-1} + u_t$… The u_t is iid $(0, \sigma_u^2)$. The stationarity hypothesis implies that $\sigma_u^2 = 0$.

Under the null, y_t, is stationary around a constant (δ = 0) or trend-stationary (δ ≠ 0). In practice, one simply runs a regression of y_t over a constant (in the case of level-stationarity) ore a constant plus a time trend (in the case of trend-stationary). Using the residuals, e_i, from this regression, one computes the LM statistic Eq. 3a-d:

$$LM = T^{-2}\sum_{t=1}^{T}S_t^2/S_{\varepsilon t}^2 \qquad (3a)$$

where, $S_{\varepsilon t}^2$ is the estimate of variance of ε_t:

$$S_t=\sum_{i=1}^{t}e_i,\ t = 1,2,\ldots\ldots T \qquad (3b)$$

The distribution of LM is non-standard: the test is an upper tail test and limiting values are provided by Kwiatkowski[21], via Monte Carlo simulation. To allow weaker assumptions about the behaviour of ε_t, one can rely, following Phillips[22] on the Newey[23] estimate of the long-run variance of ε_t which is defined as:

$$S^2(l) = T^{-1}\sum_{t=1}^{T} e_i^2 + 2T^{-1}\sum_{s=1}^{l} w(s,l) \sum_{t=s+1}^{T} e_i e_{i-k} \tag{3c}$$

where, w(s,l) = 1 - s / (l+1).
In this case the test becomes:

$$\nu = T^{-2}\sum_{t=1}^{T} S_t^2 / S^2(l) \tag{3d}$$

Which is the one considered here. Obviously the value of the test will depend upon the choice of the ‘lag truncation parameter’, l. Here we use the sample autocorrelation function of Δe_t to determine the maximum value of the lag length l.

The KPSS statistic tests for a relative lag-truncation parameter (l), in accordance with the default Bartlett kernel estimation method (since it is unknown how many lagged residuals should be used to construct a consistent estimator of the residual variance), rejects the null hypothesis in the levels of the examined variables for the relative lag-truncation parameter (l). Therefore the combined results (PP, KPSS) from all tests can be characterized as integrated of order one, I(1).

The econometric software Eviews which is used to conduct the PP, KPSS tests, reports the simulated critical values based on response surfaces. The results of the Phillips and Perron[18] and Kwiatkowski *et al.*[21] 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 [24, 25].

Following the study of Chang and Caudill[37], 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[26], 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 study are conducted using the method developed by[24, 27]. The multivariate co-integration techniques developed by[24, 25] 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.

According to Chang and Caudill[37], Johansen[27] and Osterwald-Lenum[28] 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[27] is Eq. 4:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{p} \ln(1-\hat{\lambda}_i) \tag{4}$$

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 Eq. 5:

$$\lambda_{max}(r, r+1) = -T \ln(1-\hat{\lambda}_{r+1}) \tag{5}$$

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)[29] 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 France. Table 2 shows the results from the Johansen co-integration test.

Table 1: PP, KPSS unit root tests

	PP_ test stat			KPSS test stat	
Variables	$Z(\Phi_3)$	$Z(\Phi_2)$ $Z(t_\delta)$	h_c	h_t	
In levels					
LSM	-1.92*	0.05	-2.77	0.69**,*	0.11
	(for k = 1)	(for k = 0)	(for k = 1)	(for l = 6)	(for l = 4)
LGDP	-5.76***,**,*	-4.39***,**,*	-0.39	0.69**,*	0.21**,*
	(for k = 0)	(for k = 4)	(for k = 3)	(for l = 6)	(for l = 5)
LR	0.49	-0.33	-1.93	0.45*,	0.20**,*
	(for k = 0)	(for k = 0)	(for k = 0)	(for l = 5)	(for l = 5)
In 1rst differences					
ΔLSM	-4.29	-4.90	-4.85	0.10***,**,*	0.12***,**
	(for k = 0)	(for k = 0)	(for k = 0)	(for l = 1)	(for l = 9)
ΔLGDP	-2.15***	-3.13***	-4.23	0.61	0.13***,**
	(for k = 7)	(for k = 9)	(for k = 0)	(for l = 5)	(for l = 1)
ΔLR	-5.41	-5.39	-5.76	0.52***	0.12**,*
	(for k = 0)	(for k = 0)	(for k = 0)	(for l = 5)	(for l = 7)

$Z(\Phi_3)$, $Z(\Phi_2)$, $Z(t_\delta)$: The PP statistics; h_c and h_t: The KPSS statistics; k, l = bandwidth lengths: Newey-West using Bartlett kernel; The critical values at 1, 5 and 10% are -2.62, -1.94, -1.61, for $Z(\Phi_3)$, -3.59, -2.93, -2.60 for $Z(\Phi_2)$ and for -4.19, -3.52, -3.19 for $Z(t_\delta)$, respectively. The critical values at 1, 5 and 10% are 0.73, 0.46 and 0.34 for h_c and 0.21, 0.14 and 0.11 for h_t respectively (Kwiatkowski *et al.*[21] Table 1). ***, **, *: Indicate that those values are not consistent with relative hypotheses at the 1, 5 and 10% levels of significance relatively

Table 2: Johansen co-integration tests (LSM, LGDP, LR)

Johansen test statistics				
Testing Hypothesis	λ_{trace} 0.05	Critical value [prob]**	λ_{max} 0.05	Critical value [prob]**
None*	34.19	24.27 [0.00]	23.89	17.79 [0.00]
At most 1	10.29	12.32 [0.10]	7.64	11.22 [0.19]
At most 2	2.65	4.12 [0.12]	2.65	4.12 [0.12]

Trace test and maximum eigenvalue tests indicate 1 co-integrating eqn(s) at the 0.05 level. *: Denotes rejection of the hypothesis at the 0.05 level; **: MacKinnon-Haug-Michelis[34] p-values

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.

Following the study of Chang and Caudill[37], 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[30]. 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[31]. The general form of the Vector Error Correction Model (VECM) is the following one Eq. 6:

$$\Delta LSM_t = \beta_1 \sum_i^n \Delta LSM_{t-i} + \beta_2 \sum_i^n \Delta LGDP_{t-i} + \beta_3 \sum_i^n \Delta LR_{t-i} + \lambda EC_{t-i} + \varepsilon_t \tag{6}$$

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<λ<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[26].

Table 3: Vector error correction model

	$\Delta LGDP_{t-3}$+0.13	ΔLSM_{t-1}-0.69		
ΔLSM_t = 0.012+0.24		---		ΔLR_{t-1}-0.01 ect_{t-1}
(0.18)	(0.22)	(0.83)	(-2.79)	(-0.61)
[0.85]	[0.82]	[0.41]	[0.008]	[0.04]
R^2 = 0.23		DW = 1.96		

Notes: [ ]: I denote the probability levels; Δ: Denotes the first differences of the variables; R^2: Coefficient of determination; DW: Durbin-Watson statistic

Table 4: Pairwise Granger causality tests

Country: France
Sample: 1965-2007
Lags: 2

Null hypothesis:	F-Stat [Prob	Causal relation
LGDP does not granger cause LSM	6.91 [0.002]	LGDP→LSM
LSM does not granger cause LGDP	0.98 [0.383]	
LR does not granger cause LSM	4.32 [0.020]	LGDP↔LSM
LSM does not granger cause LR	5.66 [0.007]	
LR does not granger cause LGDP	0.18 [0.833]	LGDP→LR
LGDP does not granger cause LR	6.37 [0.004]	

The following bivariate model is estimated Eq. 7 and 8:

$$Y_t = a_{10} + \sum_{j=1}^{k} a_{1j} Y_{t-j} + \sum_{j=1}^{k} b_{1j} X_{t-j} + u_t \qquad (7)$$

$$X_t = a_{20} + \sum_{j=1}^{k} a_{2j} X_{t-j} + \sum_{j=1}^{k} b_{2j} Y_{t-j} + u_t \qquad (8)$$

Where:

Y_t = The dependent
X_t = The explanatory variable
u_t = A zero mean white noise error term in Eq. 7 while
X_t = The dependent
Y_t = The explanatory variable in Eq. 8

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 [32, 33] Eq. 9 and 10:

$$\begin{aligned} &H_0: \text{ X does not Granger cause Y, i.e.,} \\ &\quad \{\alpha_{11},\ \alpha_{12}, \ldots\ldots \alpha_{1k}\} = 0, \text{if } F_c < \text{critical value of F} \\ &H_a: \text{ X does Granger cause Y, i.e.,} \\ &\quad \{\alpha_{11},\ \alpha_{12}, \ldots\ldots \alpha_{1k}\} \neq 0, \text{if } F_c > \text{ critical value of F} \end{aligned} \qquad (9)$$

And:

$$\begin{aligned} &H_0: \text{ Y does not Granger cause X, i.e.,} \\ &\quad \{\beta_{21},\ \beta_{22}, \ldots \beta_{2k}\} = 0, \text{if } F_c < \text{critical value of F} \\ &H_a: \text{ Y does Granger cause X, i.e.,} \\ &\quad \{\beta_{21},\ \beta_{22}, \ldots \beta_{2k}\} \neq 0, \text{ if } F_c > \text{ critical value of F} \end{aligned} \qquad (10)$$

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 5% levels of significance (Table 1). However, the results of the PP and KPSS 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 are non-stationary in their levels, but stationary and integrated of order one I(1), 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 France is equal to 1 (Table 2) and is the following Eq. 11:

$$\mathrm{LSM} = 0.60442 * \mathrm{LGDP} - 0.14645 * \mathrm{LR} \qquad (11)$$

The co-integration vector of the model of France 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 France: $\hat{\lambda}_1 = 0.44$, $\hat{\lambda}_2 = 0.17$, $\hat{\lambda}_3 = 0.06$, (Table 2). For France, critical values for the trace statistic defined by Eq. 4 are 34.19 for none co-integrating vectors and 10.29 for at most one vector, 2.65 for at most two vectors at the 0.05 level of significance as reported by[34], while critical values for the maximum eigenvalue test statistic defined by Eq. 5 are 23.89 for none co-integrating vectors, 7.64 for at most one vector and 2.65 for at most two vectors respectively (Table 2).

Then an error-correction model with the computed t-values of the regression coefficients in parentheses is estimated. 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 economic growth per 1% induces an increase of stock market index per 0.2% in France, while an increase of interest rate per 1% induces an decrease of stock market index per 0.6% in France 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 (-0.01) for France shows a satisfactory rate of convergence to the equilibrium state per period (**Table 3**).

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

DISCUSSION

The model of stock market development is mainly characterized by the effect of economic growth and interest rate. 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.

Most empirical studies examine the relationship between economic growth and stock market development using different estimation measures. The most representative estimation measures for stock market development are the general stock market index and stock market capitalization or stock market liquidity. The general stock market index expresses the trend of stock market development in conjunction with the investment growth and the low interest rate.

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

Stock markets give lenders immediate access to their funds while simultaneously offering borrowers a long-term supply of capital. By facilitating diversify-cation, financial intermediaries allow the economy to invest relatively more in the risky productive technology. Without stock markets, investors facing liquidity shocks are forced to withdraw funds invested in long-term investment projects. Investors also want to diversify productivity risk associated with individual investment projects. This spurs economic growth.

The results of this study are agreed with the studies of[12] and[13]. The direction of causal relationship between stock market development and economic growth is regarded as an important issue under consideration in future empirical studies. However, more interest should be focused on the comparative analysis of empirical results for the rest of European Union members-states.

CONCLUSION

This study employs with the relationship between stock market development and economic growth for France, using annually data for the period 1965-2007. For univariate time series analysis involving stochastic trends, Phillips-Perron (PP) and Kwiatkowski *et al.*[21] (KPSS) unit root tests are calculated for individual series to provide evidence as to whether the variables are integrated.

The empirical analysis suggested that the variables that determine stock market development present a unit root. Therefore, all series are stationary and integrated of order one I(1), in their first differences. Since it has been determined that the variables under examination are stationary and integrated of order 1, then the

Johansen co-integration analysis is performed taking into account the maximum likelihood procedure.

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 relation-ships, while accommodates the short-run dynamics. A short-run increase of economic growth per 1% leaded to an increase of stock market index per 0.24% in France, while an increase of interest rate per 1% leaded to a decrease of stock market index per 0.64% in France.

Furthermore, Granger causality tests indicated that economic growth causes stock market development and interest rate, while there is a bilateral causality between stock market development and interest rate for France. Therefore, it can be inferred that economic growth has a positive effect on stock market development taking into account the negative effect of interest rate on stock market development and economic growth.

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