Łukasz Zięba*

An analysis of the relationships among NASDAQ Baltic stock exchanges: VAR approach

Abstract

The author examines the relationships among three stock exchanges of selected Baltic countries: Latvia, Estonia, and Lithuania. The respective stock exchange indexes are used as variables, OMXR for Latvia, OMXT for Estonia, and OMXV for Lithuania. The regression equations are estimated with the use of Vector Autoregressive (VAR) model. The author employs 80 observations for the sample period from 2002 Q1 to 2021 Q4. After determining the optimal lag order, the impulse response function is calculated. The variance decomposition is carried out subsequently. A causality among the stock exchanges in question is determined.

JEL Classifications: C51; C58; G17

Keywords: Stock exchanges; VAR Model; Impulse Response Analysis; Variance Decomposition

Paper type: Theoretical research article

Introduction

The development of stock exchanges depends on many economic, social and political factors. These factors, to a greater or lesser extent, shape the financial markets of a given country and, consequently, also affect its stock exchanges. In today's global economy, it is all the more important as the free flow of capital allows for practically unlimited investment

---

*Ph.D., Kazimierz Pulaski University of Technology and Humanities in Radom
opportunities to individual and institutional investors. This also applies to stock exchanges. One of the consequences of such a turn of events are the processes of mergers and acquisitions of stock exchanges and the ongoing process of stock exchange consolidation. As a result, the development of stock exchanges as well as the capitalisation of companies listed in a given country may depend on some factors in other countries, regions or the situation on international financial markets. In other words, the relationships and dependencies among stock exchanges in different countries may deepen. Changes in the prices of shares listed on stock exchanges may be subject to fluctuations resulting not only from the situation in a domestic market, but also due to changes in the economic situation on foreign exchanges. This may indicate a link between the exchanges in the short term, long term or both. In this article, the author investigates whether there is a statistically significant relationship among the stock exchanges in selected Baltic countries (Lithuania, Latvia, Estonia) using the VAR method.

**Literature Review**

In the quantitative analysis of stock exchanges, the study of the determinants of their development, relationships, and the degree of integration among the analysed exchanges, authors use various methods. Some use the VAR model, which serves to study the determinants of the development of financial markets, stock exchanges, and the banking sector. The authors apply the VAR method together with a wide range of variables to determine the significance and direction of their impact on stock exchanges.

Thangavelu and Ang (2004) examine the relationship between financial development and economic growth in Australia with the use of the VAR model. They establish a causality from economic growth to the development of financial intermediaries and from financial markets to economic growth.

Caporale, Howells and Soliman (2004) conclude that well developed stock markets can foster economic growth in the long run. They employ the method of VAR and VAR causality tests. Their study refers to Argentina, Chile, Greece, Korea, Malaysia, Philippines, and Portugal. The quarterly data sample spans the period from 1977Q1 to 1998Q4. They use some sets of indicators like market capitalisation/GDP, total value of shares traded on the stock exchange/GDP, bank deposit/GDP, and the ratio of bank claims on the private sector/GDP.

The studies carried out by Rousseau and Wachtel (2000) on a group of 47 countries in the period of 1980-1995 use annual data. The application of econometric model uses short time series (5-year) and the VAR method. They employ the following set of indicators: M3/GDP, market
An analysis of the relationships...

capitalization/GDP, value traded/GDP. They confirm that there is a strong impact on the liquidity increase of stock exchanges and an increased market activity of financial intermediaries for economic growth.

Dritsaki and Dritsaki-Bargiota (2005) examine empirically the causal relationship among financial development, credit market, and economic growth in Greece. They use a trivariate autoregressive VAR model and conclude that there is a bilateral causal relationship between banking sector development and economic growth and a unidirectional causality between economic growth and stock market development in Greece in the period 1988.1-2002.12.

Shan (2005) uses a Vector Autoregression (VAR) approach with quarterly time-series data for the countries examined and utilises total credit as a proxy of financial development. He finds only weak evidence to support the hypothesis that financial development leads economic growth in 10 OECD countries and China.

Abu-Bader’s and Abu-Qarn’s (2008) empirical results strongly support the hypothesis that the finance-growth causality is bi-directional. Financial development causes economic growth through both increasing resources for investment and enhancing efficiency. The authors examine the causal relationship between financial development and economic growth in Egypt during the period 1960-2001 using the VAR model.

Dritsakis and Adamopoulos (2004) use a M2/gdp and trade flows (imports plus exports) as variables. They employ quarterly data from 1960:I to 2000: IV and the VAR method of estimation. They find that there is a causal relationship between financial development and economic growth, and between the degree of openness of the economy and economic growth in Greece in the given timeframe.

Caporale, Howells and Soliman (2005) confirm that investment productivity is the channel through which stock market development enhances the economic growth in the long run, especially in less-developed countries. As variables, they use gross fixed capital formation/nominal GDP, real change of GDP to the real level of total investment, the value of listed shares/GDP, and the total value of shares traded on the stock exchange/GDP. They employ quarterly data, 1979Q1 – 1998Q4 for Chile, Korea, Malaysia, and Philippines. The method of estimation is the VAR model.

Ghirmay (2006) employs the VAR model in his research. He states that financial development affects growth through the channels of investment and its productivity in the USA. He uses productivity, investment, and financial development as a set of variables. He utilises an annual dataset for the period of 1970-2001.

Shan and Jianhong (2006) use annual data for China from 1978 to 2001. The rate of change of total credit, the rate of change of investment, trade
flows/gdp, and the rate of change of labour force are variables and VAR is the method of estimation of structural parameters. They conclude that there is a bi-directional causality between financial development and economic growth in China. Financial development seems to be only the second force after labor input in contributing to economic growth in China.

Theophano and Sunil (2006), using bivariate VAR models, suggest that there is a negative impact of inflation and money supply on stock returns. The study covers the period 1990-1999.

Basci and Karaca (2013) examine the relationship between ISE 100 Index and a set of four macroeconomic variables (exchange, gold, import, export) using the Vector Autoregressive (VAR) model for Turkey. They utilise monthly data from January, 1996 to October, 2011. After running VAR, they conclude that the second default of the exchange is 31% explained by share indices.

Data and Methodology

The indexes of three NASDAQ Baltic exchanges serve as variables: OMXR for Latvia, OMXT for Estonia, and OMXV for Lithuania. They are all-share type (or broad) indexes, which means they cover all or almost all the companies listed on the respective exchanges. The author utilizes 80 observations for the sample period from 2002 Q1 to 2021 Q4. However, the final number of observations used in the model is 72 due to a data transformation applied in order to eliminate the problem of non-stationarity of variables.

The regression equations are estimated with the use of the Vector Autoregressive (VAR) model. The regression equation can be represented in the general matrix form as follows:

$$y_t = A_0 D_t + \sum_{k=1}^KA_k y_{t-k} + e_t$$

where:

$t = 1, 2, 3, ..., T$,

$y_t$ - the vector of current observations of $n$ variables of the model - $y_t = [y_{1t} y_{2t} ... y_{nt}]'$,

$D_t$ - the vector of deterministic equation components, such as intercept, time variable, zero-one variables or other non-stochastic regressors,

$A_0$ - the matrix of parameters of $D_t$ vector of variables with no zero elements,

$A_k$ - the matrix of parameters of lagged variables of $y_t$ vector with no zero elements,

$e_t$ - the vector of stationary error terms - $e_t = [e_{1t} e_{2t} ... e_{nt}]'$ with normal distribution and mean and variance of zero.
3 variables are under study, so it is required to estimate 3 equations as listed below:

\[ y_{1t} = \mu_1 + \sum_{i=1}^{k} \alpha_{1i} y_{1t-i} + \sum_{i=1}^{k} \beta_{1i} y_{2t-i} + \sum_{i=1}^{k} \gamma_{1i} y_{3t-i} + \varepsilon_{1t} \]  
\[ (2) \]

\[ y_{2t} = \mu_2 + \sum_{i=1}^{k} \alpha_{2i} y_{1t-i} + \sum_{i=1}^{k} \beta_{2i} y_{2t-i} + \sum_{i=1}^{k} \gamma_{2i} y_{3t-i} + \varepsilon_{2t} \]  
\[ (3) \]

\[ y_{3t} = \mu_3 + \sum_{i=1}^{k} \alpha_{3i} y_{1t-i} + \sum_{i=1}^{k} \beta_{3i} y_{2t-i} + \sum_{i=1}^{k} \gamma_{3i} y_{3t-i} + \varepsilon_{3t} \]  
\[ (4) \]

where:
- \( k \) – the number of lags, in this case up to 6,
- \( y_{1t} \) – the value of Latvian stock exchange index OMXR in time \( t \),
- \( y_{2t} \) – the value of Estonian stock exchange index OMXT in time \( t \),
- \( y_{3t} \) – the value of Lithuanian stock exchange index OMXV in time \( t \),
- \( y_{1t-i} \) – the lagged value of Latvian stock exchange index OMXR up to the lag order of 6,
- \( y_{2t-i} \) – the lagged value of Estonian stock exchange index OMXT up to the lag order of 6,
- \( y_{3t-i} \) – the lagged value of Lithuanian stock exchange index OMXV up to the lag order of 6,
- \( \alpha_{1i}, \alpha_{2i}, \alpha_{3i} \) – structural parameters, where the first subscript denotes the number of equation and the second subscript, the number of lags,
- \( \beta_{1i}, \beta_{2i}, \beta_{3i} \) – structural parameters, where the first subscript denotes the equation number and the second subscript, the number of lags,
- \( \gamma_{1i}, \gamma_{2i}, \gamma_{3i} \) – structural parameters, where the first subscript denotes the equation number and the second subscript, the number of lags,
- \( \mu_1, \mu_2, \mu_3 \) – the intercept, where the subscript denotes the equation number,
- \( \varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t} \) – error term (called shock, innovation or impulse in the VAR nomenclature), where the subscript denotes the equation number.

The basic condition for building a VAR model is the stationarity of the variables. In the first step, the stationarity is examined. At the next stage, the length of the lags that will be used to build the model is determined. The Akaike (AIC), Hannan-Quinn (HQC), and Schwartz information criteria (BIC) are most often used. Having stationary variables and selected lag order, the model is estimated. The tests of autocorrelation, the test of ARCH effect, and the test for the normality of residuals should be performed then. This is also where Granger causality is defined. Engle-Granger cointegration can also be examined to determine if there is a statistically significant long-term relationship between
the variables under study. Then the unit roots of the equation are estimated, followed by the impulse response function. Finally, variance decomposition is carried out for individual variables and possibly a forecast for future periods. In order to test for the stationarity of variables, they are subjected to the augmented Dickey-Fuller test (ADF) with the intercept. For the purposes of the ADF test, 11 lags suggested by the GRETl program are adopted. The variables turn out to be stationary, as the obtained p-values are lower than the accepted significance level of 0.05. In order to estimate the number of lags, all three information criteria are taken into account. The maximum lag of six is implemented. The function with the intercept is used. The results are presented in Table 1.

Table 1. The choice of lag order.

| Lags | loglik     | p(LR)     | AIC        | BIC        | HQC        |
|------|------------|-----------|------------|------------|------------|
| 1    | 181.50450  | -4.708458 | -4.329014  | -4.557401  |
| 2    | 201.55305  | 0.00001   | -5.015362  | -4.351335* | -4.751011* |
| 3    | 210.43053  | 0.03813   | -5.011959  | -4.063348  | -4.634314  |
| 4    | 217.71758  | 0.10332   | -4.964377  | -3.731183  | -4.473439  |
| 5    | 227.97677  | 0.01497   | -4.999355  | -3.481577  | -4.395123  |
| 6    | 241.93492  | 0.00099   | -5.137081* | -3.334720  | -4.419556  |

Source: The author’s own calculation using GRETl.

The optimal lag order is the one for which information criterion values are the lowest, which means the lowest information loss. Not all the information criteria indicate the same order of lags. After the multiple estimation of the VAR model for all the variables including and excluding seasonal instrumental variables, the second-order lags give a statistically insignificant result for the variables in each of the three equations, therefore, the order of 6 lags is used. It is consistent with the Akaike information criterion.

In each estimation, the seasonal variables are not statistically significant and some additional tests of seasonality confirm the absence of seasonality in the analysed time series. Moreover, the estimates for the order of 2 lags give too low values of the normality of the residuals test (below the adopted significance level of 0.05). As a result, the order of six lags is adopted for the model estimation.

Empirical Results
The model estimation results indicate that the changes in the Latvian stock exchange situation depend on their changes from previous periods (1, 2, 3, 4 and 6) and on changes from previous periods (2, 3, 4 and 5) of the Estonian stock exchange index. Changes in the stock market situation as measured by the stock exchange index in Lithuania do not have a statistically significant effect on the changes in the Latvian stock exchange index (see Table 2).

In the case of Estonia (see Table 3), the changes in the stock exchange situation are influenced by the changes of the Estonian stock exchange index from the previous period and the changes in the stock exchange situation in Lithuania from previous periods (2, 3, 4).

On the other hand, changes in the Lithuanian stock exchange index (see Table 4) are influenced by the changes in this index in previous periods (1, 2, 3, 4, 5) and the changes in the stock market situation in Estonia from previous periods (4, 5, 6).

The coefficient of determination for subsequent equations reaches 56%, 48% and 52%, respectively, which proves an average fit of the model to the data. However, the statistic of the Durbin-Watson test seems more important in the VAR model, which for all equations is in the required range of 1.85-2.20 (1.89, 1.90 and 1.94, respectively) and thus indicates the desired effect of the lack of autocorrelation in the random term. In addition, the VAR model is implemented with the option of robust standard errors in order to eliminate the problem of heteroskedasticity.

After estimating the model parameters, the model's diagnostic tests should be performed - the autocorrelation test, ARCH test, and test for the normality of residuals. All the tests are performed on a lag order of 6. The first three tests give the desired results — no autocorrelation, no ARCH effect, and a normal distribution of residuals.

Table 2. The normality of residuals test

| Test for normality of residuals | Doornik-Hansen test | Chi-square(6) = 11.2643 [0.0805] |
|--------------------------------|--------------------|---------------------------------|

Source: The author's own calculation using GRETL.

Additionally, the Engle-Granger cointegration test is carried out, which examines the presence of a relationship between the variables. Both the Chi-square test for the normality of residuals and the ADF test for unit root in residuals estimations indicate that the residuals are normally distributed and there is a significant relationship between the variables under study.

Table 3. Testing for a unit root in residuals (uhat)
Augmented Dickey-Fuller test for $uhat$ including 6 lags of $(1-L)uhat$, sample size 71

| unit-root null hypothesis: $a = 1$
| test without constant
| model: $(1-L)y = (a-1)y(-1) + \ldots + e$
| estimated value of $(a - 1)$: 3.73599
| test statistic: $\tau_c(3) = -4.39103$
| asymptotic p-value 0.007234
| Critical value of $\tau$ from Dickey-Fuller statistical tables = -1.94 with the significance level of 5%
| There is no unit root in $uhat$. The result of the test indicates that time series is cointegrated

Source: The author’s own calculation using GRETL.

After a positive verification of the aforementioned tests for the given VAR model, the unit roots of the characteristic equation are to be determined. In GRETL, the unit roots of the characteristic equation are estimated automatically. All the unit roots of the characteristic equation are to be less than one in terms of the modulus. The number of roots of the characteristic equation for the model consisting of three variables for six lags is 18. All the roots of the characteristic equation are inside the circle, so this condition has been met (see Figure 1).
The next step is to evaluate the impulse response function. The impulse is set at one standard error of the residuals. The response from Latvia in the first equation, Estonia in the second equation, and Lithuania in the third equation to the shock from individual variables are statistically significant in the initial period, while in the following quarters this effect fades away. This is illustrated in detail for all the equations in Figure 2.

Figure 1. Characteristic equation unit roots.
Source: The author’s own calculation using GRETL.
The final step in presenting the VAR model is the variance decomposition. Table 4 presents its course for Latvia. After some initial fluctuations, the variables are fairly stable since the ninth period. In the case of the Estonian stock exchange index (see Table 5), after some fluctuations in the initial period, the variables remain stable starting from the seventh period. As far as Lithuania is concerned, after some initial fluctuations, the variables remain stable from the fifth period onwards (see Table 6).
An analysis of the relationships...

Table 4. The decomposition of variance for the variable Latvia

| period | std. error | d_id_Latvia | d_id_Estonia | d_id_Lithuania |
|--------|------------|-------------|--------------|----------------|
| 1      | 0.0940372  | 100.0000    | 0.0000       | 0.0000         |
| 2      | 0.115513   | 95.8350     | 3.3849       | 0.7801         |
| 3      | 0.117923   | 93.2927     | 5.5793       | 1.1280         |
| 4      | 0.124468   | 85.3590     | 9.4495       | 5.1915         |
| 5      | 0.124773   | 85.0961     | 9.7178       | 5.1861         |
| 6      | 0.124967   | 84.8327     | 9.7462       | 5.4211         |
| 7      | 0.12843    | 84.2056     | 9.2405       | 6.5540         |
| 8      | 0.134148   | 80.2408     | 12.7197      | 7.0395         |
| 9      | 0.136259   | 77.8495     | 14.6705      | 7.4799         |
| 10     | 0.137231   | 77.8364     | 14.7625      | 7.4012         |
| 11     | 0.138396   | 77.2406     | 14.9280      | 7.8314         |
| 12     | 0.13856    | 77.2148     | 14.9125      | 7.8727         |
| 13     | 0.138685   | 77.0967     | 15.0448      | 7.8585         |
| 14     | 0.139732   | 77.1380     | 15.1049      | 7.7570         |
| 15     | 0.141007   | 76.1548     | 15.9844      | 7.8608         |
| 16     | 0.141137   | 76.0902     | 16.0238      | 7.8860         |
| 17     | 0.141635   | 75.8694     | 16.1877      | 7.9429         |
| 18     | 0.141731   | 75.7779     | 16.2312      | 7.9909         |
| 19     | 0.141848   | 75.6586     | 16.3621      | 7.9793         |
| 20     | 0.141917   | 75.6635     | 16.3646      | 7.9719         |

Source: The author’s own calculation using GRETL.
Table 5. The decomposition of variance for the variable Estonia

| period | std. error | d_ld_Latvia | d_ld_Estonia | d_ld_Lithuania |
|--------|------------|-------------|--------------|----------------|
| 1      | 0.123986   | 48.5775     | 51.4225      | 0.0000         |
| 2      | 0.152349   | 45.5031     | 54.3474      | 0.1495         |
| 3      | 0.15606    | 43.4620     | 56.3925      | 0.1455         |
| 4      | 0.162367   | 40.1756     | 56.5909      | 3.2335         |
| 5      | 0.164811   | 39.2176     | 57.5938      | 3.1886         |
| 6      | 0.166258   | 38.7368     | 58.0909      | 3.1723         |
| 7      | 0.166957   | 37.5172     | 56.3132      | 6.1696         |
| 8      | 0.169409   | 37.4145     | 56.0546      | 6.5309         |
| 9      | 0.169451   | 37.4127     | 56.0595      | 6.5278         |
| 10     | 0.169677   | 37.5582     | 55.9222      | 6.5196         |
| 11     | 0.170306   | 37.6082     | 55.6536      | 6.7382         |
| 12     | 0.170907   | 37.5306     | 55.7427      | 6.7267         |
| 13     | 0.171005   | 37.5447     | 55.7231      | 6.7321         |
| 14     | 0.171163   | 37.6106     | 55.6215      | 6.7679         |
| 15     | 0.171311   | 37.5602     | 55.5982      | 6.8416         |
| 16     | 0.17134    | 37.5603     | 55.5964      | 6.8432         |
| 17     | 0.171421   | 37.5998     | 55.5501      | 6.8501         |
| 18     | 0.171491   | 37.6058     | 55.5497      | 6.8445         |
| 19     | 0.171511   | 37.6074     | 55.5434      | 6.8492         |
| 20     | 0.171516   | 37.6080     | 55.5427      | 6.8493         |

Source: The author’s own calculation using GRETL.
Table 6. The decomposition of variance for the variable Lithuania

| period | std. error | d_ld_Latvia | d_ld_Estonia | d_ld_Lithuania |
|--------|------------|-------------|--------------|----------------|
| 1      | 0.120148   | 52.3606     | 23.6507      | 23.9887        |
| 2      | 0.144224   | 49.7458     | 23.2313      | 27.0229        |
| 3      | 0.150162   | 46.4345     | 28.6358      | 24.9298        |
| 4      | 0.160823   | 40.5551     | 34.6719      | 24.7730        |
| 5      | 0.163155   | 39.5971     | 36.2142      | 24.1887        |
| 6      | 0.163808   | 39.5532     | 35.9325      | 24.5143        |
| 7      | 0.167226   | 39.2110     | 34.5544      | 26.2346        |
| 8      | 0.168242   | 38.7396     | 35.2062      | 26.0543        |
| 9      | 0.168884   | 38.7485     | 35.3235      | 25.9279        |
| 10     | 0.169785   | 39.2204     | 35.1224      | 25.6572        |
| 11     | 0.170776   | 39.2269     | 35.1650      | 25.6082        |
| 12     | 0.171247   | 39.2631     | 35.1428      | 25.5940        |
| 13     | 0.171278   | 39.2490     | 35.1458      | 25.6052        |
| 14     | 0.171655   | 39.4445     | 35.0562      | 25.4993        |
| 15     | 0.171972   | 39.3023     | 35.2315      | 25.4661        |
| 16     | 0.172198   | 39.4185     | 35.1390      | 25.4426        |
| 17     | 0.172483   | 39.4080     | 35.1880      | 25.4039        |
| 18     | 0.172545   | 39.3869     | 35.2273      | 25.3858        |
| 19     | 0.172572   | 39.3784     | 35.2373      | 25.3843        |
| 20     | 0.172583   | 39.3795     | 35.2382      | 25.3823        |

Source: The author’s own calculation using GRETL.

Conclusion

The article analyses the relationships among some selected stock exchanges in the countries of the Baltic Sea region - Lithuania, Latvia, and Estonia. The VAR method is used to estimate the parameters of the regression equation. When the impulse response function is estimated, the response from the Latvian stock exchange to the shock from independent variables expires after the seventh quarter. The response of the Estonian stock exchange to the shocks from independent variables expires after the fourth quarter. The response of the Lithuanian stock exchange to shocks from independent variables discontinues after the third quarter.

In the case of variance decomposition for the Riga stock exchange, after some initial fluctuations the variables are fairly stable since the ninth period. The standard error of changes in the Latvian stock exchange index depends primarily on this variable.

In the case of the Estonian stock exchange index, after some fluctuations in the initial period, the variables remain stable starting from the seventh period. The standard error of changes in the stock exchange index in Estonia
depends in more than half on this variable and in 1/3 on the changes of Latvian stock exchange index.

As far as Lithuania is concerned, after some initial fluctuations, the variables remain stable from the fifth period onwards. The standard error of changes in the stock exchange index in Lithuania depends only in 25% on changes in this variable and to a greater extent on changes in other variables - 39% on the changes in the stock exchange index in Latvia and 35% on the changes in the Estonian stock exchange index, respectively. This seems to be a surprising result, but it may arise from the small size of the Lithuanian stock exchange and, at the same time, its greater union with the exchanges of the analyzed neighboring countries.

References
1. Abu-Bader, S., Abu-Qarn, A. S. (2008). Financial Development and Economic Growth: The Egyptian Experience. Journal of Policy Modeling 30 (5), 887–898.
2. Basci, E., S., Karaca S., S. (2013). The Determinants of Stock Market Index: VAR Approach to Turkish Stock Market, International Journal of Economics and Financial Issues 3(1), 163-171.
3. Caporale, G. M., Howells, P. G. A., & Soliman, A. M. (2004). Stock market development and economic growth: the casual linkage. Journal of Economic Development 33 (29) (1), 33-50.
4. Caporale, G. M., Howells, P. G. A., & Soliman, A. M. (2005). Endogenous growth models and stock market development: Evidence from four countries. Review of development economics 9 (2), 166-176.
5. Dritsaki, C, Dritsaki-Bargiota, M. (2005). The Causal Relationship between Stock, Credit Market and Economic Development: An Empirical Evidence for Greece. Economic Change and Restructuring 38, 113–127.
6. Dritsakis, N, Adamopoulos, A. (2004). Financial Development and Economic Growth in Greece: An Empirical Investigation with Granger Causality Analysis. International Economic Journal 18, 547–559.
7. Ghirmay, T. (2006). Financial development, investment, productivity and economic growth in the U. S. Southwestern Economic Review 33, 23-40.
8. Rousseau, P. L., Wachtel, P. (2000). Equity Markets and Growth: Cross-Country Evidence on Timing and Outcomes, 1980-1995. Journal of Banking and Finance 24, 1933-1957.
9. Shan, J. (2005). Does financial development "lead" economic growth? A vector autoregression appraisal. Applied Economics 37, 1353–1367.
10. Shan, J., Jianhong, Q. (2006). Does Financial Development “lead” Economic Growth? The case of China. Annals of Economics and Finance 7(1), 197-216.
11. Thangavelu, S.M., & Ang, J. B. (2004). Financial Development and Economic Growth in Australia: An Empirical Analysis. Empirical Economics 29 (2), 247–260.
12. Theophano, P., Sunil, P. (2006), Economic Variables and Stock Market Returns: Evidence From The Athens Stock Exchange, Applied Financial Economics 16(13), 993-1005.