THE ECONOMIC GROWTH AND THE OPPORTUNITY FOR THE PRIVATE EQUITY FUNDS TO DIVEST: AN EMPIRICAL ANALYSIS FOR EASTERN EUROPE

Mihai Precup[*]

Department of Economics, University of Paris 1 Panthéon-Sorbonne, 75231 Paris, France,
E-mail: mihai.precup@yahoo.com

Abstract: The author studies the private equity divestments in Eastern Europe and tests a long-term relation between these divestments and the real GDP variation. This research paper focuses on a sample covering the period 2000-2013 which considers the dynamics of the private equity divestments during the last financial crisis. The empirical analysis follows the methodology developed by Granger (1969), Toda and Yamamoto (1995), Dufour and Renault (1998), Konya (2004), Foresti (2006) and Onuoha, Okonkwo, Okoro, Kingsley (2018). The analysis shows that Eastern European private equity divestment market is still emerging characterized by high volatilities. The results prove that GDP recession explains in at certain degree the evolution of private equity divestments during the crisis. However, the Granger causality test shows that the information provided by the past variation of the real GDP cannot allow us to predict the short-term movements of private equity divestments in Eastern Europe.

1. Introduction

This research aims at answering to the question if there is a causal link between the evolution of private equity divestments and the evolution of economic growth in Eastern European countries?

Following the financial crisis, the uncertainties surrounding the instability of the Eastern European countries in relation to the public accounts and the sovereign debt led to market conditions that were unfavourable for the private equity

---

[*] Corresponding author: Mihai Precup. *E-mail: mihai.precup@yahoo.com*

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia.Pages 1 – 19

1

investments and the investors were looking to divest from the private equity funds and they were looking for other opportunities.

As a result of the financial crisis the private equity divestments reached record levels, the total of divestments amounted to EUR 1.6 billion in 2011, which was an increase of nearly 5 times compared to the value of the previous year. During the last years of our study, the private equity divestments remained relatively high: approx. EUR 1 billion in 2012 and EUR 741 million in 2013.

In order to understand whether the economic recession plays a role in this equation of private equity divestment, we will study whether there is a bivariate causal link between both the values of the previous years of the real GDP variation and the evolution of private equity divestments as well as a study of the link between the current values of private equity divestments in Eastern Europe and their past values. For this reason, we conducted a Granger causality test and the modified Wald test that has as endogenous variable the change in GDP in real terms.

However, it should be noted that by using the Granger test, we only wish to demonstrate the existence of a possible relationship between the real GDP variation and the private equity divestments evolution without supporting the existence of a structural economic link between both variables.

This research outlines the dynamics of the private equity divestments during the last financial crisis. Furthermore, we have shown the emergence of the private equity market in Eastern Europe in terms of GDP percentage and we believe that this market still has a lot to prove.

The remaining of this research will provide a brief description of the data and the econometric model that will underpin the empirical results obtained. In the empirical analysis we tried to determine a significant linear regression between the evolution of the private equity divestments in Eastern Europe and the real GDP change. From this linear regression we built the Gragner test to study a possible long-term or short-term relationship between the two variables. Finally, the final section of the chapter concludes on how to address the main challenge for the evolution of private equity divestments in Eastern Europe.

2. The market of private equity divestments in Eastern Europe

Following the financial crisis, the private equity market in Eastern Europe faced serious capital outflows and during this research we will try to understand whether the economic downturn is a significant determinant factor for a private equity fund wishing to withdraw the capital invested in a non-listed company.

The private equity funds in Eastern Europe experienced a strong acceleration of divestments levels during the crisis. It should be noted that we focus our research on the private equity market in Eastern European countries, such as Bulgaria,

2
sciendo

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

Czech Republic, Hungary, Poland, Romania, Baltic States, former Yugoslav states and Ukraine.
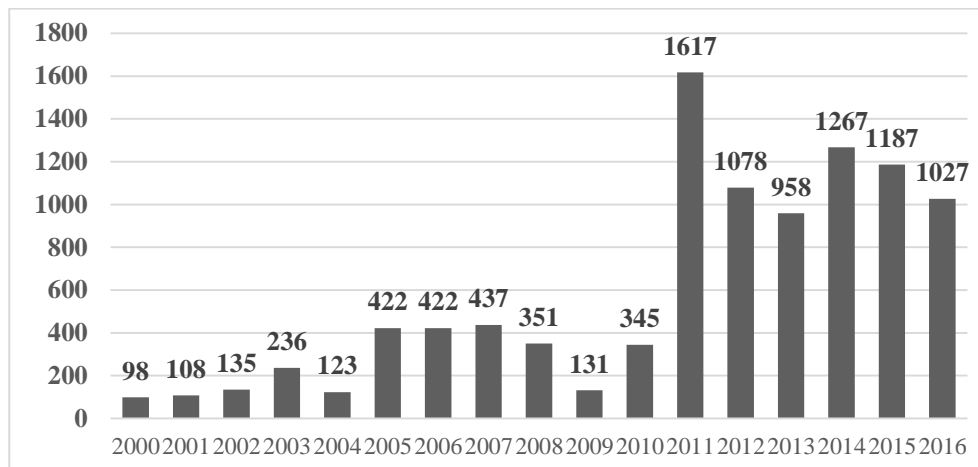

Figure 1 The evolution of the private equity divestments in Eastern Europe (Million euros)
Source: the author's prelucrations based on the information provided by the report „European Private Equity Activity 2016".Available: www.evca.eu.

As highlighted by the Figure 1, the private equity divestments in Eastern Europe were quite low during the pre-crisis period. This phenomenon was mainly due to the fact that private equity investments were not so developed in Eastern Europe in the early 2000s. However, the maximum level of private equity investment was reached in 2011 (EUR 1.6 billion) when the crisis hit the hardest the European emerging markets economies.

To be noted that a more positive message would be that in the last two years of our sample, the trend of private equity divestments has declined. The total value of the private equity funds exits in Eastern Europe declined by 34% in 2012 compared to the previous year and by 31% in 2013 compared to 2012. During the last years the private equity divestments process in Eastern Europe countries continued to slow down reaching EUR 1 bn in 2016 compared to EUR 1.6 billion in 2011.

The private equity market in Eastern Europe is an emerging market characterized by high volatilities. The emerging aspect will be shown in the following Table where we have shown the low share of private equity investments in the GDP of Eastern European countries.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

3

Precup, M., (2019)
The economic growth and the opportunity for the private equity funds to divest: an empirical analysis for Eastern Europe
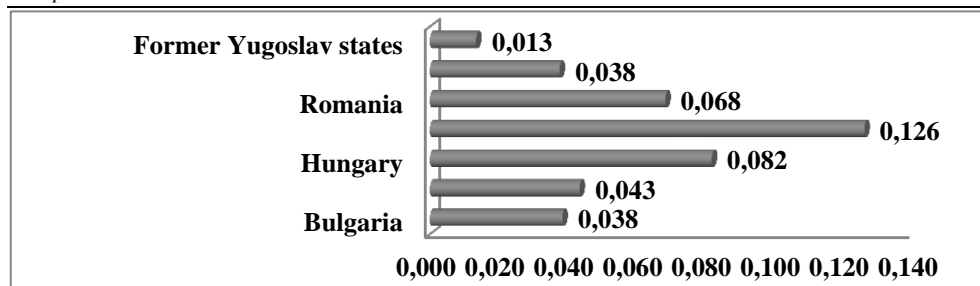

Figure 2 The share of private equity investments in the GDP of Eastern European countries for the period 2000 - 2016 (% of GDP)
Source: the author's prelucrations based on the information provided by the report „European Private Equity Activity 2016".Available: www.evca.eu.

Figure 2 shows that according to the size of the economy, expressed in GDP units, Poland, Romania and Hungary, occupy the top positions in the private equity market in Eastern Europe. However, the shares of private equity investments in the total GDP of these countries remain extremely modest, which makes us believe that the private equity in Eastern Europe remains an emerging market.

To be noted that for the same time period (2000 - 2016), the European average in terms of the share of private equity investments in GDP is 0.19%, thus slightly above the share shown in the countries of Eastern Europe. Furthermore, in some developed countries such as Great Britain, the share of private equity investments in GDP has even reached 0.8% of the GDP at the end of 2012. These countries have a mature banking system and entrepreneurs opened to new sources of financing.

As highlighted in Figure 3, during the period of 2007 to 2016 a total of 690 companies were sold from the portfolio of private equity funds. Although the trend of disinvestments is rising and the number of companies that have been de-invested increased in 2015 to 96 from 67 in 2007, the average transaction value decreased from EUR 24 million in 2011 to EUR 11 million in 2016.

4

sciendo

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
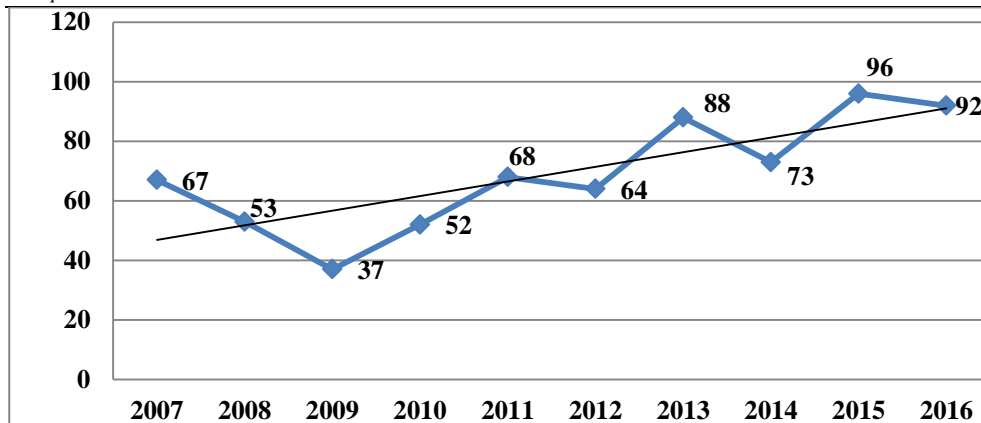Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

Figure 3 The evolution of private equity divestments in Eastern Europe in terms of number of companies exited

Source: the author's prelucrations based on the information provided by the report „European Private Equity Activity 2016".Available: www.evca.eu.

The most common way used by equity funds in Eastern Europe to exit a company was the sale to an industrial actor. Thus, out of a total of EUR 741 million of private equity divestments made in 2016, 45% were made by selling the company to an industrial actor. Although the financial markets are fairly developed in countries such as Poland, the divestments made through an IPO were 14% of the total exits, the remaining was represented by the secondary LBOs (32%), the sale of the company to another private equity fund (25%) or write-offs (6%).

3. The literature review and the methodology
Kaldor (1957) shown that for long periods of time the ratio of capital invested and GDP remain constant. This means that both the capital invested and the GDP vary at the same rate and in the same direction if a long period is taken into account. In our case if, for a longer period, economic growth is deteriorating, it should also be accompanied by a decrease in the amount of private equity investments, logically reflected by an increase in private equity divestments.
The theoretical models of economic growth developed by Barro and Sala-i-Martin (1995) and by Lucas (1998) show a close relationship between the investments made over a certain period and the evolution of GDP. For example, the endogenous economic growth model ("AK") considers that there is a linear function between the growth variable and the direct investment evolution.
Caballero (1999) and Khan (2001) have shown that both direct investment and GDP evolve in the same direction, but investment is more volatile because of the

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

5

investment projects which are less predictable. Following their conclusion, in this research we expect the real GDP growth to be correlated with the private equity divestments, but we also expect much greater volatility in the latter because of the emergence of the private equity market in Eastern European countries.

Cumming and MacIntosh (2003) analyse the exit conditions for a private equity fund in the United States and Canada and conclude that the asymmetry of information between the seller and the buyer of the company's shares plays a crucial role in choosing the exit modality of such investment. In our study we expect to see that the asymmetry of information will generate higher volatilities for the divestments compared to the evolution of private equity investments.

Cumming (2008) show that the entrepreneurs with experience take in considerations many factors during the planning of an exit strategy from a private equity investment. It was shown that experienced investors choose most of the time very original debt convertible instruments than common equity. This section and negotiation of the debt convertible instruments takes time and takes into account many factors such the economic growth or macro stability of the banking sector or the country. Therefore, we expect to see a certain correlation between the evolution of private equity divestments and the evolution of the GDP growth.

In this study we will try to establish a significant relationship between the variation of the divestments in Eastern European countries and the real GDP change over a period of 14 years.

The form we agreed for the empirical model is the following:

$$1/TD_t = \alpha + \beta_1 \, lnVarGDP_t + u_t \qquad (1)$$
$$(t = 1\dots14)$$

where the u_t is the term "error", ie factors other than the exogenous variable affecting the endogenous variable.

1 / TD - represents the inverse of the total private equity divestments made by private equity funds in Eastern Europe. At the same time, it should be noted that for reasons of data availability we preferred to use the aggregate values at Eastern European level for private equity investments.

lnVarGDP – the variation in real terms of the GDP. Real GDP growth has been transformed using natural logarithms. Therefore, the estimated coefficients for this endogenous variable are reflecting the elasticity.

Granger (1969) introduced a causality test which could provide us the empirical basis to test the existence of a possible long-term causal link between the total private equity divestments in Eastern Europe and their values in previous years as well as the existence of a long term causal link between the total private equity

6
sciendo

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

divestments and the previous values of the economic growth in the Eastern European countries.

A matter that arises in analysing the time series is whether the evolution of a time series is able to determine the evolution of a second time series. In the causality test developed by Granger, the present values of a variable $Y(y_{it})$ are conditioned by the past values of a variable X ($x_{t-1}, x_{t-2}, \ldots x_0$).

Konya (2004) affirms that by analysing the past values of the X variable, we may be able to predict the future values of the Y variable. Practically, in this part of the paper we will test whether the null hypothesis, ie if the coefficients of the past values of the variable X are equal to zero. If the results of the statistical tests exclude the null hypothesis, then we conclude that there is a Granger cause-and-effect relationship between both variables. However, in a Granger causality test, the causal link can be set backwards from $Y(y_{it})$ towards X ($x_{t-1}, x_{t-2}, \ldots x_0$).

Dufour and Renault (1998) have generalized Granger's causality test for a fixed period in the future for h time periods, and h can be infinite. The two authors show in a system with two variables that if there is no causal link between the two variables for a future time then this reasoning of the non-existence of a causal link can be generalized for any time horizon being infinite.

Foresti (2006) argues that there are three different types of simulations in which Granger causality tests can be applied:

a. In a simple Granger causality test, there may be two variables that can take values over different time periods.

b. A multiple-variable Granger causality test includes three or more variables believed to be at least one that can influence the values of the variable explained.

c. The Granger causality test can also be tested in a VAR model. This is the model used in this paper because it allows parallel testing of the bivalent causal link from both X ($x_{t-1}, x_{t-2}, \ldots x_0$) towards $Y(y_{it})$ and vice versa .

The empirical econometric model presented in this paper seeks to explain a bivalent causal link between economic growth in Eastern European countries and the evolution of private equity divestments. Therefore, in order to test the absence of a causality link between both variables, we will build a VAR model (model of the autoregressive vector) that will use the temporal series. The VAR model will have the following form:

$$1/TD_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i \, (1/TD_{t-i}) + \sum_{j=1}^{n} \beta_j \, (lnVarPIB_{t-j}) + \varepsilon_t \qquad (2)$$

Where t=1; m= 14 and n= 14

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

7

$$lnVarPIB_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i (lnVarPIB_{t-i}) + \sum_{j=1}^{q} \theta_j (1/TD_{t-j}) + \eta_t \qquad (3)$$

Where t=1; m= 14, n= 14 and ε_t and η_t represent the error term for both equations.

In order to study the existence of the Granger causality link between we will follow the steps introduced by Toda and Yamamoto (1995) and revalidated by Atmadja (2005) and also developed by Onuoha, Okonkwo, Okoro, Kingsley (2018):

1. We will build the Vector autoregression (VAR) model.
2. We will run the Granger causality test by also using the OLS - ordinary least squares metrics.
3. Finally, we will build the modified Wald test following a chi-square distribution with a probability less than 0.05%. If the probability of the Wald test exceeds P = 0.05% then we will accept the null hypothesis and conclude that X_t does not cause Y_t or vice versa.

Bernoth and Colavecchio (2014) compared the impact of the economic growth on the evolution of private equity investments in Eastern European countries with those of Western Europe. The latest seems to be attracting more private equity investment during times of strong economic growth. However, these authors showed a negative evolution of private equity investments during the recession periods and in compensation it is expected that private equity divestments to increase during the recession.

The present research studies a bivariate causal link between both the evolution of the economic growth and the evolution of private equity divestments. Therefore, it is relevant to highlight the conclusions of Simionescu (2018) who studies the main drivers of economic growth in Central and Eastern Europe. The main conclusion of this research was that the foreign direct investment was the most important determinant of economic growth in these countries.

Park (2018) analysed the impact of macroeconomic variables on the evolution of private equity investments in 34 emerging market nations. This research concluded that for Eastern European countries the economic growth paved a path towards more willingness by the owners of these emerging market firms to sell control stakes in order to obtain the financing needed.

4. The data

This empirical analysis is based on a time series analysis for the following variables: i) economic growth and ii) the level of private equity divestments in Eastern European countries, more specifically: Bulgaria, the Czech Republic, Poland, Romania, the Baltic States, the former Yugoslav states, Ukraine and Hungary.

8

sciendo

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

We have analysed a period covering the last financial crisis. Therefore, we have considered a relevant sample: 2000 – 2013. The observations have an annual frequency and were collected from the database provided by European Venture Capital Association and Thomson Reuters.
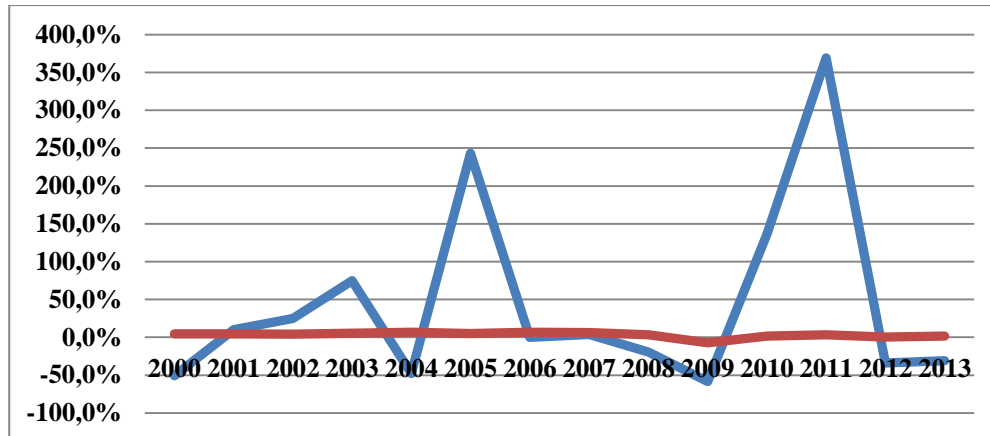

Figure 4 The variation of the economic growth in red and of the private equity divestments in blue during 2000-2013 for Eastern European Countries (%)
Source: the author's prelucrations based on the information provided by the report „European Private Equity Activity 2013".Available: www.evca.eu.

Figure 4 shows that private equity divestments have a much higher volatility than real GDP growth in Eastern European countries. However, in the empirical analysis of this research, we will try to determine to which extent the economic recession determinates the evolution of the private equity divestments. For this reason, we will check the existence of a Granger causal link between both variables.

5. The empirical analysis

5.1. Base Model Estimates
Barro (1997) studied the evolution of investment during recession periods on the American continent between 1961 and 1991. This author showed both a direct causal relationship of the private sector investment on the real GDP variation and a reverse causal relationship, explaining that the decline in the investment activity related to private sector is due to periods of economic recession.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

9

In this logic, we have also established for the Eastern European countries a relationship between the inverse of private equity divestments (1/TD) and the real GDP variation. This is reflected by the following statistically valid regression:

$$1/TD_t = \alpha + \beta_1 \, lnVarGDP_t + u_t (t = 1...14) \quad (4)$$

The statistically validated econometric model is the following:

$$1\backslash TDi = 0.112753 + (-0.008007 * logPIBi) + ui \quad (i = 1...14) \quad (5)$$

* where u_t is the error term.

According to our model, the variation of real GDP determines 62% of the evolution of total private equity divestments in Eastern European countries. The relationship is negative because in times of economic growth, investors tend decrease the investment activity and to keep the companies they invested in. According to the Student test we can assert with a probability of approximately 99% that this coefficient is non-null, so statistically significant.

In order to confirm that the relationship between the inverse of private equity divestments (1 / TD) and the real GDP variation is statistically significant, we also used the F-test. The value of F-statistic is 19.29 which is a high value, and which led us to reject the null hypothesis $H_0 : \beta_1 = \beta_2 = 0$. Thus, the F test confirmed that the chosen model was statistically significant.

5.2. Heteroscedasticity test

Barro (1997) studied the investments evolution during the recession periods on the American continent between 1961 and 1991. This author showed both a direct causal relationship of the private sector investment on the real GDP variation and a reverse causal relationship, explaining that the decline in investment activity in the private sector is due to periods of economic recession.
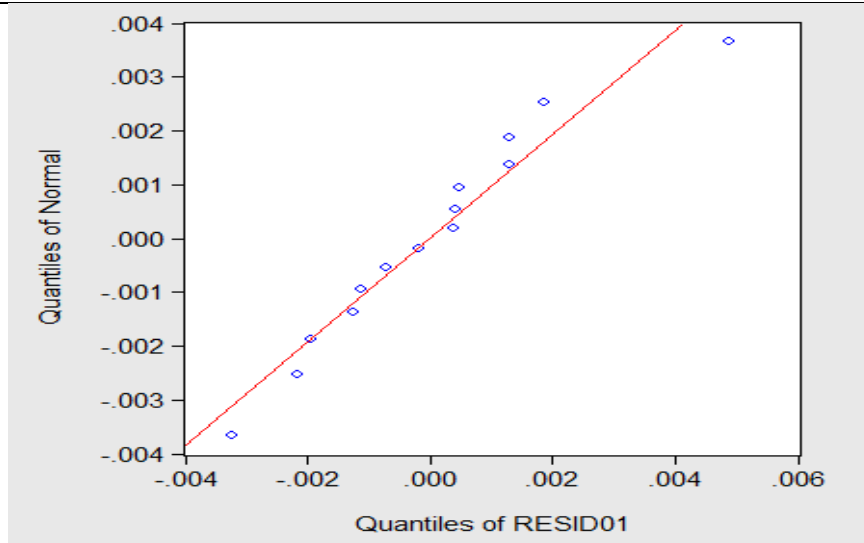
Figure 5 Heteroscedasticity graphic representation
Source: the author's simulation in EVIEWS.

In the graph above, it can be clearly seen that the residues have a normal distribution, which allows us to estimate the model by the Ordinary Least Squares estimation (OLS).

By running test of White (1980) we obtained N * R² (0,369796) $<\chi^2$ with 2 degrees of freedom was 5.99 and N * R² (0.172648) $<\chi^2$ respectively with 1 degree of freedom was 3.84. The results of the test of White (1980) show that the model does not have homoscedasticity problems, which implies that the variance of the squared estimated residuals is constant and we can accept the null hypothesis: H0 = var (u1) = var (u2) = ... = var (uT) = ct. Therefore, $H0$= homoscedasticity is accepted, and this property makes OLS estimation linear, unbiased and optimal.

5.3. Autocorrelation test

To study the existence of an autocorrelation in our model, we have represented graphicly the residual values in t according to their values in t-1. Analysing their graphical representation in Figure 6, we can see that the distribution of residues is random and that there is no pattern of regular behaviour compared to the right-hand figure in which a positive linear trend of the residues is represented.

sciendo   Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19
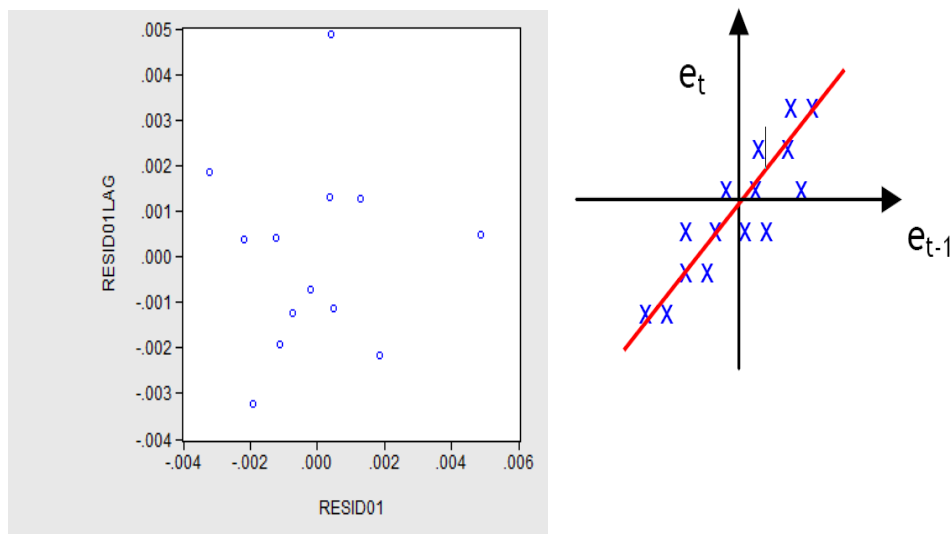
11

Figure 6 Heteroscedasticity graphic representation
Source: the author's simulation in EVIEWS.

Given that our data represent a time series with an annual frequency, it is pertinent to study the first order of autocorrelation because it might be an autocorrelation between the error terms in t-1 and t. Therefore, we used Durbin-Watson test in order to detect the presence of autocorrelation in the error terms from our linear regression:

$$DW = \frac{\sum (e_t - e_{t-1})^2}{\sum e_t^2} \approx 2 \cdot (1 - \rho_1) \qquad (6)$$

We will test the null hypothesis which is Ho: $\rho=0$ and with e_t is the error term associated with the private equity divestments at time t. If the null hypothesis is validated, then we can conclude that there is an autocorrelation of order 1 between residuals in t and t-1.

In the linear regression of our inverse-logarithmic model, we can see that DW has a value of 1,815310. The extremes of the statistic for a significance level of 5% and k '= 1 are as follows: i) the lower critical value is d1 = 1.045 and the upper critical value is dy = 1.350. Hence, DW (1.815310) belongs to the interval d (1.350) and 4-d (2.65) and we can accept the null hypothesis. Our conclusion is that in our model there is no autocorrelation of order 1.

The results of the autocorrelation tests and those of heteroscedasticity tests confirm that this econometric model gave us a linear, unbiased and optimal estimation of the econometric relationship between the inverse of private equity divestments and the real GDP variation.

5.4. Granger causality test

In this chapter, we have demonstrated the relationship between GDP growth in real terms and the evolution of total investment in Eastern European countries. In the remaining of this paper we will test the existence of a Granger cause-and-effect relationship between both variables. For this we will go through the following steps:

5.4.1. VAR model estimation

The autoregressive vector model will have the following form:

$$1/TD_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i (1/TD_{t-i}) + \sum_{j=1}^{n} \beta_j (lnVarGDP_{t-j}) + \varepsilon_t \quad (7)$$

Where m= 14 and n= 14.

$$lnVarGDP_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i (lnVarGDP_{t-i}) + \sum_{j=1}^{q} \theta_j (1/TD_{t-j}) + \eta_t \quad (8)$$

Where p=14 and q= 14,
Where ε_t and η_t are the errors for both equations.

The null hypothesis is stated as follows H0: "There is no Granger causality relationship between the private equity divestments and the variation of the real GDP in Eastern European countries". Hence, we will see if H0: $\alpha_1 = \alpha_2 = \ldots\ldots = \alpha_n = 0$ and $\gamma_1 = \gamma_2 = \ldots\ldots = \gamma_3 = 0$.

The rejection of the null hypothesis means that it was demonstrated the existence of a Granger-type causal link between the private equity divestments and the variation of the real GDP. At the same time, the rejection of the null hypothesis means that the past values of the real GDP variation in Eastern European countries determine the present values of the variable – private equity divestments.

The first step of the methodology described above is to estimate the model of the autoregressive vector (VAR) for the two variables. The results of VAR model are as follows:

sciendo Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

13

Table 1 Results of the Autoregressive Vector Estimation (VAR)

	1/TD*	lnVarGDP*	
1/TD (t-1)	0.247	-14.063	Coefficient
	0.343	8.144	Standard error
	0.722	-1.726	t-Statistic
1/TD (t-2)	0.209	0.631	Coefficient
	0.400	9.514	Erreur Standard
	0.521	0.066	t-Statistic
lnVarGDP (t-1)	0.019	0.826	Coefficient
	0.017	0.413	Erreur Standard
	1.128	1.997	t-Statistic
lnVarGDP (t-2)	0.019	-0.026	Coefficient
	0.017	0.326	Erreur Standard
	-1.426	-0.081	t-Statistique
Constant c	-0.0006	2.828	Coefficient
	0.078	1.866	Erreur Standard
	-0.007	1.515	t-Statistic
R square	0.462	0.970	
Adjusted R quared	0.155	0.953	
The sum of the squares of the residues	3.911	0.022	
Standard error	0.0023	0.056	
F-statistic	1.506	57.078	
Akaike AIC	-8.962	-2.628	

*) Where the 1/TD is the inverse of the total private equity divestments and lnVarGDP is the variation in real terms of the GDP.

Source: the author

5.4.2. Granger causality test

The objective of the Granger causality test is to prove the existence of a long-term relationship between the private equity divestments and the real GDP variation.

Table 2 Granger causality test estimation results

Endogenous variable: 1/TD*			
	F-statistic	Degrees of freedom	Probability
lnVarGDP	2.866	2	0.238
Endogenous variable: lnVarGDP*			
	F-statistic	Degrees of freedom	Probability
1/TD	3.019	2	0.221

*) Where the 1/TD is the inverse of the total private equity divestments and lnVarGDP is the variation in real terms of the GDP.

Source: the author

Using the least squares method, we choose among the results of the Granger test the most statistically significant model. Hence, due to the fact that all probabilities of the χ^2 distribution are higher than 5%, we accept the null hypothesis (H0) and we consider that $lnVarPIB_t$ does not cause Granger $1/TD_t$ and we also exclude the reverse relation: $1/TD_t$ do not cause $lnVarPIB_t$. Therefore, we can conclude that the information provided by the past variation of the real GDP cannot allow us to predict the short-term movements of private equity divestments in Eastern Europe.

5.4.3. Modified Wald test
In order to reinforce our conclusion that there is no Granger bivariate causal link between the two variables, i.e. between the economic growth of the Eastern European countries and the total private equity divestments, we have also estimated a modified Wald test.

Table 3 Modified Wald test estimation results

	F-statistic	Degrees of freedom	Probability
χ^2	2.866	2	0.238
Null Hypothesis Summary			
	F-statistic	Standard error	
Constant c (3)	0.019	0.0174	
Constant c (4)	-0.019	0.0137	

*) Where the 1/TD is the inverse of the total private equity divestments and lnVarGDP is the variation in real terms of the GDP.

Source: the author

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

15

The results of the modified Wald test show that the probability of the distribution of χ^2 is 0.2385, therefore, much higher than 0.05 and which means that means that $lnVarPIB_{t-1}$ and $lnVarPIB_{t-2}$ do not cause Granger $1/TD_t$. Therefore, between the private equity divestments in Eastern Europe and the real GDP variation there is no Granger causality.

To conclude, we can apply the reasoning developed by Dufour and Renault (1998) which demonstrate that if between two-variable there is no causal link over a defined period of time, therefore between same variables it is impossible to find a causality link for an infinite period of time. Hence, according to Dufour and Renault (1998) between the variables tested in this research paper, namely the private equity divestments and the variation of real GDP, there will not be a Granger binary causality link regardless of the time period we consider.

6. Conclusions

The sample of this paper consists of annual observations in the countries of Eastern Europe, for variables such as real GDP growth and the evolution of private equity divestments over the period 2000-2013. In order to develop a reliable econometric model, we transformed the real GDP variation by using natural logarithms, therefore the estimated coefficients for this endogenous variable represent elasticities.

This research paper has presented the dynamics of the private equity divestments during the financial crisis in Eastern European countries. This market in Eastern Europe is emerging, therefore characterized by high volatilities. The private equity divestments increased by approx. 4.7x in 2011 compared to 2010 levels, and then decreased by 33% in 2012.

The purpose of this research paper was to establish a relationship between the real GDP growth and the evolution of private equity divestments. We managed to obtain a statistically valid regression in which the real GDP growth explains in a proportion of 62% the evolution of private equity divestments in Eastern European countries.

However, following the Granger causality test and the modified Wald test, we showed that there is no Granger type relationship between the two variables, ie GDP growth in real terms does not cause the evolution of private equity divestments and vice versa. Also, following the two tests, we could also show that the variable of private equity divestments does not depend on either its previous values or the previous values of the endogenous variable represented by the real GDP variation.

The recommendation we would make is that the governments in Eastern European countries need to take measures to stimulate private equity investments and to stimulate the economic growth in these countries. The governments must take regulatory measures such as promoting the privatization of large state-owned enterprises. The governments in Eastern Europe could provide fiscal deductions for the foreign direct investments and this will boost the economic growth which will trigger, according to this study, additional private equity investments. Furthermore, the private equity funds will feel more comfortable to invest their resources in Eastern European countries if they will find legal structures similar to the limited partnerships which should be regulated by the local national authorities.

The main limit of this study was to collect data on private equity investments in Eastern Europe. This was due to a multitude of factors: first and foremost, the intrinsic factor of the private equity sector, in the sense that companies that are not listed on the stock exchange are not required to communicate their financial information on a regular basis.

Secondly, at institutional level in Eastern Europe there is a certain reluctance, opacity in communication, and luck of information available to the general public.

Thirdly, there is no database which holds consistent information about the private equity investments in Eastern European countries. Therefore, the value added of this research is that we have consolidated our own database with information collected jointly from the database of the European Venture Capital Association and of Thomson Reuters.

Author Contributions
The author conceived the study, carried out the literature review section and was responsible for the design, data collection, data analysis and interpretation.

Disclosure Statement
The author has not any competing financial, professional, or personal interests from other parties.

sciendo

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

17

References

1. Atmadja, S., (2005), Community Forestry on Government Lands: Forest Farming in East, Center for International Forestry Research - CIFOR Java, Indonesia, pp. 2-5.

2. Barro, RJ., (1997), Determinants of Economic Growth: A Cross-Country Empirical Study, NBER Working Paper, Vol 5698, pp. 12-51.

3. Bernoth, K.C., (2014), The macroeconomic determinants of private equity investment: A European comparison, Appl. Econ., Vol. 56, pp. 1170-1183.

4. Caballero, R.J., (1999), Agregate investment, Handbook of Macroeconomics, eds Taylor, J.B. and Woodford, M., Vol 1(1), pp. 813-862.

5. Dufour, J.M., and Renault, E., (1998), Short Run and Long Run Causality in Time Series: Theory, Econometrica, Vol. 66, pp. 1099-1125.

6. European Venture Capital Association „European Private Equity Activity 2016" and „Central and Eastern Europe Statistics 2016", Retrieved from: www.evca.eu, Accessed 05.06.2019.

7. Foresti, P., (2007), Testing for Granger Causality Between Stock Prices and Economic Growth, MPRA Paper No. 2962, Vol. 2, pp. 1-11.

8. Garicano, L., and Steinwender, C., (2013), Survive Another Day: Does Uncertain Financing Affect the Composition of Investments? CEP Discussion Paper.

9. Granger, C.J., (1969), Investing Causal Relationship by Econometrics Models and Cross Spectrual Methods. Econometrica, Vol. 37(1), pp. 425-435

10. Greenwood, J., Hercowitz, Z. and Krusell, P., (1997), Long-Run Implications of Investment-Specific Technological Chage, American Economic Review, Vol. 87(3), pp. 342-362.

11. Guilhon, B., and Montchaud, S., (2006), The dynamics of venture capital industry in Europe, International Journal of Technology Management, (34), pp. 146-160.

12. Jagwani, S., (2000), Supply and demand of venture capital in the US, The Park Place Economist, Vol. 8, pp. 90-98.

13. Johansen, S., (1991), Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. Econometrica, Vol. 59(6), pp. 1551-1580.

14. Kaldor, N., (1957), A model of economic growth, The Economic Jurnal, 67:268, pp. 591-624.

15. Khan, A., (2001), Understanding changes in aggregate business fixed investment, Business review, Federal Reserve Bank of Philadelphia, Q2, 2001.

16. Konya, L., (2004), Unit-root, Cointegration and Granger Causality Test Results for Export and Growth in OECD Countries, International Jurnal of Applied

Economics and Quantitative Studies, Euro-American Association of Economic Developpement, Vol. 1, No 2, pp. 67-94.

17. Lucas, R.E., (1998), On the Mechanics of Economic Development, Journal of Monetary Economics, 22, pp. 3-42.

18. Myers, S.C., and Majluf, N.S., (1984), Corporate financing and investment decisions when firms have information that investors do not have, Journal of Financial Economics, pp. 187-221.

19. Onuoha, F.C., Okonkwo, I.C., Okoro, P., Kingsley, O., (2018), The causal relationship between Foreign Direct Investment (FDI) and the macro-economy of selected west African countries: Panel ARDL/Granger Causality Analysis, African Research Review, Vol. 2, No 1.

20. Park, D., (2018), Determinants of private equity capital in emerging markets: evidence from macroeconomic and development variables, HEC Paris Library, pp. 1- 59.

21. Preqin (2014), „Global Private Equity Report" and „Q1 2014 Preqin Quarterly Update", Retrieved from: www.prequin.com. Accessed 05.06.2019.

22. Rivaud-Danset, D., and Vignes, A., (2004), Le capital-risque et ses deux marchés, Revue d'´économie industrielle, (107), pp. 171-193.

23. Schumpeter, J., (1912), The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle, Cambridge: Harvard University Press.

24. Simionescu, M., (2018), What Drives Economic Growth in some CEE Countries?, Studia Universitatis "Vasile Goldis" Arad, Economics Series, 28(1), pp. 46-56

25. Tobin, J., (1969), A General Equilibrum Approach to Monetary Theory, Journal of Money, Credit and Banking, (1), pp. 15-29.

26. Toda, H.Y., and Yamamoto, (1995), Statistical inference in Vector Autoregressions with possibly integrated processes, Journal of Econometrics, Vol. 66, pp. 225-250.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 29 Issue 3/2019
ISSN: 1584-2339; (online) ISSN: 2285 – 3065
Web: publicatii.uvvg.ro/index.php/studiaeconomia. Pages 1 – 19

19