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INTEGRATION OF GREEK AND POLISH EQUITY MARKETS WITH THE EURO AREA EQUITY MARKET. COMPARATIVE ANALYSIS

Abstract

The aim of this article is to present the comparative analysis of integration of Greek and Polish equity markets with the Euro area equity market. The authors explain and analyze theoretical aspects and measures of international equity market integration and main tendencies in the development of Greek and Polish equity markets.

Econometric analysis of Greek and Polish equity markets integration with the equity market in euro area is based on the „news-based” measures and econometric model GARCH (1.1). We use monthly statistical data for the period from 1999 till 2014 in the analysis.

The results show tendencies of integration degree in euro area equity market for the analyzed period of time. In the paper authors formulate conclusions concerning present and future of Greek equity market integration with euro area equity market and future prospects for Polish membership in European Monetary Union.

JEL Classification Code: **O52**.

Keywords: monetary union, euro area, financial markets, financial markets integration, measures of financial markets integration, equity market, news-based measures.

Introduction

International integration of equity markets is synonymous with their globalization. The larger the role of global shocks (common for many markets not just the local ones) in affecting yields on equity market indices is, the more integrated the equity markets are.

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A special case is the monetary union where there are no barriers, not even in capital flows related to the existence of multiple currencies.

In the euro area a fairly advanced degree of the financial market (including equity market) integration has been achieved. Analogically, here as everywhere else a higher degree of integration indicates the increased proportion of shocks common for the euro area countries rather than that of the local shocks in affecting the yield.

The aim of paper is answer the following questions:

1. What is the degree of financial market integration with euro area equity market in the case of Greece and Poland on the background of euro area's equity market integration?
2. What experience concern Greek equity market integration with equity market in the euro area are important for Poland from the point of view of future membership in euro area?
3. What is the impact of global recession and financial crisis on the process of Greek equity market integration with euro area equity market?

The main scope of this paper is to analyse the integration of Greek and Polish equity markets with the Euro area equity market. The choice of these two countries was dictated by the following factors. Firstly, one of them belongs to the euro zone while the other is outside the zone. Secondly, these countries are characterized by different economic situation. One is in a period of recession, the second in a period of economic growth. The selection of countries with different structures and characteristics allows parallel analysis of the phenomena.

The paper is structured as follows: in Section 1 we present the theory of integration of equity markets in the international scale and its measure, Section 2 presents the tendencies in Greek and Polish equity market's development, Section 3 presents the methodology and exhibits the results obtained from the study, and Section 4 summarises the main conclusions drawn from this research, limitations and research implications.

1. Integration of equity markets in the international scale and its measures

1.1. International integration of equity markets

International integration of financial markets plays an important role in the development of financial markets and their impact on economic growth. Equity market integration on international scale can be defined more precisely according to the law of one price. Application of the law of one price means that the assets generating identical monetary flows have the same price (rate of return, yield). In the case of shares, in two countries (regions) the price of capital raised in the financial market by issuing shares should be the same (cf. Adam et. al., p. 4). In accordance

with a broader definition of the financial market integration put forward by Baele et al. (2004: 6-7), equity markets are considered fully integrated if all the possible economic agents involved in transactions at the same price:

- are governed by the same rules when they decide to participate in share trading,
- have equal access to shares,
- are treated equally when they operate in the market.

Such a broad approach to the financial market integration implies also functioning of the law of one price. The law of one price causes that assets are characterized by identical risks and yields. The quoted definition comprises the law of one price. If the law of one price is not met, then there is a possibility of arbitrage which restores validity of the law (on condition there are no barriers to the financial market integration) (Baele et al., 2004: 7; Kowalak, 2006: 34-38).

Figure 1 shows a theoretical correlation between the integration of financial markets (including equity market), financial development and economic growth.

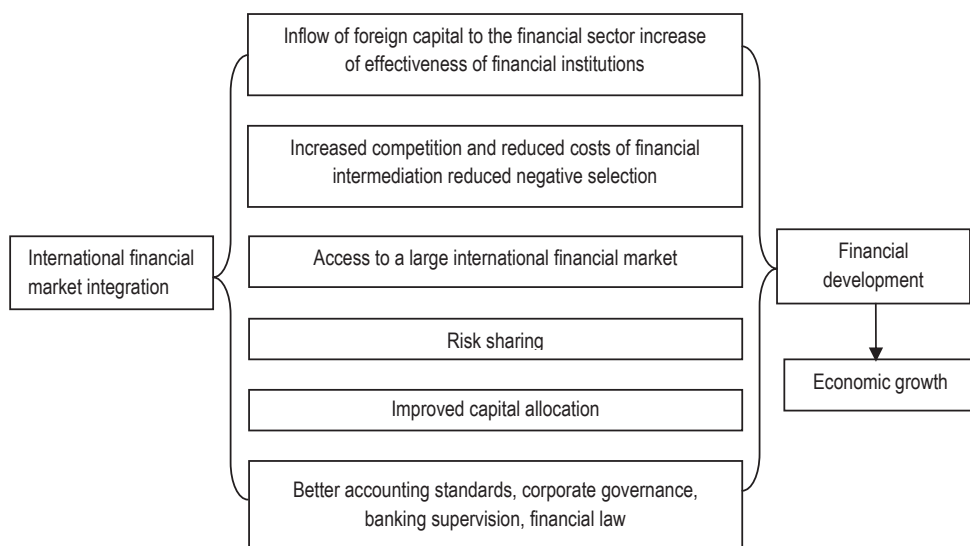


Figure 1. Theoretical correlation between international financial market integration and financial development and economic growth

Source: Bukowski, 2011: 35.

An increased degree of financial market integration means also an increased interdependence and sensitivity of markets to any kind of financial turbulences which may unexpectedly occur in different regions of global economy or in some countries of an integrated group. Integrated financial markets are becoming a major channel

for financial turbulence transmission on an international scale. The turbulences in question are transmitted via the mechanisms of:

- changes in interest rates,
- changes in exchange rates,
- changes in financial asset prices (Bukowski, 2011: 52-53).

One must also point out a significant role of the financial market (including equity markets) integration in a monetary union with a single currency and single monetary policy, hence also for the economy of a country which is a member of such a union.

- levelling out of asset-generated revenues and consumption through diversification of portfolio and mechanism of risk sharing,
- better synchronization of business cycles and economic shocks,
- reducing investment risk,
- neutralization of the shock impact on the size of incomes and consumption,
- increased synchronization degree of business cycles and reduced asymmetry of economic shocks,
- better effectiveness of uniform monetary policy of the supranational central bank³.

On the other hand it is worthwhile to draw attention to the fact that financial market integration can also be a factor strengthening economic destabilization of the monetary union economies in the environment of growing budget deficits and public debt which result mainly from a bad expansionary fiscal policy in the past and the structure of fiscal expenses as well as in the case when the share of foreign debt dominates (Bukowski 2011: 73).

1.2. Measures of international integration of equity markets

One of the measures of the international financial market integration, including equity market integration is the one based on news.

The news-based measures grasp the impact effect of the news concerning predicted shocks in financial markets and investment risk related to them. In fully integrated markets, investment portfolios should be well diversified. Information coming from local markets should not have a major effect on the prices of assets, unlike global information regarding the entire integrated market which affects price changes quite significantly. The systematic risk degree is the same in various countries whose markets have been integrated. Measurements from this group show to what extent information specific for a local financial market is significant for the remaining markets in comparison to the effect of information of global character (see: Baele et al., 2008: 20; Kowalak, 2006: 38 and onwards). In the case of equity market, a model of the „increased impact of the common news component on equity market yields” is such a measure. The „common news component” is the news concerning changes in

³ See more on this topic: Bukowski, 2011: 67-74.

the US equity market index yields (global news). In the euro area the common news component is the news concerning changes in yields on the broad DJ EUROSTOXX index corrected by the influence of the global „news” impact, i.e. from the US equity market. The higher the degree of particular countries’ equity market integration with the global market is, the lower the impact of local (domestic) turbulences on shaping the yields on assets in particular countries but the higher the impact of global factors (information, signals) coming from the United States.

In the case of the euro area countries, the larger the impact of common factors (the common „news” component) for the euro area than the local (specific for the particular countries of the euro area) ones on shaping the yields in domestic equity markets is, the higher the integration degree for these countries is. Similarly, if the examined countries are from outside the euro area, then the larger the impact of the common component for the euro area on shaping the equity market yields in these countries is, the higher the integration degree between their markets and the euro area market is. On the other hand, the impact of the „news” from the US market will define the integration degree between a given market and the global market (see: Bukowski, 2011: 46-47).

2. Tendencies in Greek and Polish equity market’s development

In this section we present the historical outline of equity markets in Greece and Poland and next, we try to compare the Greek and Polish equity markets using as a background their economies.

Let’s start with Greece. The Greek stock market is represented by the Athens Exchange (or ATHEX for short; formerly ASE – Athens Stock Exchange) which was established in September 1876 as a self-regulated public institution. Until the beginning of 1987, interest in the ATHEX was limited to Greek nationals. Then the government freed capital controls for securities investments which helped the market to take off due to the interest shown by the third country investors. The course of the stock market is clearly reflected by the trend of the ATHEX Index. The Athens Stock Exchange General Index is a major stock market index which tracks the performance of Greek stocks listed on the Athens Exchange. It is a capitalization-weighted index. The ASE General Index has a base value of 100 as of December 31, 1980. Unprecedented rise in the Greek equity market was marked by the beginning of 1999. In September 1999 the index achieved the historical record (6484 units). Since then the fall of the stock market began which had finished at the beginning of 2003 (1462 units). At that time, many of the shares that were introduced proved to be bubble. As a result the institution of the stock market lost its credibility and investors withdrew. Since early 2003, the stock market began to recover and gradually regaining investor confidence. New environment due to the Greece admission to the European Monetary Union caused that equity market started to recover lost ground

and during the period of 2007 and 2008 the ATHEX was around 5000 units. Then, a new downturn in the equity market has started. The downward trend continues today, with plenty of stock prices range down from their nominal value. Businesses use tactics of reverse split to save the price of their shares from the „disappearance”. The general index closed at the end of 2014 on 810 units, with market capitalization calculated at about 51,5 billion. euro.

Our attention shall now be drawn towards our second market: Poland. The Polish equity market is represented by the Warsaw Stock Exchange (or WSE for short) which began activity in its present form on 16 April 1991. Since then the WSE has been developing and growing rapidly and is now perceived as well established on the European market. The WSE is a joint stock company founded by the State Treasury. The Treasury holds 35% share in capital. Movements in the overall market are recorded by the Warsaw Stock Exchange Index (WIG), a value-weighted geometric mean of price relatives, based on 1,000 as at April 1991. During the first session in 1991, only five companies were listed (by the end of 1991 -12 companies were listed, joined by 6 more in 1992, and nine in 1993, further 33 companies in 1994). Despite an intervening collapse in the market in 1994-1995 and following the long-delayed mass privatisation programme, 104 companies were quoted by the end of May 1997. Subsequent years showed steady growth in the number of companies listed and there were 374 in 2008 and 470 at the end of 2014. The price variations that occurred on the WSE over 1993-1994 have to be deemed a notion of early stock market inefficiency. But it is easy to understand the development of Polish capital market comparing the following data: WIG index: 900 points in 1991 and over 50.000 points in 2014; number of companies in public trading: 12 (1991) and 470 (2014), market capitalization of WSE: 104 mln PLN (1991) and 1.251 bln PLN in 2014; turnover on WSE: 30 mln PLN (1991) and 232 bln PLN (2014).

In table 1 below we can see the main measures of the development of equity markets in Greece and Poland and main macroeconomic ratios. We measure the development of equity market using four variables: stock market capitalization to GDP, stock market total value traded to GDP and stock market turnover ratio and number of listed companies per 10k population. The stock market capitalization to GDP is a measure of the size of the stock market and is widely used in the literature as a measure of the stock market development. Because of several drawbacks of this measure we decided therefore to use also as an alternative indicator of market size the number of listed companies per 10k population. Stock market could be sizable because of the large number of listings, but it may be illiquid or shallow because of the lack of active trading. Hence, we present for stock illiquidity using the variables on stock market traded to GDP and stock market turnover ratio. Figure 2 shows the evolution of first two measures for Greek and Polish equity markets during the analyzed period. Capital markets, their situation and development are strictly correlated, inter alia, with country's economic situation. As the main macroeconomic

ratios we present GDP annual growth, government deficit, government debt and current accounts as a percentages of GDP (see table 2). The deep economic crisis that plagues Greece for last years is reflected in the macroeconomic ratios. Between 2008 and 2013 the Greek Gross Domestic Product decreased more than 25%, while unemployment increased to 27% in 2013 (Hyz, 2001; Gikas, 2004; Gikas, Tangas, 2012; Gikas et al., 2012; Gikas, 2013). Poland's overall economic performance has been very good over the last decade allowing to convert the economy towards the EU average. Economic growth slowed considerably in 2012-2013. In figure 3 we can see the trends of the GDP per Capita, in Poland and Greece, when adjusted by Purchasing Power Parity for the analysed period.

Table 1. Main measures of the development of equity markets in Greece and Poland (1999-2012)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
STOCK MARKET CAPITALIZATION / GDP														
Greece	103,29	115,33	74,38	54,65	48,97	53,12	56,25	67,43	80,15	55,42	21,79	24,20	11,70	17,90
Poland	14,07	17,20	15,70	13,90	15,51	21,86	28,71	36,21	43,98	31,49	23,89	39,90	26,40	35,80
STOCK MARKET TOTAL VALUE TRADED / GDP														
Greece	85,97	103,71	49,93	21,99	17,70	18,81	22,58	32,93	43,73	31,18	15,05	15,47	8,53	5,90
Poland	5,63	7,29	6,11	3,37	3,37	5,06	8,02	12,65	17,17	15,76	12,69	14,40	18,64	13,6
STOCK MARKET TURNOVER RATIO														
Greece	112,53	56,09	33,86	28,25	38,35	34,68	48,33	62,77	65,84	28,17	82,57	81,25	46,5	37,9
Poland	37,45	43,36	22,88	19,90	23,90	29,37	34,35	44,99	46,80	44,04	60,77	54,03	58,4	42,6
NO. OF LISTED COMPANIES PER 10K POPULATION														
Greece	0,26	0,30	0,31	0,31	0,31	0,31	0,28	0,29	0,26	0,27	0,26	0,25	na	na
Poland	0,06	0,06	0,06	0,06	0,05	0,06	0,06	0,07	0,09	0,09	0,09	0,15	na	na

Source: data.worldbank.org; sitesources.worldbank.org

Table 2. Main macroeconomic ratio for Greece and Poland, 1999-2013

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GDP GROWTH (annual %)															
Greece	3,10	4,00	3,70	3,20	6,60	5,00	0,90	5,80	3,50	-0,40	-4,40	-5,40	-8,90	-6,60	-3,30
Poland	4,50	4,30	1,20	1,40	3,60	5,10	3,50	6,20	7,20	3,90	2,60	3,70	4,80	1,80	1,70
GOVERNMENT DEFICIT/SURPLUS AS A PERCENTAGE OF GDP															
Greece	-3,00	-3,60	-4,40	-4,70	-5,60	-7,00	-5,40	-6,00	-6,80	-9,90	-15,60	-11,00	-9,60	-8,90	-12,70
Poland	na	na	-2,80	-4,50	-5,40	-5,50	-4,00	-3,60	-1,90	-3,70	-7,50	-7,80	-5,10	-3,90	-4,30
GOVERNMENT DEBT TO GDP															
Greece	96,60	94,00	103,40	103,70	101,70	97,40	98,60	100,00	106,10	105,40	112,90	129,70	146,00	171,30	156,90
Poland	38,90	39,40	36,80	37,60	42,20	47,10	45,70	47,10	47,70	45,00	47,10	50,90	54,90	56,20	55,60
CURRENT ACCOUNT TO GDP															
Greece	-2,80	-3,60	-7,70	-7,20	-6,50	-6,50	-5,80	-7,60	-11,40	-14,60	-14,90	-11,20	-10,10	-9,90	-2,40
Poland	-4,00	-9,10	-6,00	-3,10	-2,80	-2,50	-5,30	-2,40	-3,80	-6,20	-6,60	-3,90	-5,10	-5,00	-3,70

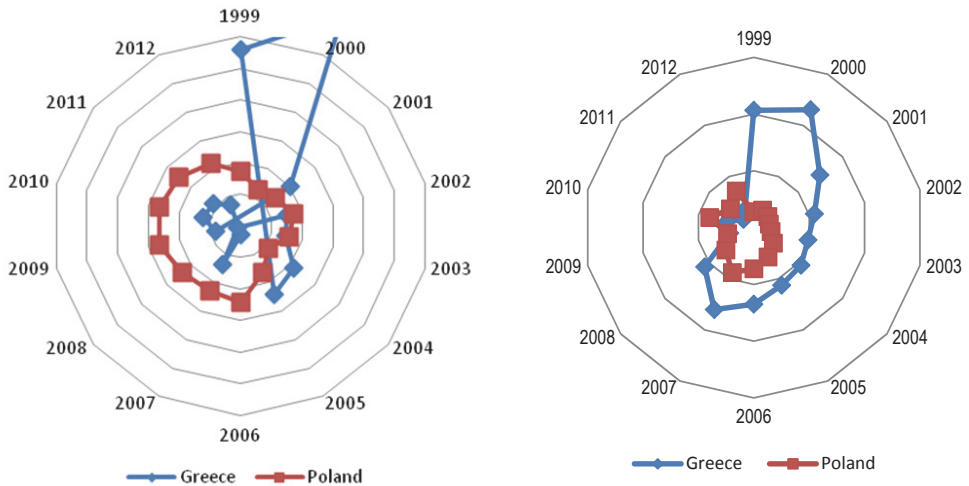


Figure 2. Evolution of Stock Market Total Value Traded as a percent of GDP (on the left) and Stock Market Capitalization as a percent of GDP (on the right) in Poland and Greece, 1999-2013.

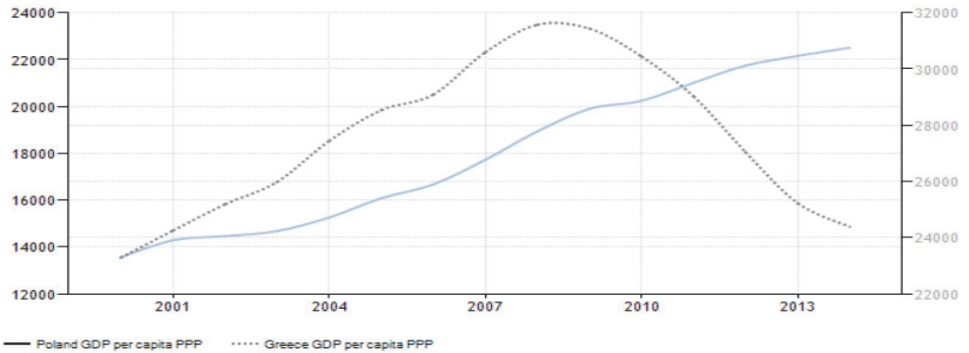


Figure 3. GDP per Capita in Poland and Greece adjusted by Purchasing Power Parity, 1999-2014

Source: www.tradingeconomics.com

3. The degree of Greek and Polish equity markets integration with the euro area's equity market

3.1. Data and a model

Our examinations covered the monthly data from the period 1999:01-2014:12 concerning indexes yields on \wedge ATH (*Athex Composite Share Price Index*), WIG (Warsaw Stock Exchange Index), DJ EUROSTOXX BROAD INDEX and DOW JONES COMPOSITE AVERAGE INDEX. Changes in yields on the DOW JONES COMPOSITE INDEX were treated as the global news (signal, shock), like in the case of investigations and statistics of the European Central Bank concerning equity market integration (see: Financial Integration in Europe, April, Statistical Annex. ECB 2014). The data sources were the ECB database (Statistical Data Warehouse) and data from Warsaw Stock Exchange and Athens Stock Exchange (stooq.pl.).

To measure the stock exchange integration degree we applied the measures based on the model of the „*increased impact of the common news component on equity market yields*” i.e. the above mentioned measures of the global shock spillover and yield variance proportion. The model was estimated in three stages by means of the GARCH (1,1) process⁴. Firstly, the equation for the US market yields was estimated⁵:

$$R_{us,t} = \mu_{us,t} + \varepsilon_{us,t}$$

where:

$R_{us,t}$ – equity market yield (on the stock exchange index) in country i over time t ,

the expected yield component $\mu_{i,t} = \alpha_{i,t} + \gamma_i R_{us,t-1}$,

$\varepsilon_{i,t}$ – the unexpected yield component.

Secondly the conditional variance for the US market was estimated:

$$E(\varepsilon_{us,t}^2) \equiv \sigma_{us,t}^2$$

where E is the expected value operator.

The subsequent stage consisted in an estimation of the euro area market yield equation:

$$R_{eur,t} = \mu_{eur,t} + \varepsilon_{eur,t}$$

where:

$$\mu_{eur,t} = \alpha_{eur,t} + \gamma_{eur} R_{eur,t-1}$$

⁴ On the subject of the GARCH (1,1) model application for examining the relationships between the yields on equity market indices see more in: (Brzezczynski, Kelm, 2002: 95-119; Jajuga, 2008; Mills, Markellos, 2008: 182, 323 and onwards).

⁵ On the model of the „*increased impact of the common news component on the equity market yields*” see more: (Baele et al., 2004: 20-21; Baltzer et al., 2008: 8-10, Bukowski, 2011: 46-47).

and $\varepsilon_{eur,t} = \beta_{eur}^{us} \varepsilon_{us,t} + e_{eur,t}$, $e_{eur,t}$ – pure local shock.

The conditional variance takes the form of:

$$E(e_{eur,t}^2) \equiv \sigma_{eur,t}^2$$

In the last stage the yields for the Greek (gr) and properly Polish (pl) equity market were estimated (i = properly gr, pl):

$$R_{i,t} = \mu_{i,t} + \varepsilon_{i,t}$$

where:

$$\varepsilon_{i,t} = \beta_i^{us} \varepsilon_{us,t} + \beta_i^{eur} e_{eur,t} + e_{i,t}$$

$$\mu_{i,t} = \alpha_{i,t} + \gamma_{i,t} R_{i,t-1}$$

$e_{i,t}$ – pure local shock and the conditional variance $E(e_{i,t}^2) \equiv \sigma_{i,t}^2$. $\beta_{i,t}^{eur}$ and $\beta_{i,t}^{us}$ indicate a dependent on the Polish or Greek market over time t sensitivity to information concerning yields in the eurozone and the United States, respectively. The magnitude of both coefficients is a measure of intensity with which the shock originating in the euro area and the United States (global shocks), respectively, spill over the Polish or Greek equity market.

Then the variance ratio was computed:

$$VR_{i,t}^{eur} = \frac{(\beta_{i,t}^{eur})^2 \sigma_{eur,t}^2}{\sigma_{i,t}^2} = \rho_{i,eur,t}^2$$

$$VR_{i,t}^{us} = \frac{(\beta_{i,t}^{us})^2 \sigma_{us,t}^2}{\sigma_{i,t}^2} = \rho_{i,us,t}^2$$

Conditional variances for the euro area, the United States and the local equity market are obtained from the standard GARCH (1,1) model.

The higher the value of the yield variance ratio (the higher the ratio of the euro area or US shock to the local shock impact) is, the higher the Polish and Greek equity market integration degree with the one or the other equity market is.

3.2. Results

3.2.1. Cointegration of time series

The Engle – Granger cointegration test indicates that time series of the yields of Dow Jones Composite Index (R_{us}), DJ Eurostoxx Broad Index (R_{eur}), WIG – Warsaw Stock Exchange Index (R_{pl}), over the period 1999:1-2014:12 are cointegrated. Time series of yields of Dow Jones Composite Index (R_{us}), DJ Eurostoxx Broad Index (R_{eur}) and \hat{ATH} – Athex Composite Share Price Index (R_{gr}) are also cointegrated (see tab. 3 below).

Table 3. Results of Engle – Granger cointegration tests for periods: 1999:1-2014:12, 1999:1- 2007:12, 2008:1-2014:12

Period	1999:1-2007:12	2008:1-2014:12	1999:1-2014:12
Greece			
Model:	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$ Test with constant and linear trend	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$ Test with constant and linear trend	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$ Test with constant and linear trend
Autocorrelation of first rank =	0,005	-0,006	0,001
Estimated value ($a-1$) =	-1,03162	-1,02112	-1,00527
Test statistics tau =	-7,43938	-6,23499	-9,68684
Asymptotic value p =	1,992e-006	1,624e-005	0,9125
Critical value tau = (Dickey-Fuller tables)	-3,45 with significance level = 0,05	-3,45 with significance level = 0,05	-3,43 with significance level = 0,05
Poland			
Model:	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$ Test with constant and linear trend (first differences)	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$ Test with constant and linear trend	$(1-L)y = (a-1) \cdot y(-1) + \dots + e$
Autocorrelation of first rank =	-0,121	0,012	-0,295
Estimated value ($a-1$) =	-2,02374	-1,21974	-0,245502
Test statistics tau =	-12,202	-7,53217	-5,10132
Asymptotic value p =	1	2,405e-006	0,002091
Critical value tau = (Dickey-Fuller tables)	-3,45 with significance level = 0,05	-3,45 with significance level = 0,05	-3,43 with significance level = 0,05

Source: own calculation.

3.2.2. The yields in the first glance

The analysis of fig. 4 substance indicates interesting information about tendencies in yields of indexes. First of all, we can observe that yields in of R_{gr} and R_{eur} are highly correlated, yield R_{gr} is less correlated with R_{us} . In the case of R_{wig} we can observe no correlation with other yields of indexes.

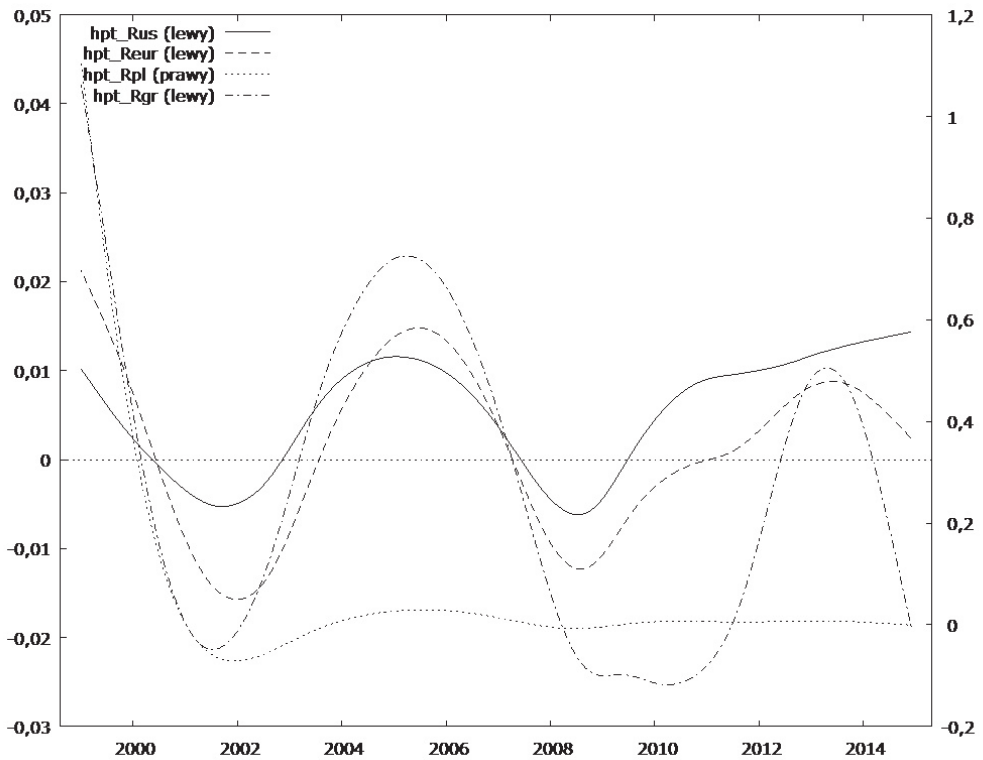


Figure 4. Yields of Dow Jones Composite Index (R_{us}), DJ Eurostoxx Broad Index (R_{eur}), WIG - Warsaw Stock Exchange Index (R_{pl}), ^ATH – Athex Composite Share Price Index (R_{gr}), over the period 1999:1-2014:12, smoothed by means of the Hodrick- Prescott ($\lambda = 14\ 400$) filter

Source: author's own compilation with the use of the GRET program.

3.2.3. Results of investigation over the Greek and Polish equity market integration with equity market in euro area

Three cases have been investigated: degree of integration in the whole period of 1999-2014, degree of integration in the period before financial and fiscal crisis in the euro area and USA: 1999-2007, period after crisis: 2008-2014. Of course, analysis which is carry on the form of econometric model do not allow to include many factor which influenced equity market. But maybe it will be task for future research. Implemented model is based on the model which is applying by ECB in the reports *Financial Integration of Europe*, prepare and publish every year.

First, we will analyze the degree of Greek and Polish equity market integration with euro area equity market in the period of 1999-2014.

In the investigated period the $\hat{A}TH$ yield and WIG yield was affected by shocks from the US equity market and euro area shocks, however, the American shocks influence indexes yields in both compared countries with higher intensity than shocks from the euro area. The American shocks intensity of spillover measured by β coefficient was in both countries higher than euro area intensity of spillover. Of course, euro area shocks intensity spillover was higher in Greece than in Poland, because there are important barriers in transfer of shocks in Poland – this country is not a member of the euro area (see figure 5 and 6).

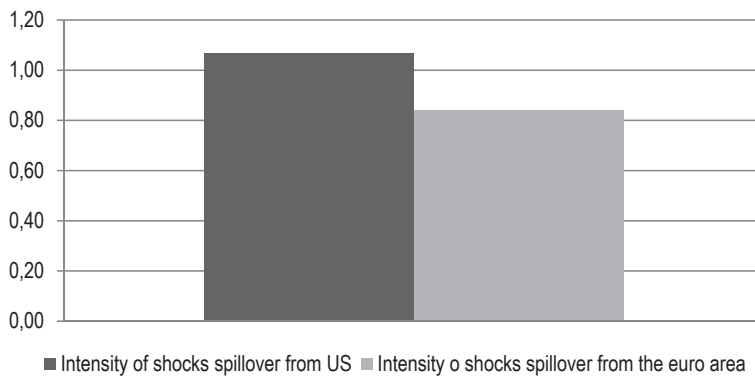


Figure 5. Intensity of global shock spillover (from the United States) and the euro area shock spillover in the Greek equity market, measured by $\beta_{gr,t}^{us}$, $\beta_{gr,t}^{eur}$ coefficients in the period of 1999-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRET program.

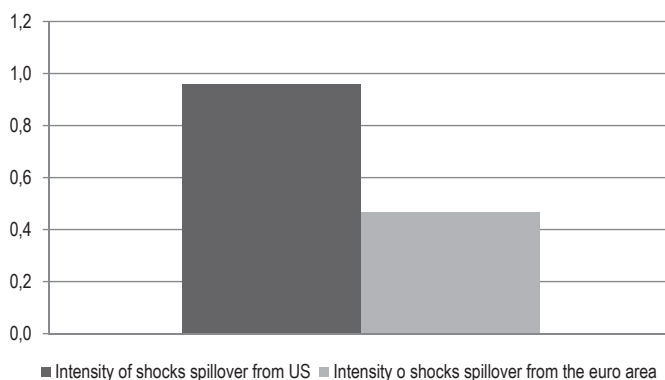


Figure 6. Intensity of global shock spillover (from the United States) and the euro area shock spillover in the Polish equity market, measured by β_{pl}^{us} , β_{pl}^{eur} coefficients in the period of 1999-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRET program.

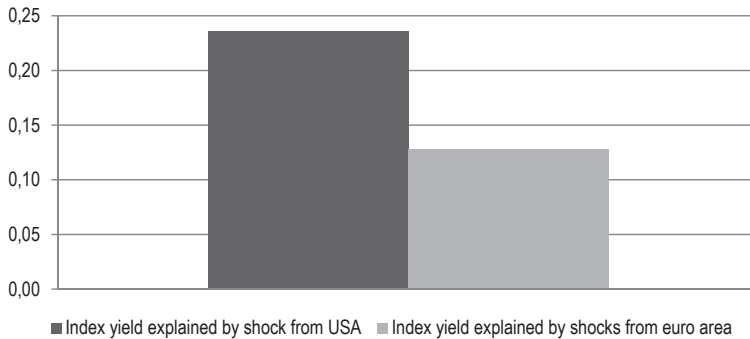


Figure 7. Greek equity market – variance ratio for the \hat{ATH} index yield explained by shocks from the euro area ($VR_{gr,t}^{eur}$) and the United States ($VR_{gr,t}^{us}$) in the periods 1999-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETl program.

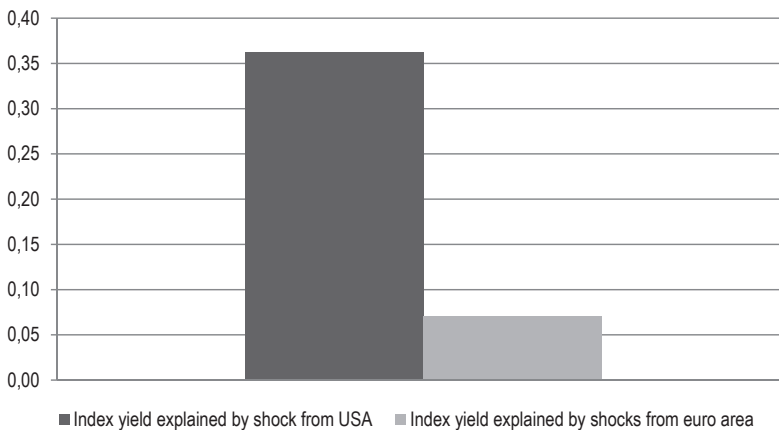


Figure 8. Polish equity market – variance ratio for the WIG index yield explained by shocks from the euro area (VR_{pl}^{eur}) and the United States (VR_{pl}^{us}) in the periods 1999-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETl program.

A similar situation existed in the case of what shocks explained the changes in the \hat{ATH} yields and WIG yields. In both investigated countries the shocks from American market shocks explained in radically higher degree changes in the yields than shocks from euro area (see fig 6 and 7). But again, Poland is not member of euro area. Equity market in Poland is more connected with American market than with the euro area equity market. For that reason euro area shocks impact on Polish equity market is much less than in the case of Greece. If we take in to account the ratio of variance, Polish market is higher integrated with American market than the Greek market.

The second case was the analysis of the degree of Greek and Polish equity market integration with euro area equity market in the period of 1999-2007 (before crisis) and 2008-2014 (period before the crisis and years after crisis). Analysis of fig. 8,9,10,11 gives us interesting information. First of all, analysis indicates that American and euro area shocks intensity spillover increased in the period of 2008-2014 in comparison to the period of 1999-2007 in the case of both countries. However that growth was higher in Greece in the case of euro area intensity spillover then in Poland. In Greece level of variance ratio VR explained share of American market shocks increased much less in the comparison with Polish equity market in the same period (see fig. 10 and 11).

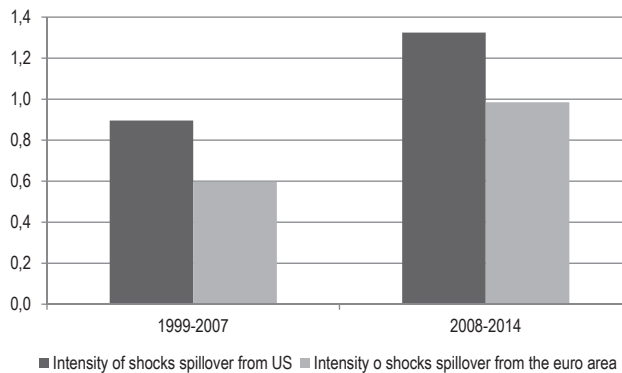


Figure 9. Intensity of global shock spillover (from the United States) and the euro area shock spillover in the Greek equity market, measured by $\beta_{gr,t}^{us}$, $\beta_{gr,t}^{eur}$ coefficients in the period of 1999-2007 and 2008-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETTL program.

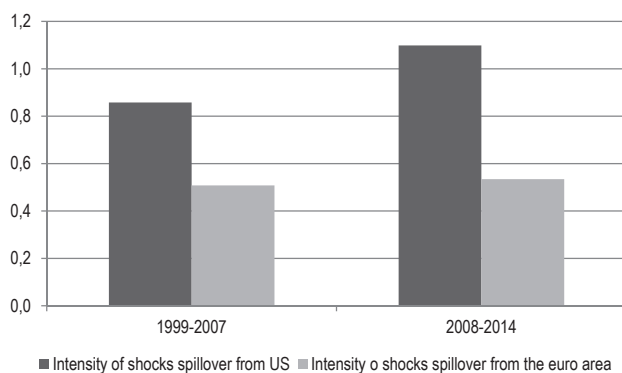


Figure 10. Intensity of global shock spillover (from the United States) and the euro area shock spillover in the Polish equity market, measured by β_{pl}^{us} , β_{pl}^{eur} coefficients in the period of 1999-2007 and 2008-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETTL program.

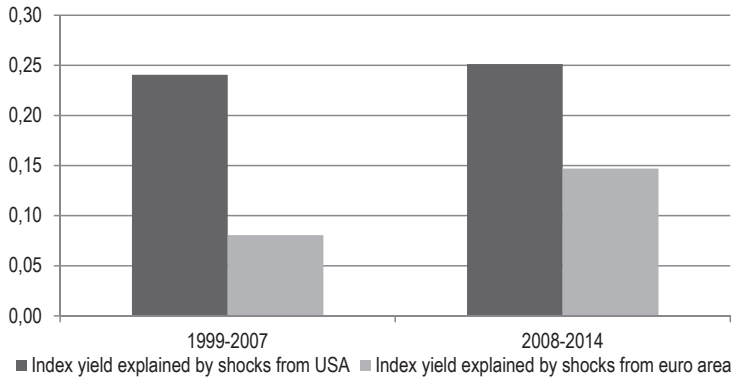


Figure 11. Greek equity market – variance ratio for the $\hat{A}TH$ index yield explained by shocks from the euro area ($VR_{gr,t}^{eur}$) and the United States ($VR_{gr,t}^{us}$) in the periods 1999-2007 and 2008-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETL program.

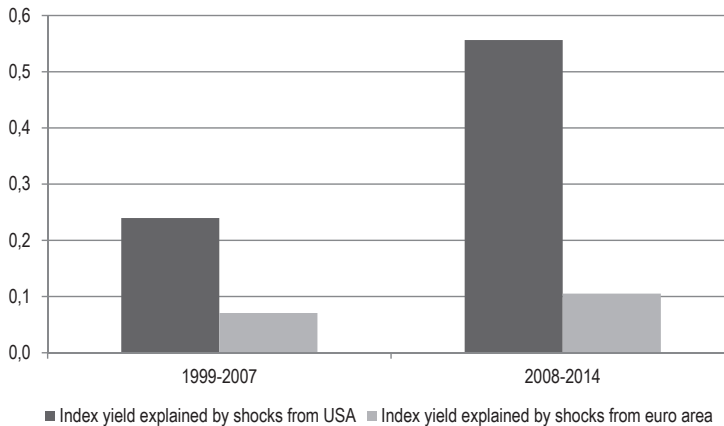


Figure 12. Polish equity market – variance ratio for the WIG index yield explained by shocks from the euro area (VR_{pl}^{eur}) and the United States (VR_{pl}^{us}) in the periods 1999-2007 and 2008-2014

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield” with the use of the GRETL program.

Conclusions

The world's economic and financial systems are becoming increasingly integrated due to the rapid expansion of international trade in commodities and financial assets. The financial assets linkage arises because households, corporations and financial

institutions can increasingly decide whether to hold domestic assets as bonds, equity and other in foreign countries.

The aim of this paper was to explore the financial integration hypothesis for equity markets (Polish and Greek) into the euro area market. There are two categories of basic approaches to defining the extent to which international financial markets are integrated: direct and indirect measures. The first one is couched in terms of the extent to which the rates of return on financial assets with similar risk characteristics are equalized, which invokes the law of one price. This is an approach which we used in this paper.

Greek and Polish equity markets can be described as emerging markets. This term was born in 1980s for countries which are considered to be in a transitional phase between developing and developed status. Our results show that both of analyzed equity markets are more integrated with the American (global) equity market than with euro area equity market. On the background of the results of analysis presented above some important questions can be formulated. First – what are the reasons that Greek equity market, market of the member country of euro area, is more integrated with American equity market than with the euro area market?

Second- what are the reasons that Polish equity market (Poland is member of EU and member high integrated in the trade business cycle dimensions), is more integrated with American equity market than with the euro area market?

It is very difficult to find answer in the framework of classical theory of finance, maybe in the behavioral finance and psychology of financial market.

Investors can be relatively firmly convinced of the determined big financial markets' news significance and its impact on the financial instruments yields, especially equities. The signals from American market are treated as signals from the global market. American economy is very attractive economy with specific features: high level of competition and economic freedom, property law protection, high level of technology, labor mobility, market flexibility and relatively high dynamics of economic growth. Those features explained the dollar's role as the world's primary reserve currency. It is very important that American sovereign debt is denominated in American dollars. 80% of official central bank reserves in the world are denominated in American dollars. As a result investors treat information and signals from American market as a most important for their investment decisions. On the other side, investments in the euro market in the case of Greek investors are easier than in the Wall Street, because common currency let them to avoid currency risk. But Greek investors can be convinced that all changes in the financial markets in the world are cause by changes in the global, American market. The same can be said in the case of Polish investors.

It is interesting that the same situation exists in Czech Republic, Slovenia, Hungary. The degree of equity market integration in those countries with American equity market is higher than with euro area equity market. Important is the case of Slovenia as a member of euro area (see: Bukowski, 2013).

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