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The Effectiveness of Investing in Stock Exchange Markets in Central and Eastern European Countries with Regard to NYSE2-LSE-HKSE2. a Comparative Risk Analysis

Jacek Pera
Ph.D., Krakow University of Economics
Faculty of Economics and International Relations
International Economics Department, Krakow, Poland
e-mail: peraj@uek.krakow.pl

Abstract

The aim of this paper is to assess the effectiveness and risk in the stock exchange market in Central and Eastern Europe countries (CEE) in view of the largest stock exchanges: NYSE2-LSE-HKSE2. The implementation of this objective was based on an analysis of basic stock market indicators and a discussion of the investment effectiveness of the stock exchange and the risk and investment effectiveness analysis in the stock exchange market in CEE with regard to NYSE2-LSE-HKSE2 – assumptions, test method, tests results. The following working hypothesis was adopted in the analysis: Despite high vulnerability to investment risk, the stock exchanges in CEE, due to dynamic development, are improving their investment position with regard to global stock exchanges. The relative indices of stock market attractiveness and an autoregressive model for forecasting changes in the stock market index were used to verify this thesis. The results from the tests make it possible to state that the stock exchanges in CEE are constantly improving their position with regard to operational effectiveness and risk mitigation when compared to the largest global stock exchanges analysed, ambitiously striving to become significant financial centres within Europe and worldwide.

Keywords: index, ratio, securities, stock exchange, risk

JEL: C1, C5, F3, G1

Introduction

In the market economy, which allows for the free flow of capital on a global scale, stock exchanges have mainly become a place for the leading and greatest players of the financial sector, whose investor moods and decisions may have a direct impact on the growth and developmental processes in a given sector. Their mere presence on specific stock exchange markets enhances the economic attractiveness of the region and the probability of capital inflows. Stock markets and the open environments of investors contribute to an improvement in the effectiveness of allocations which have the rare character of being global resources, as a result of which they influence economic growth globally (Kulpaka 2007, p. 162).

The mergers of local stock exchanges around the world has resulted in the emergence of several large, competing stock exchange units such as the stock exchanges in New York (NYSE[1]), London (LSE[2]), andNYSE Euronext[3] (an alliance established by stock exchanges in Amsterdam, Brussels, Paris and Lisbon), or HKSE2 (the Hong Kong Stock Exchange and Shanghai SE)[4]. Also, stock exchanges in Central and Eastern European countries (CEE) are some of the most dynamically developing European stock exchanges at present. They continuously improve their position in terms of operational effectiveness and risk mitigation when compared to the largest global stock exchanges analysed, ambitiously striving to become significant financial centres within Europe and worldwide. This is confirmed by, inter alia, FTSE Russell (a company creating benchmark indices for investment funds) and Stoxx (an index company that mainly specialises in indices created for European countries) officially qualifying the Polish stock exchange to the group of developed markets on September 24th, 2018. Previously, Polish stocks were generally not present in any Stoxx indices, and now they will be included in the renowned Stoxx 600 Europe, among

1 New York Stock Exchange, NYSE – the largest global stock exchange; established in 1817. Its office is located at the famous 40 Wall Street, and the trading of securities is performed entirely electronically. Nearly two thousand companies are listed on the NYSE, and capitalisation totals nineteen billion dollars.

2 London Stock Exchange – the largest European stock exchange. Established in 1801, it is one of the oldest markets trading securities. Among the 1300 companies listed, we may find such giants as HSBC, BP, Shell, Tesco and GlaxoSmithKline. Capitalisation totals ca. six billion dollars.

3 NYSE Euronext – an alliance established by the stock exchanges in Amsterdam, Brussels, Paris and Lisbon, which in the year 2000 merged with New York's NYSE. The Euronext 100 index lists several worldwide companies, including Danone, Philips, Reanault, Heineken, Carrefour and Alcatel. Capitalisation totals three billion dollars.

4 Shanghai SE – despite the fact that this stock exchange operated even before World War II , it was only officially established in 1990. The stock exchange in Shanghai lists over one thousand companies and the largest ones comprise mainly the Bank of China and Sinopec. Capitalisation is maintained at a level of nearly four billion dollars. Hong Kong Stock Exchange – the largest stock exchange in Asia, which started its activity in 1891. It lists as many as 1995 companies, 989 of which come from China. Capitalisation of the stock exchange in Hong Kong totals slightly more than three billion dollars.

others. This might mean an "injection" of fresh funds on the side of investors' using Stoxx indices as benchmarks. Stoxx, the index operator of Deutsche Boerse Group, provided a list of Polish companies that will be promoted to this index. It includes the eight largest companies in terms of free-float value listed on the stock exchange. The list includes PKO BP, Pekao, Orlen, PZU, Santander Bank Polska, CD Projekt, KGHM and LPP.

The result of the decisions of the main index companies will be indubitably positive – a USD 150 million demand of ETF and USD 200 million from active funds. Table 1 presents the FTSE Russell indices to which Poland will be transferred and the size of funds that are based on such indices. Meanwhile, Figure 1 shows the developed markets as at 24.09.2018, according to MSCI (Morgan Stanley Capital International Index – indices calculated since 1970 by the American investment bank Morgan Stanley), FTSE Russell and Stoxx.

Table 1. AUM of Passive Buyers, USD millions and estimated weight of Poland after upgrade

Name of index being tracked by ETFS	AUM USD mm	# of Funds	Weight of Poland (estimated)
FTSE Developed All Cap ex US Index	103.599	2	0.276 %
FTSE Developed Index	87.351	7	0.154 %
FTSE Developed Europe ex UK Index	56.928	13	1.059 %
FTSE Developed ex UK Index	36.778	8	0.755 %
FTSE World Developed Custom Index	34.492	2	0.154 %
FTSE Developed Europe All Cap Index	24.625	2	0.755 %
FTSE Developed ex US Index	12.684	1	0.276 %
FTSE Developed Europe Index	2.875	7	0.755 %
FTSE Developed Small Cap ex US Liquid Index	1.693	1	0.276 %
FTSE Developed Ex-North America Index	1.328	4	0.276 %
FTSE Developed Small Cap Index	1.090	1	0.154 %
Total	**363.443**	**48**	**0.442 %**

Source: Own study based on FTERussell.com, Pekao Investment Banking S.A

The countries of Central and Eastern Europe are continuously attracting new companies from abroad, and they are also searching for foreign partners in order to establish common grounds. This often entails an investment risk. Such tendencies make it necessary to re-analyse the current situation in terms of investment profitability of CEE stock exchanges – in dynamically changing international capital markets. The purpose of this paper is to assess the effectiveness and risk in the stock exchange market in CEE countries in view of the largest stock exchanges: NYSE2-LSE-HKSE2. The implementation of this objective was based on an analysis of the basic stock market indices and a discussion of the investment effectiveness of the stock exchange and the risk and investment effectiveness analysis in the stock exchange market in CEE countries with regard to NYSE2-LSE-HKSE2 – assumptions, test method, tests results.

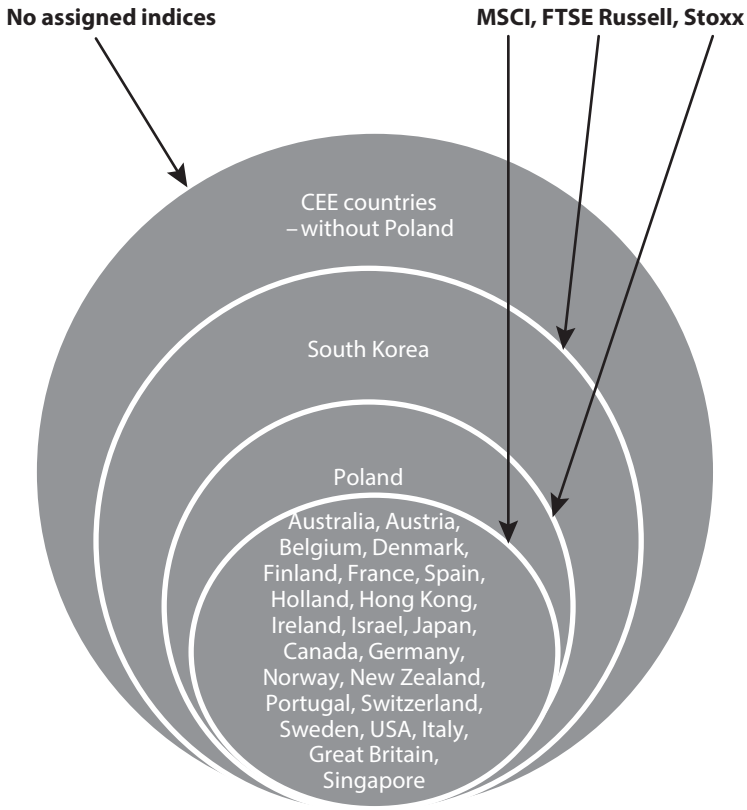

Figure 1. Development Markets according to MSCI, FTSE Russell and Stoxx
Source: Own study.

The following working hypothesis was adopted in the analysis: Despite the high vulnerability to investment risk, the stock exchanges in Central and Eastern European countries, due to dynamic development, are improving their investment position with regard to the global stock exchanges. The relative indices of stock market attractiveness and an autoregressive model for forecasting changes in the stock market index were used to verify this thesis.

The investment effectiveness of the stock exchange and the risk

In the opinion of Salamaga (Salamaga 2013, p. 113) "for at least several years in the research of financial markets, the mainstream regarding effectiveness analysis of such markets is more and more visible. In the scope of this mainstream, there is an attempt to assess the level of maturity of capital markets and to indicate possible regularities in their evolution-

ary changes. The term market effectiveness with regard to IT generally means such market property that allows for the immediate reflection of all the available market information in the price of the financial instruments (e.g., stocks). Market effectiveness in the so-called weak sense means that prices discount the resource of current information, as well as the historical ones about the market and its financial instruments (Jajuga 2008, p. 148; Hudson, Dempsey, Keasey 1996; Mark 2004; Isakov, Hollistein 1999; Hansen, Hodrick 1980; Brock, Lakonishok, LeBaron 1992). Confirmation of the hypothesis on the weak form of market effectiveness in terms of information means that, inter alia, based on historical market information it is not possible to efficiently use, e.g., tools of technical analysis to achieve above-average profits; it is not possible to 'beat' the market". However, assuming the presence of an effective market in terms of information, such detailed analysis will not bring the guaranteed positive growth rate, since the prices that are shaped on such a market will reflect the complete information available at a given moment. It means that historical and current information, as well as future expectations, will already be discounted in the price of the given securities. Therefore, preserving financial instrument prices in such a case will comply with the random walk scheme, which means that the probability of profit achievement will be the same as the probability of incurring a loss (Charnes, Cooper 1961; Gerov 2005; Gourieroux, Jasiak 2001; Lee 1972; Lubos, Stambaught 2003; Yue, Ouarda, Bobée 2001).

The essence of the effective investment in the stock exchange is to find a proper proportion between the undertaken risk and the expected income. People investing in the stock exchange decide to take a risk in different forms (Bień 2008, pp. 207–209; Gajewski 2008, p. 395–396):

— Foreign exchange risk mainly concerns foreign investments, and it may be limited by buying forward currency with the date at the end of the investment period. The high volatility of the foreign exchange rate is the most undesirable issue for a foreign investor in the stock exchange because it impedes risk evaluation. Strengthening the national currency increases the value of the investment of such an investor and encourages the achievement of profit, whereas currency depreciation has the opposite effect. On the other hand, the exchange rate level is significant when making a decision on capital investment in a given stock exchange. A weak currency means that the current stock valuation, after conversion into a foreign currency, is lower and the bonds become more attractive for the buyer. The currency exchange rate should not matter for domestic inventors.
— The risk of bankruptcy and financial risk may affect the entire market when a collapse or problems with financing a substantial number of listed companies takes place; therefore, for the purpose of this study, they were considered negligible for stock exchange assessment.
— Market risk is related to the economic situation that in the case of depreciation leads to a decrease in prices of values below their potential value. If an investor must sell his stocks, in such a situation, then he accepts an unfavourable price. The reverse situation – selling stocks with a valuation above their potential value – is desirable for investors.

— Liquidity risk occurs when there is no possibility to buy or sell stocks without a significant influence on their price. Due to the high financial liquidity of the secondary market, it is possible to find potential buyers of stocks for shorter periods, which results in long-term financing of credit by short-term capital, partly from individual investors. Liquidity and market risk may be connected. When large decreases occur in the stock exchange, there are no potential buyers of stocks, resulting in a decrease in liquidity and further decreases in prices until demand and supply equalise.
— Risk of low capitalisation and turnover. In the opinion of Gajewski (2008) and Duwendag, Ketterer, Kösters, Pohl and Simmert (1996), "apart from the economic environment, the size of the stock exchange has crucial importance, both for issuers of securities, as well as entities interested in buying them. In a large stock exchange, it is easier for entities with the demand for long-term measures to find partners who are ready to put their capital for a "long period". For investors, a decrease in the number of companies means a reduction in the possibility of choosing stocks, whereas an increase allows for the choice of stocks from a broader offer and better risk diversification. Stock exchanges with relatively low turnovers and capitalisation remain a market not safe for investors because a small number of companies are the subject of everyday trading transactions, and this means high risks of a shortage of liquidity of stocks of other companies.
— Risk of political instability in the country. A stable political situation and growing integration in the scope of the global economy mean that potential investors show a great interest in the stock exchanges that operate in such surroundings. Political instability is characterised by a reverse mechanism.

The indices that efficiently measure stock exchange effectiveness are as follows: average market capitalisation, i.e., average stock exchange value of a company listed in the stock exchange, market liquidity index, average market liquidity index, index of market share in turnover of all the stock exchanges, concentration index and market capitalisation index to the value of the GDP of the given economy (Przybylska-Kapuścińska 2008, pp. 130–134; Michorowski 2013, p. 336).

Investment effectiveness analysis of stock exchange markets in Central and Eastern European countries with regard to NYSE2-LSE-HKSE2 – assumptions, test method, test results

The analysis comprised the stock exchange markets (securities markets) of all CEE countries in the years 2008–2017 and NYSE2-LSE-HKSE2 in the system:

— Visegrad countries [PL-Poland-WSE (WIG20)-*Warsaw Stock Exchange*, CZ-Czech Republic- PSE (PX50)-*Prague Stock Exchange*, SK-Slovakia-BSE

(SAX)- *Bratislava Stock Exchange*, HU-Hungary-BSE (BUX)-*Budapest Stock Exchange*],
— Baltic coastal states disconnected from the former USSR, [LT-Lithuania-VSE (OMXV)-*Vilnius Stock Exchange*, LV-Latvia-RSE (OMXR)-*Riga Stock Exchange*, EST-Estonia-TSE (OMXT)-*Tallinn Stock Exchange*],
— Russian countries disconnected from former the USSR, [BY-Belarus[5], UA-Ukraine-PFTS (KAC20)-*Ukraine Stock Exchange*],
— countries formed from the former Yugoslavia [SLO-Slovenia-LSE (SBITOP)-*Ljubljana Stock Exchange*, HR-Croatia-ZSE (CROBEX10)-*Zagreb Stock Exchange*, BiH-Bosnia and Herzegovina-SB (BIRS)-*Sarajevska Berza*, SRB-Serbia-BB (BELEX15)-*Beogradska Berza*, MNE-Montenegro-MSE (MNS10)-*Montenegro Stock Exchange*, MK-Macedonia-MSE (MSE)- *Macedonia Stock Exchange*],
— other Balkan countries [AL.-Albania[6], BG-Bulgaria-BSE (BSESOFIX)-*Bulgarian Stock Exchange*, RO-Romania-BSE (BET10)-*Bucharest Stock Exchange*],
— USA-USA-NYSE (NASDAQ–100)- *New York Stock Exchange*.
— HK-Hong Kong-HONG KONG SE (HSI) – *Hong Kong Stock Exchange*.
— NL-Holland, BE-Belgium, FR-France, PT-Portugal- NYSE EURONEXT (EURONEXT 100).
— CH-China-SHANGHAI SE (SSE).

Relative indicators were used to have a closer look at the examined issue of stock exchange effectiveness and to draw the correct conclusions from comparisons made, which in comparison with other data, including macroeconomic data, provide a complete overview of the stock exchange market and are particularly helpful in assessing their development. Therefore, in the further analysis of the effectiveness of the stock exchange market was tested using six indicators mentioned in paragraph 2, i.e.:

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5 The Belarus stock exchange was excluded from the analysis due to its specificity and problems with establishing capitalisation. So far nobody has calculated the capitalisation of the Belarus stock exchange. Its calculation turns out to be quite a complicated issue, since according to the Belarus legislation literally all the stocks of all the joint stock companies are to be sold and bought by the stock exchange, regardless of whether they are listed or not. In 2017, 2387 joint stock companies were present in the public turnover of Belarus, only 56 of which conformed to the listing requirement, i.e., were officially listed in the stock exchange (on the so-called A list). Meanwhile, in the same year, trading activity in the stock exchange was reported for 194 companies (186 of which were on the so-called B list, which, in fact, does not specify any stock exchange requirements). Yet the situation is even more complicated by the fact that in 2017 only 8 of the 56 listed companies had any turnover. Investors are more interested in unlisted companies than in large manufacturing companies or leading banks.

6 The Tirana Stock Exchange (Bursa e Tiranës) does not exist formally – it was formed 10 years ago, and even employs workers; however, no true activity in the stock exchange ever commenced. Legislation and regulations are almost ready; however there is a problem with companies not being prepared to have a share in this market, since they do not want to – or cannot – comply with, inter alia, the formal requirements. Therefore it was decided exclude the stock exchange in Albania from the analysis.

A. AMCI-average market capitalisation index, that is, the average stock exchange value of a company listed on the stock exchange – calculated as the ratio of capitalisation (C) / number of companies (NC),

$$AMCI = C / NC \quad (1)$$

B. MLI-market liquidity index – calculated as the ratio of trade in stocks (TS) to the market capitalisation value (C), indicates the speed of capital transfers and indirectly informs us about the maturity of the stock exchange market,

$$MLI = TS / C \quad (2)$$

C. AMLI-average market liquidity index – calculated by multiplying the market liquidity index (L) and average capitalisation (C_A),

$$AMLI = L * CA \quad (3)$$

D. MSI-market share index (MT) in the turnover of all stock exchanges (TT),

$$MSI = MT / TT \quad (4)$$

E. CI-concentration index – calculated as a share of the trading value of the ten largest stock exchange companies (T10) in the total turnover of securities in the given market (TT),

$$CI= T10 / TT \quad (5)$$

F. CI/GDP-market capitalisation ration to the GDP value of the given economy – calculated as a ratio of the market capitalisation value (C) to GDP of the given economy, provides information about the level of importance of the stock exchange for the economy of the given country.

$$CI = C / GDP \quad (6)$$

5400 daily observations of changes in the main 20 stock exchange indices were adopted in total for the analysis of the examined period, making allowance for the accounting year. As has already been mentioned, the stock exchange is more effective for investors in terms of investments; they can earn more. Therefore, the stock exchange attractiveness measures stated above were used in the forecasting of changes in the stock exchange index. For this purpose, a model of changes[7] of the main stock exchange indices (7) of the

7 Autoregressive model, compare: (Brzeszczyński, Kelm 2002, p. 18), (Gajewski 2008, p. 404) extended by the author of this paper with additional variables and adjusted to the needs of the analysis.

analysed countries was built, and then its forecasting capabilities were verified. On this basis, the stock exchange effectiveness that represents a given index was estimated. A stationarity test demonstrated that all the measures, as well as the indices BELEX15, BET10, BIRS, BSESOFIX, BUX, CROBEX10, EURONEXT 100, HIS, KAC20, MNS10, MSE, NASDAQ 100, OMXR, OMXT, OMXV, PX50, SAX, SBITOP, SSE, and WIG20, are integrated at the first stage. The test series held were divided into two parts: the estimation part and the part used for testing ex-post forecasts. A one-month growth rate for indices was chosen to be the dependent value. The starting model took the following form:

$$
\begin{aligned}
\Delta_{t,t-1} ind &= \alpha_0 + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)}\, ind + \sum_{i=1}^{1} \beta_i \Delta_{t-1,t-12} \times_i + \xi_t \\
\Delta_{t,t-1}\mathbf{BELEX15} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{BELEX15} \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{BET10} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{BET10} + \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{BIRS} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{BIRS} + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{BSESOFIX} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{BSESOFIX} \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{BUX} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{BUX} + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{CROBEX10} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \\
&\quad \text{CROBEX10} + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{EURONEXT\ 100} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{EURONEXT100} \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{HIS} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{HIS} + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{KAC20} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{KAC20} + \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{MNS10} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{MNS10} + \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{MSE} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{MSE} + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{NASDAQ\ 100} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{NASDAQ100} \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t} \\
\Delta_{t,t-1}\mathbf{OMXR} &= \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{OMXR} + \\
&\quad + \sum_{i=1}^{1} \boldsymbol{\beta_i} \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi_t}
\end{aligned}
\tag{7}
$$

$$\Delta_{t,t-1}\mathbf{OMXT} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ OMXT} + \\ + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{OMXV} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ OMXV} + \\ + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{PX50} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ PX50} + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{SAX} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ SAX} + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{SBITOP} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ SBITOP} \\ + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{SSE} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ SSE} + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

$$\Delta_{t,t-1}\mathbf{WIG20} = \boldsymbol{\alpha_0} + \sum_{n=1}^{1} \propto_n \Delta_{t-1n,t-1(n+1)} \text{ WIG20} + \\ + \sum_{i=1}^{1} \boldsymbol{\beta}_i \Delta_{t-1,t-12} \times_i + \boldsymbol{\xi}_t$$

Table 2 and Figure 2 show the effectiveness of the stock exchange market of the analysed group of countries, with the use of stock exchange market indicators and model (7). The results obtained from the tests enable us to state that the stock exchanges of CEE countries are continuously improving their investment position in terms of operational effectiveness and risk mitigation when compared to the largest global stock exchanges analysed. So far, the differences have not been very significant, but the test results allow us to state that the increasing tendency will be maintained in the coming years. A reference point for CEE investment markets – at the same time, they have the highest investment position in the analysed period – is EURONEXT 100, due to the merged markets of the countries: NL, BE, FR, and PT, and the NASDAQ100 – the largest and most dynamic market worldwide. In view of these two indices, the investment markets of CEE enjoy clear growth in this investment position at the interval at the beginning and end of the examined period.

The most liquid markets (MLI) in the analysed period were the HIS, NASDAQ 100 and SSE stock exchanges, as well as platforms created as a result of stock exchange alliances (the LSE Group, Euronext, and OMX Nordic). The liquidity of stocks in the capital market of all analysed CEE countries until 2011 was lower than the EURONEXT 100, HIS, NASDAQ 100 and SSE. Such differences were the consequence of the fact that companies from CEE countries were characterised by lower capitalisation, and the main investors comprised foreign investors, who are perceived by the market as passive, investing their capital for a longer period. In addition, the consequences of the 2008 financial crisis caused growing aversion to the risk of inventors. Only from 2010 was an increase reported in the dynamics of liquidity of capital markets in CEE countries which were introduced to the EU. In addition to MLI, AMLI – calculated by multiplying the market liquidity indicator (L) and average capitalisation (CA) – points to the growing average liquidity of CEE countries in the analysed peri-

od. Despite turbulences on the financial markets caused by the crisis of 2007, markets of the countries of NYSE2-LSE-HKSE2 remained liquid. In the case of CEE countries, the share of specific groups of investors played a crucial role. The distribution of individual (IND), institutional (INS) and foreign (FOR) investors on the markets of the NYSE2-LSE-HKSE2 countries in the intervals 2008–2011–2014–2017 were shaped evenly, which of course demonstrates the maturity of these markets in terms of investments and the constant interest of foreign capital (Figure 3). A different tendency in this scope was present in CEE countries. As a result of the accession of consecutive CEE countries to the European Union, the investment market in such countries started to be increasingly noticed by foreign investors (FOR), which led to their increased activity in the stock market from 2008 (from 22.7% in 2008 up to 50% in 2017). It points to the growing interest of foreign investors in the markets of CEE countries and the level of investment risk acceptable for them in such countries. In the analysed period there was a systematic increase in the share of INS and FOR in all the markets of CEE countries – both year after year, as well as when compared to the capital markets and NYSE2-LSE-HKSE2. As a result of the growing aversion to risk, individual investors in CEE countries generated a decrease in the share in turnover, which amounted to 43% in 2008 and 35% in 2017. Foreign investors were responsible for the increase in the turnover of stocks in 2008, up from 22% to 55% in 2017, which demonstrates the increasing role of investment markets of CEE countries. Institutional investors contributed to the diversified (increase/decrease) level of turnover of stocks – the lowest level was reported in 2011: 15%; meanwhile the highest level was reported in 2014: 25%. Market liquidity is affected by, inter alia, the number of stocks in the free float, the concentration of turnover on several companies with the highest capitalisation, or the economic situation. Bearing the last factor in mind, the indicator of the is used in practice. Bearing the last factor in mind the indicator of the share in turnover on the markets in the turnover of all the stock exchanges MSI. It shows market competitiveness with regard to all the stock exchanges, revealed in the share of turnover of the given market in the turnover of the entire region and assumes the value from the range <0;1>.

Table 2. Score values for indicators: A-B-C-D-E-F and $\Delta_{t, t-1}$ in the years 2008–2017

Index	Indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
BELEX15	A/B/C/D/E/F	9.5/32.7/32.7/3/0.1/67/68	9.5/32.7/32.7/3/0.1/67/68	9.5/42.7/42.7/3/0.2/67/68	8.5/22.7/22.7/3/0.1/77/78	6.5/22.7/22.7/3/0.2/68/68	9.5/32.7/32.7/3/0.2/67/68	9.5/32.7/32.7/3/0.3/67/68	9.5/32.7/32.7/3/0.3/68/68	9.5/42.7/42.7/3/0.3/78/78	9.5/50/50/3/0.3/69/68
	$\Delta_{t, t-1}$	0.40	0.52	0.66	0.87	0.73	0.75	0.77	0.81	0.80	0.79
BET10	A/B/C/D/E/F	9.5/32/32/3/0.1/97/88	8.5/38/38/3/0.1/92/91	8.5/40/40/3/0.1/90/91	9.5/45/45/3/0.1/94/94	9.5/41/41/3/0.1/93/95	9.5/43/43/3/0.1/97/88	6.5/47/47/3/0.1/98/98	9.5/47/47/3/0.2/99/99	9.5/50/50/3/0.3/99/99	9.5/50/50/3/0.4/99/98
	$\Delta_{t, t-1}$	0.32	0.33	0.39	0.40	0.39	0.45	0.43	0.51	0.59	0.64
BIRS	A/B/C/D/E/F	10/37/37/3/0.1/97/98	10/39/39/3/0.1/97/88	5.5/42/42/3/0.1/97/98	5.5/42/42/3/0.1/97/98	4.5/45/45/3/0.3/98/98	9.5/45/45/3/0.3/98/98	9.5/32/32/3/0.3/98/98	9.5/32/32/3/0.2/99/99	9.5/47/47/3/0.3/99/99	9.5/50/50/3/0.3/99/99
	$\Delta_{t, t-1}$	0.20	0.41	0.45	0.50	0.49	0.55	0.60	0.66	0.70	0.80
BSESOFIX	A/B/C/D/E/F	9.5/30/30/3/0.1/97/98	9.5/30/30/3/0.1/93/97	9.5/32/32/3/0.1/98/98	9.5/37/37/3/0.1/96/95	9.5/40/40/3/0.1/95/95	8.5/40/40/3/0.1/99/98	8.5/47/47/3/0.3/97/98	7.5/47/47/3/0.2/95/98	9.5/47/47/3/0.4/99/98	9.5/50/50/3/0.5/99/98
	$\Delta_{t, t-1}$	0.24	0.30	0.19	0.25	0.32	0.45	0.50	0.39	0.55	0.63
BUX	A/B/C/D/E/F	29.5/30/30/3/0.2/93/91	39.5/30/30/3/0.2/95/90	39.5/32/32/3/0.2/93/90	40/37/37/3/0.2/96/92	49.5/39/39/3/0.2/97/98	49.5/40/40/3/0.2/96/96	59.5/47/47/3/0.2/97/98	59.5/47/47/3/0.3/97/97	59.5/47/47/3/0.5/97/98	66/50/50/3/0.7/97/98
	$\Delta_{t, t-1}$	0.28	0.33	0.42	0.32	0.44	0.52	0.59	0.65	0.71	0.70
CROBEX10	A/B/C/D/E/F	29.5/22.7/22.7/3/0.2/67/68	29.5/30/30/3/0.2/67/68	29.5/30/30/3/0.2/68/68	29.5/32/32/3/0.2/69/69	39.5/37/37/3/0.2/67/68	49.5/37/37/3/0.2/67/67	49.5/47/47/3/0.2/68/69	59.5/47/47/3/0.2/67/68	59.5/47/47/3/0.3/67/68	60/50/50/3/0.4/67/68
	$\Delta_{t, t-1}$	0.21	0.29	0.39	0.41	0.43	0.49	0.53	0.59	0.65	0.69
EURONEXT 100	A/B/C/D/E/F	69.5/56/56/3/0.8/30/31	69.5/59/59/3/0.7/31/34	70/60/60/3/0.9/32/33	70.5/61/61/3/0.7/34/34	70.5/65/65/3/0.8/33/33	79.5/69/69/3/0.9/32/31	79.5/75/75/3/0.7/35/32	80/80/80/3/0.9/32/33	89.5/80/80/3/0.9/34/33	95/85/85/3/0.9/35/33
	$\Delta_{t, t-1}$	1.98	2.02	2.23	2.29	2.39	2.47	2.52	2.50	2.65	2.70

HIS	A/B/C/D/E/F	65.5/55/55/3/0.7/31/33	65.5/55/55/3/0.7/32/32	79.5/59/59/3/0.7/34/34	79.5/60/60/3/0.8/35/35	69.5/65/65/3/0.8/32/32	89.5/70/70/3/0.8/33/33	89.5/75/75/3/0.8/34/33	89.5/75/75/3/0.8/35/35	89.5/75/75/3/0.8/35/35	95/80/80/3/0.8/35/35
	$\Delta_{t,\,t-1}$	1.12	1.19	1.27	1.29	1.35	1.30	1.41	1.49	1.40	1.35
KAC20	A/B/C/D/E/F	9.5/32/32/3/0.2/97/98	9.5/32/32/3/0.2/97/98	29.5/32/32/3/0.99/98	9.5/37/37/3/0.2/98/98	8.5/37/37/3/0.2/98/98	8.5/47/47/3/0.2/98/98	6.5/47/47/3/0.3/99/99	8.5/47/47/3/0.3/99/99	9.5/47/47/3/0.3/99/99	9.5/50/50/3/0.4/99/99
	$\Delta_{t,\,t-1}$	0.22	0.32	0.30	0.30	0.39	0.40	0.45	0.50	0.52	0.51
MNS10	A/B/C/D/E/F	9.5/22/22/3/0.1/67/67	9.5/22/22/3/0.1/67/67	9.5/32/32/3/0.1/67/67	8.5/32/32/3/0.1/67/67	8.5/37/37/3/0.1/67/67	9.5/37/37/3/0.1/67/67	9.5/47/47/3/0.1/67/67	9.5/47/47/3/0.1/67/67	9.5/47/47/3/0.3/67/67	9.5/50/50/3/0.4/67/67
	$\Delta_{t,\,t-1}$	0.20	0.25	0.20	0.30	0.35	0.38	0.40	0.42	0.45	0.48
MSE	A/B/C/D/E/F	10/37/37/3/0.1/97/98	9.5/39/39/3/0.2/97/98	9.5/37/37/3/0.2/98/98	8.5/39/39/3/0.2/98/98	8.5/40/40/3/0.2/97/97	9.5/40/40/3/0.2/97/96	8.5/47/47/3/0.2/99/98	9.5/49/49/3/0.2/99/98	9.5/49/49/3/0.2/99/99	9.5/50/50/3/0.3/99/99
	$\Delta_{t,\,t-1}$	0.20	0.30	0.32	0.40	0.42	0.40	0.35	0.49	0.50	0.51
NASDAQ 100	A/B/C/D/E/F	69.5/57/57/3/0.9/34/33	68/60/60/3/0.9/32/33	76/60/60/3/0.9/34/31	78/68/68/3/0.9/33/33	82/73/73/3/0.9/32/33	85/75/75/3/0.9/31/33	89/75/75/3/0.9/35/33	92/86/86/3/0.9/34/33	92/90/90/3/0.9/35/34	95/95/95/3/0.9/35/34
	$\Delta_{t,\,t-1}$	2.89	2.70	2.09	2.90	3.01	3.35	3.90	4.09	4.34	4.55
OMXR	A/B/C/D/E/F	9.5/32.7/32.7/3/0.1/97/98	9.5/37/37/3/0.1/97/98	9.5/35/55/3/0.1/95/98	9.5/38/38/3/0.1/96/98	9.5/39/39/3/0.2/91/93	9.5/40/40/3/0.2/93/92	8.5/40/40/3/0.2/97/98	9.5/45/45/3/0.3/98/98	9.5/45/45/3/0.3/98/98	9.5/50/50/3/0.5/98/98
	$\Delta_{t,\,t-1}$	0.19	0.10	0.20	0.22	0.25	0.30	0.32	0.35	0.39	0.40
OMXT	A/B/C/D/E/F	29.5/37/37/3/0.1/97/98	29.5/37/37/3/0.1/97/98	39.5/39/39/3/0.1/95/96	29.5/32/32/3/0.1/97/97	29.5/40/40/3/0.1/96/96	49.5/40/40/3/0.1/98/98	29.5/45/45/3/0.2/95/95	59.5/45/45/3/0.3/98/98	59.5/47/47/3/0.4/99/99	60/50/50/3/0.4/99/99
	$\Delta_{t,\,t-1}$	0.20	0.25	0.30	0.35	0.33	0.43	0.40	0.43	0.48	0.50

Index	Indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
OMXV	A/B/C/D/E/F	8.5/32/32/3/0.1/97/98	7/37/37/3/0.1/97/98	9.5/37/37/3/0.1/96/98	8.5/39/39/3/0.1/95/98	9.5/40/40/3/0.1/98/98	9.5/40/40/3/0.1/96/96	9.5/47/47/3/0.2/97/97	8.5/47/47/3/0.2/98/98	9.5/45/45/3/0.3/99/99	9.5/50/50/3/0.5/99/99
	$\Delta_{t,t-1}$	0.43	0.44	0.30	0.45	0.50	0.51	0.55	0.58	0.60	0.65
PX50	A/B/C/D/E/F	29.5/32/32/3/0.2/98/98	29.5/32/32/3/0.2/96/96	29.5/37/37/3/0.2/95/98	29.5/39/39/3/0.2/98/98	29.5/40/40/3/0.2/97/97	39.5/40/40/3/0.2/97/97	49.5/45/45/3/0.2/98/98	59.5/47/47/3/0.2/99/99	59.5/47/47/3/0.3/99/99	65/50/50/3/0.5/99/99
	$\Delta_{t,t-1}$	0.15	0.20	0.19	0.30	0.32	0.34	0.46	0.50	0.55	0.60
SAX	A/B/C/D/E/F	29.5/30/30/3/0.3/98/98	40/30/30/3/0.3/96/95	50/32/32/3/0.3/98/98	48/37/37/3/0.3/97/98	50/37/37/3/0.3/95/95	59.5/39/39/3/0.3/99/98	59.5/40/40/3/0.4/99/99	59.5/45/45/3/0.3/97/97	59.5/45/45/3/0.5/99/99	65/50/50/3/0.6/99/99
	$\Delta_{t,t-1}$	0.15	0.20	0.23	0.25	0.30	0.32	0.35	0.40	0.41	0.45
SBITOP	A/B/C/D/E/F	29.5/32/32/3/0.1/97/98	29.5/32/32/3/0.1/97/98	30/37/37/3/0.1/96/96	39.5/37/37/3/0.1/99/98	39.5/40/40/3/0.1/98/98	40/40/40/3/0.2/95/95	49.5/47/47/3/0.2/93/90	50/45/45/3/0.4/97/98	50/45/45/3/0.5/97/98	55/50/50/3/0.5/97/98
	$\Delta_{t,t-1}$	0.20	0.19	0.31	0.30	0.40	0.45	0.34	0.46	0.49	0.48
SSE	A/B/C/D/E/F	60/57/57/3/0.7/31/33	69/57/57/3/0.7/30/33	71/60/60/3/0.7/34/34	74/60/60/3/0.7/34/33	79/67/67/3/0.7/30/32	79/70/70/3/0.7/32/33	80/70/70/3/0.7/35/33	80.5/75/75/3/0.7/35/33	89/80/80/3/0.7/35/35	95/85/85/3/0.7/35/35
	$\Delta_{t,t-1}$	1.20	1.29	1.30	1.31	1.29	1.35	1.38	1.40	1.43	1.38
WIG20	A/B/C/D/E/F	29.5/32/32/3/0.1/67/68	29.5/37/37/3/0.1/68/68	39.5/37/37/3/0.1/67/68	49.5/40/40/3/0.2/67/68	49.5/45/45/3/0.2/68/68	59.5/45/45/3/0.2/67/68	50/48/48/3/0.2/60/60	55/48/48/3/0.3/60/60	59.5/50/50/3/0.5/60/60	65/50/50/3/0.8/60/60
	$\Delta_{t,t-1}$	0.37	0.30	0.42	0.43	0.45	0.48	0.50	0.49	0.63	0.71

Source: Own study.

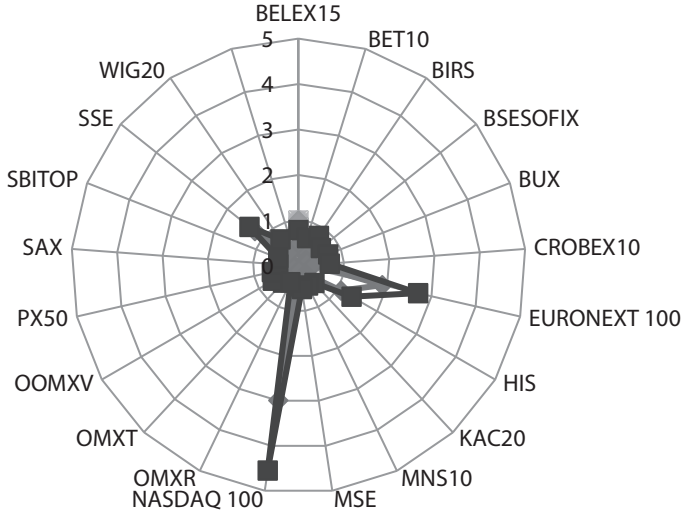

Figure 2. $\Delta_{t,\,t-1}ind$ at the beginning and at the end of the analysed period
Source: Own study.

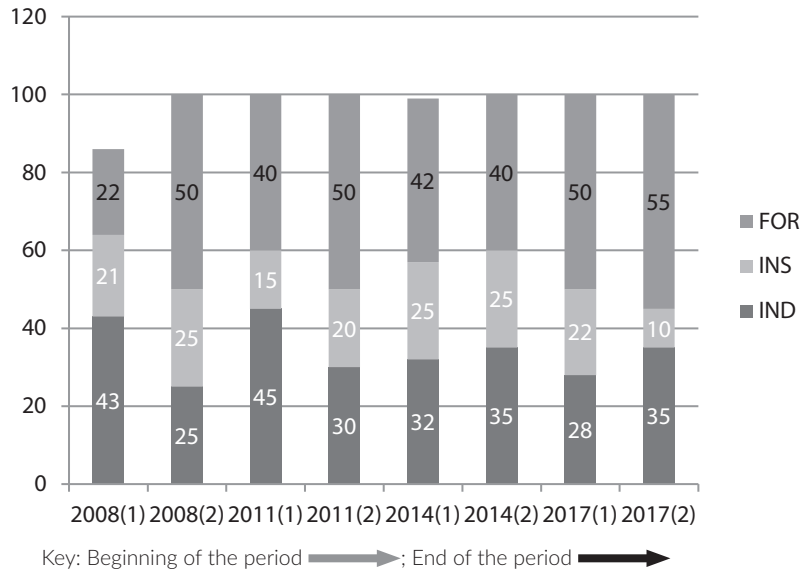

Figure 3. Structure of capital concentration of capital in CEE period countries (1) and in NYSE2-LSE-HKSE2(2) countries in the years 2008–2011–2014–2017 in %
Source: Own study.

This indicator confirms the essential position of stock exchanges from the NYSE2-LSE-HKSE2 area among the stock exchanges of CEE countries. For all countries of the NYSE2-LSE-HKSE2 area, this index is close to 1. In the case of the markets of CEE countries, the values representing this indicator are diverse. In 2008, in all CEE

countries, the value of MIG was shaped in the range: 0.1–0.3. Such low values of this indicator were justified by the financial crisis of 2007, and the resulting substantial increase in the investment risk in the world. In addition, the low macroeconomic indicators that characterised the CEE countries also influenced the value of this indicator. At the end of 2017, the value of the MIG indicator for CEE countries was shaped in the following manner: Poland (0.8), Hungary (0.7), the Czech Republic (0.5), Slovakia (0,6), Lithuania (0.5), Latvia (0.5), Estonia (0.4), Ukraine (0.4), Bulgaria (0.5), Romania (0.4), Slovenia (0.5), Croatia (0.4), Bosnia and Herzegovina (0.3), Serbia (0.3), Montenegro (0.4) and Macedonia (0.3).

In the case of AMCI for NYSE2-LSE-HKSE2 and EURONEXT, its value was reported in the range of 65–95%. In the case of CEE countries, the highest value of the indicator – in the range of 45–66% in 2017 – was reported by Poland, Hungary, Slovakia, the Czech Republic, Estonia, Slovenia and Croatia. It is worth noting that the high value of AMCI means that large and very large companies are listed on the stock exchange, which translates into relative investment security and investment risk minimisation. There was an increase in this indicator for the mentioned countries by an average of 35%. This is a significant change, given the fact that in 2008 this indicator was shaped in these countries at the level of 15% (Table 2). Such an increase also shows the growing interest of large global companies in the markets of CEE countries. In other CEE countries, AMCI was at the level of 10%.

Another indicator that emphasises the clear difference in the level of competitiveness of the stock exchange markets of CEE countries and NYSE2-LSE-HKSE2 is the concentration index (CI), which provides information about the share in turnover of stocks of the ten largest (in terms of capitalisation) stock exchange companies in the entire turnover of stocks. The lower the index, the more competitive the market. It is assumed that a value of the index over 60% points to a serious threat to the liquidity of the given stock exchange market (Gruszczyńska-Brożbar 2010, p. 141). The unquestionable leaders in this field in the analysed period include the American stock exchange and Euronext alliance, where the value of the indicator fluctuated around the level of 30–35%. By contrast, in the case of such CEE countries as Hungary, Slovenia, Romania, Bulgaria, Lithuania, Latvia, Estonia, Ukraine, Bosnia and Herzegovina, Macedonia and Albania, this indicator amounted to more than 90%, which denotes a concentration of the turnover only in the case of an insignificant group of the largest companies of the given market, and the occurrence of liquidity risk. The concentration index for the other CEE stock exchanges in the last seven years (2010–2017) was kept at a similar level, ca. 67%, which points to the constant and low risk (with no clear increasing tendency). It is worth noting that from 2014, the value of the indicator for Poland was clearly close to the values achieved by the NASDAQ stock exchange, which justifies the subsequent decisions of FTSE Russell and Stoxx in relation to the Polish stock exchange market. Turnover in the Warsaw Stock Exchange was relatively evenly distributed among the listed companies, at the same time emphasising the broad range of companies that had attracted investors.

It should be remembered that in 2008, 81 new companies joined the main market of the Warsaw Stocks Exchange (Pricewaterhousecoopers 2008, pp. 4–6) and the NewConnect platform was launched. For the purpose of comparing further the competitiveness of the stock exchange markets of CEE countries and NYSE2-LSE-HKSE2, this time, in terms of capital market significance in the given economy, the stock exchange capitalisation ratio was used in comparison with the value of gross domestic product (GDP). This indicator (CI/GDP) informs us about what part of the capital in relation to GDP is valuated by means of the stock exchange mechanism. On the basis of the data contained in Table 2, a dual trend in the change of the value of this indicator can be observed. The year 2008 is borderline, after which the index value for all CEE countries decreases by over 50%, on average. Decreasing tendencies (not as drastic an in the case of CEE countries) – in the range of 30% – may also be observed among the stock exchange markets of the NYSE2-LSE-HKSE2 countries. In the period 2008–2011, the stock exchanges declined in importance mainly as a result of investors' increased aversion to investment risk on a global scale. The share in capitalisation of the stock exchanges of CEE countries in relation to GDP, in view of the market of NYSE2-LSE-HKSE2 countries (Table 2), is characterised by a systematic increase, from the level of 40.3% in 2008 to 58.3% in 2017. However, the stock exchange market of CEE countries in this category has still been included in the total of developing markets. Despite this, in 2011, the stock exchange markets of selected CEE countries (Poland, Hungary, Czech Republic, Slovakia, Estonia) were officially added to the watch list by the Financial Times and London Stock Exchange (FTSE), giving the possibility of them being promoted from the group of advanced emerging markets to the group of developed markets – which in the case of Poland has already taken place. The FTSE experts expressed a very positive opinion on the freedom of activity of foreign investors on such markets. They also emphasised the high-quality legal regulations, the structure of deposit and settlement systems, as well as the derivatives market development. These stock exchanges increasingly conform to the standards associated with the largest capital markets from the NYSE2-LSE-HKSE2 group. The AMCI, MLI, AMLI, MSI, CI, and CI/GDP indicators did not have a significant statistical impact on the changes in the value of the indices estimated in model (7) in the period 2008–2017. In the context of the weak version of the effective market hypothesis, the small values of the parameter modules in the case of the autoregressive components suggest that the CEE markets are relatively effective. Meanwhile, NYSE2-LSE-HKSE2, where the returns observed in the past justify current returns to a very large extent, constitutes an effective market. In both the first and second situation, the level of investment risk is shaped at an acceptable level.

Conclusion

Based on the results from this investigation, it should be stated that the stock exchanges of Central and Eastern European countries are constantly improving their investment position with regard to operational effectiveness and risk mitigation when compared to the largest stock exchanges analysed, ambitiously striving to become significant financial centres within Europe and worldwide. At the same time, the working hypothesis adopted in this paper was positively verified. The increase in the investment position and, as a consequence, the decrease in the investment risk in the group of CEE countries results from multidimensional factors, and, in particular: the listing of companies with high capitalisation, which attracts all stock exchange entities (domestic and foreign investors, analysts, market commentators etc.); the provision of the availability of a relatively large number of free float stocks in the market; active measures of market makers who, through their own experience, knowledge, and invested capital, increase the liquidity of the trading of stocks; pro-developmental activities of stock exchange companies with a strong emphasis on fundraising via the stock exchange platform and subsequent new issues of securities; the developed system for communication and the exchange of information between market entities; the introduction of new financial instruments allowing for greater activity of investors, e.g., short selling. What is important in the entire market competitiveness and risk minimisation process is the emergence of new companies in trading, which increases the significance for CEE. The stock exchanges of CEE countries may be excellent places for capital investments for small and medium investors accepting a higher level of risk. Other factors have also influenced the stock exchange market development and the enhancement of the level of competition of CEE countries in view of other analysed global stock exchanges. The inflow of EU structural funds increased the number of investment projects aimed, in particular, at supporting advanced technology sectors, which increased the interest of the investors. Taking care of the security of investors, CEE countries have successfully implemented the standards of the EU directives, which enabled them to become capital markets with minimum requirements while ensuring security based on strong financial supervision. The development of the stock exchange market in CEE countries, as well as the increase in the awareness of investors in terms of the growing investment opportunities, encourages both small individual investors and issuer-enterprises to actively participate on the stock exchange market. Enhancing investor involvement, including foreign investors, affects the increase in the liquidity of stocks on the market. As a consequence of such factors and processes, the stock exchange markets of CEE countries promise to further improve their investment position compared to global stock exchanges.

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Streszczenie

Efektywność inwestycji na rynku papierów wartościowych w krajach Europy Środkowo-Wschodniej na tle NYSE2-LSE-HKSE2 Analiza porównawcza ryzyka

Celem artykułu jest ocena efektywności i ryzyka na rynku papierów wartościowych w krajach Europy Środkowo-Wschodniej na tle największych giełd świata: NYSE2-LSE-HKSE2. Realizację celu oparto na analizie podstawowych indeksów giełdowych rynku papierów wartościowych a w szczególności na omówieniu następujących zagadnień: efektywność inwestycyjną giełdy a ryzyko oraz analizę efektywności inwestycji na rynku papierów wartościowych w krajach Europy Środkowo-Wschodniej na tle NYSE2-LSE-HKSE2 – założenia, metoda badawcza, wyniki badań. W analizie przyjęto następującą hipotezę badawczą: Pomimo dużej podatności na ryzyko inwestycyjne – giełdy papierów wartościowych w krajach Europy Środkowo-Wschodniej, dzięki dynamicznemu rozwojowi, poprawiają swoją pozycję inwestycyjną na tle głównych giełd światowych. Do weryfikacji tej tezy wykorzystano następujące narzędzia badawcze: względne wskaźniki atrakcyjności rynku papierów wartościowych oraz model autoregresyjny do prognozowania zmiany indeksu giełdowego. Uzyskane wyniki z przeprowadzonych badań pozwalają stwierdzić, że giełdy papierów wartościowych krajów Europy Środkowo-Wschodniej sukcesywnie poprawiają swoją pozycję w zakresie efektywności działania i mitygacji ryzyka w stosunku do analizowanych największych giełd światowych, ambitnie dążąc do stania się znaczącymi centrami finansowym na obszarze Europy i świata.

Słowa kluczowe: indeks, wskaźnik, papier wartościowy, giełda, ryzyko.