QUANTITATIVE METHODS IN ECONOMICS
Vol. XIII, No 2, 2012, pp. 60 – 72

INDEX OF CENTRAL AND EAST EUROPEAN SECURITIES QUOTED AT WARSAW STOCK EXCHANGE - WIG-CEE

Krzysztof Kompa
Department of Econometrics and Statistics
Warsaw University of Life Sciences – SGGW
e-mail: krzysztof_kompa@sggw.pl

Abstract: After 20 years of transition in Central and Eastern Europe (CEE) the capital markets are considered to be emerging markets and they are still developing. In the last few years, the Warsaw Stock Exchange achieved the first position in the CEE region by the number of listed companies, the value of shares turnover and by the value of market capitalization. Because of the growing number of listed foreign companies from the CEE countries the Warsaw Stock Exchange decided to launch the first regional index. The aim of this paper is to describe the index construction and to investigate its properties through the application of statistical methods.

Keywords: emerging capital markets, stock index, WSE

INTRODUCTION

A stock market index is an aggregated measure of stock market dynamics. Such an index is computed from the prices of selected financial instruments (often as weighted average) and it is used to measure movements of the capital market [Blanchard, 1997, p.174]. We may distinguish different types of stock indexes such as price and total return stock indexes, volatility indexes, regional indexes, etc. The number of stock indexes that describe a certain stock exchange provides information about the capital market development.

There is a proliferation of stock market indexes. In recent years, the number of indexes developed by various providers has increased significantly. Numerous investment products are based on such indexes, as is the case for index funds (exchange-traded or not), structurized bonds, options and futures. Indexes are also used as benchmark portfolios by investment managers, both for asset allocation and performance measurement purposes [Amenc et al. 2006].

Globalization and integration have affected capital markets by allowing foreign companies to be listed at different markets, allow investors to invest abroad and construct their portfolio from different instruments that are issued or quoted in many countries. This creates demand for indexes that describe international or regional markets. Such indexes are constructed and listed by different institutions: stock exchanges, FTSE, HSBC Holding, MSCI and S&P among others.

Stock markets in Central and Eastern Europe (CEE) have been developing for over 20 years now but despite the growing importance of security exchanges in the region, the relevant body of research remains surprisingly limited [Syriopoulos 2007]. Therefore the aim of this research is to describe the construction of the index WIG-CEE, that provide information about the performance of foreign companies from the CEE region that are quoted on the Warsaw Stock Exchange, and to investigate the properties of this new index[1]. An analysis is provided for the logarithmic rates of return of the main stock indexes quoted in the reference countries, employing central tendency, dispersion and skewness measures as well as statistical inference and financial econometrics.

CENTRAL AND EAST EUROPEAN EXCHANGES

The transformation from a centrally planned economy to a market-oriented economic system in Central and Eastern Europe started in the year 1989. In 2004, eight post-communist countries together with Malta and Cyprus became members of the European Union, and two years later, two other states from the former Soviet bloc Bulgaria and Romania joined the EU. The creation of stock exchanges is one of the indications of transition, and it took place for the majority of these countries until 1995. However, some of the security exchanges were not established until 2002. It is worth mentioning that the development of each market has been implemented in different ways, independently from global trends and domestic economy. After twenty years of capital markets development in Central Europe the situation is as follows:

- Baltic stock exchanges has joint already existed NASDAQ OMX;
- Vienna together with Budapest, Ljubljana and Prague Stock Exchanges created one regional alliance CEESEG;
- Independent development of Stock Exchanges occurs in Slovakia, Bulgaria and Romania;
- Warsaw and Bulgaria Stock Exchanges became public listed companies.

According to the Federation of European Exchange (FESE) the Warsaw Stock Exchange (WSE) is the capital market in the CEE region with the highest number of listed companies. Between 2007 and 2011, the number of listed

[1] The first presentation of the index idea took place in March 2012 [Kompa, Wiśniewski 2012], while the first quotation of the index, as a total return, took place on May, 30, 2012.

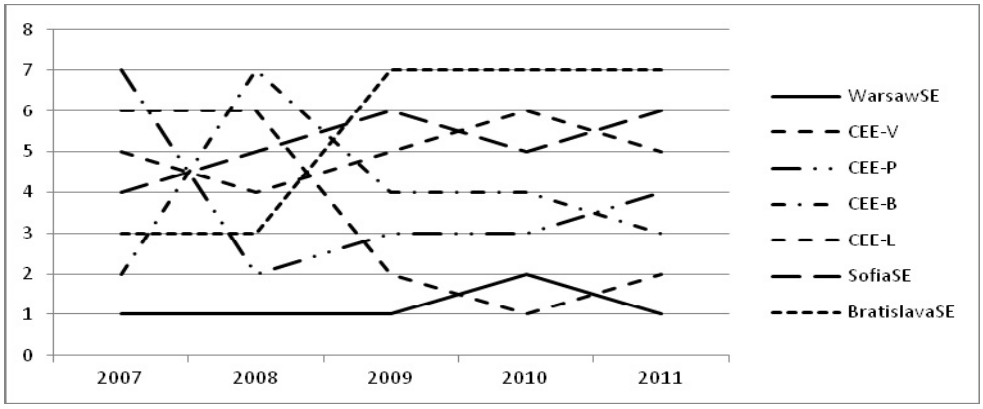
companies increased twofold. In the same period the number of listed companies on the Prague and Vienna Exchanges decreased from 32 to 26 and from 119 to 105, respectively (Table 1). In addition, the market capitalization of the WSE has been the biggest in the CEE region since 2008, while the Vienna Stock Exchange lost its leadership in market capitalization of companies. However it still kept its first position by value of turnover until 2009 when the Warsaw market gained the first place in the region. It is possible to construct a taxonomic synthetic measure by taking into consideration the main factors of the CEE Stock Exchanges: number of company listed, markets' capitalization and value of turnover. This measure confirms the leading role of WSE in the CEE region (Figure 1).

Table 1. Number of listed companies on main CEE Exchange

Market Operator	2011	2010	2009	2008	2007
Warsaw Stock Exchange	777	584	486	458	375
CEESEG - Vienna	105	110	115	118	119
CEESEG – Prague	26	27	25	29	32
CEESEG – Budapest	54	52	47	43	41
CEESEG - Ljubljana	66	72	76	84	87
Bulgaria Stock Exchange	393	390	399	399	369
Bratislava Stock Exchange	147	165	172	193	160

Source: Federation of European Exchanges

Figure 1. Taxonomy of CEE Stock Exchanges



Source: own computation from FESE Note: CEE-V denotes Vienna SE, CEE-P denotes Prague SE, CEE-B denotes Budapest SE and CEE-L denotes Ljubljana SE

WARSAW STOCK EXCHANGE INDEXES

The Warsaw Stock Exchange was founded in 1991 as a joint stock company held solely by the Polish State Treasury. The mission of the WSE was to provide

an organized trading in financial instruments (equities, bonds, structured products, investment certificates and derivatives), to promote such trading and to disseminate market information. In 2010, WSE became a public company and its shares have been trading on the WSE Main List since November 9, 2010.

The Warsaw Stock Exchange conducts trading in financial instruments in four markets. The Main List has been in operation since the first trading day on April 16, 1991. Most of the instruments are traded here: equities, rights-to-shares, pre-emptive rights, as well as other equity-based instruments, bonds, futures contracts, option and others. NewConnect is a market organized and maintained by WSE as an alternative trading system. It was designed for startups and developing companies. The market was launched on August 30, 2007. Catalyst is a debt instruments market launched on September 30, 2009. Catalyst contains two different platforms for retail and wholesale customers. State Treasury, municipal, corporate and mortgage instruments are traded on this market. The Energy Market was launched on December 11, 2010. It is a transaction platform for energy deals and energy-related futures for all type of customers: producers, traders and users.

At the end of 2011 the market capitalization of companies listed on WSE was 450 billion PLN and the value of turnover of equities reached a historical high of 258 billion PLN. The volume of futures contracts turnover also reached a high of 13 million contracts traded.

The first foreign company – BACA bank was listed in October 2003 (dual listed on both the Warsaw and Vienna Stock Exchanges). In 2006 the WSE launched a new aggressive strategy focusing on the acquisition of new companies, domestic and foreign. As a result of this campaign, the number of foreign companies listed on all WSE markets increased from 20 in 2006 to 45 in 2011. Because of a rapidly growing number of companies of Ukraine domicile, a decision was made to launch the first index of foreign companies listed on WSE in 2011 - the WIG-Ukraine index.

Due to the steady development of the Warsaw Stock Exchange the number of stock indexes has been increasing systematically, providing a good description of the WSE markets. At present several groups of the main market indexes can be distinguished:

- Total Index WIG, and total indexes for branches;
- Price Blue Chip Index WIG20, and indexes for medium and small size companies mWIG40 and sWIG80;
- Index of domestic companies WIG Poland, and index of Ukrainian companies WIG-Ukraine;
- Indexes for investment strategies WIG20short and WIG20lev;
- Index of companies that obey corporate governance rules RESPECT and that pay dividend WIGdiv.

Therefore, the next step was introduce a new index for the WSE that describes the performance of foreign companies from the CEE region that are listed on the Warsaw Stock Exchange: WIG-CEE.

WIG-CEE INDEX CONSTRUCTION

A stock index is generally a portfolio of stocks, bonds or other kinds of investments. Stock indexes are used to represent either segments and sectors of a stock exchange or the whole stocks traded on the exchange. One of the most common ways to understand a stock index is to look at the composition of the stocks it represents. Generally, the set of rules requires the stocks to satisfy certain criteria, such that [Broby 2011]:

- All the investments in the index are subject to selection.
- Includes calculations and rules for weighting of the index components.
- Provides specific instructions for adjustments to maintain consistency.

According to the main assumption, the index contains companies from Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania and Ukraine. The selection of companies for the index portfolio is based on two-level parallel analysis: country and company. A certain company and country is included in the index composition if the following criteria are fulfilled:

- there are at least two companies from one country;
- the companies should represent at least two different industry (branches) according to the WSE Industry Classification;
- the companies listed on the WSE should cover at least 10% of the whole market capitalization
- there must be at least 10% of shares in free float.

Other WIG-CEE index criteria are similar to the main WSE indexes i.e.:

- the index portfolio is based on the number of shares in free float;
- only 50% of companies from each country listed on the WSE are admitted in the index composition;
- the weighting depends on the number of companies in the index portfolio i.e. if the number of companies in the index composition is above 30 then the contribution of one company is limited to 10% and to 25% otherwise.

Periodic adjustments take place every quarter at the end of February, May, August and November when the new portfolio of the index is evaluated as a background to index changes after the third Friday of March, June, September and December. In the case of a merger, delisting or bankruptcy the company could be removed from the index portfolio and new company is added if there are other companies from the country of origin that fulfill the distinguished roles.

The general formula for the index calculation is as follows:

$$I(t) = \frac{M_t}{M_0 A_t} I(0)$$

where M_t , M_0 - market value of index portfolio at date t and the base date, $I(t)$, $I(0)$,– index value at the date t and base date, A_t – adjustment coefficient.

The WIG-CEE index composition procedure is as follows:

The free-float value of CEE securities quoted on the WSE and selected for the WIG-CEE index - $WIGCEE_{val}$ - is defined as:

$$WIGCEE_{val} = n_1 p_1 + n_2 p_2 + ... + n_N p_v = \sum_{i=1}^{N} n_i p_i ,$$

where N – number of securities in WIG-CEE index portfolio, n_i - number of shares of *i-th* company in free-float, p_i - market price of shares i; i = 1, 2, 3, …, N.

The weighting factor ω_i describing a part of the capitalization of one company relative to the value of the index portfolio is calculated as:

$$\omega_i = n_i p_i / \sum_{i=1}^{N} n_i p_i$$

Let: $\omega_{i,\max} = \max_i \{\omega_i\}$. In any case of relation between weight factor $\omega_{i,\max}$ and desired contribution Ω of one company in the index portfolio composition: $\omega_{i,\max} < \Omega$ or $\omega_{i,\max} > \Omega$, factor $\omega_{i,\max}$ is replaced (due to the index methodology) by Ω: $\omega_{i,\max} = \max_i \{\omega_i\} \rightarrow \omega^*_{i,\max} = \Omega$ and new weight factors ω_i^* are calculated as: $\omega_i^* = \varphi \cdot \omega_i$, where the scale factor φ is defined as $\varphi = (1-\Omega)/(1-\omega_{i,\max})$. Recursion of the full procedure occurs until $\max_i \{\omega_i^*\} - \Omega < \varepsilon$. Therefore, the final *WIG-CEE* index calculation formula is as follows:

$$WIGCEE_t = \sum_{i=1}^{N} \omega_i^* n_i p_{i,t}$$

where ω_i^* - scaled weights, n_i - number of shares of *i-th* company in the index portfolio, $p_{i,t}$ - market price of shares i at the trading day t; i = 1, 2, 3, …, N

If adjustment of the WIG-CEE index is necessary, then after composition of new portfolio for the date of adjustment T_i , the adjustment factor is calculated as:

$$\psi(T_i) = \frac{WIGCEE_i(T_i)}{WIGCEE_{i-1}(T_i)}$$

where $WIGCEE_{i-1}(T_i)$, $WIGCEE_i(T_i)$ – value at the day T_i of index portfolio composed before and after adjustment respectively, and the new *WIG-CEE* is listed until next adjustment event as:

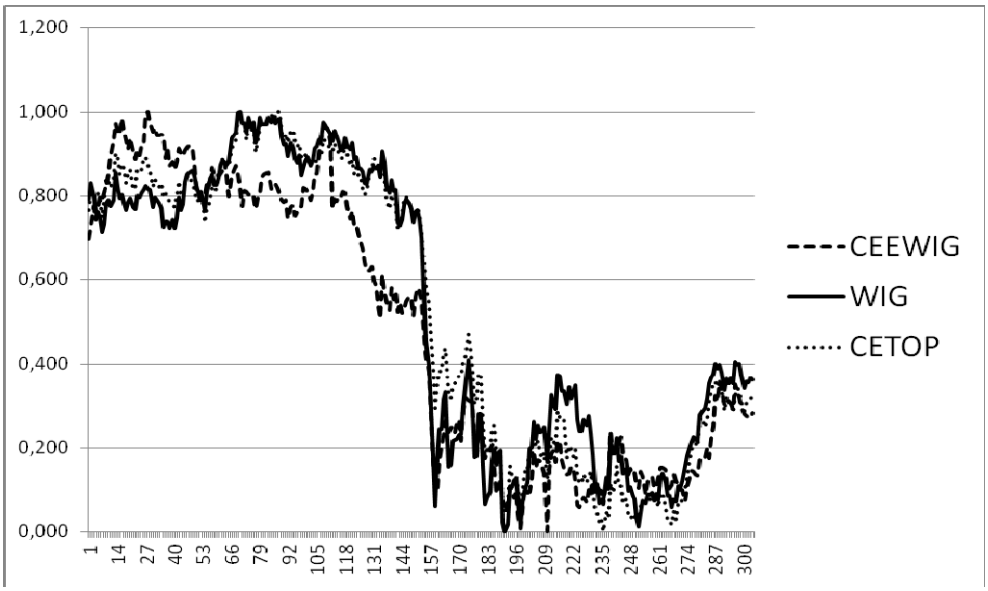
$$WIGCEE(T_i + t) = \frac{WIGCEE_i(T_i + t)}{\psi(T_i)}; t \in [0, T_{i+k+1} - T_{i+k}]$$

where: T_i – day of implementation of adjusted index, t - every trading day between adjustment days i =1,2,3,…

EMPIRICAL ANALYSIS OF *WIG-CEE* INDEX

In our investigation we consider the main stock indexes for selected CEE countries i.e.: Poland – WIG, CEE Region (quoted at Vienna Stock Exchange) – CETOP20, Czech Republic – PX, Hungary – BUX, Bulgaria – SOFIX. The time span of the investigation is from 1.01.2011 to 31.12.2011. During this period we distinguish four periodical adjustments that are defined due to the WIG-CEE index specification. The lists of companies that are used for the index calculation at the beginning and the end of the year 2011 are presented in the Appendix (Tables A1 and A2) and the final plot of the WIG-CEE time series is given in Figure 2.

Figure 2. Plot of WIG-CEE, WIG & CETOP20 time series for the analyzed period



Source: own calculation

In our investigation, we want to recognize selected statistical properties of the proposed WIG-CEE index and compare it to other indexes from CEE Stock Exchanges. We consider the logarithmic rates of return from the stock indexes daily quotations:

$$r_t = \ln(WIGCEE_t) - \ln(WIGCEE_{t-1})$$

and we apply daily expected returns from the participation units - y_t; risk measures (- standard deviation - S, variability coefficient - V) and measures of asymmetry - A and concentration – K, as well as statistical parametric and nonparametric tests. Selected results are presented in the tables below where bold letters denote the rejection of the null hypothesis at the significance level 0.05.

The results in Table 2 indicate that all the indexes are very strong however, the logarithmic rates of return are strongly correlated with the regional index CETOP and BUX while it is less correlated with WIG, PX and SOFIX (Tab. 3)

Table 2. Indexes correlation table

	WIG-CEE	*WIG*	*CETOP*	*BUX*	*PX*	*SOFIX*
WIG-CEE	1				$u = \frac{\rho_{xy}}{\sqrt{\frac{1-\rho_{xy}^2}{n}}}$	
WIG	0.9414285	1				
CETOP	0.9518828	0.9827428	1			
BUX	0.9524188	0.9733519	0.9751545	1		
PX	0.9625844	0.9703824	0.9917603	0.9686424	1	
SOFIX	0.8482803	0.8675074	0.9053097	0.8412209	0.8919088	1

Source: own computation

Table 3. Logarithmic rates of return correlation table

	WIG-CEE	*WIG*	*CETOP*	*BUX*	*PX*	*SOFIX*
WIG-CEE	1				$H_0: \rho_{xy}=0$	
WIG	0.6536972	1			$H_1: \rho_{xy}>0$	
CETOP	0.6263809	0.9074728	1		$\mu_\alpha = \mu_{0,05} = 2,575$	
BUX	0.5473974	0.6975237	0.8236008	1		
PX	0.5454550	0.6748685	0.7756087	0.5554220	1	
SOFIX	0.1605466	0.1589521	0.1532889	**0.0829252**	0.1991412	1

Source: own computation

The descriptive statistics (Table 4.) confirm similarity of behavior of logarithmic rates of return for analyzed indexes.

Table 4. Descriptive statistics of logarithmic rates of return for analyzed indexes

Statistics	*WIG-CEE*	*WIG*	*CETOP*	*BUX*	*PX*	*SOFIX*
n	303	303	303	303	303	303
Min	-0.06297358	-0.062436059	-0.079617	-0.06984201	-0.061346	-0.04073
Max	0.068081575	0.04104653	0.0520295	0.05514917	0.0425934	0.036421
Mean	$-0.0^{3}52543$	$-0.0^{3}440151$	$-0.0^{3}691$	$-0.0^{3}33191$	$-0.0^{3}631$	$-0.0^{3}48$
Std. Error	$0.\ 0^{3}802722$	$0.0^{3}761359$	$0.0^{3}9807$	$0.0^{3}93665$	0.0007929	0.000583
Median	$-0.0^{3}46548$	8.50915E-05	0	0	0	0
Std. Dev	0.01397291	0.013252893	0.017071	0.01630411	0.0138021	0.01015
Variance	$0.0^{3}195242$	$0.0^{3}175639$	$0.0^{3}2914$	$0.0^{3}26582$	$0.0^{3}1905$	$0.0^{3}103$
Kurtosis	4.33721072	4.017978897	2.6049766	2.11391176	2.4124816	1.991368
Skewness	0.111051945	-0.83275825	-0.588969	-0.43754545	-0.487634	-0.02527
Volatility	26.5932389	30.10985129	24.705479	49.1215934	21.878849	21.22921
Spread	0.131055155	0.103482589	0.1316461	0.12499107	0.1039391	0.077155
Total	-0.15920535	-0.133365867	-0.209367	-0.10056971	-0.191145	-0.14488
Confidence level(95,0%)	0.001579636	0.00149824	0.0019299	0.00184318	0.0015603	0.001148

Source: own computation
Note: $0,0^{3}$ denotes 0,000

The results presented in Table 5 show that over the analyzed period the expected daily returns from all investigated indexes are significantly negative, the time series of daily rates of return are characterized by significant asymmetry and the probability distribution is not normal which is additionally confirmed by the Kolmogorov-Lilliefors and Jarque-Berra normality tests.

Table 5. Test statistics for daily rates of return

	WIG-CEE	WIG	CETOP	BUX	PX	SOFIX
Mean value H_0: $E(r)=0$; H_1: $E(r)<0$ (mean value is significantly negative)						
U-statistics	0.65456093	0.578112958	0.70457631	0.354363407	0.7956038	0.8199501
Skewness *Ho: A=0; H1: A<0* or *A>0*						
U-statistics	0.789172346	5.917859269	4.18541339	3.109344616	3.46529091	0.1796122
Kurtosis *Ho: K=0; H1: K>0*						
U-statistics	15.4108366	14.27655244	9.25591843	7.511082773	8.57195147	7.0756627

Source: own computation

In Table 6 we compare the expected rates of return and variance of returns for each pair of indexes. It is noted that the expected returns from all indexes are the same since the null hypothesis about equality of two expected values cannot be rejected. However, some of indexes are characterized by a different risk that is denoted by bold letters.

Table 6. Test statistics for daily rates of return

Two means equality H_0: $E(r_i)= E(r_j)$; H_1: $E(r_i) \neq E(r_j)$						
	WIG-CEE	WIG	CETOP	BUX	PX	SOFIX
WIG-CEE	x					
WIG	0.0770807	x				
CETOP	-0.1306285	-0,2020289	x			
BUX	0.1568769	0,0896715	0,2647736	x		
PX	-0.0934260	-0,1734727	0,0476846	-0,2435874	x	
SOFIX	0.0476681	-0,0396075	0,1865471	-0,1325277	0,1551516	x
Two variance equality H_0: $\sigma_i=\sigma_j$; H_1: $\sigma_i>\sigma_j$ $\boldsymbol{F_{kryt}}$ **= 1.208766**						
WIG-CEE	x					
WIG	1.1116068	x				
CETOP	**1.4926071**	**1.65919216**	x			
BUX	**1.3615122**	**1.51346617**	1.0962863	x		
PX	0.97570649	1.08460197	**1.529771**	**1.3954116**	x	
SOFIX	**1.8949726**	**1.70471484**	**2.82845**	**2.5800282**	**1.848937**	x

Source: own computation

Another characteristic that is tested is the weak form of informational efficiency that is verified using Wald-Wolfowitz tests of 2-runs and 3-runs and McKinley variance ratio test together with the testing for the so called weekday effects employing daily and weekly rates of returns (Table 7 and 8).

Table 7. Test statistics for weekday effects for daily logarithmic *WIG-CEE* rates of returns

H_0: $E(r)=0$		Mon	Tue	Wed	Thu	Fri
H_1: $E(r)\neq 0$		-1.0214269	0.3133852	-0.1430307	-1.1432172	0.724936
Means equality	Mon	x				
	Tue	-0.0036744	x			
	Wed	-0.6576837	0.3037549	x		
	Thu	0.0486789	1.1077494	0.7259947	x	
	Fri	-1.2389857	-0.4023868	-0.6235574	-1.3199403	x
Variance equality	Mon	x				
	Tue	2.0613918	x			
	Wed	0.8344243	**1.7200753**	x		
	Thu	0.8919438	**1.8386455**	1.0689331	x	
	Fri	0.9045226	**1.8645755**	1.0840081	1.0141028	x
N		61	61	61	60	60
Mean		-0.0020183	0.0004313	-0.0002582	-0.0021511	0.0013737
Std. Dev		0.0154329	0.010749	0.0140975	0.0145753	0.0146777
Variance		0.0002382	0.0001155	0.0001987	0.0002124	0.0002154

Source: own computation

Table 8. Test statistics for weekday effects - weekly logarithmic *WIG-CEE* rates of returns

H_0: $E(r)=0$		Mon	Tue	Wed	Thu	Fri
H_1: $E(r)\neq 0$		-0,6524608	-0,7622185	-0,6857958	-0,7294278	-0,7516035
Means equality	Mon	x				
	Tue	0.1447402	x			
	Wed	0.0964169	-0.043901	x		
	Thu	0.1988478	-0.0069522	0.0363483	x	
	Fri	0.1654522	-0.0876765	-0.0396791	-0.0786827	x
Variance equality	Mon	x				
	Tue	**1.3323742**	x			
	Wed	**1.3861923**	1.0403926	x		
	Thu	**1.3933674**	1.0457778	1.0051762	x	
	Fri	0.9859896	**1.3513066**	**1.4058893**	**1.4131664**	x
N		61	61	61	60	60
Mean		-0,0020183	0.0004313	-0.0002582	-0.0021511	0.0013737
Std. Dev		0,0154329	0.010749	0.0140975	0.0145753	0.0146777
Variance		0,0002382	0.0001155	0.0001987	0.0002124	0.0002154

Source: own computation

None of the null hypotheses of all applied tests is rejected, except in some cases of variance of returns i.e. risk is different on Tuesdays for daily data and

on Mondays and Fridays for weekly rates of return. Therefore, we are not allowed to reject the hypothesis about market efficiency in the Fama sense.

CONCLUSIONS

In this paper we discuss the construction and methodology of the index describing companies operating in the CEE that are listed on the Warsaw Stock Exchange – WIG-CEE. We also investigate the basic properties of the index and compare the generated WIG-CEE time series to quotations of the WIG, CETOP, BUX, PX and SOFIX indexes. In our opinion the presented index appropriately describe the CEE stocks quoted on the WSE and, since it has been quoted at the WSE since May, 2012, it can be used as a basic instrument for derivatives.

REFERENCES

Amenc, N. Goltz, F. Le Sourd, V. (2006). Assessing the Quality of Stock Market Indices. EDHEC Publication Lille-Nice.

Blanchard O. (1997) Macroeconomics, Prentice Hall, Upper Sadle River.

Broby, D. P. (2007) A Guide to Equity Index Construction. Risk Books, London.

Broby, D. (2011) Equity Index Construction, The Journal of Index Investing, Fall 2011. Vol. 2, No. 2: pp. 36-39

Fama E. F. (1970) Efficient Capital Markets: A Review of Theory and Empirical Work, Journal of Finance, pp. 383 – 417

Kompa, K. Wiśniewski T. (2012) The First Index of Warsaw Stock Exchange for Central and East European Securities – WIG-CEE, paper presented at 73rd International Atlantic Economic Conference in Istanbul (draft under reviewing procedure).

Syriopoulos, T. (2007) Dynamic Linkages between Emerging European and Developed Stock Markets: Has the EMU any Impact?, International Review of Financial Analysis, 16, pp. 41-60.

APPENDIX

Table A1. *WIG-CEE* Index Portfolios: Index portfolio at the beginning of 2011

No	Company	Country	Share in index	Value of package [PLN mill]
1	KERNEL	Ukraine	25,00%	1 083 500
2	CEZ	Czech Republic	25,00%	1 083 500
3	ASTARTA	Ukraine	16,44%	712 685
4	PEGAS	Czech Republic	12,91%	559 684
5	OLYMPIC	Estonia	7,18%	311 156
6	FORTUNA	Czech Republic	6,39%	276 822
7	AGROTON	Ukraine	4,56%	197 617
8	SILVANO	Estonia	1,64%	71 162
9	PHOTON	Czech Republic	0,64%	27 556
10	BGSENERGY	Czech Republic	0,24%	10 318

Source: own computation

Table A2. WIG-CEE Index Portfolios: Index portfolio at the end of 2011

No.	Company	Country	Package [PLN mill]	Share in index	No	Company	Country	Package [PLN mill]	Share in index
1	ICPD	BG	4,03	0,06%	14	AGROTON	UKR	487,58	0,82%
2	SOPHARMA	BG	718,08	1,46%	15	ASTARTA	UKR	1600	3,78%
3	BGSENERGY	CZ	32,55	0,06%	16	COALENERG	UKR	1168,94	2,81%
4	CEZ	CZ	11104,6	25,00%	17	IMCOMPANY	UKR	327,09	0,59%
5	FORTUNA	CZ	800,44	1,96%	18	KERNEL	UKR	5613,7	23,16%
6	ICMVISION	CZ	3,92	0,01%	19	KSGAGRO	UKR	344,78	0,72%
7	PEGAS	CZ	650,66	4,46%	20	MILKILAND	UKR	562,5	0,95%
8	PHOTON	CZ	38,18	0,08%	21	OVOSTAR	UKR	572,7	0,01%
9	OLYMPIC	EST	802,05	1,96%	22	SADOVAYA	UKR	417,07	0,64%
10	SILVANO	EST	552,61	1,11%	23	WESTAISIC	UKR	187,57	1,82%
11	AGROWILL	LT	62,77	1,07%	24	MOL	HUN	11133,7	25,00%
12	AVIASG	LT	214,46	0,87%	25	ESTAR	HUN	382,8	1,58%
13	AGROLIGA	UKR	23,04	0,02%					

Source: own computation