AN ANALYSIS OF WEAK-FORM EFFICIENCY ON THE BUCHAREST STOCK EXCHANGE

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Abstract: This paper aims to study a controversial issue such as an apparent antagonistic contradiction between the concept of market efficiency and the emerging capital markets. It is very well known the fact that most of the efficient market research have focused on developed capital markets and it is considered in general that emerging capital markets are not efficient in semi-strong form or strong form. Emerging capital markets are less efficient than the developed market given their structural and institutional disfunctions. Also, they are volatile and risky but nevertheless it is expected to generate strong investment returns.The main purpose of this study is to test the existence of weak-form efficiency of an emerging capital market, such as Bucharest Stock Exchange (BSE). The analysis is based on the daily price of BSE indexes : BET, BET-C and BET-FI during the period of January 2007 to July 2011.

JEL classification: G10, G12, G14, G17

Key words: efficient market hypothesis, emerging capital markets, financial econometrics, indexes, models

1. INTRODUCTION

Capital markets are extremely unpredictable and complicated, so it's difficult to believe that their chaotic behaviour can be classified into a specific pattern. In general, the concept of capital market is characterized by dramatical movements, nonlinearity, uncertainty, anomalies and cycles of evolution. In a sophisticated manner of speaking, a capital market is a complex and dynamic system with noisy, nonstationary and chaotic data series (Peters, E. E, 1994). Moreover, all these features are much more pronounced in the case of emerging capital markets.

In the literature, empirical tests of emerging capital market efficiency are insufficient and rarely definitive in order to reach a conclusion about the issue. Even the concept of emerging capital market is constantly changing and generates theoretical polemics. In economic theory, the concept of emerging capital market presents a great number of definitions and theoretical approaches. The term "emerging market" was first used in 1981 by Antoine W. van Agtmael, an american economist who argued that an emerging market is a new economy which is in a phase of transition to a developed market.

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Statistically, these emerging markets represent over 70% of the world, containing about 80% of world population and 20% of Gross Global Product. Also, emerging markets are considered countries in transition because they are in the process of changing from a closed economy to an open economy. However, no economy is perfectly open or closed.

"Emerging markets" are countries or markets that are not very stable economically and financially, but make progresses in this direction, using factors that includes : trade, investments, external financing and efficient government. [J. Aizenman, 2005].

Fundamental characteristics of an emerging market concern the economic and financial structure, the existence of pro-cyclical policies, the great economic growth based mainly on consumption and the astonishing growth potential that characterized the capital market, the labor market and the goods and services markets.

The main emerging markets limits under the influence of the current financial crisis have multiple causes and explanations, which differ from state to state. In the case of Romania, these vulnerabilities include "weak capacity to dissipate the adverse effects of the crisis, as presented in the economy. The reason for this failure lies in weak intra-communication system, generated by the underdevelopment of the financial and economic structures" [E. Dinga, 2009].

Currently, the notion of emergent market refers to the countries with a high volatility and who are in transition, dealing with changes in economic, political, social and demographic situation. These economies have a more robust growth to reach the level of developed countries, providing an opportunity for investors who are prepared to assume additional risk to get higher yields. Therefore, the emerging markets have become increasingly more attractive to investors, so foreign capital injection of funds in these countries are increasingly high [A. Mody, 2004].

In terms of capital markets, the concept of "emergent" differentiates itself through different connotations. An emerging capital market, like Bucharest Stock Exchange, is characterized by deep functional, structural and institutional dysfunctions. In other words, we can identify certain particularities such as : high volatility, the existence of bubbles, panic, speculation, anomalies, high-risk investment opportunities, a low level of liquidity, reduced capitalization, strong correlation with developed capital markets, reduced number of transactions, insufficient development of financial instruments, exchange rate instability and many others also.

The central idea of this article has as aim testing the Efficient Market Hypothesis on Bucharest Stock Exchange (the weak form of the efficiency). This study is based on the use of a time series representing daily price of BSE indexes : BET, BET-C and BET-FI during the period of January 2007 to July 2011. I specifically chose this time interval to cover both Romania's Integration in the European Union on January 1st 2007 and the entire period from the beginning of the global financial crisis until now.

2. EFFICIENT MARKET HYPOTHESIS – THEORETICAL BACKGROUND

Efficient Market Hypothesis was the main subject of numerous polemics about classical finance for a long period of time.

According to Eugene Fama : "an efficient market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants".

Efficient Markets Hypothesis suggests that since everyone has access to the same information, it is impossible to regularly beat the market, because that stock prices are efficient, reflecting everything we know as investors. In other words, a market in which prices always "fully reflect" available information is called efficient.

In another train of thoughts, Efficient Markets Hypothesis holds that any information is available to all investors on the market, so stock prices always incorporate and reflect all relevant information. Therefore, the price of a stock should reflect the knowledge and expectations of all investors.

A widely accepted idea is that in an efficient market at any point in time the actual price of a security will be a good estimate of its fundamental value. Technically, in an efficient market, no investment strategy can earn excess risk-adjusted average returns, or average returns greater than are warranted for its risk (Barberis, N., Thaler, R., 2003).

In the literature, market efficiency involves three dimensions : allocational, operational and informational efficiency. However, it has been noted that capital markets with higher informational efficiency are more likely to retain higher operational and allocational efficiencies (Müslümov et al, 2004). A market is efficient with respect to a set of information if it is impossible to make economic profits by trading on the basis of this information set (Ross, 1987).

Malkiel suggested the following definition:

"A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. Formally, the market is said to be efficient with respect to some information set…if security price would be unaffected by revealing that information to all participants. Moreover, efficiency with respect to an informational set …implies that it is impossible to make economic profits by trading on the basis of (that informational set)."

The subject of this study is the analysis of weak-form efficiency on the Bucharest Stock Exchange. Implicitly, the main point of interest is the concept of informational efficiency. Synthesizing, a market in which prices always "fully reflect" available information is called efficient.

The most important issue regarding efficient market theory is that it is not possible to outperform the market over the long-term. An efficient capital market is characterized by the fact that any information is available to all investors or market participants, so stock prices always incorporate and reflect all relevant information. Due to this issue, the price of a stock should reflect the knowledge and expectations of all investors or market participants.

Malkiel said that a capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. Formally, the market is said to be efficient with respect to some information set, Ωt , if security prices would be unaffected by revealing that information to all participants. Moreover, efficiency with respect to an information set, Ωt , implies that it is impossible to make economic profits by trading on the basis of Ωt.

One of the main aspects of Efficient Markets Hypothesis is represented by the degrees of efficiency issue. Thus, on a capital market, the degree of informational efficiency involves the following categories :

- Weak Form Efficiency
- Semi-strong Form Efficiency
- Strong Form Efficiency

In an informationally efficient market, price changes must be unforecastable if they fully incorporate the expectations and information of all market participants. In other words, if stocks were predictable and not uncertain, it would therefore be possible to take action in order to generate systematic gains. But exactly these issues made the stocks uncertain and unpredictable. The prices depend on a summation of so many small and relatively independent sources of variation that the result is like a random walk (Samuelson, P., 1965).

In the context of a globalized world, the weak form efficiency seems the most realistic option. Referring to the weak form efficiency, Efficient Markets Hypothesis suggest that in this case current price of a financial asset reflects all the historical financial information available on the market. Houthakker and Williamson consider that if the weak form of the efficient market holds, prices will exhibit a "random walk", which is a representative concept of probability theory.

Ko and Lee have shown that "If the random walk hypothesis holds, the weak-form of the efficient market hypothesis must hold, but not vice versa. Thus, evidence supporting the random walk model is the evidence of market efficiency. But violation of the random walk model need not be evidence of market inefficiency in the weak form" .

According to semi-strong form efficiency, share prices adjust to publicly available new information very rapidly and in an unbiased manner, such that no excess returns can be earned by trading on that information. In other words, neither fundamental analysis or technical analysis techniques will be able to reliably produce excess returns.

The strong form efficiency includes both semi-strong form efficiency and weak form efficiency. In this case in particular, share prices reflect all information, public and private, but none of these can earn excess returns.

According to Fama (1998), known as the father of efficient market hypothesis : "market effciency survives the challenge from the literature on long-term return anomalies. Consistent with the market effciency hypothesis that the anomalies are chance results, apparent overreaction to information is about as common as underreaction, and post-event continuation of pre-event abnormal returns is about as frequent as post-event reversal. Most important, consistent with the market effciency prediction that apparent anomalies can be due to methodology, most long-term return anomalies tend to disappear with reasonable changes in technique".

3. EMPIRICAL FRAMEWORK

The analysis is based on the daily price of BSE indexes : BET, BET-C and BET-FI during the period of January 2007 to July 2011.

The main statistical properties, specifically Skewness and Kurtosis, suggest that historical data is non-normally distributed. The BDS test was used to to determine whether the residuals are independent and identically distributed. The hypothesis was rejected.

In this study I used also the Unit Root Test. When running Unit Root Test, the null hypothesis is that the variable has a unit root. I also used the stationary test Augmented Dickey-Fuller. The analysis performed in this article has led to the conclusion that the time series are not stationary in levels, regardless the level of confidence, which is 1%, 5% and 10%.

I have used this methodology individually for each of the three indices of Bucharest Stock Exchange, namely BET, BET-C and BET-FI.

The test were performed using Eviews 6.0.

4. CONCLUSIONS

Efficient Markets Hypothesis highlight the fact that absolute rationality of the capital market characterized by the fact that all investors are rational it is a statement of fact and must be generally accepted.

Efficient market theory was a revolutionary concept which had became very important and widely accepted since the early 1970s. However, the concept of efficient capital market is sometimes perceived as an utopia. This is a consequence of the fact that the current reality reflect a different and globalized world, which is constantly changing and progressing.

In general, it is considered that emerging capital markets are not efficient in semi-strong form or strong form. Emerging capital markets are less efficient than the developed market given their structural and institutional disfunctions. Also, they are volatile and risky but nevertheless it is expected to generate strong investment returns.

However, an emerging capital market, such as Bucharest Stock Exchange it is quite different comparing to the classic concept of efficiency.

The study presented in this article suggests that Efficient Markets Hypothesis is't accomplished, not even the weak form efficiency, during the period of January 2007 to July 2011.

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Appendixes

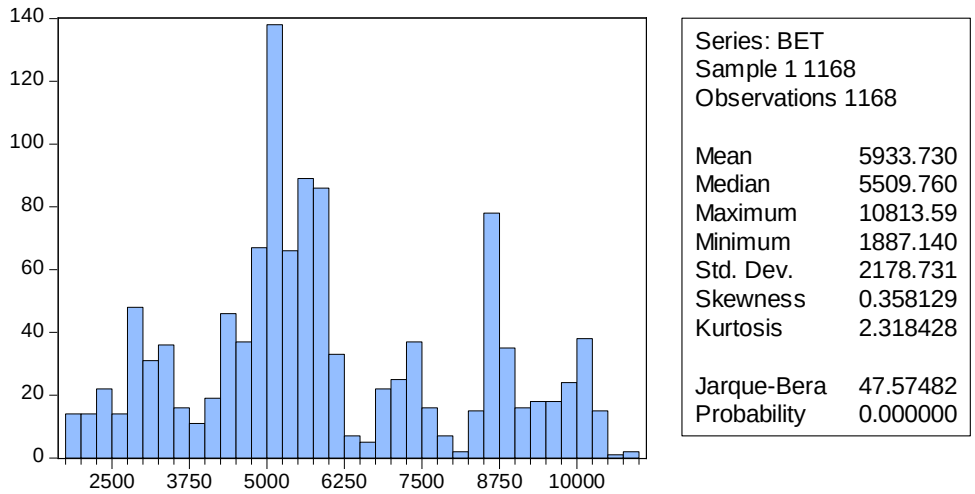

Figure no. 1 Histogram for BET

Table no.1 Augmented Dickey-Fuller Test
- Level -

Null Hypothesis: BET has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.893990	0.9550
Test critical values:	1% level	-3.965930	
	5% level	-3.413667	
	10% level	-3.128895	

*MacKinnon (1996) one-sided p-values.

R-squared	0.001345	Mean dependent var	-2.660043
Adjusted R-squared	-0.000371	S.D. dependent var	111.5493
S.E. of regression	111.5700	Akaike info criterion	12.26975
Sum squared resid	14489308	Schwarz criterion	12.28276
Log likelihood	-7156.398	Hannan-Quinn criter.	12.27466
F-statistic	0.783695	Durbin-Watson stat	1.915375
Prob(F-statistic)	0.456956		

Table no.2 Augmented Dickey-Fuller Test
- First order difference -

Null Hypothesis: D(BET) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 16 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.566330	0.0000
Test critical values:	1% level	-3.966047	
	5% level	-3.413724	
	10% level	-3.128929	

*MacKinnon (1996) one-sided p-values.

R-squared	0.492626	Mean dependent var	0.022200
Adjusted R-squared	0.484551	S.D. dependent var	154.8258
S.E. of regression	111.1568	Akaike info criterion	12.27614
Sum squared resid	13974453	Schwarz criterion	12.35954
Log likelihood	-7039.783	Hannan-Quinn criter.	12.30762
F-statistic	61.00698	Durbin-Watson stat	1.995516
Prob(F-statistic)	0.000000		

Table no.3 BDS Test for BET

BDS Test for BET
Date: 11/05/11 Time: 10:54
Sample: 1 1168
Included observations: 1168

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.126370	0.001166	108.3961	0.0000
3	0.233493	0.002201	106.0616	0.0000
4	0.323777	0.003112	104.0333	0.0000
5	0.399556	0.003850	103.7924	0.0000
6	0.463136	0.004405	105.1480	0.0000

Raw epsilon	4463.225		
Pairs within epsilon	1148374.	V-Statistic	0.841778
Triples within epsilon	1.16E+09	V-Statistic	0.728503

Dimension	C(m,n)	c(m,n)	C(1,n-(m-1))	c(1,n-(m-1))	c(1,n-(m-1))^k
2	567736.0	0.834463	572512.0	0.841483	0.708093
3	563051.0	0.828998	571421.0	0.841321	0.595505
4	558969.0	0.824402	570331.0	0.841159	0.500625
5	555200.0	0.820251	569241.0	0.840995	0.420695
6	551723.0	0.816517	568150.0	0.840828	0.353381

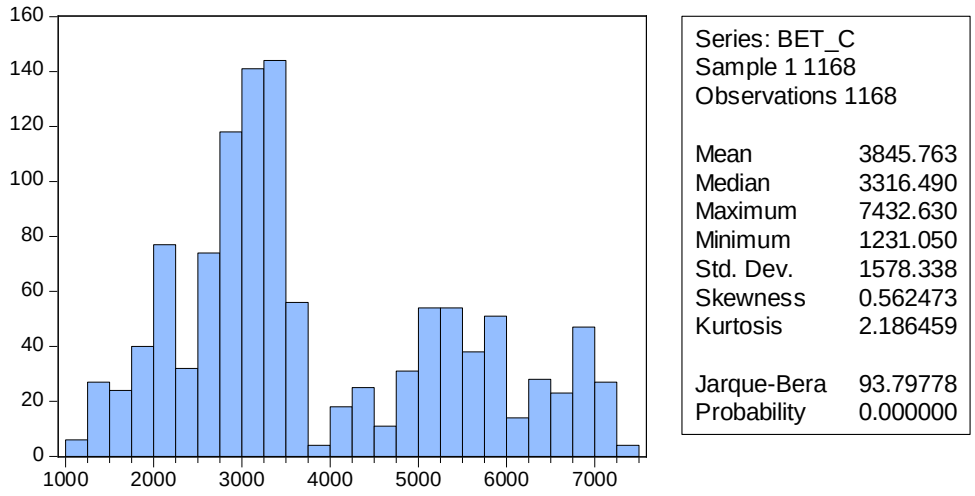

Figure no.2 Histogram for BET-C

Table no.4 Augmented Dickey-Fuller Test
- Level -

Null Hypothesis: BET_C has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.830517	0.9614
Test critical values:	1% level	-3.965937	
	5% level	-3.413671	
	10% level	-3.128897	

*MacKinnon (1996) one-sided p-values.

R-squared	0.006144	Mean dependent var	-1.764014
Adjusted R-squared	0.003578	S.D. dependent var	67.48436
S.E. of regression	67.36353	Akaike info criterion	11.26151
Sum squared resid	5272976.	Schwarz criterion	11.27887
Log likelihood	-6561.460	Hannan-Quinn criter.	11.26806
F-statistic	2.394402	Durbin-Watson stat	2.000352
Prob(F-statistic)	0.066845		

Table no.5 Augmented Dickey-Fuller Test
- First order difference -

Null Hypothesis: D(BET_C) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 18 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.993038	0.0000
Test critical values:	1% level	-3.966061	
	5% level	-3.413731	
	10% level	-3.128933	

*MacKinnon (1996) one-sided p-values.

R-squared	0.477145	Mean dependent var	-0.014791
Adjusted R-squared	0.467866	S.D. dependent var	92.21104
S.E. of regression	67.26566	Akaike info criterion	11.27330
Sum squared resid	5099302.	Schwarz criterion	11.36560
Log likelihood	-6449.874	Hannan-Quinn criter.	11.30815
F-statistic	51.42360	Durbin-Watson stat	1.993935
Prob(F-statistic)	0.000000		

Table no.6 BDS Test for BET-C

BDS Test for BET_C
Date: 11/05/11 Time: 11:02
Sample: 1 1168
Included observations: 1168

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.202701	0.001627	124.5867	0.0000
3	0.344869	0.002570	134.1815	0.0000
4	0.444013	0.003041	146.0159	0.0000
5	0.512840	0.003148	162.8905	0.0000
6	0.560358	0.003016	185.8183	0.0000

Raw epsilon	2480.460		
Pairs within epsilon	957984.0	V-Statistic	0.702219
Triples within epsilon	8.30E+08	V-Statistic	0.520902

Dimension	C(m,n)	c(m,n)	C(1,n-(m-1))	c(1,n-(m-1))	c(1,n-(m-1))^k
2	472948.0	0.695143	477438.0	0.701742	0.492442
3	468718.0	0.690108	476469.0	0.701520	0.345240
4	465057.0	0.685894	475499.0	0.701295	0.241882
5	461755.0	0.682196	474529.0	0.701068	0.169356
6	458706.0	0.678857	473560.0	0.700840	0.118499

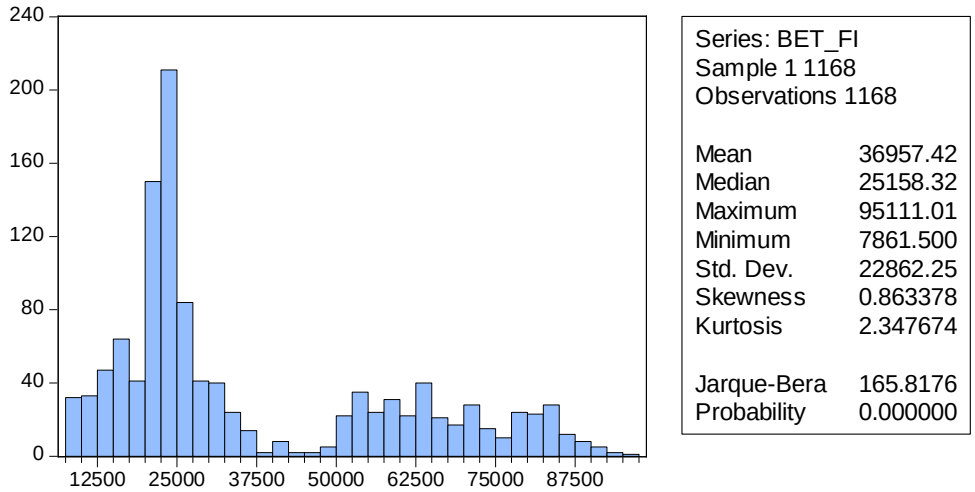

Figure no.3 Histogram for BET-FI

Table no.7 Augmented Dickey-Fuller Test
- Level -

Null Hypothesis: BET_FI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.087077	0.9294
Test critical values:	1% level	-3.965937	
	5% level	-3.413671	
	10% level	-3.128897	

*MacKinnon (1996) one-sided p-values.

R-squared	0.018596	Mean dependent var	-38.59333
Adjusted R-squared	0.016062	S.D. dependent var	984.6165
S.E. of regression	976.6770	Akaike info criterion	16.60961
Sum squared resid	1.11E+09	Schwarz criterion	16.62698
Log likelihood	-9679.405	Hannan-Quinn criter.	16.61616
F-statistic	7.339241	Durbin-Watson stat	2.004624
Prob(F-statistic)	0.000071		

Table no.8 Augmented Dickey-Fuller Test
- First order difference -

Null Hypothesis: D(BET_FI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 16 (Automatic based on Modified HQ, MAXLAG=22)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.053066	0.0000
Test critical values:	1% level	-3.966047	
	5% level	-3.413724	
	10% level	-3.128929	

*MacKinnon (1996) one-sided p-values.

R-squared	0.443889	Mean dependent var	-0.643800
Adjusted R-squared	0.435039	S.D. dependent var	1293.195
S.E. of regression	972.0164	Akaike info criterion	16.61301
Sum squared resid	1.07E+09	Schwarz criterion	16.69640
Log likelihood	-9533.478	Hannan-Quinn criter.	16.64449
F-statistic	50.15374	Durbin-Watson stat	1.995892
Prob(F-statistic)	0.000000		

Table no.9 BDS Test for BET-FI

BDS Test for BET_FI
Date: 11/05/11 Time: 11:05
Sample: 1 1168
Included observations: 1168

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.201996	0.001927	104.8173	0.0000
3	0.343656	0.003050	112.6649	0.0000
4	0.442643	0.003616	122.3964	0.0000
5	0.511472	0.003752	136.3017	0.0000
6	0.559159	0.003602	155.2241	0.0000

Raw epsilon	37876.38		
Pairs within epsilon	958880.0	V-Statistic	0.702876
Triples within epsilon	8.40E+08	V-Statistic	0.526951

Dimension	C(m,n)	c(m,n)	C(1,n-(m-1))	c(1,n-(m-1))	c(1,n-(m-1))^k
2	473192.0	0.695501	477953.0	0.702499	0.493505
3	468750.0	0.690155	477048.0	0.702373	0.346500
4	465021.0	0.685841	476145.0	0.702248	0.243199
5	461688.0	0.682097	475238.0	0.702115	0.170625
6	458681.0	0.678820	474331.0	0.701981	0.119661