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Testing Weak form of Market Efficiency in Next 11 Emerging Markets

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ABSTRACT

The focus of present study is to investigate the weak form of market efficiency in the next eleven prosperous countries reported by Goldman Sachs. We have applied unit root tests and Co-integration methodology on the weekly returns of next eleven stock market indices for a sample period starting from Jan 2013 to March 2017. The empirical results reveal that stock markets of PSI (Philippine), NSE 30 (Nigeria), BIST 100 (Turkey) and JKSE (Indonesia) are efficient in weak form. These results support an empirical evidence of predictability of weekly returns in these stock markets. Further, we found co-integration vectors for the market indices including KOSPI (South Korea), EGX 30 (Egypt), HNXI (Vietnam), KSE 100, IPC (Mexico) and DSE (Bangladesh). This result implies non-existence of a weak form of market efficiency for the selected stock markets.

JEL classification: C32, G14, G10.

Keywords: Efficient market hypothesis, time series, co-integration, next 11 countries.

1. INTRODUCTION

A stock market in which stock prices quickly incorporates all kinds of available information of different time horizons is said to be an efficient market. The Efficient Market Hypothesis (EMH) is a proposition that stock markets are efficient which discounts all the possible and available information, with the prices of stocks reflecting their true value.

There exist different levels or degrees of market efficiency. A market is weak form efficient only when the current stock prices are not predictable from historical stock price information or technical analysis (Fama 1991). The market is semi-strong form efficient when the current security prices discounts the

information available with public. Finally, the strong form of market efficiency exists when stock prices reflects both the information available in public and private domain. The market can be expected to be efficient because of price-takers and information is costless and is widely available to all participants. As soon as the new information is provided investors will react quickly and fully then the stock prices adjust accordingly.

The major purpose of current study is to examine the weak form of market efficiency in the Next 11 emerging countries by using Co-integration methodology which includes Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam. These countries have a high potential of becoming along with BRICS countries among the world's largest economies in the 21st century. The extant literatures have studied the market efficiency of various stock markets either individually or in a combination with other markets, but this is first study to focus on weak form of efficiency in the next 11 countries.

Even though the earlier studies have confirmed the presence of market efficiency and inefficiency at different time intervals for various developed and emerging markets, however, studies examining the market efficiency among the various markets at the same time periods are rare. The extant literature more focused on the investigation of the efficient market hypothesis of various countries and very limited literature available on efficient market hypothesis of next 11 countries. Hence the present study contributes to the literature by investigating the weak form of market efficiency in the context of next 11 countries.

The outline of research paper is organised as follows: Section 2 provides an account of the relevant literature review, Section 3 describes the data and sample, Section 4 explains the methodology used in empirical analysis. Section 5 discusses the results and discussion, and finally, Section 6 concludes the paper.

2. LITERATURE REVIEW

Griffin et. al., (2010) used trading techniques and other measures of efficiency by using a sample data of 28 countries from each of developed and emerging countries. Their study concluded and opposed the false notion that emerging markets less efficient than developed markets. Al-Jafri and Altaee (2011) used Unit root test, Runs test, and other tests to examine the random walk behavior and efficiency of the Egyptian equity market. The variance ratio tests show that the variance increases more than proportionately in the daily returns. ADF, PP, and KPSS provide evidence that the Egyptian exchange EGX 30 index is non-stationary and do not follow a random walk.

Pavabutr & Chaihetphon (2010) studied the standard and mini futures' efficient price adjustments. They found that futures price leads spot price. Gupta (1990) studies the impact of index futures introduction on stock market volatility, and the relative volatility of spot market and futures market. He discovered that volatility has declined after the introduction of index futures.

Inoue & Hamori (2014) studied the efficiency in Indian commodity futures market. They established a co-integration relationship which proved the existence of efficiency in the market. They provided conclusive evidence that the Indian commodity futures market is not efficient market. And Indian commodity futures market is showing signs of efficiency in the recent periods. Mall et. al., (2008) studied the long-run market efficiency over 10 Years. They identified indications of efficiency in India's F & O market with respect to the spot market. The price movement in futures market can justify the expected volatility in the spot market.

Baklaci and Tutek (2006) examined the efficiency of futures market and documented an empirical evidence for information incorporation in spot prices due to the impact of futures market.

Lim et. al., (2013) studied the efficiency of the two official stock markets in China by using a. sample of daily prices of two categories of share indices for a period of four years. They haves used different market efficiency tests such as serial correlation test, variance ratio and other tests and found that the selected stock market reflects weak form of efficiency.

Lagoarde-Segot and Lucey (2008) conducted twenty statistical tests and developed an 'efficiency index' for each selected stock market. Their study revealed weak form of market efficiency for the selected market indices. Mobarek et. al., (2008) studied the Bangladesh stock market and concluded that the market would be more efficient only when the efficiency of operation and information is increased. This study suggested that the investor's confidence will increase, thereby increasing economic activities.

Edmans (2009) found that block holders can significantly enhance the value of a firm even if they lack control rights. By using a sample of stocks listed on NYSE Chordi, Roll & Subrahmanyam (2008) had depicted that a measure of market efficiency is negatively related to the predictability of stock returns from the orders already executed.

Lim et. al., (2008) investigated the efficiency of eight stock markets in Asia region during 1997 financial crisis and discovered that there is higher inefficiency due to financial turmoil. They also reported that there is an improved market efficiency post-crisis period. Kristoufek & Vosvrda (2013) studied 41 stock indices from 2000 to 2011 and applied their new method to measure capital market efficiency by utilizing dynamic systems in relation to a standard martingale definition of capital market efficiency. By using various dimension measures they constructed a vector and concluded that Japanese NIKKEI is the most efficient market where the least efficiency markets are Venezuelan IBC, Malaysian KLSE, Slovakian SAX, CS of Sri Lanka and Peruvian IGRA. Kristoufek and Vosvrda (2014) studied 25 commodities futures among various groups and analyzed the market efficiency. They concluded that heating oil is most efficient followed by WTI crude oil, cotton, wheat and coffee. Rao (2015) examined the relationship between spot and futures exchange rates to offer inferences on foreign exchange market efficiency. His study results reveal the absence of efficiency in Indian foreign exchange market for the sampled period.

3. DATA AND SAMPLE

Based upon Goldman Sachs report in the year 2005, we have selected "next eleven" stock market indices of next emerging countries. The stock market indices of these countries include KOSPI (South Korea), IPC (Mexico), BIST 100 (Turkey), EGX 30 (Egypt), TEPIX (Iran), JKSE (Indonesia), PSI (Philippine), KSE 100 (Pakistan), HNXI (Vietnam), DSE (Bangladesh) and NSE 30 (Nigeria). The sample of this study includes weekly returns of these stock indices from January 1, 2013 to March 26, 2017. We have collected the data from the websites of their respective stock markets and Google finance.

4. METHODOLOGY

We applied ADF and PP Unit root tests to investigate stationarity in the time series. The Augmented Dickey-Fuller (ADF) test equations are given as below:

$$\Delta S_t = c_1 + \alpha_2 t + \beta S_{t-1} + \delta \sum_{i=1}^{k} \Delta S_{t-i} \quad (1)$$

$$\Delta S_t = c_1 + \beta S_{t-1} + \delta \sum_{i=1}^{k} \Delta S_{t-i} + \varepsilon_t \quad (2)$$

$$\Delta S_t = \beta S_{t-1} + \delta \sum_{i=1}^{k} \Delta S_{t-i} + \varepsilon_t \quad (3)$$

Where S_t is the time series value at time t, c_1 is constant term, $\alpha_2 t$ denotes trend, k represents the number of lagged terms, and ε_t is residual. Further, we have applied non-parametric Philips-Perron (PP) Unit root test. Johansen's co-integration test is used to measure the co-integration vectors among the selected market indices. The equation for this test is given below:

$$S_t = \alpha_1 + A_1 S_{t-1} + \cdots + A_k S_{t-k} + \varepsilon_t \quad (4)$$

$$\Delta S_t = \alpha_1 + \Pi S_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta S_{t-1} + \epsilon_t \quad (5)$$

where, $\Pi = \sum_{i=1}^{k} A_i - I$ and $\Gamma_i = -\sum_{j=i+1}^{k} A_j$

The zero value of Π indicates non-existence of co-integration vectors in the selected time series.

5. RESULTS AND DISCUSSION

The above table presents descriptive statistics of weekly returns of selected market indices for the period of study. Based upon the results reported in Table1, we can infer that mean of the sample returns of the next eleven countries are positive except NSE 30 and indicate significant growth, with NSE 30 and KSE 100,

Table 1
Descriptive statistics of stock market indices weekly returns

	PSI	*TEPIX*	*PSI*	*NSE 30*	*KSE 100*	*BIST 100*	*KOSPI*	*JKSE*	*IPC*	*HNXI*	*EGX 30*	*DSE*
Mean	0.001	0.002	0.001	–0.001	0.005	0.001	0.001	0.001	0.001	0.002	0.005	0.002
Standard Error	0.001	0.003	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.003	0.001
Median	0.000	0.005	0.000	0.000	0.005	0.001	0.002	0.001	0.002	0.002	0.004	0.000
Standard Deviation	0.021	0.039	0.021	0.033	0.020	0.033	0.017	0.022	0.020	0.020	0.039	0.021
Sample Variance	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.000
Kurtosis	0.968	1.521	0.968	6.534	0.149	1.138	0.114	2.773	0.315	1.673	5.608	0.668
Skewness	0.088	0.402	0.088	0.266	–0.155	–0.470	–0.327	0.077	0.124	–0.350	0.500	0.120
Range	0.146	0.0238	0.146	0.314	0.114	0.221	0.098	0.178	0.131	0.149	0.367	0.142
Minimum	–0.069	–0.021	–0.069	–0.135	–0.058	–0.134	–0.054	–0.087	–0.063	–0.079	–0.154	–0.075
Maximum	0.077	0.023	0.077	0.179	0.056	0.087	0.044	0.091	0.068	0.070	0.213	0.067

KOSPI (South Korea), TEPIX (Iran), IPC (Mexico), BIST 100 (Turkey), EGX 30 (Egypt), TEPIX (Iran), JKSE (Indonesia), PSI (Philippine), KSE 100 (Pakistan), HNXI (Vietnam), DSE (Bangladesh) and NSE 30 (Nigeria).

EGX 30 recording the lowest and highest mean respectively. It was observed that the standard deviation of EGX 30 is almost double that of the KSE 100, but the mean return is approximately the same for both the indices. This suggests that EGX 30 is highly volatile with a range of 0.35 and is the one which recorded highest negative return among the next eleven countries. The median returns of EGX 30 are approximately equal to its mean return which suggests that there is sudden fall or rise in returns, to expand its range. The weekly returns of KOSPI, KSE 100, BIST 100 (Turkey) and HNXI (Vietnam) were negatively skewed. This is in line with the existing studies documented in literature (Aggarwal and Rao, 1990). On the other hand, positive skewness was observed for IPC (Mexico), IPC (Iran), EGX 30 (Egypt), JKSE (Indonesia), PSI (Philippine), KSE 100 (Pakistan), HNXI (Vietnam), DSE (Bangladesh) and NSE 30 (Nigeria).

We applied both Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to examine the presence of a unit root in the selected stock market indices. Table 2 presents an insignificant result of ADF and PP tests in the level data except for KOSPI, which implies the existence of non-stationarity of stock market indices at level data. On contrary, we found significant unit root test results for the selected stock market indices at first difference level. i.e. all the time series are I(1) except KOSPI which is I(0). According to Seiler (2004) the basic requirement for performing a co-integration test is the existence of unit root in a time series.

Table 2
Unit Root Tests – ADF and PP

Variables	*Level Data*	*Probability*	*Stationary Status*	*First Difference data*	*Probability*	*Stationary Status*
			ADF Test			
PSI	-2.151	0.225	Non-Stationary	-14.768	0.000	Stationary
NSE 30	-1.012	0.749	Non-Stationary	-12.521	0.000	Stationary
KSE 100	-0.209	0.934	Non-Stationary	-13.695	0.000	Stationary
BIST 100	-2.840	0.055	Non-Stationary	-15.848	0.000	Stationary
KOSPI	-3.487	0.009	Stationary	-17.161	0.000	Stationary
JKSE	-1.880	0.342	Non-Stationary	-16.381	0.000	Stationary
IPC	-1.756	0.402	Non-Stationary	-17.997	0.000	Stationary
HNXI	-1.539	0.512	Non-Stationary	-12.135	0.000	Stationary
EGX 30	-0.010	0.956	Non-Stationary	-12.805	0.000	Stationary
TEPIX	-1.042	0.702	Non-Stationary	-12.027	0.000	Stationary
DSE	-1.643	0.459	Non-Stationary	-12.157	0.000	Stationary
			PP Test			
PSI	-2.165	0.220	Non-Stationary	-14.768	0.000	Stationary
NSE 30	-1.012	0.749	Non-Stationary	-14.637	0.000	Stationary
KSE 100	-0.225	0.932	Non-Stationary	-13.685	0.000	Stationary
BIST 100	-2.780	0.063	Non-Stationary	-15.857	0.000	Stationary
KOSPI	-3.351	0.014	Stationary	-17.352	0.000	Stationary
JKSE	-1.708	0.426	Non-Stationary	-16.467	0.000	Stationary
IPC	-2.396	0.144	Non-Stationary	-18.487	0.000	Stationary
HNXI	-1.495	0.534	Non-Stationary	-12.132	0.000	Stationary
EGX 30	-0.157	0.940	Non-Stationary	-12.732	0.000	Stationary
TEPIX	-0.205	0.702	Non-Stationary	-14.027	0.000	Stationary
DSE	-1.184	0.682	Non-Stationary	-12.240	0.000	Stationary

Table 3
Johnson Co-integration Test Results

	NSE 30	*KSE 100*	*BIST 100*	*KOSPI*	*JKSE*	*IPC*	*HNXI*	*EGX 30*	*DSE*
					Trace				
PSI	6.723 [0.610] (0)	6.635 [0.620] (0)	11.819 [0.165] (0)	11.203 [0.199] (0)	6.341 [0.655] (0)	9.073 [0.358] (0)	14.901 [0.061] (0)	8.309 [0.432] (0)	10.852 [0.220] (0)
NSE 30		5.376 [0.767] (0)	9.997 [0.280] (0)	9.659 [0.307] (0)	3.196 [0.957] (0)	8.811 [0.383] (0)	10.067 [0.275] (0)	2.427 [0.986] (0)	14.961 [0.060] (0)
KSE 100			9.149 [0.351] (0)	15.759 [0.045] (1)	6.187 [0.673] (0)	15.563 [0.048] (1)	7.867 [0.0479] (0)	3.246 [0.954] (0)	15.550 [0.049] (1)
BIST 100				13.099 [0.111] (0)	15.113 [0.057] (0)	10.679 [0.232] (0)	13.106 [0.110] (0)	13.060 [0.112] (0)	13.947 [0.084] (0)
KOSPI					13.594 [0.094] (0)	13.066 [0.112] (0)	15.967 [0.042] (1)	16.143 [0.039] (1)	21.207 [0.006] (1)
JKSE						8.060 [0.459] (0)	9.396 [0.330] (0)	6.242 [0.666] (0)	9.385 [0.330] (0)
IPC							11.269 [0.195] (0)	7.294 [0.543] (0)	14.799 [0.063] (0)
HNXI								10.762 [0.227] (0)	13.750 [0.090] (0)
EGX 30									15.580 [0.048] (1)
					Eigen				
PSI	6.223 [0.584] (0)	6.502 [0.549] (0)	8.007 [0.378] (0)	7.488 [0.433] (0)	5.377 [0.698] (0)	6.935 [0.496] (0)	10.410 [0.186] (0)	8.042 [0.374] (0)	9.473 [0.248] (0)
NSE 30		5.376 [0.693] (0)	9.089 [0.278] (0)	9.467 [0.249] (0)	2.799 [0.959] (0)	8.809 [0.302] (0)	8.788 [0.304] (0)	2.397 [0.978] (0)	13.796 [0.059] (0)
KSE 100			8.783 [0.304] (0)	15.486 [0.031] (1)	6.176 [0.590] (0)	15.561 [0.031] (1)	7.733 [0.406] (0)	3.118 [0.938] (0)	15.141 [0.036] (1)
BIST 100				7.114 [0.475] (0)	12.715 [0.086] (0)	8.976 [0.288] (0)	10.274 [0.194] (0)	12.463 [0.094] (0)	13.887 [0.057] (0)
KOSPI					11.037 [0.152] (0)	11.292 [0.140] (0)	13.405 [0.068] (0)	15.853 [0.027] (1)	21.191 [0.003] (1)
JKSE						7.334 [0.450] (0)	7.396 [0.443] (0)	6.222 [0.584] (0)	9.284 [0.263] (0)
IPC							10.342 [0.190] (0)	7.292 [0.455] (0)	14.757 [0.041] (1)
HNXI								10.699 [0.169] (0)	10.758 [0.166] (0)
EGX 30									15.544 [0.031] (1)

Statistics value [probability] (Number of co-integrating vectors)

We have applied co-integration test for each pair of market indices by using a sample of selected market indices. The above table presents pair wise co-integration results for the selected stock market indices during

the period of study. We found no co-integration between PSI (Philippine) and other market indices, NSE 30 (Nigeria) and other market indices, BIST 100 (Turkey) and other market indices, JKSE (Indonesia) and other market indices for weekly returns. The empirical results reveal absence of Co-integration vectors in the majority pairs of market indices included in the empirical analysis. It implies the existence of the weak form of market efficiency for these stock markets.

However, we found that KOSPI (South Korea) was cointegrated with EGX 30 (Egypt), HNXI (Vietnam) and DSE (Bangladesh) for weekly returns. Likewise KSE 100 (Pakistan) was co-integrated with DSE (Bangladesh) and IPC (Mexico) for weekly returns. Further, we found that DSE (Bangladesh) was co-integrated with IPC (Mexico) and EGX 30 (Egypt) for weekly returns. The existence of co-integration vectors in these stock market indices implies weak form of market efficiency does not exist in these stock markets.

6. CONCLUSION

This study examined the weak form of market efficiency in the context of next eleven emerging and developing countries by using the weekly prices of selected stock market indices for a sample period starting from Jan 2013 to March 2017. At first, we applied Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to examine the presence of a unit root which is an important criterion for random walk. We found an insignificant result of ADF and PP tests in the level data except for KOSPI, which implies the existence of non-stationarity of stock market indices at level data. On contrary, we found significant unit root test results for all stock market indices at first difference level.

After that, we have applied co-integration test for each pair of market indices by using a sample of selected market indices. The empirical results reveal absence of Co-integration vectors in the majority pairs of market indices included in the empirical analysis. As the stock market indices of (Philippine), NSE 30 (Nigeria), BIST 100 (Turkey) and JKSE (Indonesia) are not co-integrated with other market indices. This implies the existence of the weak form of market efficiency for these stock markets. Further, we found co-integration vectors for the market indices including KOSPI (South Korea), EGX 30 (Egypt), HNXI (Vietnam), KSE 100, IPC (Mexico) and DSE (Bangladesh). On the other hand this empirical result implies a non-existence of weak form of market efficiency for these stock market indices.

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