Journal of Business Economics and Management
ISSN 1611-1699 print / ISSN 2029-4433 online
2012 Volume 13(1): 167–188
doi:10.3846/16111699.2011.620140

TESTING WEAK-FORM EFFICIENCY OF EMERGING ECONOMIES: A CRITICAL REVIEW OF LITERATURE

Mohammad Nurunnabi

Business School, Edge Hill University, St Helens Road, Ormskirk, Lancashire, L39 4QP, UK
E-mail: mohammad.nurunnabi@edgehill.ac.uk

Received 26 January 2011; accepted 09 August 2011

Abstract. Due to the globalisation and mobilisation of capital markets, the concept of EMH is gaining a lot of importance in both developed and emerging economies. Most of the researches on the weak-form efficiency to date were based on the developed countries. The present study will seek to provide a comprehensive understanding of the weak-form efficiency in emerging economies. In terms of practical implications, the paper has direct implications for future research in EMH in particular emerging economies. The paper contributes in manly three ways: First, the paper collates and examines the broader and most effervescent literature and their findings. Second, it also presents a comprehensive, encompassing research work and a holistic view of various aspects of weak-form EMH. Finally, no studies have been conducted to date on a literature review of EMH weak-form efficiency in emerging economies. Nevertheless, the limitation of the study is that the findings are presented that may not be generalized to developed nations, which may be quite different in socio-cultural and political settings including the behavioral aspects of investors and the strength of the capital market.

Keywords: efficient market hypothesis (EMH), weak-form market efficiency, emerging economies, South Asia.

Reference to this paper should be made as follows: Nurunnabi, M. 2012. Testing weak-form efficiency of emerging economies: a critical review of literature, *Journal of Business Economics and Management* 13(1): 167–188.

JEL Classification: M41, M14, G34.

1. Introduction

The concept of EMH came from Fama (1970, 1991) based on the argument of Samuelson (1965) who found that the anticipated price of an asset fluctuate randomly. During the past decades, the efficient market hypothesis (EMH) has been a debatable issue in empirical finance literature because of its significance and implications. The study consists four sections including the introduction. The next section provides an overview of random walk model and its implication on weak-form efficiency test. The section three contains the critical review of literature on weak-form efficiency in developed countries, emerging markets and South Asian perspective. The final section summarizes the conclusions.

"The primary role of the capital market is allocation of ownership of the economy's capital stock. In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that security prices at any time "fully reflect" all available information. A market in which prices always "fully reflect" available information is called 'efficient' (Fama 1970: 383)".

Fama (1970) suggested three applicable models of EMH including Fair Game model, the Submartingale model, and the Random Walk model. The EMH can be classified into three forms: weak-form, semi-strong form and strong form (Roberts 1959). *Weak-form of efficiency* claims that the current share prices reflect all the information that is contained in the historical sequence of prices and technical analysis cannot be used to predict and beat market; *Semi Strong-form of efficiency* implies that current share prices not only reflect all information content of historical prices but also reflect all the publicly available information; *Strong-form of efficiency* states that current share prices reflect all information whether it is publicly available or private information (insiders information) (Fama 1970). Later, Malkiel (1992) extended Fama's definition following the two arguments: the security prices would be unaffected by revealing the information and it is impossible to make profit based on the revealed information. Therefore, EMH can be measured by the profits based on the information (Jensen 1978; Campbell *et al.* 1997; Timmermann, Granger 2004). However, their definitions were based on the information and transaction costs, not involving joint hypothesis (Pesaran 2005).

Nowadays, the concept of EMH in emerging market is becoming more important because of the globalization, free movement of investments across national boundaries and the huge capital inflows from developed economies. Traditionally, the markets of developed economies are more efficient compare to emerging markets (Gupta 2006). The fundamental reason is that the development of capital markets is lower which which results in less regulations and control in the weak markets (Gupta 2006). Among the emerging countries in South Asia, the capital markets of Bangladesh are enormously growing very vastly, however not like India, but in an impressive way (See Table 1).

Table 1. Comparison of stock markets performance in South Asia (2008–2009 and 2007–2008)

Country	Market Name	2008–2009	2007–2008	% Change
Bangladesh	Dhaka (DSE-GEN)	3000.50	2149.32	39.60
India	Mumbai (BSE-SENSEX)	13461.60	14650.50	–8.12
Pakistan	Karachi (KSE-100)	12289.00	13772.50	–10.77
Sri Lanka	Colombo (CSE-SELECTED)	2457.84	2572.20	–4.45

At this stage, it is useful to assess the level of efficiency in Bangladeshi stock market. However, very few research focus on the Bangladesh and they are dated and inconclusive. The empirical research found that emerging markets are not efficient in semi-strong form or strong form. So, it is justifiable to review the weak-form studies rather than semi-strong form or strong form. Wong and Kwong (1984) suggest that if the evidence fails to support weak-form efficiency, it is unnecessary to test the semi-strong form or strong form efficiency at the stricter levels. There are other reasons which might be affected to test the semi-strong form or strong form efficiency in emerging economies, including the unavailability of sufficient data, structural profile, inadequate regulations, lack of supervision, companies' information circulation before the officially availability of annual reports, dramatic movement of the markets and the rumours of information (Worthington, Higgs 2003).

2. Random walk model

Traditionally, the lower the market efficiency, the greater the predictability of stock price changes. According to Fama (1970), the efficient market exists if the share prices are reflected by all available information. In other words, in an efficient market, price changes must be a response only to new information. As the information arrives randomly in market, the share prices fluctuate unpredictably. In weak-form efficient, the price movements fluctuate and the changes of price are independent. In that case, the investors cannot predict the insights of the future prices based on the past information and cannot earn abnormal returns.

The random walk idea of the asset price was introduced by Bachelier in 1900 (Poshakwale 1996). The random walk model sates that the price changes cannot be predicted from earlier changes, the successive price changes of any stock are independent and the price changes occur without any significant trends. The random walk will be consistent with equity being appropriately priced at an equilibrium level, whereas the absence of a random walk will follow the inappropriate of pricing of capital and risk. This has important implications for the allocation of capital development of overall economy. The random walk model can be stated as follows:

$$P_{t+1} = n + P_t + \varepsilon_{t+1}, \tag{1}$$

where P_{t+1} = Price of share at time t+1; n = Expected price change; P_t = Price of share at time t; ε_{t+1} = Random error with zero mean and finite variance

Ko and Lee (1991) argued 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". Fama (1970) strongly support the random walk model in testing the efficiency and pointed out that this model is more powerful than the fair game model. However, Jensen (1978) found that anomalous price behaviour where certain series appeared to follow predictable paths. In later study, Fama (1998) suggests that new behavioural

based theories are required because of the apparent anomalies. The most of the previous empirical literature has focused on the random model to test the weak-form efficiency (Groenewold; Kang 1993; Huang 1995; Groenewold, Ariff 1998; Lee *et al.* 2001; Smith, Ryoo 2002; Fama, French 1988; Osborne 1959; Cootner 1962, 1964; Fama 1965; Fama, Blume 1966; Dimson, Mussavian 1998; Cowles, Jones 1937; Poterba, Summers 1988; Fama *et al.* 1969, 1993; Fama 1995; Groenewold *et al.* 1993). Hence, the present study signifies the prior literature on examining the random walk behaviour to test weak-form efficiency in emerging stock market.

On the contrary, the economic theory suggests a number of sources of nonlinearity in the financial data. One of the most frequently citied reasons of nonlinear adjustment is presence of market frictions and transaction costs. Existence of bid-ask spread, short selling and borrowing constraint and other transaction costs render arbitrage unprofitable for small deviations from the fundamental equilibrium. Subsequent reversion to the equilibrium, therefore, takes place only when the deviations from the equilibrium price are large, and thus arbitrage activities are profitable (He, Modest 1995). Consequently, the dynamic behaviour of returns will differ according to the size of the deviation from equilibrium, irrespective of the sign of disequilibrium, giving rise to asymmetric dynamics for returns of differing size (Dumas 1992, 1994; Krägler, Krugler 1993; Obstfeld, Taylor 1997; Shleifer 2000; Coakley, Fuertes 2001; Taylor 2008). In addition to transaction costs and market frictions, interaction of heterogeneous agents (Hong, Stein 1999; Shleifer 2000), diversity in agents' beliefs (Brock, LeBaron 1996; Brock, Hommes 1998) also may lead to persistent deviations from the fundamental equilibrium. On the other hand, heterogeneity in investors' objectives arising from varying investment horizons and risk profiles (Peters 1994), herd behaviour or momentum trading (Lux 1995) may give rise to different dynamics according to the state of the market, i.e., whether the market is rising or falling.

3. Critical review of literature

There are two schools of thoughts on the market efficiency. The first one argues that the markets are efficient and the future returns are unpredictable (Fama 1970). On the other hand, the second ones argue that the EMH theory is contradictory because of the empirical evidence of 'anomalies' (Summers 1986; Keim 1988; Fama, French 198; Lo, MacKinlay 1988; Poterba, Summers 1988). The weak-form efficient market hypothesis states that the current returns are considered to contain all information that is incorporated in historic data and the future returns cannot be forecasted from past returns data. Fama (1991) has extended the predictability power of past returns including the seasonal in returns and the predicting ability of variables (dividends, firm size and interest rates). Following by Fama's theory, there were enormous studies conducted on the weak-form test. The summary of selected studies on developed markets, emerging markets and south Asian markets are given in Table 2. The prior researches are discussed on the arguments surrounding three categories to simplify the research objectives:

3.1. Empirical evidence of developed markets

The earlier study on the weak-form efficiency mostly focused on the developed markets (Working 1934; Kendall 1943, 1953; Cootner 1962; Osborne 1962). Kendall (1953) examined the 19 indices of British industrial share prices and commodity prices in New York and Chicago. Based on the zero serial correlation, the study supports the random walk model. Kendall's findings were supported by the previous study of Working (1934). However, the studies did not provide the economic rationale for the hypothesis because their justifications were based on small sample (Working 1934; Kendall 1953; Roberts 1959). Kendall (1954) argued that the small sample bias equals $-1/(T-1)$, where T is the number of time-series observations. Bias-adjusted first-order serial correlation coefficients for annual earnings changes are close to zero (Kothari 2001).

Consistent with the previous work of random walk model, Osborne (1959, 1962) suggested that the market conditions would lead to random walk model. He also concluded that the transaction varies on individual securities because of the investors' decisions, so the economic justification for the random walk is not important and the arguments were based on the fair game model. Alexander (1961) was somewhat supportive to the conclusion of Osborne (1959, 1962) and stated that it would be well on speculating prices as a random walk. The criticism is that Alexander (1961) did not expand 'fair game' assumption is not sufficient to lead to a random walk. Later, Alexander (1964) used the daily data on price indices from 1897 to 1959 and found the evidence against random walk model. He also mentioned that from the view of submartingale model, the market efficiency did not require the random walk concept. Niederhoffer and Osborne (1966) investigated the NYSE and indicated that the existence of market inefficiency because the analysts or the specialists hold important information which are monopoly in nature and this information might be used to turn a profit with respect to strong form EMH.

The pioneering work, Lo and MacKinlay (1988) examined the US security prices based on the 1216 weekly observations for the period 6th September 1962 to 26th December 1985. They first introduced the variance ratio to test the weak-form. They found that significant positive serial correlation for weekly and monthly holding-period returns and therefore, the study revealed that the rejection of random walk hypothesis for the sample period. On the other hand, Fama and French (1988) found that negative serial correlation for longer period and the 25% and 40% of the variation of longer-period return was predictable from the past returns. Poterba and Summers (1986) also concluded the rejection of random walk hypothesis and hence found the evidence against EMH. They also argued that the rejection of random walk could not be explained because of the infrequent trading or time varying volatilities.

On the other hand, Lee (1992) investigated the US and ten other industrialized countries, namely Australia, Belgium, Canada, France, Italy, Japan, Netherlands, Switzerland, United Kingdom, and Germany to test whether the weekly stock returns follow random walk model or not. Using the variance ratio test, he pointed out that the random model on weekly returns did exist for those countries. Consistent with Lee (1992) study,

Choudhry (1994) examined the individual stock indices in seven OECD countries (US, United Kingdom, Canada, France, Germany, Japan and Italy) from the period 1953 to 1989. Applying Augmented Dickey-Fuller and KPSS unit root tests, and Johansen's co integration tests, he concluded that the markets of the seven OECD countries were efficient for the sample period.

Chan *et al.* (1997) tested 18 international stock markets (Australia, Belgium, Canada, Denmark, Finland, France, Germany, India, Italy, Japan, Netherlands, Norway, Pakistan, Spain, Sweden, Switzerland, the United Kingdom, and the United States) for justifying the weak-form efficiency using Phillips-Perron (PP) unit root and cointegration tests from 1962 to 1992 with 384 monthly observations. They concluded all the sampled stock markets were weak-form efficient. However, the result was very much contradictory especially in India and Pakistan.

Al-Loughani and Chappel (1997) examined the weak-form efficiency in UK (Daily observations of FTSE 30 Index) for the period June 1983 to November 1989 using Lagrange multiplier (LM) serial correlation, unit root and non-linear tests. They rejected the random walk model during the sample period and concluded that FTSE 30 was not efficient in weak-form.

Groenewold (1997) investigated the weak-form efficiency in Australia (Statex Actuaries' Index) and New Zealand (NZSE-40 Index) from 1975 to 1992 based on the daily observations. The conclusion was contradictory because the unit root tests were supportive to weak-form in both countries, whereas Granger causality test rejected the EMH and the both countries' were not cointigrated. Lee and Mathur (1999) concluded the Spanish future markets followed the random walk hypothesis and weak-form efficient based on the serial correlations, unit root tests, and variance ratio tests.

With regard to Groenewold (1997) and Lee and Mathur (1999) conclusions, Worthington and Higgs (2004) tested the random walk hypothesis in 16 developed markets (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom) from December 1987 to May 2003 using serial correlation, runs, unit root and multiple variance ratio tests. They used the daily returns of share indices in US$. The evidence showed that the most of the EU markets were weak-form efficient except France, Finland and Netherlands. The different test provided the mix result which was inconclusive in nature and they did not comment on that.

Gan *et al.* (2005) tested the market efficiency in New Zealand, Australia, US and Japan Stock Indices from 1990–2003 and based on the Augmented-Dickey Fuller (ADF) and Phillips-Perron unit root tests (PP) they concluded that the weak-form efficiency did exist in all the sampled countries. This result was supported by Groenewold (1997) study.

Torun and Kurt (2008) examined the weak-form efficiency of 11 EMU (European Monetary Union) countries for the period 1999–2006 using stock market price index, consumer price index and purchasing power of euro variables. They employed the panel unit root tests. The study revealed that the markets of all 11 countries were weak-form efficient.

Hasanov (2009a) re-examined the efficiency of the Australia's and New Zealand's stock markets, using the work of Narayan (2005). He applied the nonlinear unit root test procedure following Kapetanios *et al*. (2003) and concluded that both Australia's and New Zealand's stock stock markets were not weak form efficient, contrary to the findings of Narayan (2005).

3.2. Empirical evidence of emerging markets

The emerging stock markets have been highly focused by both researchers and investors. Due to the globalization and the inflow of FDI, the emerging markets have opened up their economy which attracted global investors. Therefore, various studies have concentrated on the return behaviour and the predictability, but the majority of them examine the random walk behaviour in emerging markets.

Laurence (1986) studied on the KLSE stock exchange in Malaysia and SES stock exchange in Singapore to find out the random walk hypothesis for the period 1973 to 1978. Using the runs and autocorrelation test, he concluded that both KLSE and SSE did not follow the random walk and they are not weak-form efficient. In contrast to Laurence (1986) study, Barnes (1986) found that the KLSE stock markets were weak-form efficient for sample period 1975 to 1980. He used the same test of Laurence (1986) and implied to 30 companies and sis sector indices.

On the other hand, Parkinson (1987) tested the weak-form efficiency in Kenya (NSE) from 1974 to 1978 based on the monthly prices of 50 individual companies. He used the single run test only. The result showed that the NSE did not exhibit the weak-form efficiency. On the continuation of Parkinson (1987) work, Dickinson and Muragu (1994) also investigated NSE for the period 1979 to 1989 using the weekly prices of 30 most actively traded stocks. They revealed that the weak-form efficiency exist in NSE. So, the result is contradictory to the earlier study in Kenya. The reason might be the use of a different test.

Urrutia (1995) examined the random walk behaviour in four Latin American emerging markets (Argentina, Brazil, Chile, and Mexico) from 1975 to 1991 based on the variance ratio and runs tests. The result was mixed, because the variance ratio rejected the random walk hypothesis in four countries whereas the run tests did support for weak-form efficiency in all four countries. Similar with the study, Ojah and Karemera (1999) tested the weak-form efficiency in the same four Latin American countries applying the multiple variance ratios and run tests from 1987 to 1997 and concluded based on the multiple variance ratio test that the all for countries did follow weak-form efficiency.

Karemera *et al.* (1999) studied the weak-form efficiency test in 15 emerging stock from 1986 to 1997 markets using Ojah and Karemera (1999) methods. They concluded that 10 out of 15 emerging markets followed the random walk hypothesis based on the multiple variance ratios, but only 5 out of the 15 were consistent the random walk hypothesis under the run tests. So, the result was very much controversy in nature because of the different conclusion.

Chang *et al.* (1996) investigated the weak-form efficiency in Taiwan (TSE) from 1967 to 1993 applying Ljung-Box Q, the runs and the unit root tests. The study stated that that TSE was weak-form efficient. Consistent with the study, Chang and Ting (2000) also examined the TSE using a single test (variance ratio test) for the period 1971 to1996. They also confirmed that TSE was weak-form efficient based on monthly, quarterly and yearly returns. However, the result based on the weekly data showed that the TSE was not weak-form efficient. Tas and Dursonoglu (2005) used the DF unit root test and run test to examine the weak-form efficiency in Turkey (ISE-30 indices) from 1995 to 2004. They revealed that both of the tests rejected random walk hypothesis in ISE.

Hasanov (2009b) re-investigated the efficiency of the South Korea's stock market, extending work of Narayan and Smyth (2004). He used the nonlinear unit root test developed by Kapetanios *et al.* (2003). The study rejected the null hypothesis of unit root and therefore South Korea's stock market was not weak form efficient, contrary to the findings of Narayan and Smyth (2004).

In the Middle East, Butler and Malaikah (1992) tested the random walk model in Kuwait and Saudi Arabian stock markets from 1985 to 1989 using autocorrelation test. The data comprised the daily returns of two stock markets. The study revealed that the Saudi Arabian stock market was weak-form efficient but the Kuwaiti stock market was not weak-form efficient. In a similar study, Abraham *et al.* (2002) confirmed that Kuwait, Saudi Arabia, and Bahrain stock markets did not follow random walk hypothesis. They used the variance ratio and runs tests for the period 1992 to 1998. Again, Hassan *et al.* (2003) used the GARCH-M and EGARCH models to test the weak-form efficiency in Kuwait (KSE) stock market. The study found the evidence of inefficiency market. They also mentioned that the reason of inefficiency were various regulatory reforms carried out in the sample period.

Moustafa (2004) investigated the weak-form efficiency in UAE stock market from 2001 to 2003 using the daily price indices. They applied the run test and found that 40 stocks out of the 43 were random at 5% level of significance which was considered to be weak-form efficient. They pointed out that UAE was one of the fastest growing countries and the new structural development of stock market was happening.

In African emerging markets study, Appiah-Kusi and Menyah (2003) examined the weak-form efficiency in 11 African stock markets (Botswana, Egypt, Ghana, Ivory Coast, Kenya, Mauritius, Morocco, Nigeria, South Africa, Swaziland, and Zimbabwe) from 1989 to 1995 using weekly data indices. Employing a logistic map and EGARCH-M model, they provided the evidence of five countries (Egypt, Kenya, Mauritius, Morocco, and Zimbabwe) out of eleven were consistent with the weak-form efficiency. They also mentioned that inappropriate models could provide the risk premiums in EMH. In a similar study, Akinkugbe (2005) concluded that the Botswana stock markets were weak-form and semi-strong-form efficient. He used Autocorrelation, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests for the period 1989–2003 based on the 738 weekly observations.

In European emerging markets study, Gilmore and McManus (2003) examined the random walk hypothesis in Czech Republic, Hungary and Poland for the period 1995 to 2000 based on the weekly comprehensive indices. They used the various methods including unit root, variance ratio, autocorrelation, Johansen and Granger causality, Naïve, ARIMA and GARCH. The result was mixed: All the tests except Granger-causality provided the evidence against weak-form efficiency in Czech Republic, Hungary and Poland.

In another study, Smith and Ryoo (2003) tested the weak-form efficiency in five European emerging markets (Greece, Hungary, Poland, Turkey and Portugal) from 1991 to 1998 using the weekly data indices. They found that Greece, Hungary, Poland and Portugal did not follow the weak-form efficiency while Turkey was found to be weak-form efficient. They mentioned that Turkey stock markets were weak-form efficient because they were larger and liquid compare to other four markets. However, the result was controversial with the previous studies, because the larger markets in some cases did not follow random walk model (Hong Kong and Korea- Huang 1995; Mexico- Urrutia 1995) whereas the small markets did follow the random walks (Indonesia- Huang 1995; Argentina- Urrutia 1995; Ojah, Karemera 1999).

Abrosimova *et al.* (2005) investigated the random walk hypothesis in Russian stock market using daily, weekly, monthly RTS indices from 1995 to 2001 and concluded that Russian market was weak-form efficient. On the other hand, Hassan *et al.* (2006) found that Czech Republic, Hungary, Poland and Russia were not weak-form efficient, but Greece, Slovakia, and Turkey followed the random walks. The similar findings were conducted by Aktan *et al*. (2010) based on Baltic stock markets.

Hasanov and Omay (2007) addressed efficiency of eight transition stock markets, including Bulgarian, Chinese, Czech, Hungarian, Polish, Romanian, Russian and Slovakian stock markets by testing whether the price series of these markets contain unit root. The results of nonlinear unit root tests indicated that only Bulgarian, Czech, Hungarian and Slovakian price series contain unit root, consistent with weak form efficiency.

In a similar study, Hasanov and Omay (2008: 2645) argued that "time series analysis allow proper modelling of nonlinearities in economic and financial variables. A growing body of research was dedicated to investigation of potential nonlinearities in conditional mean of many economic and financial variables, mainly concentrating in developed economies. However, nonlinearities in financial variables in developing economies have not been fully examined yet". They investigated Europe's two largest emerging stock markets, namely, the Greek and Turkish stock markets using STAR family models. They did not find nonlinearity in conditional variance, but found strong evidence in favour of nonlinear adjustment of stock returns. They concluded that "allowing for nonlinearity in conditional mean results in a superior model and provides good out-of-sample forecasts, which contradicts to efficient market hypothesis" (p. 2645).

Recently, Omay and Karadagli (2010) investigated efficiency of Bulgarian, Greek, Hungarian, Polish, Romanian, Russian, Slovenian and Turkish stock markets. They em-

ployed the nonlinear unit root test proposed by Kapetanios *et al.* (2003) and nonlinear panel unit root test by Ucar and Omay (2009). The ADF and PP indicated Bulgarian, Greek, Hungarian, Polish, Romanian, Russian, Slovenian and Turkish stock markets were weak form efficient, while the results of nonlinear unit root test implied that Russian, Romanian and Polish stock markets were not weak form efficient. The findings questioned the traditional literature of EMH literature arguing: 'the linear panel unit root test suggest that this group as all efficient where as nonlinear panel unit root test suggest as a group they are not efficient' (Omay, Karadagli 2010: 1).

3.3. Empirical evidence of South Asian stock markets

In South Asian emerging markets study, Poshakwale (1996) tested the weak-form efficiency in India (BSE) based on the day of the week effect from 1987 to 1994. He found that the prices did not follow normal distribution and runs and serial correlation tests showed that the non random behaviour. Therefore, he concluded that the Indian stock market (BSE) was not weak-form efficient. However, the conclusion was contradictory with previous study of Sharma and Kennedy (1977) who found that BSE was weak-form efficient. In another South Asian study, Abeysekera (2001) provided the evidence of inefficiency weak-form in Sri Lanka (CSE). He used the daily, weekly and monthly returns of the Sensitive Share Index from 1991 to 1996. Gupta and Basu (2007) tested the weak-form efficiency in Indian two major stock markets (BSE and NSE) from 1991 to 2006. They concluded that the both stock exchanges in India did not follow the weak-form efficiency.

Siddiqui and Gupta (2009) investigated the random walk hypothesis in the Indian stock market (NSE) using daily stock indices from 1 January 2000 to 31 October 2008. They employed both non-parametric (Kolmogorov–Smirnov normality test and run test) test and parametric test (Autocorrelation test, Autoregression, ARIMA model). They found that the Indian stock market did not follow weak-form of market efficiency. They also mentioned that various macro economic factors were important to justify the efficiency or inefficiency in emerging markets.

There are few studies conducted on the DSE weak-form efficiency (Dhaka Stock Exchange), but not on the CSE (Chittagong Stock Exchange). The first attempt was done by Alam *et al.* (1999). They examined the weak-form efficiency of DSE for the period 1986 to 1995 based on the monthly stock price indices. Applying variance ratio test, they revealed that the DSE followed random walk model and the DSE was weak-form efficient.

Hassan, Islam and Basher (2000) examined the weak-form efficiency in DSE for the period September 1986 – November 1999. They found that the equity return of the DSE were the positive skewness of 0.11 and 22.93, excess of kurtosis of 49.66 and 992.65 and the deviation from the normality. They also revealed that there was a significant negative serial correlation (–0.07) which implied that the DSE market was not weak-form efficient. They further found that there were a significant relationship between the conditional volatility and the stock returns.

Mobarek and Keasey (2002) investigated to test weak-form efficiency based on the daily price indices of all listed DSE securities for the period 1988 to 1997. The sample covered 2638 daily observations. They used various tests including Autocorrelation test, Autoregression and run tests. They concluded that the significant autocorrelation coefficient at different lags which did not support the weak-form efficiency or random walk model of DSE market.

Ahmed (2002) examined the random walk in DSE from January 1990 to April 2001 and for two sub-periods. Using Ljung-Box statistic, he found that the first sub period had positive autocorrelation compare to the second sub period but the full period had dominant negative autocorrelation and therefore, the result rejected the null hypothesis of weak-form efficiency in DSE. He also mentioned that the new information took nearly a month to fully reflect the share prices in DSE. Based on the filter rule, Kader and Rahman (2004) found that the abnormal profit was possible on a regular basis using specific trading patterns. They concluded the DSE did not follow weak-form efficiency and it violated the random walk hypothesis.

Khaled and Islam (2005) tested the weak-form efficiency of the DSE market. They used the daily, weekly and monthly market prices for the period 1990 to 2001. They applied the unit root and variance ratio. Further, they investigated the structural changes based on the variance ratio for the period before the July 1996 when the market was boomed and after the March when the market crashed. They mentioned that the EMH could not be rejected on the monthly data. They concluded that market inefficiency was for the pre-boomed time not for the post-crash time of market. They also revealed that the DSE market was in favour of predicting share price before the July 1996 pre-boomed time using the heteroscedasticity of variance ratio test. The study criticized the work of Mobarek and Keasey (2002) who found that the market inefficiency during the market crash time. Khaled and Islam (2005) argued that the possibility of getting the inefficiency result (Mobarek, Keasey (2002)) might be the use of Box-Pierce Q test which was considered the less powerful test of autocorrelation in the presences of heteroskedastic errors.

Mollah *et al.* (2005) examined the weak-form efficiency in DSE-20 using daily price indices for the period 2001 to 2003. The stationarity of time series were used in their study. They found that the coefficient was not significant which did not support the weak-form efficiency of the DSE-20 market. They also pointed out the past prices could be used to forecast and predict the future prices in DSE-20. Although, the study was based on the top 20 companies in Dhaka Stock Exchange, the sample period was relatively low compare to other empirical studies in both developed and emerging markets. The findings are supported by the prior studies (Mobarek 2000; Chowdhury *et al.* 2001) on the Bangladeshi stock markets. Table 2 shows summary of the selective empirical studies on weak-form efficiency in different stock markets.

Table 2. Summary of the selective empirical studies on weak-form efficiency in developed, emerging and South Asian stock markets

The plus (+) sign denotes that the weak-form efficiency or random walk hypothesis is not rejected; the negative (–) sign indicates that the weak-form efficiency or random walk hypothesis is rejected; and the plus-minus signs together (+/–) indicates the mixed results of rejecting the random walk hypothesis. The studies are divided into three categories: Developed Markets, Emerging Markets and South Asian markets

Study	Country / Market	Period	Methodology	Findings
		Developed Markets:		
Lo and MacKinlay (1988)	US	1962–1985	Variance ratio test	–
Lee (1992)	US and other ten industrialized countries	1967–1988	Variance ratio test	+
Choudhry (1994)	Seven OECD Countries (US, UK, Canada, France, Germany, Japan and Italy)	1953–1989	ADF unit root test KPSS unit root tests Johansen cointegration tests	+
Chan *et al.* (1997)	18 international stock markets	1961–1992	Phillips-Perron (PP) unit root test and Cointegration tests	+
Al-Loughani and Chappel (1997)	UK	1983–1989	LM serial correlation, Unit root test and Non-linear tests	–
Groenewold (1997)	Australia and New Zealand	1975–1992	Granger causality test and Unit root test	+/–
Lee and Mathur (1999)	Spain	1989–1998	Serial correlations, Unit root, and Variance ratio test	+
Worthington and Higgs (2004)	16 European developed markets	1987–2003	Serial correlation test, Runs test, Unit root test and Multiple variance ratio test	+
Gan *et al.* (2005)	New Zealand, Australia, US and Japan	1990–2003	ADF unit root tests and Phillips-Perron (PP) unit root test	+
Torun and Kurt (2008)	11 EMU (European Monetary Union) countries	1999–2006	Panel unit root tests	+
		Emerging Markets:		
Laurence (1986)	Singapore and Malaysia	1973–1978	Runs test and Autocorrelation test	–

Continue of Table 2

Study	Country / Market	Period	Methodology	Findings
Barnes (1986)	Malaysia	1975–1980	Run test and Autocorrelation test	+
Parkinson (1987)	Kenya	1974–1978	Single run test	–
Dickinson and Muragu (1994)	Kenya	1979–1988	Run test and Autocorrelation test	+
Urrutia (1995)	Argentina, Brazil, Chile and Mexico	1975–1991	Variance ratio test and Run test	+
Ojah and Karemera (1999)	Argentina, Brazil, Chile and Mexico	1987–1997	Multiple variance ratios test and Run test	+
Karemera *et al.* (1999)	15 emerging markets	1986–1997	Multiple variance ratios test and Run test	+
Chang *et al.* (1996)	Taiwan	1967–1993	Ljung-Box Q, Run test and Unit root tests	+
Chang and Ting (2000)	Taiwan	1971–1996	Variance ratio test	+
Tas and Dursonoglu (2005)	Turkey	1995–2004	DF unit root test and Run test	–
Butler and Malaikah (1992)	Kuwait and Saudi Arabia	1985–1989	Autocorrelation test	–
Abraham *et al.* (2002)	Kuwait, Saudi Arabia and Bahrain	1992–1998	Variance ratio test Run test	+/–
Hassan *et al.* (2003)	Kuwait	1995–2000	GARCH-M model and EGARCH model	–
Moustafa (2004)	The United Arab Emirates (UAE)	2001–2003	Run test	+
Appiah-Kusi and Menyah (2003)	11 African stock markets	1989–1995	Logistic map and EGARCH-M model	+/–
Akinkugbe (2005)	Botswana	1989–2003	Autocorrelation test ADF unit root test and Phillips-Perron (PP) unit root test	+
Gilmore and McManus (2003)	Czech Republic, Hungary and Poland	1995–2000	Unit root test Variance ratio test Autocorrelation, Johansen and Granger causality, ARIMA and GARCH model	–

End of Table 2

Study	Country / Market	Period	Methodology	Findings
Smith and Ryoo (2003)	Greece, Hungary, Poland, Portugal and Turkey	1991–1998	Variance ratio test and Autocorrelation test	+/–
Abrosimova *et al.* (2005)	Russia	1995–2000	Unit root test Variance ratio test and Autocorrelation test	+
Hassan *et al.* (2006)	Seven European emerging stock markets	1988–2002	Ljung-Box Q-statistic Run test and Variance ratio test	+/–
	South Asian Markets:			
Poshakwale (1996)	India (BSE)	1987–1994	Serial correlation test and Run test	–
Sharma and Kennedy (1977)	India (BSE)	1963–1973	Run test Spectral analysis test	+
Abeysekera (2001)	Sri Lanka (CSE)	1991–1996	Run test Autocorrelation test and Unit root test	–
Gupta and Basu (2007)	India (BSE and NSE)	1991–2006	ADF test, PP test and KPSS test	–
Siddiqui and Gupta (2009)	India (NSE)	2000–2008	Kolmogorov–Smirnov test Run test Autocorrelation test Autoregression and ARIMA model	–
Alam *et al.* (1999)	Bangladesh (DSE)	1986–1995	Variance ratio test	+
Hassan *et al.* (2000)	Bangladesh (DSE)	1986–1999	Variance ratio test	–
Mobarek and Keasey (2002)	Bangladesh (DSE)	1988–1997	Autocorrelation test, Autoregression and Run test	–
Ahmed (2002)	Bangladesh (DSE)	1990–2001	Ljung-Box statistic test	–
Khaled and Islam (2005)	Bangladesh (DSE)	1990–2001	Unit root test and Variance ratio test	–
Mollah, Rahman and Islam (2005)	Bangladesh (DSE-20)	2001–2003	Stationarity of time series	–

4. Conclusion

The prior empirical studies show that there are contradictory evidences of weak-form efficiency in both developed and emerging markets. Traditionally, the developed markets are weak-form efficient (Lee 1992; Choudhry 1994; Chan *et al.* 1997). However, this is not consistent because the recent evidence shows the mixed evidence compared to the earlier studies (Groenewold 1997; Abraham *et al.* 2002; Appiah-Kusi, Menyah 2003; Smith, Ryoo 2003). On the other hand, generally the emerging markets do not follow random walks (i.e. other factors may be relevant, cultural factors in Baltic, Luptáková *et al.* 2005; Tvaronavičienė, Michailova 2006; and political factors, Sepper, Alas 2008). Again, the mixed evidence exists. The emerging markets differ from the developed countries because of the poor level of liquidity and trading activity, weak institutional infrastructure and more information asymmetry (Khaled, Islam 2005). Khaled and Islam (2005) also mentioned that not all of the emerging markets are necessarily entirely inefficient and in fact, some researchers have found some of the larger and even smaller stock markets in emerging countries to be weak-from efficient. The debate still remains on theoretical implications of the EMH across the world. For example, there is extensive literature which is claimed that many economic variables, including financial ones, follow nonlinear processes (see, for example, Granger, Teräsvirta 1993; Campbell *et al.* 1997; McMillan 2003). In recent years, although, predictability and efficiency of emerging markets have attracted interest of financial economists (e.g., Emerson *et al.* 1997; Dockery, Vergari 1997; Liu *et al.* 1997; Zalewska-Mitura, Hall 1999; Rockinger, Urga 2001; Harrison, Paton 2004; Cajueiro, Tabak 2006), no consensus on whether or not efficient market hypothesis holds for these markets is attained yet. A common feature of these studies is that possible nonlinearities in conditional mean of the series have not been taken into account in testing efficiency of these markets. Therefore, possible nonlinearities in data generating process should explicitly be taken into account in analysing financial time series in order to avoid spurious results. There are only few studies on South Asian stock markets on an individual country basis, but the results are mixed and conflicting: The majority of the studies reject the weak-form efficiency in DSE, NSE and CSE (Mobarek, Keasey 2002; Hassan *et al.* 2000; Ahmed 2002; Kader, Rahman 2004; Khaled, Islam 2005; Mollah *et al.* 2005), except Alam *et al.* (1999) who support the weak-form efficiency in DSE. So, consistent with the previous literature, the study identifies the gap and urging further research on behavioural explanation to answer those reasons. Most importantly, how it deviates from the developed market and what are the practical reasons behind this? No studies have been conducted to examine the weak-form efficiency of the overall stock markets of South Asian context. Paradoxically, the present study is considered to be the first study to provide the overall pictures of the South Asian market efficiency comparisons based on the evidence of prior literatures. Besides making a contribution to the literature on the weak-form efficiency of emerging stock market like Bangladesh, India and Sri Lanka with more recent EMH literature information and categorisation, the findings of the study may be equally relevant in other emerging countries' stock markets. The study also calls for further research on the reasons for market efficiency using qualitative aspects to enlighten the behavioural issues of the markets.

References

Abeysekera, S. 2001. Efficient market hypothesis and the emerging capital markets in Sri Lanka: evidence from the Colombo stock exchange – a note, *Journal of Business Finance and Accounting* 28(1): 249–261. doi:10.1111/1468-5957.00373

Abraham, A.; Seyyed, F. J.; Alsakran, S. A. 2002. Testing the random walk behavior and efficiency of the Gulf stock markets, *Financial Review* 37(3): 469–480. doi:10.1111/0732-8516.00008

Abrosimova, N.; Dissanaike, G.; Linowski, D. 2005. *Testing the Weak-Form Efficiency of the Russian Stock Market* [online], [cited 10 February 2009, 27 January 2009]. Working paper. Available from Internet: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=302287>.

Ahmed, F. 2002. *Market Efficiency in Emerging Stock Markets: the Case of Dhaka Stock Exchange* [online], [cited 27 January 2009]. Available from Internet: <http://www.fgda.org/pubblicazioni_schedarivistauk.php?Id=780>.

Akinkugbe, O. 2005. Efficiency in Botswana stock exchange: an empirical analysis, *The Business Review* 4(2): 223–230.

Aktan, B.; Korsakienė, R.; Smaliukienė, R. 2010. Time- varying volatility modelling of Baltic stock markets, *Journal of Business Economics and Management* 11(3): 511–532. doi:10.3846/jbem.2010.25

Alam, I. M.; Hasan, T.; Kadapakkam, P. 1999. An application of variance-ratio test to five Asian stock markets, *Review of Pacific Basin Financial Markets and Policies* 2: 301–315. doi:10.1142/S0219091599000175

Alexander, S. S. 1961. Price movements in speculative markets: trends or random walks, *Industrial Management Review* 2: 7–26.

Alexander, S. S. 1964. Price movements in speculative markets: trends or random walks, *Industrial Management Review* 8: 338–372.

Al-Loughani, N.; Chappell, D. 1997. On the validity of the weak-form efficient markets hypothesis applied to the London stock exchange, *Applied Financial Economics* 7: 173–176. doi:10.1080/096031097333736

Appiah-Kusi, J.; Menyah, K. 2003. Return predictability in African stock markets, *Review of Financial Economics* 12: 247–270. doi:10.1016/S1058-3300(02)00073-3

Bachelier, L. 1900. Théorie de la Spéculation (Doctoral dissertation in Mathematical Sciences, Faculté des Sciences de Paris, defended March 29, 1900), *Annales de /'École Normale Supérieure* 3: 21–86. Translated with permission of Gauthier-Villars, Paris, France, as Chapter 2 in Cootner, P. H. (1964). Ed. *The Random Character of Stock Market Prices.* Cambridge, MA: The MIT Press.

Barnes, P. 1986. Thin trading and stock market efficiency: the case of the Kuala Lumpur stock exchange, *Journal of Business Finance and Accounting* 13(4): 609–617. doi:10.1111/j.1468-5957.1986.tb00522.x

Brock, W.; LeBaron, B. 1996. A structural model for stock return volatility and trading volume, *Review of Economics and Statistics* 78: 94–110. doi:10.2307/2109850

Brock, W. A.; Hommes, C. H. 1998. Heterogeneous beliefs and routes to chaos in a simple asset pricing model, *Journal of Economic Dynamics and Control* 22: 1235–1274. doi:10.1016/S0165-1889(98)00011-6

Butler, C. K.; Malaikah, S. J. 1992. Efficiency and inefficiency in thinly traded stock markets: Kuwait and Saudi Arabia, *Journal of Banking and Finance* 16: 197–210. doi:10.1016/0378-4266(92)90085-E

Cajueiro, D. O.; Tabak, B. M. 2006. Testing for predictability in equity returns for European transition markets, *Economic Systems* 30: 56–78.

Campbell, J. Y.; Lo, A. W.; MacKinlay, A. C. 1997. *The Econometrics of Financial Markets*. Second edition. Princeton: Princeton University Press, New Jersey.

Chan, K. C.; Gup, B. E.; Pan, M. P. 1997. International stock market efficiency and integration: a study of eighteen nations, *Journal of Business Finance and Accounting* 24(6): 803–813. doi:10.1111/1468-5957.00134

Chang K. P.; Ting, K. S. 2000. A variance ratio test of the random walk hypothesis for Taiwan's stock market, *Applied Financial Economics* 10(5): 525–552. doi:10.1080/096031000416406

Chang, T.; Fawson, C.; Glover, T. F.; Fang, W. 1996. The weak-form efficiency of the Taiwan share market, *Applied Economics Letters* 3: 663–667. doi:10.1080/135048596355899

Choudhry, T. 1994. Stochastic trends and stock prices: an international inquiry, *Applied Financial Economics* 4: 383–390. doi:10.1080/758518670

Chowdhury, S. S. H.; Sadique, M. S.; Rahman, M. A. 2001. Capital market seasonality: the case of Dhaka stock exchange (DSE) returns, *South Asian Journal of Management* 8(3): 1–7.

Coakley, J.; Fuertes, A. M. 2001. Nonparametric cointegration analysis of real exchange rates, *Applied Financial Economics* 11: 1–8. doi:10.1080/09603100150210200

Cootner, P. H. 1962. Stock prices: random vs. Systematic changes, *Industrial Management Review* 3(Spring): 24–45.

Cootner, P. H. 1964 . *The Random Character of Stock Market Prices*. Cambridge, MA: The MIT Press.

Cowles, A.; Jones, H. 1937. Some a posteriori probabilities in stock market action, *Econometrica* 5: 280–294. doi:10.2307/1905515

Dickinson, J. P.; Muragu, K. 1994. Market efficiency in developing countries: a case study of the Nairobi stock exchange, *Journal of Business Finance and Accounting* 21(1): 133–150. doi:10.1111/j.1468-5957.1994.tb00309.x

Dimson, E.; Mussavian, M. 1998. A brief of history of market efficiency, *European Financial Management* 4(1): 91–193. doi:10.1111/1468-036X.00056

Dockery, E.; Vergari, F. 1997. Testing the random walk hypothesis: evidence for the Budapest stock exchange, *Applied Economics Letters* 4: 627–629. doi:10.1080/758533288

Dumas, B. 1992. Dynamic equilibrium and the real exchange rate in a spatially separated world, *Review of Financial Studies* 5: 153–180. doi:10.1093/rfs/5.2.153

Dumas, B. 1994. Partial Equilibrium versus general equilibrium models of the international capital market, in Van der Ploeg, F. (Ed.). *The Handbook of International Macroeconomics* 9. Blackwell, 301–347.

Emerson, R.; Hall, S. G.; Zalewska-Mitura, A. 1997. Evolving market efficiency with an application to some Bulgarian shares, *Economics of Planning* 30: 75–90. doi:10.1023/A:1003053807165

Fama, E. F. 1965. The behaviour of stock market prices, *Journal for Business* 38: 34–105. doi:10.1086/294743

Fama, E. F. 1970. Efficient capital markets: a review of theory and empirical work, *Journal of Finance* 25(2): 383–417. doi:10.2307/2325486

Fama, E. F. 1976. *Foundation of Finance*. New York: Basic Books.

Fama, E. F. 1991. Efficient capital market: II, *Journal of Finance* 5: 1575–1617. doi:10.2307/2328565

Fama, E. F. 1995. Random walks in stock market prices, *Financial Analysts Journal* 21(5): 55–59. doi:10.2469/faj.v21.n5.55

Fama, E. F. 1998. Market efficiency, long-term returns, and behavioral finance, *Journal of Financial Economics* 49: 283–306. doi:10.1016/S0304-405X(98)00026-9

Fama, E. F.; Blume, M. 1966. Filter rules and stock market trading profiles, *Journal of Business* 39: 226–241. doi:10.1086/294849

Fama, E. F.; French, K. R. 1989. Business conditions and expected returns to stocks and bonds, *Journal of Financial Economics* 25: 23–50. doi:10.1016/0304-405X(89)90095-0

Fama, E. F.; French, K. R.; Booth, D.; Sinquefield, R. 1993. Differences in the risks and returns of NYSE and NASD stocks, *Financial Analysts Journal* 49: 37–41. doi:10.2469/faj.v49.n1.37

Fama, E. F.; French, K. R. 1988. Permanent and temporary components of stock prices, *Journal of Political Economy* 96(2): 246–273. doi:10.1086/261535

Fama, E. F.; Jensen, M.; Roll, R. 1969. The adjustment of stock prices to new information, *International Economic Review* 10: 1–21. doi:10.2307/2525569

Gan, C.; Lee, M.; Hwa, A. Y. H.; Zhang, J. 2005. Revisiting share market efficiency: evidence from the New Zealand Australia, US and Japan stock indices, *American Journal of Applied Sciences* 2(5): 996–1002. doi:10.3844/ajassp.2005.996.1002

Gilmore, C. G.; McManus, G. M. 2003. Random walk and efficiency tests of Central European equity markets, *Managerial Finance* 29(4): 42–61. doi:10.1108/03074350310768283

Granger, C. W. J.; Teräsvirta, T. 1993. *Modelling Nonlinear Economic Relationships*. Oxford: Oxford University Press.

Groenewold, N.; Ariff, M. 1998. The effects of de-regulation on share-market efficiency in the Asia-Pacific, *International Economic Journal* 12(4): 23–47.

Groenewold, N.; Kang, K. C. 1993. The semi-strong efficiency of the Australian share market, *Economic Record* 69(2): 405–410. doi:10.1111/j.1475-4932.1993.tb02121.x

Groenewold, N.; Tang, S. H. K.; Wu, Y. 2003. The efficiency of the Chinese stock market and the role of the banks, *Journal of Asian Economics* 14: 593–609. doi:10.1016/S1049-0078(03)00097-6

Groenewold, N. 1997. Share market efficiency: tests using daily data for Australia and New Zealand, *Applied Financial Economics* 7: 645–657. doi:10.1080/758533856

Gupta, R. 2006. Emerging markets diversification: are correlations changing over time?, in *International Academy of Business and Public Administration Disciplines (IABPAD) Conference*, January 3–6, 2006, Orlando.

Gupta, R.; Basu, P. K. 2007. Weak-form efficiency in Indian stock markets, *International Business and Economics Research Journal* 6(3): 58–64.

Harrison, B.; Paton, D. 2004. Transition, the evolution of stock market efficiency and entry into EU: the case of Romania, *Economics of Planning* 37: 203–223.

Hasanov, M. 2009a. A note on efficiency of Australian and New Zealand stock markets, *Applied Economics* 41(2): 269–273. doi:10.1080/00036840600994286

Hasanov, M. 2009b. Is South Korea's stock market efficient? Evidence from a nonlinear unit root test, *Applied Economics Letters* 16(2): 163–167. doi:10.1080/13504850601018270

Hasanov, M.; Omay, T. 2007. Are the transition stock markets efficient? Evidence from non-linear unit root tests, *Central Bank Review, Research and Monetary Policy Department, Central Bank of the Republic of Turkey* 7(2): 1–12.

Hasanov, M.; Omay, T. 2008. Non-linearities in emerging stock markets: evidence from Europe's two largest emerging markets, *Applied Economics* 40(23): 2645–2658. doi:10.1080/00036840600970310

Hassan, K. M.; Al-Sultan, W.; Al-Saleem, J. A. 2003. Stock market efficiency in the Gulf Cooperation Council Countries (GCC): the case of Kuwait stock exchange, *Scientific Journal of Administrative Development* 1(1): 54–72.

Hassan, K. M.; Haque, M.; Lawrence, S. 2006. An empirical analysis of emerging stock markets of Europe, *Quarterly Journal of Business and Economics* 45(1): 31–52.

Hassan, M. K.; Islam, A. M.; Basher, S. A. 2000. *Market Efficiency, Time-Varying Volatility and Equity Returns in Bangladesh Stock Market* [online], [cited 17 February 2009]. Available from Internet: <http://econwpa.wustl.edu:80/eps/fin/papers/0310/0310015.pdf>.

He, H.; Modest, D. M. 1995. Market frictions and consumption-based asset pricing, *Journal of Political Economy* 103: 94–117. doi:10.1086/261977

Hong, H.; Stein, J. C. 1999. A unified theory of underreaction, momentum trading, and overreaction in asset markets, *Journal of Finance* 54: 2143–2184. doi:10.1111/0022-1082.00184

Huang, B. N. 1995. Do Asian stock markets follow random walks: evidence from the variance ratio test, *Applied Financial Economics* 5(4): 251–256. doi:10.1080/758536875

Jensen, M. C. 1978. Some anomalous evidence regarding market efficiency, *Journal of Financial Economics* 6: 95–101. doi:10.1016/0304-405X(78)90025-9

Kader, M. A.; Rahman, A. F. M. A. 2004. Testing the weak-form efficiency of an emerging market: evidence from the Dhaka stock exchange of Bangladesh, *AIUB Journal of Business and Economics* 4(2): 109–132.

Kapetanios, G.; Shin, Y.; Snell, A. 2003. Testing for a unit root in the nonlinear STAR framework, *Journal of Econometrics* 112: 359–379. doi:10.1016/S0304-4076(02)00202-6

Karemera, D.; Ojah, K.; Cole, J. A. 1999. Random walks and market efficiency tests: evidence from emerging equity markets, *Review of Quantitative Finance and Accounting* 13(2): 171–188. doi:10.1023/A:1008399910942

Keim, D. B. 1988. Stock market regularities: a synthesis of the evidence and explanations, in Dimson, E. (Ed.). *Stock Market Anomalies*. Cambridge: Cambridge University Press.

Kendall, M. 1953. The analysis of economic time series, *Journal of the Royal Statistical Society* Series A (96): 13–32.

Kendall, M. 1954. Note on bias in the estimation of autocorrelation, *Biometrika* 41: 403–404.

Kendall, M. G. 1943. *The Advanced Theory of Statistics*. London: Griffin.

Khaled, M.; Islam, A. 2005. Test of weak-form efficiency of the Dhaka stock exchange, *Journal of Business Finance and Accounting* 32(7): 1613–1624. doi:10.1111/j.0306-686X.2005.00642.x

Ko, K. S.; Lee, S. B. 1991. A comparative analysis of the daily behaviour of stock returns: Japan, the U.S and the Asian NICs, *Journal of Business Finance and Accounting* 18: 219–234. doi:10.1111/j.1468-5957.1991.tb00590.x

Kothari, S. P. 2001. Capital markets research in accounting, *Journal of Accounting and Economics* 31: 105–231. doi:10.1016/S0165-4101(01)00030-1

Krägler, H.; Krugler, P. 1993. Nonlinearities in foreign exchange markets: a different perspective, *Journal of International Money and Finance* 12: 195–208. doi:10.1016/0261-5606(93)90024-6

Laurence, M. M. 1986. Weak-form efficiency in the Kuala Lumpur and Singapore stock markets, *Journal of Banking and Finance* 10: 431–445. doi:10.1016/S0378-4266(86)80031-0

Lee, C. F.; Chen, G. M.; Rui, O. M. 2001. Stock returns and volatility on China's stock markets, *Journal of Financial Research* 24(4): 523–543.

Lee, C. I.; Gleason, K. C.; Mathur, I. 1999. Efficiency tests in the French derivatives market, *Journal of Banking and Finance* 24: 787–807. doi:10.1016/S0378-4266(99)00067-9

Lee, U. 1992. Do stock prices follow random walk? Some international evidence, *International Review of Economics and Finance* 1(4): 315–327. doi:10.1016/1059-0560(92)90020-D

Liu, X.; Song, H.; Romilly, P. 1997. Are Chinese stock markets efficient? A cointegration and causality analysis, *Applied Economics Letters* 4: 511–515. doi:10.1080/758536636

Lo, A. W.; MacKinlay, A. C. 1988. Stock market prices do not follow random walks: evidence from a simple specification test, *Review of Financial Studies* 1(1): 41–66. doi:10.1093/rfs/1.1.41

Luptáková, S.; Vargic, B.; Kincel, I. 2005. National culture dimension of power distance in the Baltic States, *Journal of Business Economics and Management* 6(2): 61–69.

Lux, T. 1995. Herd behavior, bubbles and crashes, *The Economic Journal* 105: 881–896. doi:10.2307/2235156

Malkiel, B. 1992. Efficient market hypothesis, in Newman, P.; Milgate, M; Eatwells, J. (Eds.). *The New Palgrave Dictionary of Money and Finance.* London: Macmillan. Available from Internet: <http://EzineArticles.com/232602>.

McMillan, D. G. 2003. Non-linear predictability of UK stock market returns, *Oxford Bulletin of Economics and Statistics* 65(5): 557–573. doi:10.1111/j.1468-0084.2003.00061.x

Mobarek, A. 2000. *Weak-Form Market Efficiency of an Emerging Market: Evidence from Dhaka Stock Market of Bangladesh* [online], [cited 31 January 2009]. Available from Internet: <http://www.bath.ac.uk/cds/enbs-paperspdfs/mobarek-new.pdf>.

Mobarek, A.; Keasey, K. 2002. *Weak-Form Market Efficiency of an Emerging Market: Evidence from Dhaka Stock Market of Bangladesh* [online], [cited 12 February 2009]. Available from Internet: <http://www.bath. ac.uk/Centres/CDS/enbs-papers/mobarek_new.htm>.

Mollah, A. S.; Rahman, M. Z.; Islam, M. S. 2005. Return behavior of the DSE-20: an empirical investigation on the Dhaka stock exchange, *Journal of Business Studies* 26(2): 151–262.

Moustafa, M. A. 2004. Testing the weak-form efficiency of the United Arab Emirates stock market, *International Journal of Business* 9(3): 31–52.

Narayan, P. K. 2005. Are the Australian and New Zealand stock prices nonlinear with a unit root?, *Applied Economics* 37: 2161–2166.

Narayan, P. K.; Smyth, R. 2004. Is South Korea's stock market efficient?, *Applied Economics Letters* 11: 707–710. doi:10.1080/1350485042000236566

Niederhoffer, V.; Osborne, M. F. M. 1966. Market making and reversal on the stock exchange, *Journal of the American Statistical Association* 61: 897–916. doi:10.2307/2283188

Obstfeld, M.; Taylor, A. M. 1997. The great depression as a watershed: international capital mobility over the long run, *CEPR Discussion Papers* 1633.

Ojah, K.; Karemera, D. 1999. Random walk and market efficiency tests of Latin American emerging equity markets: a revisit, *The Financial Review* 34(2): 57–72. doi:10.1111/j.1540-6288.1999.tb00454.x

Omay, N. C.; Karadagli, E. C. 2010. Testing weak form market efficiency for emerging economies: a nonlinear approach, *MPRA Paper* 27312. University Library of Munich, Germany.

Osborne, M. F. M. 1959. Brownian motion in the stock market, *Operations Research* 1: 145–173. doi:10.1287/opre.7.2.145

Osborne, M. F. M. 1962. Periodic structure in the Brownian motion of stock prices, *Operations Research* 10: 345–379. doi:10.1287/opre.10.3.345

Parkinson, J. M. 1987. The EMH and CAPM on Nairobi stock exchange, *East Africa Economy Review* 3(2): 105–110.

Pesaran, M. H. 2005. Market Efficiency Today, *IEPR Working Paper*.

Peters, E. E. 1994. *Fractal Market Analysis: Applying Chaos Theory to Investment and Economics*. John Wiley & Sons, Inc.

Poshakwale, S. 1996. Evidence on weak form efficiency and day of the week effect in the Indian stock market, *Finance India* 10(3): 605–616.

Poterba, J.; Summers, L. 1986. The persistence of volatility and stock market fluctuations, *American Economic Review* 76: 1142–1151.

Poterba, J. M.; Summers, L. 1988. Mean reversion of stock prices, *Journal of Financial Economics* 22: 27–59. doi:10.1016/0304-405X(88)90021-9

Roberts, H. V. 1959. Stock market "patterns" and financial analysis: methodological suggestions, *Journal of Finance* 14: 1–10. doi:10.2307/2976094

Rockinger, M.; Urga, G. 2001. A time varying parameter model to test for predictability and integration in stock markets of transition economies, *Journal of Business and Economic Statistics* 19: 73–84. doi:10.1198/07350010152472634

Samuelson, P. 1965. Proof that properly anticipated prices fluctuate randomly, *Industrial Management Review* 6: 41–49.

Sepper, R.; Alas, R. 2008. Role of politics in public sector organizational change, *Journal of Business Economics and Management* 9(1): 13–23. doi:10.3846/1611-1699.2008.9.13-23

Sharma, J. L.; Kennedy, R. E. 1977. A Comparative analysis of stock price behavior on the Bombay, London and New York stock exchanges, *Journal of Financial and Quantitative Analysis* (September): 391–413. doi:10.2307/2330542

Shleifer, A. 2000. *Inefficient Markets: an Introduction to Behavioural Finance*. Clarendon Lectures in Economics. Oxford: Oxford University Press.

Siddiqui, S.; Gupta, P. K. 2009. *Weak Form of Market Efficiency- Evidences from Selected NSE Indices*. Available from Internet: <http://ssrn.com/abstract=1355103>.

Smith, G.; Ryoo, H. J. 2003. Variance ratio tests of the random walk hypothesis for European emerging stock markets, *The European Journal of Finance* 9: 290–300. doi:10.1080/1351847021000025777

Smith, G. K. J.; Ryoo, H. J. 2002. African stock markets: multiple variance ratio tests of random walks, *Applied Financial Economics* 12(7): 475–484. doi:10.1080/09603100010009957

Summers, L. H. 1986. Does the stock market rationally reflect fundamental values?, *Journal of Finance* 41(3): 591–601. doi:10.2307/2328487

Tas, O.; Dursonoglu, S. 2005. Testing random walk hypothesis for Istanbul stock exchange, *International Trade and Finance Association Conference Papers* [online], [cited 12 January 2009]. Available from Internet: <http://services.bepress.com/otfa/15th/art38>.

Taylor, N. 2008. Can idiosyncratic volatility help forecast stock market volatility?, *International Journal of Forecasting* 24: 462–479. doi:10.1016/j.ijforecast.2008.06.001

Timmermann, A.; Granger, C. W. J. 2004. Efficient market hypothesis and forecasting, *International Journal of Forecasting* 20: 15–27. doi:10.1016/S0169-2070(03)00012-8

Torun, M.; Kurt, S. 2008. Testing weak and semi-strong form efficiency of stock exchanges in European Monetary Union countries: Panel Data causality and Co integration Analysis, *International Journal of Economic and Administrative Studies* 1(1): 67–82.

Tvaronavičienė, M.; Michailova, J. 2006. Factors affecting securities prices: theoretical versus practical approach, *Journal of Business Economics and Management* 7(4): 213–222.

Ucar, N.; Omay, T. 2009. Testing for unit root in nonlinear heterogeneous panels, *Economics Letters* 104: 5–8. doi:10.1016/j.econlet.2009.03.018

Urrutia, J. L. 1995. Tests of random walk and market efficiency, *Journal of Financial Research* 18: 299–309.

Wong, K. A.; Kwong, K. S. 1984. The behaviour of Hong Kong stock prices, *Applied Economics* 16: 905–917. doi:10.1080/00036848400000059

Working, H. 1934. A random difference series for use in the analysis of time series, *Journal of the American Statistical Association* 29: 11–24. doi:10.2307/2278456

Worthington, A. C.; Higgs, H. 2003. Weak-form Market Efficiency in European Emerging and Developed Markets, *Discussion Paper* No. 159. School of Economics and Finance, Queensland University of Technology, Brisbane, Australia. Available from Internet: <http://nseindia.com/content/indices/ind_faq8.htm>.

Worthington, A. C.; Higgs, H. 2004. Random walks and market efficiency in European equity markets, *Global Journal of Finance and Economics* 1(1): 59–78.

Zalewska-Mitura, A.; Hall, S. G. 1999. Examining the first stages of market performance: a test for evolving market efficiency, *Economics Letters* 64: 1–12. doi:10.1016/S0165-1765(99)00074-9

KRITINĖ KYLANČIOS EKONOMIKOS MAŽO RINKOS EFEKTYVUMO LITERATŪROS APŽVALGA

M. Nurunnabi

Santrauka

Dėl globalizacijos ir mobilizacijos kapitalo rinkose efektyvios rinkos hipotezės koncepcija įgyja vis didesnę svarbą tiek išsivysčiusiose, tiek sparčiai kylančios ekonomikos šalyse. Dauguma tyrimų, susijusių su mažu rinkos efektyvumu, buvo atliekami ekonomiškai stipriose valstybėse, tačiau šiame straipsnyje siekiama pateikti išsamų paaiškinimą apie mažą efektyvumą kylančios ekonomikos šalyse. Straipsnį sudaro trys dalys: pirmoji dalis skirta mokslinių darbų ir jų rezultatų analizei, antrojoje dalyje pateikiami autoriaus atlikto tyrimo rezultatai, susiję su efektyvios rinkos hipotezės reiškiniu, trečioji dalis susijusi su pagrindiniu šio straipsnio tikslu, t. y. kylančios ekonomikos mažo efektyvumo mokslinių darbų kritine analize įvairiose šalyse.

Reikšminiai žodžiai: efektyvios rinkos hipotezė, mažas efektyvumas, rinkos efektyvumas, sparčiai kylanti ekonomika, Pietų Azija.

Mohammad NURUNNABI is a Senior Lecturer in Accounting at Edge Hill University, Lancashire, UK and pursuing PhD at University of Edinburgh, UK. He has presented papers in British Accounting Association (BAA), Irish Accounting and Finance Association (IAFA) and the Institute of Chartered Accountants of Scotland (ICAS). His current research focuses on Corporate Governance, Critical Accounting and IFRSs Implementation Issues. He has published in academic journals including the International Journal of Managerial and Financial Accounting, International Journal of Critical Accounting, Journal of Human Resource Costing & Accounting, Journal of Asia Business Studies and PROSHIKHYAN, A Journal of Training and Development.