

EQUITY MARKET LIBERALISATION AND MARKET EFFICIENCY IN EMERGING AND FRONTIER MARKETS

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Abstract

Market openness has been a popular policy choice over the last three decades especially for the emerging and frontier economies. This study investigates whether the equity market liberalisation changes market efficiency. For this purpose, stock return behaviour of 22 countries is assessed by using panel data analysis. The results show that the market efficiency remains unchanged after capital market liberalisation. This study is better equipped to isolate the impact of market openness as it considers a group of countries rather than a single country. A number of tests are used before making any inference from the models. Therefore, findings are robust.

Keywords: Capital market liberalisation, market efficiency, emerging and frontier markets, panel data analysis.

1. Introduction

Financial liberalisation has been a popular policy choice over the last three decades despite the debate on its promises and perils. Financial liberalisation includes equity market openness, bond market openness, banking sector liberalisation, foreign exchange reforms and privatisation. Among these forms of openness, equity market liberalisation has been the most important economic policy decision for the countries.¹ Equity or Capital market liberalisation means that foreign investors can buy or sell securities in the local market without restrictions, and local investors can buy or sell securities in the foreign market without restrictions (Bekaert and Harvey, 2003). It aims to deviate from financial repression by reducing direct government intervention in the market (Demirgüç-Kunt and Detragiache, 2000).

Capital market openness has some potential benefits for emerging and frontier markets. The role of the market is enhanced following liberalisation for at least three

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¹ See, for instance, Bekaert et al. (2003).

reasons. First, it provides an important channel through which foreign investors have access to the domestic market economy (Arestis and Demetriades, 1999). Second, it reduces the cost of capital by encouraging firms to issue equity as an alternative source of financing (Bekaert and Harvey, 2000). This exempts them from borrowing at a higher interest rate from banks. Third, it provides global investors a hedge against risk by improving stock's risk-return characteristics (Umultu et al., 2010).

However, the policymakers of emerging and frontiers markets must assess the benefits of market openness against the uncertainties that market openness may bring with it. Kim and Singal (2000) point out that foreign flow of funds are highly sensitive to changes in interest rates, the expectation of future returns from investments, the future growth potential of a country, political stability, etc. The problem of market integration is that even a small shock in one country's economy may destabilise the economic situation by affecting the economy of other countries. As domestic market become sensitive to foreign economy conditions, volatility in the stock price of one country may also increase volatility in domestic asset prices. Therefore, investors may demand a higher risk premium for these uncertainties, which may increase the cost of capital and consequently, reduce investments.

Unfortunately, empirical research has not resolved these conflicting views so far. Thus, this study aims to contribute to this liberalisation debate by examining whether the market efficiency changes due to liberalisation. This study is organised as follows. Section 2 discusses the theoretical backgrounds of the equity market liberalisation. Section 3 provides a literature review. Section 4 briefly explains the country selection criteria. Section 5 explains the methodologies used in this study. Section 6 discusses the empirical results. Finally, section 7 contains the concluding remarks.

2. Theoretical Background

In finance theory, the efficient market hypothesis stresses that a market is weak form efficient if it is not possible to earn abnormal returns consistently by trading based on information available as stock prices reflect all the current information. The root of this proposition can be traced back to 1953 when Maurice Kendall examined stock price behaviour and failed to identify any predictable patterns of stock prices. Rather he found that stock prices are random. In 1970, Fama, in his seminal work, synthesised this theory and used the property of stock price randomness in explaining market efficiency. He categorised efficient market hypothesis (EMH) into weak form, semi-strong form and strong form efficiency. Fama stated that, if stock prices follow the random walk, the equity market is weak form efficient. According to random walk hypothesis, past stock returns contain all the information available and therefore, future stock returns cannot be predicted using past returns. Thus, the stock return is said to follow martingale or a random walk, the behaviour of which is

stochastic. When investors, domestic and international, have increased access to the stock market, the stock price is expected to reflect all the available information surrounding the market. Random walk properties influences return dynamics of stock prices and investors' trading strategies (Füss, 2005). The simple version of the random walk model takes the following form:

$$p_t = \mu + p_{t-1} + \varepsilon_t$$

In the above equation,

p_t = natural logarithm of stock price t

μ = drift or expected price change

ε_t = error term which is independent and identically distributed

The model implies that residuals are uncorrelated and therefore returns are also uncorrelated. Fama (1970) highlighted that although random walk hypothesis and weak form efficiency are not identical if the stock price follows random walk market is said to be weak form efficient. The randomness of share price can be the outcome of weak form efficiency.

There is no specific theory about market liberalisation and stock price randomness. Therefore, no conclusive direction is available about whether stock market efficiency increase, decrease or remain unchanged after liberalisation. As per the previous studies which are discussed in more detail in the literature review, results are mixed. Thus, it is left to the empirical analysis to find out whether equity market liberalisation changes market efficiency.

3. Literature Review

An important aspect that has received the attention of the researchers is whether asset price is random or martingale. The empirical findings in this regard are mixed. Numerous empirical

studies have claimed that equity market liberalisation increases market efficiency. Therefore, asset price is not predictable as it follows the stochastic process. Studies investigating the effect of liberalisation on market efficiency have usually divided the sample periods into pre and post liberalisation periods. For instance, Kim and Singal (2000) investigated how efficiently the stock markets behave due to liberalisation. They used Lo and MacKinlay variance ratios tests in 14 countries and concluded that liberalisation, in general, increases market efficiency. Füss (2005) studied Asian emerging markets. He used the Lo and MacKinlay variance ratio test and Chow and Denning variance ratio test to investigate whether stock market prices follow random

walk. He concluded that Asian emerging markets do not follow random walk before liberalisation. However, larger markets follow random walk after liberalisation. Nguyen and Fontaine (2006) found similar results. They used a dynamic model that consists of monthly indices of eight emerging markets. The results show that markets that were not efficient before liberalisation gradually converge to efficiency after liberalisation whereas other countries are efficient both before and after liberalisation. Ulici and Nistor (2011) used Lo and MacKinlay test on seven emerging countries and concluded that markets become efficient following stock market liberalisation. Applying univariate and panel unit root test for five African countries, Zhang et al. (2012) found that three countries are weak form efficient and their stock prices follow random walk or martingale.

However, other studies found different results. Groenewold and Ariff (1998) examined weak form efficiency hypothesis in developed and emerging markets and tested whether financial deregulation affects efficiency. They used autocorrelation test and regression of future return on past return and identified that emerging markets do not become efficient after liberalisation. The findings of Kawakatsu and Morey (1999) are similar. Their analysis consists of nine emerging markets and several econometric tests. They used split sample structural change test, permutation test and unit root tests in addition to variance ratio test.

For most of the countries in their sample, the test results show that the behaviour of emerging market stock prices are not significantly different after liberalisation from the behaviour before liberalisation. Markets were weak-form efficient long before they were opened and liberalisation had little effect on efficiency. Basu et al. (2000) analysed the predictability of returns of emerging countries pre and post capital market liberalisation. They applied the Ljung and Box autocorrelation test and the Lo and MacKinlay variance ratio test. The results found little evidence of increasing market efficiency after liberalisation. Worthington and Higgs (2004) studied the weak form efficiency and random walk property of sixteen developed and four emerging country. They applied various tests such as simple multiple variance ratio test and unit root test. They found that majority of the both developed and emerging markets do not comply with random walk criteria. Using martingale hypothesis test and a stochastic dominance approach to analyse market efficiency, Vieito et al. (2016) found that stock market liberalisation plays little role in enhancing market efficiency in Latin American countries.

The country-specific studies on market efficiency and financial liberalisation usually use variance ratio test or unit root test. Dockery and Kavussanos (1996) used panel unit root test to examine the efficiency of Athens stock exchange. Their results reject

the random walk hypothesis although the finding of Laopodis (2004) for the same market is different. Laopodis (2004) examined the degree of change in stock market efficiency in Greece due to liberalisation. His test results of autocorrelation and variance ratio test show that Greece was weak-form efficient long before liberalisation was announced and after the liberalisation, same pattern continued. Narayan and Smyth (2004) tested weak-form efficiency by applying unit root test on return index of the South Korean market. They found evidence that the market is weak form efficient. The stock market of Turkey shows the similar pattern. Odabasi et al. (2004) used parametric and non-parametric tests on Turkish stock index and found that it became efficient over time. For India, Singh (2010) found similar results by applying the run test and serial correlation test on return index.

4. Description of the Country Selection Criteria

Three criteria are used to select the countries in this study. First, the selected market is either an emerging or a frontier market as classified by FTSE Russell (2015). These markets are selected because they are likely to play an increasingly important role as economic forces in the years ahead (World Economic Outlook, 2011). Second, countries that liberalised their stock market around the same time are included in the sample. For this purpose, countries that liberalised their market during 1980's and 1990's are selected. This period is import because the majority of the emerging and frontiers economies liberalised their market around this time and experienced more or less similar economic reforms. Third, the countries are selected based on their data availability. Countries that have the data of at least two years prior to official liberalisation date are included in the sample. Based on these three criteria, twenty-two countries, namely, Bangladesh, Brazil, Chile, Colombia, Côte d'Ivoire, Ghana, India, Indonesia, Jordan, Kenya, Malaysia, Mauritius, Mexico, Nigeria, Oman, Pakistan, Peru, Philippines, Sri Lanka, Thailand, Tunisia and Turkey are selected.

5. Data and Methodology

This study examines whether capital market liberalisation changes the market efficiency i.e. whether stock returns are random or martingale following liberalisation. The random walk hypothesis is discussed using three methods, panel unit root test, variance ratio test (VRT) developed by Lo and Mckinlay (1988) and the Multiple variance ratio test (MVRT) suggested by Chow and Denning (1993).

5.1.1. Panel Unit Root Test for Random Walk or Martingale

Panel unit root contains more time series information of cross-sectional units. Therefore, this test is a popular method for investigating the market efficiency and

used in numerous studies². If the stock returns are stationary, it does not follow the random walk and the market is not weak form efficient.

In conducting the panel unit root test, equity returns data are divided among two periods, before liberalisation and after liberalisation, to verify the effect of liberalisation on market efficiency. The structure of panel unit root test followed by of most of the methods in general is:

$$\Delta y_{it} = \rho_i y_{it-1} + \sum_{j=1}^{p_i} \phi_{ij} \Delta y_{it-1} + \alpha_i d_{it} + \varepsilon_{it}$$

Where, y_{it} indicates the pooled variable, ϕ_{ij} is the slope vector, d_{it} are exogenous variables and ε_{it} is the error term. Panel unit root for random walk or martingale is examined using several methods such as Im-Pesaran-Shin (2003), ADF-Fisher chi-square test and PP- Fisher chisquare test as proposed by Maddala and Wu (1999). All the methods use the null hypotheses that the panel contains unit root. If the test results show that data are non- stationary or have unit root, then the stock returns are martingale or follow random walk hypothesis. In other words, if stock returns are non-stationary, markets are weak-form efficient.

5.1.2. Panel Variance Ratio Test

In this study, the randomness of stock returns is also examined using panel variance ratio test (VRT) suggested by Lo and MacKinlay (1988). One key property of random walk is that its increments are linear function of time. Variance ratio test exploits this property. Variance Ration test statistic for the returns of k period can be defined as

$$VR(q) = \frac{\frac{1}{q} \text{var}(R_t(q))/q}{\text{var}(y_t - y_{t-1})} = \frac{\hat{\sigma}^2(q)}{\hat{\sigma}^2(1)}$$

Where, $V(q)$ is the linear combination of $(q-1)$ autocorrelation coefficients and $R_t(q)$ is the q period continuously compounded return. This test provides two test statistics; asymptotic standard normal test statistic under homoscedasticity known as Z statistic and heteroscedasticity consistent test statistic know as Z^* . This estimate is robust to heteroscedasticity and disturbance term. Researchers suggest that for returns, this estimate is preferred³. The basic Lo and MacKinlay test suggested for periods “2 4 8 16” as intervals (q) to compare variances of these periods to the variance of one-period innovations. In other words, the test divides the data into 2,

² See for instance, Harrison and Moore (2010), Ibrahim et al. (2011).

³See, for instance, Huang (1995).

4, 8 and 16 periods to test for the random walk. However, researchers have modified these periods according to their research requirements⁴. In this study data are divided into two periods; 10 years before and 10 years after liberalisation to test the random walk of stock returns. Both Z and Z^* statistics are calculated using 1 year as the base interval and comparing its variance with 2, 4 and 8 period intervals as 16 periods before and after liberalisation is not available. The null hypothesis for the test is stock returns follow random walk or martingale.

5.1.3. Panel Modified Variance Ratio Test

The Lo and MacKinlay variance ratio test has some limitations. First, this test is asymptotic test and is rightly skewed for finite samples (Charles and Darné, 2009). Second, it tests individual variance ratio for specific interval q but the hypothesis for martingale requires $VR(q) = 1$ for all q . Due to these limitations, Modified Variance Ratio (MVR) proposed by Chow and Denning (1993) is used as this test is an advance version of VRT. The Modified Variance Ratio test statistic can be expressed as follows

$$MVR(q) = \frac{\hat{\sigma}^2(q)}{\hat{\sigma}^2(1)} = 1$$

While conducting this test, heteroscedasticity in the data, if any, has been taken into account and bootstrapping was used to evaluate the statistical significance. This makes the test results more robust.

6. Empirical Results

The aspect of stock returns investigated in this study is whether market efficiency changes after market liberalisation. To investigate this, three models are used: Panel unit root test, Lo and MacKinlay variance ratio test and Multiple variance ratio test (MVRT). The test results of these models are discussed in turn.

6.1.1. Panel Unit Root Test for Random Walk or Martingale

Unit root test identifies whether stock returns follow the random walk or is martingale. If it follows random walk, the market is weak form efficient. Table 1 depicts the results of panel unit root test before and after the markets are liberalised. The small p-values of ADF-Fisher chi-square test and PP-Fisher chi-square test show that the null hypothesis of unit root is rejected in both of the periods. Although, Im, Pesaran and Shin test do not reject the null hypothesis, results of the majority of the tests are accepted. In other words, stock returns do not follow

⁴ See, for instance, Wright (2000) and Kim and Singal (2000).

random walk and the markets are not weak-form efficient either before or after liberalisation

Table 1: Panel Unit Root Test for Random Walk

	Pre-liberalisation	Post-liberalisation
Im, Pesaran and Shin W-stat	-0.93802	-1.54235
ADF - Fisher Chi-square	52.1283**	79.0613***
PP - Fisher Chi-square	66.2896***	129.73***

* significant at the 0.10 level, **significant at the 0.05 level, *** significant at the 0.01 level
Results are at level; Results include both trend and intercept

6.1.2. Results of Variance Ratio Test

Variance ratio test is also calculated by dividing the data into two sub-samples; before and after liberalisation. Table 2 reports the results of the test before liberalisation. It shows that the test statistics are significant at 1% level considering both asymptotic normal test statistics under homoscedasticity and heteroscedasticity consistent variance at all the time intervals. That is, stock returns do not follow random walk 2, 4 or even 8 periods before liberalisation. Therefore, null hypothesis of random walk or martingale is rejected. In other words, the market is not weak-form efficient before liberalisation.

Table 2: Results of Variance Ratio Test before Liberalisation

	q=2	q=4	q=8
VR(q)	0.5971	0.1756	0.0146
Z(q)	-4.9511*** (0.0814)	-5.4147*** (0.1522)	-4.0936*** (0.2407)
Z*[q]	-3.1747*** [0.1269]	-3.6868*** [0.2236]	-3.0553*** [0.3225]

VR (q) is the variance ratio for q-day returns, Z(q) is variance ratio test statistics under homoscedasticity, standard errors in parenthesis, Z*[q] is heteroscedasticity consistent variance ratio test statistics, Robust standard errors in Brackets

* significant at the 0.10 level, **significant at the 0.05 level, *** significant at the 0.01 level
Base observation interval is one year

Table 3 reports the results of the test after liberalisation. Identical to Table 1, results after liberalisation also show that the hypothesis of random walk can be rejected at 1% level. Stock returns do not follow random walk 2, 4, and 8 periods after

liberalisation. Therefore, the market is not weak-form efficient even after market liberalisation.

Table 31: Results of Variance Ratio Test after Liberalisation

	q=2	q=4	q=8
VR(q)	0.4794	0.2325	0.0765
Z(q)	-7.3256*** (0.0711)	-5.7726 (0.1330)	-4.3931 (0.2102)
Z*[q]	-4.5801*** [0.1137]	-4.1187 [0.1863]	-3.5941 [0.2570]

VR (q) is the variance ratio for q-day returns, Z(q) is variance ratio test statistics under homoscedasticity, standard errors in parenthesis, Z*[q] is heteroscedasticity consistent variance ratio test statistics, Robust standard errors in Brackets

* significant at the 0.10 level, **significant at the 0.05 level, *** significant at the 0.01 level

Base observation interval is one year

6.1.3. Results of Multiple Variance Ratio Test

Similar methods are used for Multiple Variance ratio test, i.e. it also calculated by dividing the data into two sub-samples; before and after liberalisation. Table 4 reports the results of the test before liberalisation. This provides an interesting result. It shows that the test statistics are not significant even at 10% level considering heteroscedasticity and conducting bootstrapping. That is, stock returns follow random before liberalisation. Therefore, null hypothesis of random walk or martingale cannot be rejected. In other words, the market is weak form efficient before liberalisation

Table 4: Results of Multiple Variance Ratio Test before Liberalisation

	Fisher Combined Test Statistic	p-value
VR(q)	45.24	0.429

*significant at the 0.10 level, **significant at the 0.05 level, *** significant at the 0.01 level

Base observation interval is one year

Table 5 reports the results of the test after liberalisation. Identical to Table 1 and 3, results after liberalisation show that the hypothesis of random walk can be rejected at 1% level. Stock returns do not follow random walk after liberalisation. Therefore, the market is not weak-form efficient after market liberalisation.

Table 5: Results of Multiple Variance Ratio Test after Liberalisation

	Fisher Combined Test Statistic	p-value
VR(q)	72.62***	0.0042

*significant at the 0.10 level, **significant at the 0.05 level, *** significant at the 0.01 level
Base observation interval is one year

One interesting aspect of these results is that equity market liberalisation does not change stock market efficiency. That is, stock prices do not follow random walk after market is liberalised. All the methods used agreed to this conclusion. This is consistent with the results of Groenewold and Ariff (1998), Basu et al., (2000), Worthington and Higgs (2004) and Vieito et al. (2016) who identified that liberalisation does not change market efficiency.

However, it cannot be taken as evidence that market openness has no effect on market efficiency and that equity market liberalisation is not required. Rather, several points should be taken into account. First, official liberalisation dates are used in this study for the purpose of testing. But, liberalisation is a gradual process. The announcement of liberalisation is usually made long before actual market opening. If the investors are rational, the simple announcement or even the anticipation of the announcement of market openness should alter the nature of the market. Second, market liberalisation is usually a part of economic reform packages that includes other policies as well. It is possible that one policy decision neutralises the effect of another policy decision. Joint tests of the policies may better illuminate in this regard. Third, analysis of individual country may differ from the result of the 'average' country that panel data consider. However, these results disclose a general pattern of market efficiency before and after the market is liberalised.

7. Conclusion

This study investigates whether the market liberalisation changes market efficiency. For this purpose, stock returns behaviour of twenty-two countries is assessed before and after market liberalisation by using panel data analysis. The results show that market does not become efficient after liberalisation.

The theory of market efficiency does not provide any direction about whether market efficiency increase, decrease or remain same after equity market liberalisation. The finding of this study reports an interesting aspect that equity market liberalisation does not affect stock market efficiency. The stock prices are not random before and after liberalisation. This result, however, is consistent with the

results of Groenewold and Ariff (1998), Basu et al. (2000), Worthington and Higgs (2004) and Vieito et al. (2016) who identified that stock market liberalisation does not change market efficiency.

This study is better equipped to isolate the impact of market openness as it considers a group of countries rather than a single country. However, every country has a unique feature that is likely to be different from the 'average' country that the panel data analysis considers. Therefore, it is difficult to argue that these results are ubiquitous. Liberalisation of the market is a complex process, and a number of other factors are associated with it. However, findings are robust as several diagnostic tests are used before making any inference from the models.

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