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Identification of Rational Bubbles in Emerging Markets of SAARC

Abstract

The upsurge of globalization has made investors cautious towards investing decisions, and resultantly, the techniques of forecasting and carefully analyzing the stock markets have emerged. This trend has gained momentum in emerging economies particularly. One such trend is to overcome the investing risks associated with formation of rational bubbles. Bubbles are formed when prices of stock inflate to a very high level, but they ultimately burst. This phenomenon is short lived. Investors may take advantage of this phenomenon and gain high returns but may also suffer as the entire investing value declines when the bubble bursts. The present study tries to identify rational bubbles in the capital markets of emerging economies of South Asia. The monthly data extends from June 1997 to February 2018 from Karachi, Bombay, Dhaka and Colombo stock markets and sup-Augmented Dicky Fuller (SADF) test developed by Phillips and Yu (2011) was estimated to identify the rational bubbles. The results revealed the presence of rational bubbles. The current study is of significant nature for facilitation of investors in future making investing decisions concerning with the formation of rational bubbles.

Introduction

Since the upsurge of globalization, the investors have become more and more cautious and research oriented in taking investment decisions. This has made the researcher more concerned about market efficiency. However, while studying the stock markets, it is necessary to consider the conditions of the perfect capital markets (Copeland, Weston, & Shastri, 1983). Firstly, there are no constraining regulations, transaction costs or taxes and hence markets are frictionless. Moreover, the assets are completely divisible and marketable. Secondly, in both type of markets, commodity and security market, there exists a perfect competition. Participants in both the markets are price takers i.e. the suppliers of the goods, services, stocks or securities with lowest average cost are price takers. Thirdly, the availability of the information in the security markets, is costless, flows freely and is received in the

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same manner and at the same time by all the individuals. The investors in the security markets are mostly rational, but the ones looking for maximizing their utility are not considered to be rational (Hamid, Suleman, Ali Shah, Akash, & Shahid, 2017).

The efficient market hypothesis has been tested in the various economies as well as the random walk hypothesis. In order to provide investors insight about the SAARC region, this study has been conducted helping investors taking rational decisions. This type of studies are conducted in a wide range in developed nations like Europe, US, and countries in ASEAN i.e. Singapore and Indonesia (Nartea et al., 2017). But SAARC region seems a bit overlooked in this type of research. This region comprises of countries i.e. India, Maldives, Bhutan, Nepal, Sri Lanka, Pakistan, Afghanistan and Bangladesh, and all these countries are developing countries (A. Ahmad et al., 2016). These developing economies have emerging stock markets. It is evident that the emerging stock markets show variances in the asset prices prevailing in the stock markets.

Moreover, the evidence of presence of the variances in the stock markets can also be linked to the existence of the rational bubbles (Ahmed, Rosser Jr, & Uppal, 2015). So it is necessary to study these emerging stock markets for the presence of rational bubbles which will provide insights to the investors and help them in decision making. Among these 8 countries of SAARC region the trading volume of Maldives, Bhutan, Nepal, and Sri Lanka is extremely low. And Afghanistan does not own a stock market. So these countries can be skipped (S. Ali, Naseem, & Sultana, 2013). The emerging economies of Pakistan, Bangladesh, Sri Lanka and India are taken as proxy for testing the presence of rational bubble in SAARC region. The stock markets of these four countries will be taken for testing the presence of the rational bubbles. This study will provide investors insights about the stock markets in SAARC region.

Literature Review

The rational and irrational bubbles may lead to higher prices of stocks, which ultimately burst. In a study conducted in US based on US stock market, credit market and labor market shows that the bubbles in stock market when crash/burst lead to unemployment. The boom of bubble is often characterized by the expansion of the credit to the private sector and ultimately the price of the asset also rises. When the burst phase occurs, the asset price falls, the investment value falls leading to the economic recession. During recession, the unemployment rate also rises (Miao et al., 2016).

A study (Shaik & Maheswaran, 2017) conducted on ASEAN to test market efficiency of stock markets of Indonesia, Cambodia, Malaysia, Thailand, Lao, Philippines, Singapore and Vietnam applied Unit Root Test, Variance Ratio Test, Automatic variance ratio test, spectral shape test, Average exponential test and rank and sign based test. The unit root test rejected the presence of random walk hypothesis in any of the countries. The remaining tests gave mixed results. Overall, Lao, Cambodia and Singapore gave consistent results of weak market efficiency. Malaysia gave mixed results. However, Indonesia, Thailand Philippines and Vietnam gave consistent results of market inefficiency, leading to the deduction that bubbles might exist in these countries.

In case of Pakistan, India and Sri Lanka weak form of market efficiency is rejected which depicts presence of rational bubbles or arbitrage (Hamid et al., 2017). Once a rational or speculative bubble is identified it can help in decisions of policy making and international portfolio diversification (Tran, 2016). In addition to that, in

the presence of the rational bubbles, such fiscal policies should be designed that balances the economic state and the asset prices (Teulings, 2016). Further, innocuous events or obnoxious events like terrorism may cause a rational bubble to burst thus declining the stock returns (Ramiah & Graham, 2013).

The evidence of presence of rational bubbles is available in the countries selected i.e. Pakistan (N. Ahmad, Raheem Ahmed, & Ahmed Meenai, 2015; X. Wang, 2014), India (Chang & Gupta, 2014). However, a study rejected presence of speculative bubbles in Pakistan, India, Sri Lanka (Tran, 2016). And presence of speculative bubbles in Bangladesh is also rejected (Tran, 2016). Another study conducted on Organization of Islamic Cooperation (OIC) rejects the presence of the rational bubbles in Pakistan and Bangladesh (Yu & Hassan, 2009). Summing up, plenty of studies have been conducted on stock markets of developed regions. Specific bubble episodes, which occurred previously, have helped the researchers and investors in gaining plenty of insights. A lot of studies have been conducted on the SAARC region as well. But they have not taken as extensive data as in this study has been taken.

Methodology

This study being explanatory in nature where the data was taken from stock markets of the four countries given as below:

- KSE-100 from Pakistan Stock Exchange,
- BSE-Sensex-100 from Bombay Stock Exchange,
- DSE-Board of Dhaka Stock Exchange,
- Colombo-All Share Index from Colombo stock exchange.

The study is time series using monthly data and confined to a specific time i.e. from January 1997 till 2018 February. The reason for choosing the time period is that data prior to 1997 is not available for CSX. So, the aim was to take the maximum data available and keeping the data balanced for all the stock exchanges so that it would help in further comparisons and analysis.

Supremum Augmented Dicky Fuller (SADF) test proposed by Phillips and Yu (2011) is used to testify the presence of rational bubbles in each of the three variables of the four capita market indices. With the invention and development of new tests, researches tend to rely more on the latest tests and previous methods of testing are considered obsolete. Homm and Breitung (2012) established that in order to detect rational bubbles, SADF test can be used. It is centered on recursive calculations of the statistics of ADF keeping the initial or starting point fixed. The window can be expanded and the number of observations is set by the user. Moreover, the testing procedure is centered on autoregressive process. The initial point is kept fixed and is increased by one observation using the sample size stepwise. Following are the hypothesis

Ho: δ = 1 (Ho: there exists no rational bubble)

H1: δ > 1 (H1: there exists rational bubble)

SADF test is based on the following equation:

$$yt = \mu + \delta yt{-}1 + X\, p\; i{=}1\; \varphi i \Delta yt{-}i + \varepsilon t.$$

where, the variable yt is in question (e.g., the return/ price of a stock), p is the number of lags, µ is an intercept, πi for i = 1 . . . p are the coefficients of differenced lags and lastly, ε_t is the error term (Caspi, 2013).

Results and Discussion

The tests were run directly on the index; nominal stock market returns for each of the selected indices. Descriptive statistics and empirical statistics i.e. SADF test were obtained. The table 1 and 2 represents descriptive statistics of market indices, nominal returns.

The table 1 shows that positive skewness in case of BSE shows lack of a bubble. However, positive kurtosis shows leptokurtosis which implies that index is centered on mean suggesting a bubble with fat tail. The P value of Jarque-Bera is lesser than 0.05, which rejects normality of data suggesting a bubble. Same is the case of Colombo Stock Exchange and Karachi Stock Exchange. Lastly, the case of Dhaka Stock Exchange is bit different. Skewness suggests absence of bubble and kurtosis value which is positive suggests presence of leptokurtosis i.e. bubble. But the P value of Jarque-Bera test is greater than 0.05 suggesting absence of the bubble.

Table 1: Descriptive Statistics of Indices of KSE, BSE, CSE, DSE

Statistics	KSE	BSE	CSE	DSE
Mean	13589.96	13748.53	3327.53	4741.72
Median	9813.05	13786.91	2460.62	4583.10
Maximum	50591.57	35965.02	7797.96	6306.86
Minimum	841.70	2810.66	403.60	3438.89
Std. Dev.	13278.80	9295.71	2534.71	654.83
Skewness	1.160	0.441	0.329	0.677
Kurtosis	3.250	2.002	1.442	3.032
Jarque-Bera	56.567	18.409	29.791	4.510
Probability	0.0000	0.0001	0.0000	0.1048
N	249	249	249	59

From table 2 it is evident that market returns from all stock exchanges respectively have positive kurtosis i.e. fat tail around mean suggesting leptokurtosis, an indicator of bubble. Secondly, the Jarque-Bera statistics i.e. the P value is lesser than 0.05 for returns of Bombay stock exchange, Colombo Stock Exchange and Karachi Exchange suggesting bubble. However, the p-value for Dhaka stock exchange is higher than 0.05, indicating normality of data and suggesting absence of bubble. Negative skewness in case of Bombay Stock Exchange and Karachi Stock Exchange suggests the presence of bubble, contrary to Colombo stock exchange and Dhaka stock exchange. So, overall it can be said that BSE, DSE and KSE fulfill all the requirements of bubble as per the descriptive statistics.

Table 2: Descriptive Statistics of Nominal Returns (KSE, BSE, CSE, DSE)

Statistics	KSE	BSE	CSE	DSE
Mean	0.0176	0.0059	0.0103	0.0090
Median	0.0199	0.0101	0.0052	0.0079
Maximum	0.2726	0.2203	0.2526	0.1333
Minimum	-0.3616	-0.3138	-0.1682	-0.1066
Std. Dev.	0.0751	0.0692	0.0685	0.0500
Skewness	-0.4556	-0.7146	0.5478	0.2967
Kurtosis	6.3529	4.8346	4.3398	3.4316
Jarque-Bera	109.6572	55.8878	31.0783	1.3015
Probability	0.0000	0.0000	0.0000	0.5216
N	*249*	*249*	*249*	*59*

Table 3: SADF Test Results

Variables	t-Value	T-statistics @ 99%	T-statistics @ 95%	T-statistics @ 90%	p-value
BSE Index	4.465	1.913	1.438	1.150	0.000
CSE Index	5.787	1.894	1.415	1.113	0.000
KSE Index	4.227	1.913	1.438	1.150	0.000
DSE Index	-0.383	1.801	1.191	0.882	0.6160
BSE nominal returns	-6.060	1.976	1.462	1.156	1.000
CSE nominal returns	-5.541	1.933	1.384	1.158	1.000
KSE nominal returns	-5.721	1.976	1.462	1.156	1.000
DSE nominal returns	-3.664	1.933	1.299	0.916	1.000

The table shows that in case of indices, the P values are significant depicting that the bubbles formed in the indices had significant impact on indices. However, in case of returns it is clear that bubbles formed in the returns had no impact on economy.
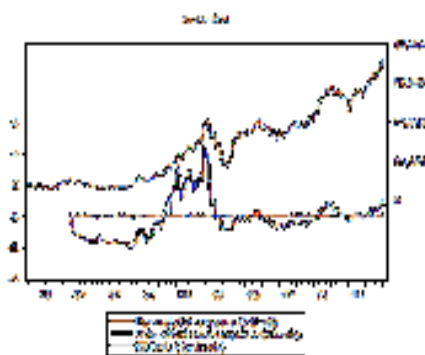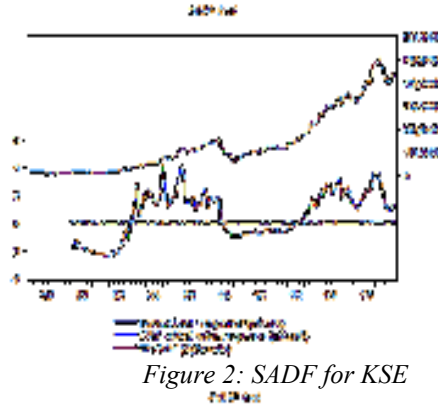

Figure 1: SADF for BSE

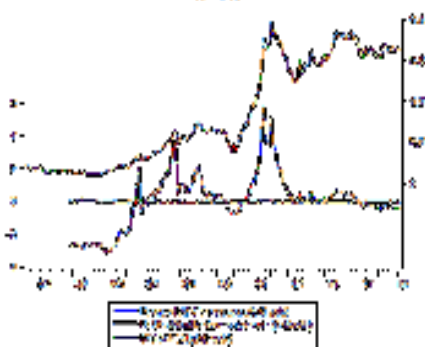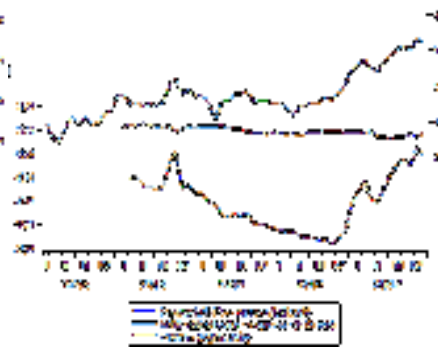*Figure 2: SADF for KSE*

Figure 3: SADF for CSE

Figure 4: SADF for DSE

Figure 1, 2 and 3 shows the presence of bubbles in indices of BSE, CSE and KSE respectively from 2003 to 2008. Figure 1 also shows slight bubble in 2010 and 2013. Figure 2 shows presence of major bubble from 2010 to 2012. However, figure 4 shows absence of bubbles. In other words, there are no bubbles in Dhaka stock exchange. From figure 1 and 3 it is clear that BSE and KSE are currently having bubble in their

stock exchanges created since 2016 and 2012 respectively. However, from figure 3 and figure 4 it is clear that Colombo stock exchange and Dhaka stock exchange are currently free of any bubble respectively.
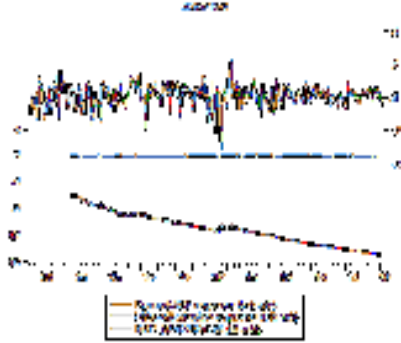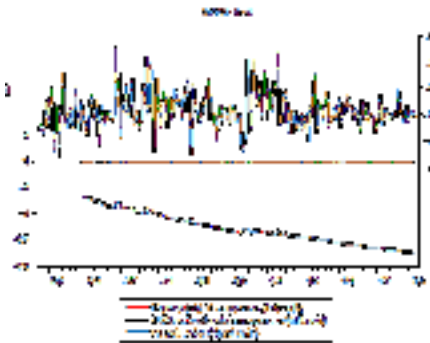

Figure 5: SADF for BSE Nom-Ret

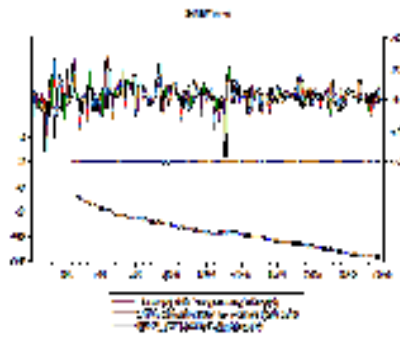*Figure 6: SADF statistics CSE Nom-Ret*

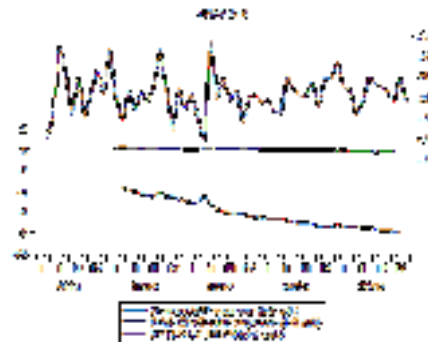*Figure 7: SADF for KSE Nom-Ret*

Figure 8: SADF for DSE Nom-Ret

From Figures 5, 6, 7 and 8 it is clear that there is the absence of bubbles in nominal returns of BSE, CSE, KSE and DSE respectively. This depicts that there is no existence of arbitrage opportunity in nominal returns of Bombay, Colombo, Karachi and Dhaka stock exchanges respectively.

In case of capital market of India, the results of graph/simulation have indicated that bubble was present from 2005 to 2008. During this time period, overall there was a boom in the stock markets around the globe. Eventually, in 2007 and 2008 due to collapse in subprime mortgage this bubble ended. The bubble shown in BSE can be linked to it. Moreover, the SADF statistics and simulation generated in figure 5 does not show presence of rational bubbles in the nominal returns. So from here we can infer that if the index possesses the bubbles, the impact is not necessarily reflected in the returns of the stock. Hence the returns earned by the investors could be stable, thus rejecting the arbitrage opportunity in returns (Chang & Gupta, 2014).

Moreover, in case Colombo stock market, the results have pointed out the presence of rational bubbles which are significant consistent with earlier studies (Ahmed et al., 2010). From the graph/simulation, it is clear that bubble was created in 2003. Moreover, from mid of 2004, another bubble was created and stayed until mid of 2008. It could be linked to subprime mortgage crisis and global financial crisis of 2008 as overall round the globe, all the markets seemed to be doing well.

In case of Karachi Stock Exchange, significant rational bubbles are also found in the index values. The bubble which was created in 2003 and stayed until mid of 2008 can be linked to the global financial crisis. Later, the bubble was created in 2013. Currently, Karachi Stock Exchange possesses bubble created from 2013. In 2013, multi-billion dollars China Pakistan Economic Corridor (CPEC) projects One-Belt-One-Road (OBOR) were initiated in Pakistan which were expected to bring capital inflow of US$ 46 billion through foreign investment. Moreover, almost 60% of the Karachi stock market is now owned by Chinese investors being another reason of bubble. The results are consistent with the study conducted showing the presence of bubbles in stock market in Pakistan (N. Ahmad et al., 2015; Ahmed et al., 2010). Moreover, the results are consistent with X. Wang (2014) showing the presence of bubble and collapsing of bubble in 2008. Similar to other capital markets of the region, no rational bubbles exist in nominal returns of KSE. Hence, the impact of presence of rational bubble in index does not necessarily reflect in returns. Thus rejecting the implication that the investors can earn above normal returns.

Lastly, as expected, Dhaka capital market also depicted footprints of rational bubbles. But since data is not complete, the graph is not showing presence of any rational bubbles consistent with (Yu & Hassan, 2009). The study was constrained to data availability in case of Dhaka Stock Exchange which was available only from 2013 onwards. From the graph it is clear that there is no bubble in Dhaka Stock Exchange from 2013 till now.

CONCLUSION

The findings of the study suggest that rational bubbles exist in the indices of stock exchanges of Pakistan (Karachi Stock Exchange), India (Bombay Stock Exchange) and Sri Lanka (Colombo Stock Exchange), and there is an absence of any rational bubbles in stock market of Bangladesh i.e. Dhaka Stock Exchange. However, this impact of rational bubbles was not reflected in the returns (capital gain yield) nominal returns of these indices. The nominal returns were all free from rational bubbles of all the indices. It could be implied that the existence of rational bubble in the indices necessarily does not show impact on the returns of the indices. The study also concludes that the presence of rational bubbles in a certain region or country can be formed due to existence of rational bubbles in any other region or country. Moreover, any innovation in financial, cultural or economic terms or any initiation of project in a country might also inflate the prices of the index of the country like in Pakistan leading to a formation of bubble. The study was focused on monthly variables and considered only the capital gain yield. A comparative study revolving around daily and weekly variables could also be done. The inflation rates can also be extrapolated for a detailed analysis of this region. Moreover, this region can also be compared with other developed regions i.e. ASEAN, European nations etc. Another recommendation is to conduct a study considering the dividend yield for all three variables and stock markets.

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