

THE BEHAVIOUR OF SHARE PRICES IN EMERGING MARKETS : EVIDENCE FROM THE COLOMBO STOCK EXCHANGE

Abeyratna Gunasekarage
and
Sisira R.N.Colombage

1. Introduction

Ever since the publication of Fama's seminal article in 1965 titled "The Behaviour of Stock Market Prices", which introduced the Efficient Market Hypothesis (EMH)¹, the share prices of world stock markets have been subjected to extensive research by finance academics throughout the world. The early studies of this topic have investigated the basic form of EMH - the weak form - which states that the share prices should not exhibit any patterns or display any trends and in consequence, investors should not be able to beat the market by earning abnormal profits on a regular basis simply by looking at past share prices and extrapolating into the future. The evidence of empirical studies which have studied share price behaviour of developed stock markets such as the USA and the UK suggest that, on average, share prices of such markets follow a random walk and their behaviour does not follow any predictable patterns (Roberts, 1959; Alexander, 1961, Cootner, 1962; King, 1966; Moore, 1967; Griffiths, 1970; Granger and Morgenstern, 1970; Brealey, 1970; Dryden, 1970a, 1970b; Cunningham, 1973; and Girmes and Benjamin, 1975).

The findings of these early studies have stimulated the interest of academics in testing the share price behaviour of small or less developed stock markets outside the UK and the USA. As a result many studies have focussed on equities traded on European, Australian, African and Asian markets. For example, European stock markets were scrutinised by Conrad and Juttner (1973), Niarchos (1971), Solnik (1973), Jennergren (1975) and Jennergren and Korswold (1975) while Praetz (1969, 1973) analysed Australian share prices. The African stock markets were investigated by Affeleck-Graves and Money (1975), Parkinson(1987) and Dickinson and

¹ The EMH postulates that in an efficient market share prices should reflect all the available information and hence it should not be possible to consistently outperform the market, after adjusting for differences in risk, by trading on such information.

Muragu (1994) while Asian stock markets were examined by Ang and Pohlman (1978), Gandhi, Saunders and Woodward (1980), Laurence (1986), Barnes (1986) and Yong (1990). All these studies provide an extensive literature on the share price behaviour of equities traded on less developed capital markets, even though their findings are less pronounced than those documented for the USA and the UK.

Even though the Colombo Stock Exchange (CSE) has recorded a remarkable rate of growth in the last decade² and grabbed the attention of policymakers as a key factor in the economic development³ of the country, very little published evidence on the behaviour of prices of shares traded exist. To the knowledge of the author, only two published articles have investigated the behaviour of share prices in Sri Lanka, Abeyratna and Power (1995) conducted the first study using prices for the most frequently traded 20 shares over the 16-month period from April 1993 to July 1994. They employed both serial correlation and runs tests to examine the data. The results of the serial correlation analysis revealed that the majority of the coefficients were negative although not statistically significant. However, the analysis of runs test results suggested some evidence of positive persistence in share price changes although only 40 percent of the securities studied showed a significant departure from randomness. The second study which was conducted by Samarakoon (1996) examined the predictability of short horizon share returns. He employed autocorrelation analysis on daily, weekly and monthly returns in the 1985-1995 sample period using data for the market and sectoral indices. He found significant autocorrelations of about 30 percent in the daily market returns for the

² For example, in 1996 the market capitalisation of CSE stood at Rs. 104.2 billions and the annual turnover amounted to Rs. 7,403 millions (of which 55 percent was contributed by the foreign investors). There were 235 listed companies in the market and the volume of shares traded amounted to Rs. 227 millions. The comparative figures for 1988 were as follows: market capitalisation Rs. 15.7 billions; annual turnover Rs. 319 millions; 176 listed companies; and trading volume Rs. 12 millions. However, the market capitalisation of the CSE remained below 25 percent of the GDP, which indicated its emerging nature and the availability of opportunities for future developments.

³ The existence of a well-functioning domestic capital market has been recognised as a key factor in economic development in Sri Lanka. In this respect, a number of steps have been taken by the governments during last two decades such as the opening of the banking sector to foreign owners, repeal of the business acquisition act, abolition of 100 per-cent transfer of property tax on share develop stock market in Sri Lanka (Colombo Stock Exchange Annual Report. 1996).

The Behavior of Share in Emerging Markets

1991-1995 sub period. Strong evidence of predictability of monthly returns was also uncovered for sectoral indices over the same period. The results of the study rejected the random walk hypothesis for the market indices and for sectoral indices.

Both of these studies have fundamental weaknesses with respect to sample selection. First, the use of most frequently traded shares in the first investigation may generate a bias since such shares are presumably the most heavily researched by investors in the market. Second, the use of market indices in the second study is inappropriate since an index reveals the average movements in the overall market or the sector but not the movements of the price changes of individual securities.

The current paper attempts to overcome these weaknesses by exploring the behaviour of (all the individual securities traded on the market during the five-year period from 1st January 1993 to 31st December 1997.

This paper contains five sections. The remainder of the paper is organised as follows. The next section describes the data used in the study while the methodology is outlined in the section followed by it. A discussion of research findings is provided in the penultimate section of the paper and the last section offers the conclusion of the study.

96

2. The Data

This study focuses on all the shares traded on the market during the five-year period from January 1993 to December 1997. This selection criterion generated a sample of 232 companies spread across 16 industries. The industry classification of the sample is given in Table 1. In terms of the number of quoted companies, the leading industries are Manufacturing, Hotels & Travels, and Bank, Finance & Insurance. Industries such as Construction & Engineering, Investment Trust and Oil Palm were comprised of only a small number of companies. The majority of industries had less than 10 quoted companies included in this study. However, in terms of market capitalisation as at 31st December 1997, Bank, Finance & Insurance sector: dominated all the other sectors bearing 28.36 percent of the overall market while sectors such as Diversified, Beverage, Food & Tobacco, Manufacturing and Hotels & Travels followed it having 17.17 percent, 14.30 percent, 13.99 percent and 8.78 percent

respectively. On the same date, the least market capitalisation was reported by Investment Trust sector (0.39 percent) while sectors such as Footwear & Textiles (0.54 percent), Stores & Supplies (0.54 percent), Services (0.70 percent), Oil Palm (1.01 percent) and Motors (1.17 percent) followed it.

Not all the companies had their shares traded during the overall sampling period; 21.8 percent (51 companies) received listing status within this five-year period. The age analysis of the quoted companies in the sample is provided in Table 2.

Table 1

Industry Classification of the Sample

Industry	Code	Number	Percentage
Banks, Finance & Insurance	BFIN	25	10.78
Beverage, Food & Tobacco	BF&T	20	8.62
Chemicals & Pharmaceuticals	C&PH	12	5.17
Construction & Engineering	C&EN	5	2.16
Diversified	DIVE	8	3.45
Footwear & Textiles	FW&T	8	3.45
Hotels & Travels	H&TR	40	17.24
Investment Trust	INVT	5	2.16
Land & Property	L&PR	18	7.76
Manufacturing	MANU	42	18.10
Motors	MOTO	8	3.45
Oil Palm	OILP	5	2.16
Plantation	PLAN	6	2.59
Services	SERV	9	3.88
Stores & Suppliers	S&SP	7	3.01
Trading	TRAD	14	6.02
Total		232	100.00

Table 2

Analysis of the Sample by the Number of Years of Trading

Trading Ferquency	Number	Percentage
1 Year <	4	1.72
2 Years < 1 Year	18	3.45
3 Years < 2 Years	13	5.60
4 Years < 3 Years	14	6.04
5 Years < 4 Years	12	5.17
6 Years	181	78.02
Total	232	100.00

The variable of interest is weekly share returns and for this purpose weekly closing share prices were obtained. The closing prices on every Friday were used and in the case when Friday was a holiday, the trading price on the previous day is employed.

As a thinly traded capital market⁴, CSE suffers from the problem of infrequent trading and an adjustment was needed for the weeks in which a share was not traded. Heinkel and Kraus (1988) suggest three approaches to deal with periods with no transactions in share trading. The first approach is to ignore the periods with no trading and to use only return data for trading periods. The second alternative is to assign a zero return to periods with no trading. The final approach is to construct a linear model, which can be used to estimate returns for periods with no price movements, in this study, the second method is employed to handle the infrequent trading problem since the other two methods are biased towards EMH⁵. All the stock prices were adjusted for capital structure changes such as splits, bonuses and rights issues.

⁴ See Gunerathne Bandara and Abeyratna (1997) for a discussion on *hin trading problem of CSE.

⁵Yong (1990) suggests three reasons for the superiority of this approach. First, it is not quite appropriate to ignore the weeks with no trading since non-trading is a characteristic of a thinly traded market and ignoring them may let statistical tests (such as runs test) to conclude that the market is efficient. Secondly, by employing a linear model to "fill in" the missing observations, the values we use are not the actual once, but rather the estimates. Finally, assigning zero returns to the weeks with no trading will at least reflect the actual return during the particular week (p. 50).

3. Methodology

The variables of interest in the study are the weekly returns earned by shares traded on the Colombo Stock Exchange. These returns were estimated according to the following identity.

$$R_{i,t} = \ln (P_{i,t} / P_{i,t-1})$$

[1]

where, $R_{i,t}$ is the return on share i in week t , $P_{i,t}$ is the price of share i in week t and $\ln$ is natural logarithm. This weekly return variable was used to test following three main hypotheses.

- I. The population correlation coefficients of successive returns at all lags, 1 through 10, are zero.
- II. The weekly returns follow a random walk.
- III. The weekly returns conform to a normal distribution.

The first hypothesis tests the independent nature of successive share returns or the non-existence of any predictable patterns in a time series of returns. The second hypothesis is designed to test the randomness or the non-existence of any trends in the return series. The third hypothesis is aimed at testing the distributional properties of weekly returns of shares. The first hypothesis was tested using autocorrelations as well as Q-statistics⁶. The runs tests are employed to test the second hypothesis. Finally, central tendency measures (skewness and kurtosis) along with the Kolmogorov-Smirnov test procedure were used to test the third hypothesis.

⁶The autocorrelation coefficient provides a measure of relationship between the values of a random variable in time t and its value k periods earlier. On the other hand, the Q-Statistic (Box- Ljung Q - Statistic) provides an aggregate measure of the relationship between the value of a variable in time t and a specific number of its lagged values at k periods earlier.

⁷This is calculated as follows.

$$\text{Absolute Percentage Difference} = \left[\frac{|\text{Actual No. of Runs} - \text{Expected No. of Runs}|}{\text{Expected No. of Runs}} \right] \times 100$$

The Behavior of Share in Emerging Markets

In addition to above tests, two more statistical tests were performed to examine two further qualities of the price behaviour of equities on the CSE: (I) the relationship between continuity in trading and the efficiency of the market and (II) the exploitability of predictable patterns to earn abnormal returns.

To test the relationship between continuity in trading and the efficiency of the market, Spearman rank correlation coefficient between efficiency measures (runs test results and Q-statistic) and the number of weeks traded was used. For this purpose, from runs test, the share with the highest absolute percentage difference in runs⁷ was ranked lowest in efficiency and from Q-statistics test, the share with the highest Q- statistic was ranked lowest in efficiency. On the other hand, the number of trading weeks was assumed to correspond to continuity in trading and the share with the lowest number of trading weeks was ranked lowest for continuity in trading.

The examination of the exploitability of predictable patterns was based only on shares whose first-order autocorrelations were statistically significant. Using returns of these shares, following regression was estimated.

$$R_{i,t} = \alpha + \beta(R_{i,t-1})$$

[2]

where $R_{i,t}$ is the return On Share i in week t , $R_{i,t-1}$ is the return on share i in week $t-1$ and α and β are the parameters to be estimated. A statistically significant first- order autocorrelation suggests that systematic patterns exist between current share return and the share return of the most recent past week. If this pattern can be exploited to earn abnormal profits, these equities should have a high R^2 . A low R^2 would suggest that even though there are predictable patterns in time series of share returns, they cannot be profitably exploited to beat the average market since the autocorrelation structure is more complex.

4. Discussion of results

Autocorrelation Analysis

The results of the autocorrelation analysis, which was conducted to determine the dependence between share return at week t and return, at week $t-k$ ($k = 1, 2, 3, \dots, 10$), are reported in table 3.

A visual inspection of table 3 indicates that, on average, only a minority of shares in each sector displayed a departure from independence. For example, at lag 1 the percentage of shares that exhibited significant autocorrelations varied from zero percent in the Plantation sector to 50 percent in the Footwear and Textiles sector. The majority of the sectors (14 out of 16) had 75 percent or more shares with statistically insignificant autocorrelations at the same lag level. All the important sectors had a lower percentage of statistically significant autocorrelations. For example, in Manufacturing sector only 21.43 percent of companies displayed a statistically significant dependence in successive share returns at first-order lag level. The relevant statistics for Hotels & Travel, Banks, Finance & Insurance and Beverage, Food & Tobacco sectors were 7.5 percent, 20 percent and 10 percent respectively. The numbers and percentages of significant autocorrelations typically declined as the lag length increased indicating that more recent price movements carried more weight in determining the price movement in the next period. This picture is apparent from the autocorrelations of the overall market where the highest percentage of significant autocorrelations occurred at lag 1 and lag 2 (16.81 percent and 12.07 percent respectively).

A similar picture emerges from an analysis of the Q-statistic which test the null hypothesis that the autocorrelation structure is not significant. Only 22.85 percent of shares of the overall market displayed statistically significant Q-statistics for share returns. Even though the numbers and percentage; of shares of each sector with significant autocorrelations are greater than those at individual lag levels are, only 5 sectors had more than 25 percent of companies with significant Q-statistics. For example, 60 percent of shares in the Investment Trust sector had statistically significant Q-statistics while 50 percent shares in the Footwear & Textiles sector, 50 percent shares in the Motors sector, 40 percent shares in the Construction and Engineering sector and 28.57 percent shares in the Manufacturing: sector had P-values which were less

The Behavior of Share in Emerging Markets

than 0.05. However, all these sectors, except Manufacturing sector, are relatively minor sectors in the market,

An examination of the distribution of the signs (positive and negative) of the autocorrelations may also be important for an analyst trying to predict the nature of future price changes. Table 4 reports the percentage of positive and negative autocorrelations across 1 - 10 lags for the 16 industries and the overall market. The results for the overall market indicate that positive and negative autocorrelations are distributed evenly, on average, across all the lag levels. This behaviour does not provide any strong evidence for the existence of persistence in weekly share returns.

However, this pattern was not clearly visible at the sectoral level - most of the sectors did not show even distributions with respect to signs of autocorrelations over different lag levels. Only a few sectors (Beverage, Food & Tobacco, Hotels & Travels, Manufacturing, Trading) showed a reasonable distribution between positive and negative correlations. This behaviour may provide an opportunity for analysts to forecast the nature of price changes of shares traded on rest of the sectors in the 171 market.

Table 3

Number and Percentage of Shares with Significantly Non-zero Autocorrelations

Industry	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Q-Start
BFIN	5 20.00	5 20.00	0 0.00	3 12.00	0 0.00	0 0.00	2 8.00	0 0.00	1 4.00	3 12.00	4 16.00
BF&T	2 10.00	1 5.00	2 10.00	1 5.00	1 5.00	1 5.00	1 5.00	1 5.00	3 15.00	3 15.00	4 20.00
C&PH	1 8.33	0 0.00	1 8.33	2 16.67	0 0.00	1 8.33	0 0.00	2 16.67	0 0.00	0 0.00	2 16.67
C&EN	1 20.00	0 0.00	0 0.00	0 0.00	0 0.00	1 20.00	1 20.00	0 0.00	0 0.00	1 20.00	2 40.00
DIVE	2 25	1 12.50	0 0.00	4 50	0 0.00	1 12.50	3 37.50	0 0.00	0 0.00	1 20.00	2 40.00
FW&T	4 50.00	1 12.50	1 12.50	1 12.50	1 12.50	3 37.50	2 25.00	1 12.50	1 12.50	0 0.00	4 50.00
H&TR	3 7.50	3 7.50	2 5.00	3 7.5	2 5.00	2 5.00	4 10.00	3 7.50	2 5.00	1 2.50	8 20.00
INVT	1 20.00	2 40.00	1 20.00	2 40.00	1 20.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3 60.00
L&PR	2 11.11	3 16.67	0 0.00	0 0.00	2 11.11	1 5.56	2 11.11	0 0.00	0 0.00	1 5.56	2 11.11
MANU	9 21.43	6 14.29	2 04.76	6 14.29	2 4.76	4 9.52	4 09.52	1 2.38	1 2.38	3 7.14	12 28.57
MOTO	2 25.00	2 25.00	0 0.00	1 12.50	1 12.50	1 12.50	0 0.00	1 12.50	1 12.50	1 12.50	4 50.00
OILP	1 20.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
PLAN	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 16.67	0 0.00	0 0.00	0 0.00	1 16.67	1 16.67
SERV	2 2.22	0 0.00	0 0.00	0 0.00	1 11.11	1 11.11	2 2.22	1 11.11	0 0.00	0 0.00	2 22.22
S&SP	2 28.57	1 14.29	1 14.29	0 0.00	0 0.00	1 14.29	0 0.00	0 0.00	0 0.00	0 0.00	1 14.29
TRAD	2 14.29	3 21.43	1 7.14	1 7.14	1 7.14	1 7.14	2 14.29	2 14.29	0 0.00	0 0.00	3 21.43
Market	39 16.81	18 12.07	11 4.74	24 10.35	12 5.17	19 8.19	23 9.91	12 5.17	9 3.88	14 6.03	53 22.85

The Behavior of Share in Emerging Markets

Table 4

Percentages of Positive and Negative Autocorrelations

Industry	Lag1	Lag2	Lag3	Lag4	Lag5	Lag6	Lag7	Lag8	Lag9	Lag10
BFIN	44	92	60	48	56	36	60	60	76	56
+VE	56	8	40	52	44	64	40	40	24	44
- VE										
BF&T	30	50	50	30	45	50	55	60	65	45
+VE	70	50	50	70	55	50	45	40	35	55
- VE										
C&PH	58	50	75	67	50	33	42	42	50	25
+VE	42	50	25	33	50	67	58	58	50	75
- VE										
C&EN	80	40	20	60	20	100	60	60	80	0
+VE	20	40	80	40	80	0	40	40	20	100
- VE										
DIVE	50	75	50	50	88	50	63	25	18	50
+VE	38	25	50	50	12	50	25	75	62	50
- VE										
FW&T	13	38	88	25	38	75	50	50	50	50
+VE	87	62	12	75	62	25	50	50	50	50
- VE										
H&TR	53	60	45	38	60	35	45	53	40	43
+VE	47	40	55	60	40	65	55	48	60	57
- VE										
INVT	60	80	80	40	100	20	40	60	40	60
+VE	40	20	20	60	0	80	60	40	60	40
- VE										
L&PR	22	39	61	33	17	61	56	44	39	28
+VE	78	61	33	67	83	39	39	56	61	72
- VE										
MANU	60	55	43	57	48	36	55	43	55	45
+VE	38	41	50	38	48	60	41	50	41	48
- VE										
MOTO	50	63	63	50	75	38	50	38	50	38
+VE	50	37	37	50	25	62	50	62	40	62
- VE										
OILP	0	0	0	0	0	0	0	0	0	25
+VE	100	100	100	100	100	100	100	100	100	75
- VE										
PLAN	17	50	67	17	33	67	83	17	50	17
+VE	83	50	33	83	67	33	17	83	50	83
- VE										
SERV	22	56	33	22	44	11	33	22	22	22
+VE	56	22	33	44	22	56	33	44	56	44
- VE										
S&SP	71	43	43	43	29	43	43	71	29	29
+VE	29	57	57	57	71	57	57	29	71	71
- VE										
TRAD	57	43	29	43	43	36	43	50	29	36
+VE	43	57	71	57	57	64	57	43	71	64
- VE										
Market	43	53	50	39	47	43	49	43	43	36
+VE	55	45	47	59	51	55	48	54	53	62
- VE										

Runs Test Analysis

The results of the runs tests which investigate whether changes in share returns exhibit any patterns are reported in table 5.

Table 5
Number and Percentage of Shares with Significantly
Non- Random Returns

Industry	Number	Percentage
BFIN	8	32.00
BF&T	8	40.00
C&PH	4	33.33
C&EN	2	40.00
DIVE	3	37.50
FW&T	1	12.50
H&TR	14	35.00
INVT	0	0.00
L&PR	3	16.67
MANU	13	30.95
MOTO	1	12.50
OILP	1	20.00
PLAN	2	33.33
SERV	2	22.22
S&SP	1	14.29
TRAD	4	28.57
Total	67	28.88

An analysis of the table reveals that the majority of shares in each sector displayed randomness in weekly returns over this five-year period; the actual numbers of runs did not differ in a statistically significant manner from the expected numbers of runs for them. A sectoral analysis indicates that the degree of non-randomness ranged from 0 percent to 40 percent; the highest level of non-random behaviour was observed for Beverage, Food & Tobacco (40 percent), Construction & Engineering (40 percent) Diversified (37.5 percent), Hotels & Travels (35 percent), Chemicals & Pharmaceuticals (33.33 percent), Plantation (33.33 percent) and Banks, Finance & Insurance (32 percent). However, at the aggregate market level, only a minority of companies - 67 out of 232 companies - showed non-randomness in weekly share returns. These findings clearly indicate that the majority of shares in each sector follow a random walk and only a minority of companies exhibited a statistical departure from randomness.

The Behavior of Share in Emerging Markets

When the first-order autocorrelation is positive, indicating a certain degree of positive linear dependence, one would expect the total number of observed runs to be fewer than the total number of runs expected, if the series of share returns had been independent. On the other hand, when the first-order autocorrelation is negative one would expect the total number of observed runs to be greater than the total number of runs expected. This notion was examined by comparing the actual number of runs with the expected number of runs; the number and percentage of shares whose actual number of runs is less than expected is reported in Table 6.

Table 6
Number and Percentage of Shares whose Actual Number
of Runs is Less than Expected number of Runs

Industry	Number	Percentage
BFIN	17	68.00
BF&T	15	75.00
C&PH	11	91.67
C&EN	5	100.00
DIVE	4	50.00
FW&T	5	62.50
H&TR	31	77.50
INVT	4	80.00
L&PR	10	55.56
MANU	26	61.90
MOTO	7	87.50
OILP	1	20.00
PLAN	5	83.33
SERV	4	44.44
S&SP	3	42.86
TRAD	9	67.29
Total	157	67.67

The distribution of the signs of the correlations reported in Table 4 indicated that seven sectors - Construction & Engineering (80 percent), Stores & Supplies (71 percent), Investment Trust (60 percent), Manufacturing (60 percent), Chemicals & Pharmaceuticals (58 percent), Trading (57 percent) and Hotels & Travels (53 percent) - displayed positive persistence for a majority of share returns at the first lag. However, the results reported in table 6 do not corroborate this finding. As

the runs test results indicate, the majority of companies in many sectors had fewer actual runs than expected. More than 50 percent of companies in 12 sectors exhibited positive

Persistence in share returns⁸ which ranged from 100 percent for Construction & Engineering sector to 55.56 percent for Land & Property sector. A similar picture emerges for the overall market while a 67.67 percent majority (157 out of 232 companies) had positive persistence in their share returns.

Distributional Properties Analysis

The Kolmogorov-Smirnov test of goodness of fit⁹ was employed to examine whether the distributions of weekly share returns were normal and central tendency measures were used to detect ally skewed and peaked distributions and the results are reported in table 7.

The table reveals that with the exception of four sectors (Bank, Finance & Insurance, Beverage Food & Tobacco, Hotels & Travel, Manufacturing), none of the shares in all other sectors displayed a normal distribution in their weekly returns. Even for these four sectors, evidence of non-normality existed for more than 90percent of the shares in each sector. The Kolmogorov-Smirnov D-statistics for these shares were greater than their respective critical values; all the D-statistics were significant at 5 percent suggesting that the share distribution is skewed and/or peaked¹⁰. These two properties were tested by examining skewness and kurtosis measures. All the sectors except Services had positively skewed distributions for the majority of their shares. In some sectors (Construction & Engineering, Investment Trust, Motors, Plantation) all the companies' share returns were positively skewed. The kurtosis measures for the companies in our sample indicate that most of the shares in all the sectors display leptokurtic behaviour in their security returns. In some sectors (Construction & Engineering, Footwear & Textiles, Investment Trust, Motors, Oil palm, Services, Stores & Supplies), all the companies displayed this leptokurtic behaviour. On the basis of this distributional

⁸Abeyratna & Power(1995) observed a similar contradiction for the most frequently traded 20 shares.

⁹This test is based on a comparison of the observed sample cumulative relative frequency distribution with the hypothetical population cumulative distribution function.

¹⁰Shapiro-Wilke W-statistics were also calculated and the normality assumption was rejected for these companies by that statistic too.

The Behavior of Share in Emerging Markets

evidence it can be said that the shares traded on CSE have a peaked distribution in their weekly returns which are either positively or negatively skewed and therefore, their behaviour does not conform to a normal distribution.

Table 7
Distribution Nature of Weekly Share Return

Industry	Non-normal	+Vely 1 Skewed	-Vely Skewed	Leptokurtic (Kurtosis>3)
BFIN	24 96.00%	20 80.00%	4 16.00%	18 72.00%
BF&T	18 90.00%	16 80.00%	2 10.00%	16 80.00%
C&PH	12 100.00%	7 58.33%	5 41.67%	11 91.67%
C&EN	5 100.00%	5 100.00%	0 0%	5 100.00%
DIVE	8 100.00%	7 87.50%	1 12.50%	6 75.00%
FW&T	8 100.00%	5 62.50%	3 37.50%	8 100.00%
H&TR	39 97.50%	24 60.00%	15 37.50%	39 97.50%
INVT	5 100.00%	5 100.00%	0 0%	5 100.00%
L&PR	18 100.00%	11 61.11%	7 38.89%	17 94.44%
MANU	41 97.62%	29 69.05%	12 28.57%	35 83.33%
MOTO	8 100.00%	8 100.00%	0 0%	8 100.00%
OILP	5 100.00%	3 60.00%	2 40.00%	5 100.00%
PLAN	6 100.00%	6 100.00%	0 0%	5 83.33%
SERV	9 100.00%	3 33.33%	6 66.67%	9 100.00%
S&SP	7 100.00%	4 57.14%	3 42.86%	7 100.00%
TRAD	14 100.00%	12 85.71%	2 14.29%	13 92.86%
Market	227 97.85%	165 71.12%	62 26.72%	207 89.22%

The table reports the numbers and percentages of shares in each sector and the-market that displayed non- normality, positive skewness, negative skewness and leptokurtic nature in their distributions.

Spearman Correlation Analysis

Both runs test results and Q-statistic were used to rank companies in each sector and the Spearman rank correlation for each of them with continuity of trading (ranked using the number of trading weeks for each company) was calculated and the results are reported in table 8¹¹.

Table 8
Spearman Rank Correlation Coefficients

Industry	N	Runs Vs. Weeks	Q-stat. Vs Weeks
BFIN	15	0.6607**	0.1464
BF&T	14	0.6906**	-0.1560
C&PH	12	0.0318	0.2491
C&EN	5	0.1000	0.5000
DIVE	7	0.1786	-0.2143
FW&T	7	-0.0357	-0.4286
H&TR	32	-0.0121	0.0717
INVT	5	0.4000	0.2000
L&PR	16	0.2559	-0.5265*
MANU	29	0.5628**	-0.0342
MOTO	7	-0.0714	0.3929
OILP	5	-0.9747**	-0.6000
SERV	9	-0.5462	-0.5272
S&SP	7	-0.3571	-0.7143
TRAD	11	-0.2831	-0.7534**

The table reports two correlations: (I) between absolute percentage differences in runs and the number of weeks traded and (II) between q-statistics and the number of weeks traded. An (**) denotes statistical significance at 5 percent (1 percent) level.

Two results shall be observed from this table. First, if these companies which displayed a higher level of efficiency in their share price behaviour (having lower percentage differences between actual runs and expected runs or having lower Q- statistic) tended to have a higher number of trading weeks and if the companies which exhibited a lower level of efficiency in their price behaviour tended to have a lower numbers of trading weeks, we should be able to observe a negative correlation for

¹¹Only the 181 companies that were traded all over the five-year period were considered in this analysis to prevent any bias in continuity ranking. This selection procedure eliminated Plantation sector from the analysis since all the plantation companies had been traded less than five years during the sampling period.

most of the sectors in the market. Second, if this relationship is relatively strong, the correlations should be statistically significantly different from zero. If the shares of a sector display both these properties, we should be able to detect a statistically significant negative correlation between efficiency and continuity. All analysis of table 8 indicates that the first argument is supported by the evidence in five sectors (Footwear & Textiles, Oil Palm, Services, Stores & Supplies, Trading) since the correlations for these sectors are negative; there is an association between efficiency and continuity for these five sectors. This relationship was not observed at all in four sectors (Banks, Finance & Insurance, Chemicals & Pharmaceuticals, Construction & Engineering, Investment Trust); the correlations for these sectors were positive. However, among the negative correlations, only three values (one runs-ranked and two Q-statistic -ranked) were statistically significant displaying a strong association between efficiency and continuity. Three sectors (Banks, Finance & Insurance, Beverage, Food & Tobacco, Manufacturing) have positive correlations which are statistically significant at the 99 percent confidence interval for which no proper explanation could be provided. Based on these results, we can reasonably argue that the efficiency of the market is independent of the continuity in trading.

Predictability of Share Returns

Using autocorrelation analysis we were able to detect 39 companies that had statistically significant autocorrelations at the first-order level. Using weekly returns of these companies equation 2 was estimated and the results are reported in table 9.

As anticipated. F-Statistic for all the shares are statistically significant at either the 1 percent or the 5 percent level. This demonstrates that the most recent past week's share returns have a great influence on the current week's share returns. However, as the R^2 statistics indicate, only a small proportion of the current share returns of companies is explained by past return values; the R^2 values ranged from 0.011 to 0.101. Even for the share with the highest R^2 , only 10.1 percent of current returns are explained by the past week's returns. This low explanatory power of the model implies that even though there are predictable patterns in successive share returns, such patterns cannot be exploited profitably to earn abnormal returns.

Table 9
Predictability of Share Returns

[$R_{it} = \alpha + \beta(R_{it-1})$]				
Share	Industry	Coefficient	F-Stat	R ² (adj.)
ALLI	BFIN	0.1300	4.40*	0.013
CDIC	BFIN	0.2906	6.78*	0.071
CFIN	BFIN	0.3176	29.98**	0.101
CINS	BFIN	-0.1460	5.58*	0.018
CTCE	BFIN	0.2009	10.80**	0.037
GILB	BF&T	-0.1386	5.03*	0.015
KFP	BF&T	0.1697	7.60**	0.025
CHMX	C&PH	0.2490	17.03**	0.059
DOCK	C&EN	0.1611	6.81**	0.022
CTI-JR	DIVE	-0.2876	23.09**	0.079
JKH	DIVE	0.1506	5.94*	0.019
ASCO	FW&T	-0.2252	13.68**	0.047
KUKU	FW&T	-0.2829	22.29**	0.077
PTEX	FW&T	-0.1361	4.84*	0.015
VTEX	FW&T	-0.2548	11.58**	0.059
AHUN	H&TR	0.2023	10.93**	0.037
GHLL	H&TR	-0.2075	11.46**	0.039
REEF	H&TR	0.2162	12.56**	0.043
CFI	INVT	-0.1840	8.97**	0.030
COLL	L&PR	0.1822	8.79**	0.029
YORK	L&PR	-0.1397	5.10**	0.016
ACL	MANU	0.1717	7.81**	0.026
BOGA	MANU	-0.2412	15.80**	0.054
COMP	MANU	-0.1400	5.12**	0.016
ELAS	MANU	-0.1977	5.90**	0.032
GRAN	MANU	0.1719	7.78**	0.026
MPAC	MANU	0.1706	7.67**	0.025
RICH	MANU	0.1477	5.69*	0.018
SIL	MANU	0.1746	9.85**	0.036
SINI	MANU	-0.2105	11.87**	0.041
ASHO	MOTO	0.1238	3.99**	0.011
SMOT	MOTO	0.2053	9.32**	0.038
SELI	OILP	-0.1543	6.24*	0.020
JKL	SERV	0.1733	7.93**	0.026
MSL	SERV	-0.1645	7.12**	0.023
HUNT	S&SP	0.1562	6.40*	0.021
MULL	S&SP	0.1716	7.77**	0.026
CARM	TRAD	-0.1724	7.96**	0.026
CWM	TRAD	0.1621	4.21**	0.021

The table reports the code of the share whose first-order autocorrelation was statistically significant, the industry for which the company belongs, the coefficient of equation 2 and the associated F-statistics and R² values. An * (**) denotes statistical significance at 5 percent (1 percent) level.

Comparison with Previous Findings

A comparison between the findings of this study and the results of previous studies was conducted with respect to average autocorrelations, significant autocorrelations and positive correlations at the first-order lag level and the results are reported in table 10.

Table 10
A Comparison with Findings of Other Studies

Country	Average Corr.	Significant Corr. (%)	Positive Corr. (%)
France	-0.049	26	32
Italy	0.001	17	47
United	-0.055	18	20
Germany	0.056	23	77
Netherlands	0.002	13	58
Belgium	-0.088	29	6
Switzerland	-0.022	6	35
Sweden	0.024	17	67
Hong Kong	0.030	22	56
Japan	-0.065	8	23
Philippines	-0.055	11	22
Singapore	-0.077	15	23
Malaysia	-0.046	40	33
Australia	-0.165	50	10
United States	-0.038	14	30
Sri Lanka	-0.003	17	43

This table was adapted from studies by Fama (1965) on the US market, Solnik (1975) on eight European countries. Ang and Pohlman (1978) on four Asian countries and Australia and Young(1990) on Malaysian market.

Even though the previous studies are not totally comparable as the time periods, sample size, and the return horizons etc. differ from this study, few observations are worth mentioning. The average serial correlation for the Sri Lankan market is negative, as it is for many countries (10 out of 15). The absolute average autocorrelation is lower than all the countries except those of Italy and Netherlands. In terms of the percentage of significant autocorrelations, the Sri Lankan market displayed a similar level of performance to share markets in Italy, the UK, Sweden

and the USA. It outperformed France, Germany, Belgium, Hong Kong, Malaysia and Australia. However, in terms of efficiency, Netherlands, Switzerland, Japan, Philippines and Singapore surpassed it. The Sri Lankan market had lower positive autocorrelations than Germany, Netherlands, Sweden, Hong Kong and Italy, but it was outperformed by France, the UK. Belgium, Switzerland, Japan, Philippines, Singapore, Malaysia, Australia and the USA.

5. Conclusion

In this study various aspects relating to the behaviour of share prices were investigated using weekly return observations for the entire market in Sri Lanka in an attempt to provide the evidence on an emerging market in South Asia. Following conclusions emerge from the analysis. First, even though the shares displayed a positive or negative persistence in their successive returns, only a minority of securities displayed a statistically significant departure from independence. As Q - Statistics indicate only four sectors (Investment Trust, Footwear & Textiles, Motors, Construction & Engineering) had statistically significant autocorrelations between 40-60 percent in their respective samples. For all the other sectors, statistically significant flat autocorrelations remained below 30 percent of respective samples. Second, none of the sectors showed non-randomness in majority of their share returns. In the overall market, 28.88 percent shares displayed non-randomness in their weekly returns. However, 8 sectors (Banks, Finance & Insurance, Beverage, Food & tobacco, Chemicals & Pharmaceuticals. Construction & Engineering, Diversified, Hotels & Travels, manufacturing, Plantation) displayed non-randomness for 30-40 percent of shares in their samples. Third, almost all the companies demonstrated a deviation from normality in their share returns over this five-year period; most of the shares had positively skewed and leptokurtic distributions. In some sectors (Construction & Engineering, Investment Trust, Motors) all the companies demonstrated this behaviour. Fourth, the past share returns were able to explained only a minor proportion of current share returns which implied that even though predictable patterns exist they cannot be profitably exploited to earn above average returns. Finally, in terms of efficiency in price behavior, the Colombo Stock exchange demonstrated a similar performance to those of the USA, the UK, Italy, Sweden, and Singapore. It outperformed Australia, Malaysia, Belgium, Germany and Hong Kong.

References

Abeyratna, G. and Power, D.M., (1995), "A Test of the Weak-form of the Efficient Market Hypothesis: Evidence Using Daily Data from the Colombo Stock Exchange," *Sri Lanka Journal of Social Sciences*, Vol 18. pp. 41-53.

Affleck-Graves, J.P., and Money, A.H., (1975), "A Note on the Random Walk Model and South African Share Prices," *The South African Journal of Economics*, Vol. 43, pp, 382-388.

Alexander, S.S., (1961), "Price Movements in Speculative Markets: Trends or Random Walks," *Industrial Management Review*, Vol. 2, pp. 7-26.

Ang, J.S. and Pohlman, R.A., (1978), "A Note on the Price Behaviour of Far Eastern Stocks," *Journal of International Business Studies*, Spring.

Barnes, P., (1986), "Thin Trading and Stock Market Efficiency: The Case of the Kuala Lumpur Stock Exchange," *Journal of Business Finance and Accounting*, Vol. 13, pp. 609-617.

Brealey, R.A., (1970), "The Distribution and Independence of Successive Rates of Return from the British Equity Market," *Journal of Business Finance*, Vol. 2, pp. 29-40.

Conrad, K. and Juttner, D. J., (1973), "Recent Behaviour of Stock Market Prices in Germany and the Random Walk Hypothesis," *Kyklos*, Vol. 26, pp. 576-598.

Cootner, P. H., (1962), "Stock Prices: Random Vs Systematic Changes," *Industrial Management Review*, Vol. 3, pp. 24-45.

Cunningham, S.W., (1973), "The Predictability of British Stock Market Prices," *Applied Statistics*, Vol. 22, pp. 313-331 .

Dickinson, J. P. and Muragu, K., (1994), "Market Efficiency in Developing Countries: A Case Study of the Nairobi Stock Exchange," *Journal of Business Finance and Accounting*, Vol. 21, pp, 133-150.

Dryden, M. M., (1970a). "Filter Tests of U.K. Share Prices." *Journal of Applied Economics*, Vol. 1, pp. 261-275.

Dryden, M. M., (1970b), "A Statistical Study of U.K. Share Prices," *Scottish Journal of Political Economy*, Vol. 17, pp. 369-389.

Fama, E. F., (1965), "The Behaviour of Stock Market Prices," *Journal of Business*, Vol. 38, pp. 34-105.

Gandhi, D. K., Saunders, A. and Woodward, R. S., (1980), "Thin Capital Markets: A Case Study of Kuwaiti Stock Market," *Applied Economics*, Vol. 12, pp. 341-349.

Girmes, D.H. and Benjamin. A.E.. (1975). "Random Walk Hypothesis for 543 Stocks and Shares Registered on the London Stock Exchange," *Journal of Business Finance and Accounting*, Vol. 2, pp. 135-145.

Granger, C.W.J. and Morgenstern, O., (1970), *Predictability of Stock Market Prices*, Heath-Lexington, Massachusetts.

Griffiths, R.A., (1970), "Relative Strength - An Indicator for Investment in the Equity Market," Unpublished MSc Dissertation, Department of Statistics, Granfield College, Cambridge, England.

Gunerathne: Bandara, W.M. and Abeyratna. G., (1997), "Thin Traded Capital Markets: An Empirical Investigation of Colombo Stock Exchange, Discussion Paper, Department of Business Administration, University of Sri Jayewardenepura, Nugegoda, Sri Lanka,

Heinkel, R. and Kraus, A., (1988), "Measuring Event Impacts in Thinly Traded Stocks," *Journal of Financial and Quantitative Analysis*, Vol. 23, pp. 71-88.

Jennergren, L.P., (1975), "Filter Tests of Swedish Share Prices," in Elton and Gruber eds., *International Capital Markets*, Amsterdam, North-Holland, pp. 55-67.

Jennergren, L.P. and Korsvold, P.O.E., (1975), "The Non-Random Character of Norwegian and Swedish Stock Market Prices," in Elton and Gruber eds. *International Capital Markets*, Amsterdam, North-Holland. pp. 37-54.

The Behavior of Share in Emerging Markets

King, B.F., (1966), "Market and Industry Factors in Stock Price Behaviour," *Journal of Business*. Vol. 39, pp, 39-90,

Laurence. M., (1986), "Weak Form Efficiency in the Kuala Lumpur and Singapore Stock Exchanges," *Journal of Business and Finance*, Vol. 10, pp. 431-445.

Moore, A.B., (1967), "Some Characteristics of Changes of Common Stock Prices," in Cootner eds., *The Random Character of Stock Market Prices*, MIT Press, Cambridge, pp, 139-161.

Niarchos, N.A., (1971), "Statistical Analysis of Transactions on the Athens Stock Exchange." Unpublished PhD Dissertation, Nottingham College, Nottingham, England,

Parkinson, J.M., (1987), "The EMH and the CAPM on the Nairobi Stock Exchange," *East African Economic Review*, Vol. 2, pp. 105-110.

Praetz, P.D., (1969), "Australian Share Prices and the Random Walk Hypothesis," *Australian Journal of Statistics*, Vol. II, pp. 123-139.

Praetz, P.D., (1973), "A Spectral Analysis of Australian Share Prices," *Australian Economic Papers*, Vol. 12, pp. 70-78.

Roberts, H.V., (1959), "Stock Market 'Patterns' and Financial Analysis: Methodological Suggestions," *Journal of Finance*, Vol. 14, pp. 1-10.

Samarakocn, L.P., (1996), "Predictability of Short-Horizon Returns in the Sri Lankan Stock Market", *Sri Lanka Journal of Management*, Vol. I, pp. 207-224

Solnik, B.H., (1973), "Note on the Validity of the Random Walk for European Stock Prices," *Journal of Finance*, Vol. 28, pp. 1151-1159.

Yong. O., (1990), "Thin Capital Markets: A Study of Stock Market Efficiency of Malaysian Stocks," *Malaysian Management Review*, Vol. 25, pp. 49-69.