Thin Traded Capital Markets: An Empirical Investigation into Shares Traded on the Colombo Stock Exchange

[1] W.M. Guneratna Bandara, [2] G. Abeyratna
[1]Department of Commerce, University of Sri Jayewardenepura, Gangodawila, Nugegoda,
[2]Department of Business Administration, University of Sri Jayewardenepura, Gangodawila, Nugegoda

Introduction

The existence of a well-functioning domestic capital market has been recognised as a key factor in the economic development in Sri Lanka since, it provides a mechanism which facilitates the effective accumulation of capital and the efficient allocation of funds to those investment opportunities with the highest positive NPVs. The adoption of more open economic strategies in 1977 and the liberalisation of fiscal and monetary policies by successive governments during the last two decades have paved the way for the domestic financial development in the country. In particular, a number of specific steps have been taken by the government such as (i) the opening of the banking sector to foreign owners, (ii) repeal of the business acquisition act, (iii) abolition of 100 percent transfer of property tax on share transactions between non-nationals and (iv) privatisation of government owned business undertakings to develop the security market (Colombo Stock Exchange annual report, 1991). As a result of these measures the Colombo Stock Exchange (CSE) has expanded rapidly and trading activities has grown fast during the recent past[1].

According to Drake (1977), the existence of a well-functioning efficient security market positively influences domestic savings ratio of developing countries. Furthermore, it facilitates the inflow of large international capital flows into the domestic economy. However, the allocational efficiency, operational efficiency and pricing efficiency of a stock market [2] are heavily dependent on the thickness of the market. According to Gandhi et. al. (1980): A 'thick' capital market is one in which traded shares are liquid and divisible and the volume of daily trading is high and steady. Effective information flows and low transaction costs enable investors to react quickly to perceived changes in the 'value' of any company. Asset pricing in a 'thick' capital market will obviate excessive price adjustments as share values will reflect all relevant past and current information, thus limiting the effect on prices of new information flows. Low price volatility and high trading volume in the secondary security market should lower the cost of finance in the primary market and facilitate capital accumulation and economic development (p. 342).

---

[1] For example, in 1996 the market capitalisation stood at Rs.104.2 billion and the annual turnover amounted to Rs.7,403 million (of which almost 55 percent was contributed by foreign investors). There were 235 listed companies in the market and the volume of shares traded amounted to Rs.227 million. The comparative figures for 1988 were as follows: market capitalisation Rs.15.7 billion; annual turnover Rs.319 million; 176 listed companies; and trading volume Rs.12 million.

[2] When the market is allocationally efficient, it channels funds to those firms and organisations with the most promising real investment opportunities. If it is operationally efficient, the buyers and sellers of securities can purchase transaction services at prices that are as low as possible. However, when the market is efficient in pricing securities, share prices at any point in time are said to 'fully reflect' all available information that is relevant to the determination of value (Samuels et. al. 1990, pp. 247-248).

However, if shares in the stock market are thinly traded, it constraints the benefits to be gained from the market, impede the financial development and as a consequence hinder the economic growth of the country.

This paper investigates whether the shares traded on the CSE are thinly traded. The remainder of the paper is organised as follows. Section 2 describes the data used in the study while section 3 outlines the methodology. The results of the study are discussed in section 4. The last section of the paper offers a number of concluding remarks.

Data

As an emerging stock market in a developing country, the CSE does not possess computerised databases that can be readily used for research purposes[3]. The problems of undertaking research in such a situation have been documented by Russel (1972), Solnik (1973) and more recently by Dickinson and Muragu (1994). One possible strategy for overcoming this problem is to use the all share indices which are published for many stock exchanges and are therefore, readily available for empirical analysis. However, the use of a market index in share price studies may be inappropriate for two reasons. First, the market index only describes the average movements in the overall market; it does not show the price changes of sectors or of individual securities. Second, the use of the market index may introduce a serial correlation into the analysis depending upon the way in which the index is weighted. To overcome above criticisms and to enhance the validity of the analysis, this study employs data relating to all share price indices, sectoral indices as well as individual share prices.

A number of series of data ranging from all share price indices to individual share prices for the period from 1 January 1992 to 31 December 1994 have been used in the study. First, for the purpose of comparing return characteristics of the Sri Lankan market with those of the developed markets, daily values for all share indices for the USA (NYSE all share index), the UK (FT all share index), Japan (NICKIE all share index) and Sri Lanka (CSE all share index) were gathered. Second, to study the behaviour of share prices of different industries traded on CSE, daily indices for all the 14 sectors[4] in the market were collected for the same period. Finally, a stratified random sample of 50 individual companies were selected to represent 25 percent of the total number of companies in each industry and daily share prices were again used in the analysis. However, the number of companies was reduced to 42 since 8 companies had to be dropped due to the non availability of data[5].

---

[3] For the purpose of this study, the researchers had to create their own database to have individual share prices compatible with CSE all share price index since the individual share prices were available only for the dates of actual trades of securities. Even though processed data may be available with private companies, the cost of obtaining such information is substantial.

[4] Since 1995 the number of sectors has been increased to 16 introducing two more sectors namely diversified and plantations.

[5] Data relating to NYSE all share index, FT all share index and NICKIE all share index were gathered from Datastream. All data relating to the Sri Lankan market were received from Forbes & Walker Ltd. And Asia Capital Ltd..

Methodology

The analyses that were undertaken in this study were based on daily returns earned by indices or individual securities, which were estimated according to the following identity:

$$R_{i,t} \equiv Ln \left[P_{i,t} / P_{i,t-1} \right] \qquad [1]$$

where, $R_{i,t}$ is the return on index/share i for day t, Ln is natural logarithm, $P_{i,t}$ is the value of index i or the price of share i on day t and $P_{i,t-1}$ is the value of index i or the price of share i on day t-1[6].

A battery of tests, based on the daily returns, was employed to examine different issues relating to thin trading problem for the CSE. First, the volatility of share returns of the CSE was compared with the return volatility of developed markets (the USA, the UK and Japan). For this purpose the coefficient of variation (standard deviation divided by mean) measure was employed on the daily returns of all share indices. Several researchers have argued that the emerging markets are more volatile than the longer-established developed markets since financial systems of such countries are more regulated and their financial structures are relatively immature (Peterson, 1994, p. 49). If the CSE is thinly traded, the return volatility of shares traded should be very high and in consequence, the coefficient of variation for CSE all share index should be greater than the coefficient of variation of other markets.

Second, the risk premium demanded by Sri Lankan investors is compared with that required by investors in developed countries. The risk-return trade-offs of markets and hence the attitude towards risk of the investors of respective markets are observed using the following equation:

$$\bar{R}_i = a + b(STD_i) \qquad [2]$$

where, $\overline{R_i}$ is the monthly mean return for the index i, *a* and *b* are the parameters to be estimated and STD_i is the standard deviation of monthly returns of the index i. To estimate the above model, monthly mean returns and their respective standard deviations were calculated using daily returns on all share indices, which had already been calculated[7]. If the shares of the market are thinly traded, uncertainty increases and as a result the risk premium demanded by shareholders should be higher. In

---

[6] Fama (1965, pp. 45-46) provides three reasons for using changes in log prices rather than simple price changes in share price studies. First, the change in log price is the yield, with continuous compounding, from holding the security for the day. Second, the variability of simple price changes for a given share is an increasing function of the price level of the security and taking logarithms seemed to neutralise most of this price effect. Third, for changes less than plus or minus 15 percent the change in log price is very close to the percentage price change, and for many purposes it is convenient to look at the data in terms of percentage price changes. Strong (1992, p. 535) suggests further two reasons why logarithmic returns are preferable to discrete returns. Theoretically, he argues, logarithmic returns are analytically more tractable when taking together sub-period returns to form returns over longer intervals (simply add-up the sub period returns). Empirically, logarithmic returns are more likely to be normally distributed and so confirm to the assumptions of standard statistical techniques.

[7] This method had been used by Sharpe (1966), Briscoe et.al. (1969) and Gandhi et. al. (1980) for the USA, the UK and Kuwaiti markets respectively, in a different context, to examine the risk premium demanded by shareholders of above markets.

accordance with the above explanation, if the CSE is infrequently traded, we should be able to observe a higher value for the coefficient '*b*' for CSE than that for the other markets.

Third, serial correlation and runs tests[8] were employed on daily returns of 14 industrial sectors to study whether the market exhibits any systematic patterns over time. The serial correlation coefficient provides a measure of the relationship between the value of a random variable in time *t* and its value *k* periods earlier. Therefore, for the changes in log price for a given share from the end of day *t*-1 to day *t* (defined earlier as $R_{i,t}$), the serial correlation coefficient for lag k is given by:

$$r_k = \frac{\text{Covariance}(Ui, t, Ui, t-k)}{\text{Variance}(Ui, t)} \qquad [3]$$

If the distribution of U_i has a finite variance, then for large samples the standard error of the serial correlation, $\delta(r_k)$, can be computed as:

$$\delta(r_k) = \frac{1}{\sqrt{(N-K)}} \qquad [4]$$

where, N is the sample size (see Kendall, 1948, p. 412). The hypothesis tested in this study was that the correlation coefficients of successive daily changes of 14 sectoral indices on the CSE at lag k (k = 1,2,3, ..., 30) were zero. For this purpose serial correlation coefficients, r_k, were computed for each sector over 30 lags and the hypothesis was tested using a two-tailed test. A coefficient was considered to be statistically significant if it exceeds ± 1.96 of its standard error, $\delta(r_k)$.A run is defined as a sequence of consecutive share price changes of the same sign; a plus run of length i is a sequence of i consecutive positive price changes preceded and followed by either negative or zero changes. For share price changes there are three different types of possible price changes – positive, negative and zero – and therefore three possible types of runs. If the assumption holds that the sample proportions of positive, negative and zero price changes are good estimators of the population proportions, and the independence hypothesis applies to the sequence of price changes, ther. the total expected number of runs of all signs for a share (m) can be computed as:

$$m = \frac{N(N+1) - \sum_{i=1}^{3} n_i^2}{N} \qquad [5]$$

[8] These two techniques have been widely used in the studies which have examined the randomness of share price movements. For example, see Cootner (1962), Fama (1965), King (1966) and Moore (1967) for US evidence, Kendall (1953) and Griffiths (1970) for UK evidence, Praetz (1969) for Australian evidence, Jennergren and Korsvold (1975) for Swedish evidence, Jennergren (1975) for Norwegian evidence, Niarchos (1971) for Greek evidence and Abeyratna and Power (1995) for Sri lankan evidence.

where, N is the total number of price changes and n_i (i = 1, 2, 3) are the number of price changes of each sign (i.e. positive, negative, zero). The standard error of m is given by:

$$\delta_m = \sqrt{\frac{\sum_{i=1}^{3} n^2 \left[\sum_{i=1}^{3} n_i^2 + N(N+1) \right] - 2N \sum_{i=1}^{3} n_i^3 - n^3}{N^2 (N-1)}} \qquad [6]$$

and for large N the sampling distribution of m is approximately normal. Since for large samples the distribution of the total number of runs is approximately normal with mean, m, and standard error, δ_m, then the difference between the actual number of runs and the expected number of runs can be expressed by means of the usual standardised variable, Z, as follows:

$$Z = \frac{(R + \frac{1}{2}) - m}{\delta_m} \qquad [7]$$

where, R is the actual number of runs and ½ in the numerator is a discontinuity adjustment. The computed value of Z is significant at 5 percent level if it lies beyond its critical value.

According to Fama (1970), if the movement of share prices shows a systematic pattern over time, then the market is imperfect and shares may be thinly traded. Accordingly, if the CSE is thinly traded, we should be able to observe systematic patterns in movements in the sectoral indices.

Finally, three alternative beta measures – (i) normal beta, (ii) Scholes-Williams beta and (iii) Dimson beta – were calculated in order to observe thin trading problem looking at the above measures at individual company level. In a thin traded capital market in which shares suffer from infrequent trading, the covariances of individual shares with the market are substantially underestimated. As a result, infrequently traded shares tend to have beta estimates which are biased downwards, while the figure for frequently traded securities is upward biased (Dimson, 1979, p. 198). This problem underestimates the actual market risk faced by a company. Scholes and Williams (1977) and Dimson (1979) suggest two alternative beta measures, both of which adjust for thin trading. Therefore, for the comparative purpose, these three beta measures were calculated as follows:

$$\beta_N = \frac{\textbf{Covariance(Ri,Rm}}{\textbf{Variance(Rm)}} \qquad [8]$$

where, β_N is the normal beta, Covariance (R_i, R_m) is the covariance between the returns of share i and the market and variance (R_m) is the variance of the returns on the market portfolio;

$$\beta_{SW} = \frac{\beta^{-1} + \beta^{0} + \beta^{+1}}{1 + (2\rho m)} \qquad [9]$$

where, β_{SW} is the Scholes-Williams beta[9], β^N is an estimate of the slope coefficient in a simple regression of the return on the security on day t against the return on the market in day t+n and ρ_m is an estimate of the first order serial correlation coefficient for the market index; and

$$\beta_D = \sum_{k=-3}^{3} \beta_k \qquad [10]$$

where, β_D is the Dimson beta[10], β_k, k = -3, -2, -1 0 1, 2, 3 are estimates of the slope coefficients in a multiple regression of the return on the share on day t against the return on the market in periods t-3, t-2, t-1, t, t+1, t+2 and t+3. If the CSE is thinly traded, we should be able to observe that the normal beta is underestimated when compared to other two alternative beta measures. In other words, if the CSE is thickly traded we should not be able to detect a material difference between normal betas and other two beta measures.

Results

The results obtained from the analyses of the all share price indices are reported in tables 1 and 2.

Table 1

Return Volatility – 1992 to 94

Country	1992	1993	1994	1992-94
USA	30.3889	16.5172	47.2500	48.3636
UK	17.1698	6.6750	18.4103	23.0625
Japan	15.6923	11 .9091	22.7917	70.6550
Sri Lanka	4.5072	4.3668	410.6667	43.0455

The table reports the coefficients of variation (STD/Mean) for the three-year period for the USA, the UK, Japan and Sri Lanka.

[9] The Scholes-Williams (SW) beta estimator is based on two key assumptions. First, although trades are non-synchronous, a transaction takes place in every measurement interval. Second, price adjustment delays arise only through non-synchronous trading so that an observed transaction price is the true price at the time of the transaction. Under these assumptions, the SW beta estimator is a consistent estimator of the true beta.

[10] The Dimson beta, which is normally called Dimson Aggregate Coefficients (DAC) Estimator does not require that a trade takes place in every return interval. This method has been employed by Dimson and Marsh (1986) with k=-1, ..., +5.

Table 2

Risk Premium Demanded by Investors – 1992 to 94

Country	1992	1993	1994	1992-94
USA	0.2469	-0.2212	-0.4280	-0.1728
UK	0.3714	0.2303	-0.7206	0.1604
Japan	0.1499	0.1010	0.3001	0.0623
Sri Lanka	0.1449	0.8075	-0.2586	0.1831

The table reports 'b' coefficients of the markets for the three-year period ascertained using the equation of

$$\overline{R_i} = a + b\,(STD_i).$$

A visual inspection of these two tables indicates that the aggregate Sri Lankan market data do not show a marked difference from developed markets over the three-year period from 1992 to 1994. The coefficients of variation in table 1 indicate that the USA market has displayed the greatest volatility in 1992 followed by UK and Japan. On the other hand, Japanese market reported the highest volatility in 1993 followed by the USA and UK. In both these years the coefficients of variation for the Sri Lankan market were minimal. However, in 1994 Sri Lankan market exhibited the greatest volatility[11] in share returns. When the overall three-year period (1992-94) is considered the volatility of CSE is less than that of Japan and the USA. A similar picture emerges from table 2 which reports the risk premia demanded by the investors in the respective markets. With the exception of 1993, the risk premium demanded by Sri Lankan investors is either similar to or lower than those of the other markets; the attitude of the investors in Sri Lanka towards risk seemed not to be significantly different from the attitude of investors in developed share markets. These results indicate that at the aggregate level the CSE does not seem to suffer from a severe thin trading problem.

Tables 3 and 4 report the results of the statistical analyses, which were performed using daily returns of the indices of the 14 industrial sectors, traded on the Colombo Stock Exchange. The first-order autocorrelations for the 14 sectors are reported in table 3[12].

A brief analysis of table 3 indicates that, on average, the first-order serial correlations are large in magnitude; 40 out of 56 correlations (71.43 percent) are greater than 0.25. Most of the correlations are negative – 71.43 percent, and the majority of the negative coefficients are significant – 82.50 percent. This pattern was more prevalent in 1992 and in the overall period of three years (1992-94) where 100 percent and 92.86 percent of the autocorrelations were negative and significantly different from zero.

---

[11] This may be attributable to the uncertainty created among the stock market investors, specially among overseas investors, with respect to the economic policies of the government as a result of the transfer of political power from a right-wing government to a coalition government which consisted of few leftist parties.

[12] The serial correlation coefficients have been calculated for 30 lags and the rest of the coefficient values are available with the authors upon request.

Table 3

First-Order Autocorrelations – 1992-94

Industry	1992	1993	1994	1992-94
Banking, Finance & Insurance	-0.499**	0.275**	0.437**	-0.497**
Beverage, Food & Tobacco	-0.449**	0.299**	-0.247**	-0.360**
Chemicals & Pharmaceuticals	-0.454**	0.057	0.242**	-0.355**
Construction & Engineering	-0.425**	-0.483**	-0.176**	-0.473**
Footwear & Textiles	-0.477**	-0.006	0.099	-0.438**
Hotels & Travels	-0.500**	0.249**	0.228**	-0.456**
Investment Trusts	-0.496**	0.031	0.117	-0.491**
Land & Property	-0.217**	-0.030	0.299**	0.077*
Manufacturing	-0.458**	0.273**	0.357**	-0.399**
Motors	-0.487**	0.087	-0.012	-0.470**
Oil Palms	-0.468**	-0.531**	-0.120	-0.499**
Services	-0.487**	-0.016	-0.495**	-0.494**
Stores & Supplies	-0.499**	-0.006	-0.055	-0.490**
Trading	-0.479**	-0.477**	0.087	-0.455**
Confidence Intervals at 99%	+ or - 0.1662	+ or – 0.1662	+ or – 0.1687	+ or – 0.0732
Confidence Intervals at 95%	+ or – 0.1263	+ or – 0.1263	+ or – 0.1281	+ or – 0.0964
No. of Significant Coefficients	14	7	8	14
% of Significant Coefficients	100.00	50.00	57.14	100.00

The table 3 reports the first-order serial correlations for the three individual years of 1992, 1993 and 1994 and for the overall three-year period of 1992-94.

The analysis of first-order autocorrelations over this three-year period indicates a greater degree of linear dependence in successive share price changes of Sri Lankan indices at the one period lag level. Statistically the vast majority of the coefficients are significantly different from zero at 5 percent level; the hypothesis that successive changes in share prices are independent can be rejected for 43 out of 56 coefficients – an overwhelming majority of 76.79 percent. The majority of the significant coefficients (which ranges from –0.531 to 0.437) are large in absolute terms which could be helpful for professional analysts who are attempting to predict future share price movements[13].

[13] However, the number of significant autocorrelations decreased for all the sectors as the lag length increased which means that the more recent price movements carry more weight in determining the next price movement.

An examination of the autocorrelation coefficients at the individual sector level indicates that for 5 industries (Banking, Finance & Insurance; Beverage, Food & Tobacco; Construction & Engineering; Hotels & Travels; Manufacturing) the first-order autocorrelations are significant for all the sub periods as well as for the overall three-year period. Moreover, for 5 more industries (Chemicals & Pharmaceuticals; Land & Property; Oil Palms; Services; Trading) the correlations are statistically significant for two individual years as well as for the overall period. If we apply a decision rule of number of significant coefficients ≥ 2 (out of 3 coefficients in three individual years representing 66.67 percent or more) for lack of independence, the hypothesis of independence could be rejected for 71.43 percent of the sectors traded on the CSE.

An examination of the test results of the runs reported in table 4, reveals that in an overwhelming majority of the instances the actual number of runs is less than the expected number of runs indicating an existence of a positive persistence in share returns; a share price change tends to be followed by further changes in the same direction. Out of the 14 sectors studied, 11 sectors (78.57 percent) in 1992, 12 sectors (85.71 percent) in 1993 and 13 sectors (92.86 percent) in 1994 showed this positive persistence. A similar conclusion can be drawn for the overall three-year period from an examination of the last column of the table where 92.86 percent (13 out of 14 sectors) coefficients are negative. Moreover, except in 1992, the majority of the sectors reported a significant difference between the actual number of runs and the expected number of runs; 50 percent in 1993, over 57 percent in 1994 and more than 78 percent for the overall three-year period.

Table 4

Differences Between Actual Number of Runs and Expected Number of Runs -- 1992 to 94

Industry	1992	1993	1994	1992-94
Banking, Finance & Insurance	-34.33**	-45.34**	-38.79**	-110.39**
Beverage, Food & Tobacco	1.67	-10.40	-4.45	-33.98**
Chemicals & Pharmaceuticals	-10.62	-20.96**	-14.92*	-27.34*
Construction & Engineering	-12.13*	-23.32**	15.23*	-16.61
Footwear & Textiles	-19.34**	-8.22	-14.58	-38.93**
Hotels & Travels	-5.50	-25.59**	-18.00*	-43.52**
Investment Trusts	-7.55	2.51	-17.08*	-32.96*
Land & Property	9.75	-13.66	-14.99*	-13.72
Manufacturing	-11.75	-25.40**	-34.86**	-76.25**
Motors	-13.40	-17.52*	-12.99	-37.28**
Oil Palms	-1.79*	0.53	-0.79	0.91
Services	-8.25	-1.06	-3.77	24.34*

Stores & Supplies	1.61	-16.80**	-16.23*	-27.99**
Trading	-7.51	-13.15	-10.14	-30.58**
No. of Significant Coefficients	4	7	8	11
% of Significant Coefficients	28.57	50.00	57.14	78.57

The table reports the differences between the number of runs observed and the number of runs expected for the three-year period for the 14 sectors traded on CSE. An *(**) denotes the statistical significance at 5% (1%) level where the hypothesis of 'non-systematic patterns in the movements of share prices over the time' was rejected.

Alternative beta measures for the randomly selected sample of 42 shares are reported in table 5. In accordance with the idea that the normal beta underestimates the actual market risk faced by the firm in thin traded capital markets, the majority of the shares in our sample have lower values for normal beta estimates compared with the beta estimates which are based on Scholes-Williams (1977) and Dimson (1979) approaches.

Table 5

Alternative Beta Estimates

(1) Share	(2) $Beta_N$	(3) $Beta_{SW}$	(4) $Beta_D$	(5) % of (2)-(3)/(2)	(6) % of (2)-(4)/(2)
1	0.2218	0.3071	0.4218	-38.4581	-90.1713
2	-0.2242	-0.2574	-0.3304	14.8082	47.3684
3	0.6483	0.7143	0.5443	-10.1805	16.0420
4	0.3392	0.5548	0.5503	-63.5613	-62.2347
5	1.3500	1.2849	1.2466	4.8222	7.6593
6	-0.0612	-0.0426	0.0094	-30.3922	-115.3595
7	0.8205	1.0283	1.2027	-25.3260	-46.5814
8	0.0244	0.0325	0.0280	-33.1967	-14.7541
9	0.3188	0.6708	1.7028	-110.4141	-434.1280
10	0.4286	0.5792	1.0834	-35.1377	-152.7765
11	0.1176	0.2633	1.0369	-123.8946	-781.7177
12	0.7488	0.7736	0.8460	-3.3120	-12.9808
13	0.7948	0.9120	0.9224	-14.7458	-16.0544
14	0.0234	0.01865	0.0054	20.9402	76.9231
15	0.9257	1.1592	1.2730	-25.2242	-37.5176
16	0.7377	0.8169	0.9992	-10.7361	-35.4480

17	-0.0180	0.0583	-0.0587	-424.7911	227.0195
18	-0.0426	-0.0194	-0.0114	-54.4601	-73.2394
19	0.3592	0.4122	0.5073	-14.7550	-41.2305
20	-0.0369	-0.0283	-0.0499	-23.3062	35.2304
21	0.6656	0.6832	0.3816	-2.6442	42.6683
22	-0.0029	-0.0048	-0.0063	65.5172	117.2414
23	-0.0026	0.0528	0.2567	-2130.7692	-9973.0769
24	0.9175	1.2928	1.2198	-40.9046	-32.9482
25	0.7160	0.4812	0.5192	32.7933	27.4860
26	-0.0358	-0.0994	-0.0961	177.6536	168.4358
27	1.6561	1.7927	1.2569	-8.2483	24.1048
28	0.0602	0.0573	0.0551	4.8173	8.4718
29	0.1748	0.3100	0.4598	-77.3455	-163.0435
30	0.2079	0.2378	0.2866	-14.3819	-37.8547
31	1.7925	1.9583	1.3018	-9.2497	27.3752
32	0.1041	0.1264	0.1672	-21.4217	-60.6148
33	0.4063	0.5167	0.5969	-27.1720	-46.9111
34	-0.0332	-0.0468	-0.0192	40.9639	-42.1687
35	0.5235	0.4841	0.6225	7.5263	-18.9112
36	1.7870	1.8547	1.6349	-3.7885	8.5115
37	-0.0644	-0.0910	-0.1026	41.3043	59.3168
38	0.6637	0.7385	1.4385	-11.2702	-116.7395
39	1.3328	1.3796	1.5389	-3.5114	-15.4637
40	1.5769	1.5894	1.5056	-0.7927	4.5215
41	1.5283	1.7576	1.3828	-15.0036	9.5204
42	0.6729	1.0108	0.7739	-50.2155	-15.0097

Table 5 reports normal beta, Scholes-Williams beta and Dimson beta for the sample of 42 shares for the three-year period 1992-94. The percentage difference between normal beta and Scholes-Williams beta and normal beta and Dimson beta are reported in columns 5 and 6 respectively.

As the fifth column of table 5 reports, the percentage difference between normal beta and Scholes-Williams beta is negative for an overwhelming majority of 76.19 percent of the sample companies in our study. These differences range from -0.79 percent to –2130.77 percent. On the other hand, the percentage difference between normal beta and Dimson beta is negative, as reported in the sixth column of table 5, for 59.52 percent of the companies in the sample. These differences range from –12.98 percent to –9973.08 percent. In summary, these results indicate that when the market risk is analysed at individual company level, it is clearly evident that the CSE is thinly traded

and therefore, normal beta is unable to represent the accurate level of the market risk faced by the companies traded on the market.

Conclusion

In this study we investigated whether the Colombo Stock Exchange suffers from infrequent trading using a number of series of data and employing a battery of statistical techniques. The analyses carried out at the aggregate market level revealed that the CSE does not seem to suffer from a severe thin trading problem when its return characteristics were compared with frequently traded markets such as the USA, the UK and Japan. However, the analyses undertaken at the sectoral level indicated some patterns in persistence of share returns. These sectoral evidences contradicted with the results of the analyses performed at the overall market level indicating an existence of a thin trading problem at the sectoral level. This problem was more prevalent at the individual company level where the results indicated that the normal beta measures substantially underestimated the market risk faced by companies compared with Scholes-Williams betas and Dimson betas which are adjusted for thin trading. This thin trading problem can be due to several reasons such as rumor driven share prices, leakage of company specific information before its official release, non active participation in share market activities by majority shareholders, illiquidity of the market, high return offered by other avenues of investment such as bank deposits, the dominance of the market by foreign investors, less developed security analyst service and non existence of a widespread share ownership.

This situation hinders the economic development of the country since it adversely affects the financial development as well as the existence of a well-developed capital market which are crucially important for the accumulation of funds (both domestic and overseas) and channeling of them among investment opportunities. Further, this thin trading problem has implications for security analysts and investors who use the beta coefficient as a measure of market risk and for finance researchers who use it in their studies (eg. event studies).

However, the results of this study should be interpreted with caution, because the period for which the data were gathered had a bull market demonstrating upward swing in share price indices. But, it was followed by a bear market, which was not captured by the period of investigation of this study. Future research will benefit from examining the return characteristics of the market for both bull and bear runs.

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.

Briscoe, G., Samuels, J.M. and Smythe, D.J., (1969), "The Treatment of Risk in the Stock Market", *Journal of Finance.*

Colombo Stock Exchange Annual Report, 1991.

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

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

Dimson, E., (1979), "Risk measurement when Shares are Subject to Infrequent Trading," *Journal of Financial Economics,* Vol. 7, pp.197-226.

Dimson, E. and Marsh, P., (1979), "Ever Study Methodologies and the Size Effect: The Case of UK Press Recommendations," *Journal of Finance Economics,* Vol. 17, pp.113-142.

Drake, P.J., (1977), "Securities Markets in Less Developed Countries," *Journal of Development Studies.*

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

Fama, E.F., (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance,* Vol. 25, pp. 383-417.

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

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

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

Kendall, M.G., (1948), *The Advance Theory of Statistics,* Vol. 2, Second Edition, Griffin & Co., London.

Kendall, M.G., (1953), "The Analysis of Economic Time Series, Part I: Prices," *Journal of the Royal Statistical Society*, Vol. 96, pp. 11-25.

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

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.

Peterson, P.P., (1994), *Financial Management and Analysis*, First Edition, McGrow- Hill, New York.

Praetz, P.D., (1969), "Australian Share Prices and the Random Walk Hypothesis," *Australian Journal of Statistics*, Vol. 11, pp.123-139.

Russel, A.H., (1972), "The City University – F.T. Actuaries Data Bank of Daily Share Prices," in Szego and Shell eds., *Mathematical Methods in Investment and Finance*, North-Holland, pp. 638-654.

Samuels, J.M., Wilkes, F.M. and Brayshaw, R.E., (1990), *Management of Company Finance*, Fifth Edition, Chapman and Hall, London.

Scholes, M. and Williams, J., (1977), "Estimating Betas from Nonsynchronous Data," *Journal of Financial Economics*, Vol. 5, pp. 309-327.

Sharpe, W.F., (1966), "Mutual Fund Performance, *Journal of Business*.

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

Strong, N., (1992), "Modeling Abnormal Returns: A Review Article," Journal of Business Finance *and Accounting*, Vol. 49, pp.533-553.