An Examination of the Cross-Sectional Relationship between Beta and Return : Evidence from the Colombo Stock Market

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Abstract

We examine whether there is a risk-return relation on the common stocks of the Colombo Stock Exchange (CSE) in Sri Lanka, using cross-sectional regression with a modified version of the three-step method of Fama and MacBeth (1973) that is a two-step method developed by Kunimura (2008). The theoretical basis of the study is the two-parameter portfolio model. Our findings show that there was no significant risk, return relationship on the CSE for the total sample period from 1996 to 2006.

The goodness of fit measure R^2 for the entire sample period was approximately 0.082, showing weak fitness in the empirical findings. In general, our findings can be taken as evidence that the beta coefficient alone is not a powerful variable to explain the portfolio return but that it will meet with some success when applied to a modified approach such as a conditional risk-return assessment in the CSE.

Keywords : portfolio beta, portfolio return, CSE

I Introduction

In finance, the Capital Asset Pricing Model (CAPM) is utilized to determine a theoretically appropriate required rate of return of an asset. This model was introduced by Jack Treynor (1962), William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966) independently, building on the earlier study of Harry Markowitz (1959) on diversification and modern portfolio theory. The concept of diversification is one of the main tools of modern portfolio theory. The CAPM takes into account the asset's sensitivity to non-diversifiable risk. This is also known as systematic risk or market risk and is often represented by the beta (β). According to the CAPM, beta is the only relevant measure of a stock's risk. It measures a stock's relative volatility, that is, it shows how much the price of a particular asset goes up and down compared with how much the stock market as a whole goes up and down. Seen another way, it represents the variability related to

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common stock returns by general movements in the market.

The CAPM decomposes a portfolio's risk into systematic and specific risk or unsystematic risk. Systematic risk is the risk of holding the market portfolio. As the market moves, each individual asset is more or less affected. Interest rates, recessions and wars are examples of systematic risk. During economic recessions, such as what occurred at the end of 2008, the market declines sharply and individual firms follow suit. Specific risk, in contrast, is unique to an individual asset. It represents the component of an asset's return that is uncorrelated with general market movements. According to the CAPM, the marketplace compensates investors for taking systematic risk but not for taking specific risk or un-diversifiable risk. This is because specific risk can be eliminated through the diversification of investment.

The theory of asset pricing is used to analyze the relationship between risk and rates of return in securities. The return of an asset or security is the risk-free return plus a risk premium based on the excess of the return on the market over the risk-free rate multiplied by the asset's systematic risk (which cannot be eliminated by diversification). The model is given as follows:

$$E(R_i)=R_f+\beta_i(E(R_m)-R_f) \qquad (1)$$

where $E(R_i)$ is the expected return on the capital asset, R_f is the risk-free rate of interest, β_i (the beta coefficient) is the sensitivity of the asset returns to market returns, $E(R_m)$ is the expected return of the market, and $E(R_m)-R_f$ is sometimes known as the market premium or risk premium. The formula for beta calculation is;

$$\beta_i=\frac{Cov(R_i, R_m)}{\sigma^2(R_m)} \qquad (2)$$

where $\mathrm{cov}(R_i, R_m)$ is the covariance between the return of firm i and the market return, and $\sigma^2(R_m)$ is the variance of the market return.

The general idea behind CAPM is that investors need to be compensated in two ways: for the time value of money invested and for the risk incurred. The time value of money is measured by R_f in the formula and compensates investors for keeping money in any investment over a period of time. The other half of the formula indicates the risk and estimates the amount of compensation the investor hopes for taking on additional risk. This is measured by taking a beta times the market premium or risk premium. Equation (1) indicates that investors require higher levels of expected returns to compensate them for higher expected risk.

Our main objective in this paper is to examine whether there is a relationship between risk and return in the Sri Lankan stock market by using a long sample period with a modified version of the test procedure of Fama and MacBeth (1973). While there have been earlier studies such as that by Samarakoon (1997) on the risk and return relationship in Sri Lanka, the current research is different in three important ways. First, previous research used relatively shorter time periods. In contrast, in this study we examined the long time period from 1994 to 2006, the ending year for which stock prices were available at the time of the research. Second, in this research we used all the listed firms in the Colombo Stock Exchange (CSE). The authors of prior work did not utilize banking, insurance, finance and investment firms for their research. Third, in the current paper capital changes and dividends are properly adjusted and beta is calculated methodologically. Thus, we contribute a new approach in the present study by examining the relationship between beta and return using a long-time series of returns data.

Following this introductory section I, the rest of the paper is organized as follows: An overview of related literature is presented in section II. Section III describes the data, the methodology and the model used to carry out the empirical tests. Section IV is devoted to providing insight into how the two-parameter portfolio model is able to capture the relation between risk and return on the CSE. This paper concludes in Section V with a summary of the empirical findings.

Ⅱ Review of the Literature

Does the relationship between risk and return hold positive? The existing literature examines this issue by looking at the Sharpe (1964)- Lintner (1965)- Black (1972) (SLB) versions, henceforth referred to as the SLB model of the risk-return relationship. This model has been widely used in applications such as determining the cost of capital estimation for firms and evaluating portfolio performance.

In 1973, Fama and MacBeth tested the relationship between average return and risk in the New York Stock Exchange (NYSE) for common stocks. They adopted a three-step procedure to test the SLB model. In the first step, portfolios were formed based on the estimated beta for individual firms. The second step recomputed the individual security beta and averaged across the securities within the portfolio to get the portfolio beta. In the final step, using data from another subsequent time period, portfolio returns were regressed on portfolio betas. They tested three testable implications: (1) the relationship between the expected return on a stock and its beta in any portfolio is linear; (2) the beta of an individual stock is a complete measure of the risk of that stock in the efficient portfolio; and (3) higher risk should be expected with higher return. They concluded that there was a positive flat relationship between return and risk, with respect to portfolios. They were unable to reject the hypothesis of linearity between security portfolio risk and its expected return, as indicated by the two-parameter model. Simultaneously, they tested the additional risk that is not measured by beta and found that no measure of risk, in addition to portfolio risk, systematically affects average returns.

Following Fama and MacBeth (1973), a considerable number of researchers tested the empirical relationship between risk and return. Reinganum (1981) used daily returns as well as monthly returns and tested the risk-returns tradeoff in the NYSE. He found no systematic relationship between estimated beta and average return across securities in daily stock returns. His study also revealed that the SLB model did not have enough power to explain the risk-return tradeoff. He determined that the low betas portfolios earned higher daily returns than those of the high beta portfolios during the period 1964-1979. In monthly return analysis, he identified a positive risk return relationship. The high beta portfolios earned average higher returns than did the low beta portfolios. Reinganum's (1981) work had two weak points, however. Though it revealed a positive tradeoff, this tradeoff was not consistent with the sub periods. The other point was that the mean difference in returns across portfolios was not significant.

In addition to evidence that the CAPM does not seem to support the cross-sectional variation of returns, researchers have discovered several other fundamental variables that are related to returns. The most important finding was the size effect of Banz (1981), which is that common stocks of small firms have higher risk-adjusted returns than those of large firms. Banz (1981) used return and risk data during the period 1936-1975 in the NYSE for common stocks. Schwert (1983) found a weak relationship between risk and return tradeoff.

Tinic and West (1984) observed that the SLB model was less valid in the empirical analysis. They found a positive relationship between portfolio risk and returns in monthly data when they included return data for the entire year. Further, they noted that during several months of the year, a negative risk-returns relationship existed. These results led them to prove that the SLB model is not consistent across the months of the year, which called into question the validity of the two-parameter model of testing the CAPM. They also expressed serious doubt about the validity of the SLB model in the cross-section regression. In related work, Lakonishok and Shapiro (1984), LS (1986) found an insignificant relationship between beta and return. They extended their analysis to market capitalization (firm size) and found a significant relationship between returns and market capitalization.

Fama and French (1992) examined the relation between monthly returns and beta using data for 1963-1990 in the NYSE. The results do not support the SLB model and show an insignificant relationship between risk and return. In contrast, the ratio of book value to market value is significantly positively related with the average returns of portfolios. A possible deathblow to CAPM is the 1992 study by Fama and French, in which they conclude that when size and the market to book value are included in the model, beta becomes insignificant. The usefulness of beta as the measure of market risk is, however, questionable. Most researchers have found that common stock returns are affected by specific risk or unsystematic risk (e.g., Lakonishok and Shapiro (1986)).

CAPM is widely used to determine the relationship between risk and return in several Asian markets. Hawawini (1991) studied the relationship between the average return and the risk for common stocks in the Tokyo Stock Exchange, employing a similar methodology to that found in Fama and MacBeth (1973). He found no evidence of a significant relationship between risk and return in the sample period of his study. He did find a significant monthly seasonal pattern among the average returns and risk. When the year is divided into two parts, January and the rest of the months of the year, the results show two pictures. First, in January there is a significant positive relationship between average portfolio return and risk, but during the rest of the year there is a significant negative relationship between the variables. Wong and Tan (1991) examined the risk return relationship for the Singapore stock market for the period 1980–1985, using weekly data for empirical analysis. They found a negative relationship between risk and return for both single stocks and portfolios.

Samarakoon (1997) investigated the relationship between beta, size, book-to-market equity (BE/ME), leverage and earnings-price ratio (E/P) with respect to average stock returns in Sri Lanka. The research involved 75 companies for the period 1990–1996. This sample did not include banking, insurance, finance and investment firms in the CSE. Since the sample was very small, Samarakoon (1997) did not use a portfolio approach to analyze the data. As a result, all the variables were measured on an individual asset basis. In the findings, he revealed that average stock returns and beta were negatively related. While the E/P ratio showed a significant positive relationship with average stock returns. The other three variables were not related to average returns in the CSE. Huang (1997) analyzed the risk-return relationship in the Taiwan stock market for the period 1971–1993 and determined that the relation between risk and return was negative.

Garza-Gomez et al. (1998) examined the relationship among market value of equity, return and cash flow risk in the Japanese stock market and found that firms with similar cash flows and high-risk cash flows had lower market value and higher expected returns. On the other hand, they revealed a positive relationship between physical size and expected returns that contradicted the Banz (1981) findings.

Hodoshima et al. (2000) analyzed the relationship between returns and beta using cross-sectional data for the period 1956–1995 in the Japanese stock market. They employed a three-step procedure to estimate the portfolio betas. In the first step, they estimated beta for each individual security by using 2 years of data. Based on the obtained results, they constructed 20 portfolios by ranking the individual beta from largest to smallest. In the second step, they recomputed beta for each portfolio by using the next 2 years of data. Finally, they used another 2 years of data and obtained the portfolio return by averaging the returns of the securities belonging to each portfolio. They showed a flat relationship between average return and average beta in the 20 portfolios. Fletcher (2000) examined the relationship between risk and return in monthly international stock returns from January 1970 to July 1998 in 18 developed markets. Similar to early studies, he found a flat relationship between risk and return in international stock returns during the sample period.

In summary, the authors of several studies emphasized that there is a flat relationship between risk and return in Asian stock markets.

Ⅲ Data, Methodology and Models

The data on monthly closing prices of common stocks and capital changes were extracted from a tape compiled by the CSE from February 1994 to December 2006. Monthly returns for common stocks listed on the CSE were calculated using an adjustment formula (Sriyalatha (2008)). The number of firms in the sample varies from a minimum of 201 to a maximum of 237, depending on the delisting of firms and new listing of firms on the CSE.

The methodology used to test the risk-return relationship allowed us to examine the relationship as a predictive model of portfolio returns. Under the predictive model, one must use the beta coefficient over a given period of time and return of portfolios realized during a subsequent time period for the analysis.

We applied the market model (3) to estimate the beta coefficients for individual stocks (Sriyalatha (2008)). We used two proxies of the market return, a value weighted index (VWI) called the All Share Price Index (ASPI) and an artificial index called the Equally Weighted Index (EWI). We tested the validity of these two indices and finally concluded that the ASPI was better than the EWI for measuring market return in the CSE. Therefore, we used the VWI as a proxy for the market return in the CSE. The model used to estimate the beta was as follows:

$$R_{i,t}=\beta_{0,i}+\beta_{1,i}R_{m,t}+\varepsilon_{i,t} \qquad i=1, 2, \cdots, n \tag{3}$$

In the model, $R_{i,t}$ and $R_{m,t}$ denote the monthly return of the i^{th} security in time t and market return of time t, respectively. β_0 and β_1 denote the intercept and slope coefficient of the regression line, respectively. ε_{it} is the error term of the i^{th} security at time t.

We constructed the portfolio return and betas for the market model using a modified version of the three-step method of Fama and MacBeth (1973) that is a two-step method developed by Kunimura (2008).

The two-step approach has provided insights into the non-stationary nature of beta between the portfolio formation period and the testing period. However, the two-step version of this procedure also has some drawbacks, such as extreme data of the largest portfolio and smallest portfolio beta. Fama and MacBeth (1973) assumed that the formation of a portfolio on the basis of ranked individual beta caused the bunching of positive and negative sampling errors within the portfolios. Finally, they hoped that a large portfolio beta would tend to overstate the true beta portfolio and a low beta portfolio would tend to be an underestimate. They expected that the regression phenomenon could be avoided to a large extent by forming portfolios. This was a main drawback of this approach, and we therefore used a modified two-step procedure to examine the risk and return relationship.

In the two-step approach to testing the risk and return relationship, the first step is the beta estimation and portfolio formation period and the second step is the testing period. In the first step, we estimated beta for individual stocks, using two years of monthly returns data (Sriyalatha (2008)). The first beta was estimated by using market returns and individual stock returns from February 1994 to January 1996. The second beta was estimated from March 1994 to February 1996. Dropping one month of data and adding a new one, we repeated the entire procedure until we reached the last year of data, December 2006. Next, we observed the beta (β_1) and its t-statistics value $\{t(\beta_1)\}$ and p-value of beta (β_1). We understood that in some cases the probability value was very high and the t value of beta $\{t(\beta_1)\}$ was very low. This sign provides insight into the weak relationship between risk and return or indicates that beta has no power to explain the return. Therefore, we decided to delete any beta value above the 10% probability level. We then ranked the stocks on the basis of the estimated betas and assigned each stock to one of ten portfolios. Portfolio 1 contained stocks with the highest betas, the next highest were in portfolio 2, and so on, with portfolio 10 containing stocks with the lowest betas. We calculated portfolio risk by taking the arithmetic mean of the risk of the individual securities that made up the portfolio. The portfolio return was obtained by averaging the next month returns of the individual stocks belonging to each portfolio.

For the sample period, the number of securities within each portfolio varied from year to year. For 1996 to 2000, the number of securities within each portfolio was 10 to 12, and for the later years the number ranged from 12 to 17, on average. By examining the average value of the portfolio return and beta over the specific months of the year or over the specific years of the entire period, or over the entire period, we were able to test the relationship between risk and return on the CSE as the second step of the risk-return analysis. The formation of portfolios has several advantages. Although the estimated individual security betas have big measurement errors, the estimated betas for portfolios will tend to have smaller measurement errors. The use of portfolios gives an easy way of adjusting for delisting firms. The model used to estimate the portfolio return and beta is a two-parameter portfolio model, and it is described as follows:

$$R_{p,t}=\gamma_0+\gamma_{1t}\beta_{p,t-1}+\mu_{p,t} \qquad P=1,\cdots,N\,;\ t=1,\cdots,T \tag{4}$$

where γ_0, γ_1, β_p and R_p, denote the constant term, systematic risk premium, the beta coefficient of portfolio p and the monthly return on the portfolio p, respectively. μ_p denotes an error term of the portfolio at time t. N and T are the number of portfolios and observations, respectively. Equation (4) exhibits the relationship between portfolio risk and return. In a market of risk-averse investors, expect higher return for higher risk. This leads to the positive relationship between risk and return in the market.

The approach and results of the empirical test are explained in more detail in section IV.

Ⅳ　Results

The major tests of the implications of the market model are presented in this section. The results are reported for three periods: the overall period 1996-2006, and two sub-periods, 1996-2000 and 2001-2006. The choice of sub-periods reflects the desire to keep separate the pre-and post-new century. Empirical results are presented for two different versions of the risk-return regression computation of Equation (4): the first version is based on a monthly analysis of the risk and return relationship, and the second version is computed on an annual basis. This section starts by reporting the results of the risk and return empirical test results by monthly analysis.

A. Average beta vs. average realized return

Starting with the February 1996 to December 2006 sample period, there are 131 months in which to examine the risk and return relationship in the CSE. First, the estimated portfolio beta ($\hat{\beta}_{p,t-1}$) and portfolio return ($\hat{R}_{p,t}$) are regressed to test the risk return relationship in each month. The total monthly results are summarized in Table 1. Columns 1 to 4 show the month and year, market return of the VWI (R_m), value of the average portfolio beta ($\bar{\hat{\beta}}_{p,t-1}$) and average portfolio return ($\bar{\hat{R}}_{p,t}$) for the testing period, respectively. The average portfolio beta ($\bar{\hat{\beta}}_{p,t-1}$) is obtained by averaging 10 portfolios betas in each month, and the average portfolio return ($\bar{\hat{R}}_{p,t}$) is calculated by taking the arithmetic mean of returns of the individual firms belonging to each portfolio in each month. Also shown are the value of the slope coefficient ($\hat{\gamma}_{1t}$) and the T value of the slope coefficient ($t(\hat{\gamma}_1)$) from Equation (4).

Table 2 shows the months with a significant relationship between risk and return in regression analysis (computed using Equation (4)). Columns 2 to 8 show the month and year with a significant relationship between risk and return, market return of VWI (R_m), estimated average portfolio beta ($\bar{\hat{\beta}}_{p,t-1}$), average portfolio return ($\bar{\hat{R}}_{p,t}$), estimated slope coefficient ($\hat{\gamma}_{1t}$), T value of the slope coefficient ($t(\hat{\gamma}_1)$) in Equation (4) and the total number of months that show the significant relationship between risk and return in each year, respectively. The total sample period was 131 months, from which these 47 significant months were determined. Table 2 shows that if the P value of the slope coefficient ($\hat{\gamma}_{1t}$) is less than 0.05, the relation between risk and return is significant. The slopes $\hat{\gamma}_{1t}$ on the beta of portfolio and return of portfolio in Table 2 are always close to or more than 2 standard errors from 0.

Another important finding depicted in Table 2 is that the relation between risk and return is positive when the market return is positive. When the market return is negative, portfolio return and beta are inversely related. Recognizing this relationship motivated us to analyze the conditional risk-return relationship. Three months we analyzed showed mixed results. There are 24 negative significant months and 20 positive significant months during the sample period, while

Table 1 Relationship between risk and return in the monthly analysis

Month/Year	R_m	$\bar{\hat{\beta}}_{p,t-1}$	$\bar{\hat{R}}_{p,t}$	$\hat{\gamma}_{1t}$	$t(\hat{\gamma}_1)$	Month/Year	R_m	$\bar{\hat{\beta}}_{p,t-1}$	$\bar{\hat{R}}_{p,t}$	$\hat{\gamma}_{1t}$	$t(\hat{\gamma}_1)$
						Jan. 1997	0.030	0.891	0.021	0.010	0.621
Feb. 1996	0.007	1.047	−0.029	0.010	0.692	Feb. 1997	−0.002	0.893	0.002	0.000	−0.001
Mar. 1996	0.009	0.777	0.005	0.027	0.877	Mar. 1997	0.027	0.948	0.014	0.014	0.572
April 1996	−0.040	0.849	−0.019	−0.015	−0.972	April 1997	0.138	0.957	0.142	0.032	0.588
May 1996	−0.005	0.906	−0.007	0.026	2.030	May 1997	−0.010	1.043	−0.006	−0.038	−2.454
Jun. 1996	−0.089	0.898	−0.062	0.026	2.030	Jun. 1997	0.076	1.024	0.053	−0.024	−1.012
July 1996	−0.071	0.908	−0.063	−0.056	−3.007	July 1997	0.089	1.053	0.115	0.047	0.849
Aug. 1996	0.007	0.897	0.024	0.034	2.302	Aug. 1997	−0.067	1.074	−0.014	−0.055	−2.350
Sep. 1996	0.037	0.877	0.047	0.052	1.803	Sep. 1997	−0.045	1.065	−0.057	−0.013	−1.416
Oct. 1996	0.046	0.864	0.043	0.033	1.622	Oct. 1997	−0.071	0.998	−0.036	−0.037	−1.875
Nov. 1996	−0.003	0.864	−0.014	0.009	0.348	Nov. 1997	−0.085	1.046	−0.062	−0.024	−1.674
Dec. 1996	−0.006	0.868	0.001	−0.007	−0.422	Dec. 1997	0.044	1.026	0.037	0.022	0.699
Jan. 1998	−0.061	0.983	−0.059	−0.009	−0.442	Jan. 1999	−0.043	0.847	−0.003	−0.062	−2.245
Feb. 1998	0.047	0.960	0.039	0.023	1.808	Feb. 1999	−0.006	0.881	0.008	−0.060	−2.313
Mar. 1998	0.025	0.981	0.001	0.022	2.835	Mar. 1999	−0.065	0.878	−0.039	−0.088	−3.674
April 1998	0.088	0.989	0.051	0.037	2.005	April 1999	0.026	0.867	0.034	0.021	0.980
May 1998	−0.146	0.963	−0.087	0.034	0.852	May 1999	−0.003	0.907	−0.013	−0.046	−1.592
Jun. 1998	−0.175	0.966	−0.092	−0.070	−2.266	Jun. 1999	−0.056	0.896	−0.032	−0.038	−3.537
July 1998	0.026	0.861	0.046	0.045	1.677	July 1999	0.094	0.885	0.072	0.069	2.822
Aug. 1998	−0.202	0.866	−0.124	−0.111	−5.738	Aug. 1999	−0.017	0.844	0.010	−0.013	−0.507
Sep. 1998	0.006	0.819	0.022	0.027	0.959	Sep. 1999	0.013	0.844	0.033	0.029	0.510
Oct. 1998	0.000	0.820	0.003	−0.005	−0.121	Oct. 1999	−0.070	0.836	−0.041	−0.024	−1.214
Nov. 1998	0.133	0.825	0.150	0.063	1.614	Nov. 1999	0.042	0.807	0.039	0.012	0.431
Dec. 1998	0.037	0.871	0.038	−0.021	−0.453	Dec. 1999	0.031	0.806	0.046	0.011	0.634
Jan. 2000	−0.031	0.832	−0.026	0.007	0.419	Jan. 2001	−0.018	0.981	−0.027	−0.020	−1.992
Feb. 2000	−0.026	0.817	−0.006	−0.014	−0.743	Feb. 2001	0.007	0.981	0.009	0.005	0.306
Mar. 2000	−0.095	0.789	−0.066	−0.031	−3.616	Mar. 2001	−0.044	0.968	−0.021	−0.045	−3.264
April 2000	−0.038	0.798	−0.024	−0.041	−2.165	April 2001	−0.017	0.931	−0.021	−0.002	−0.171
May 2000	0.004	0.825	0.012	−0.011	−0.544	May 2001	0.010	0.931	0.026	0.001	0.133
Jun. 2000	0.068	0.820	0.076	0.043	1.558	Jun. 2001	0.017	0.872	0.049	0.033	2.637
July 2000	−0.006	0.928	−0.012	−0.040	−2.831	July 2001	−0.022	0.932	−0.013	−0.021	−0.932
Aug. 2000	−0.028	0.916	0.005	0.046	2.287	Aug. 2001	−0.028	0.984	−0.030	−0.002	−0.134
Sep. 2000	0.051	1.079	0.064	0.023	1.069	Sep. 2001	−0.009	0.988	0.004	−0.027	−1.873
Oct. 2000	−0.059	1.077	−0.048	−0.045	−3.314	Oct. 2001	0.202	0.972	0.228	0.171	3.771
Nov. 2000	−0.137	1.053	−0.084	−0.040	−2.835	Nov. 2001	0.059	1.072	0.177	0.000	−0.003
Dec. 2000	0.030	0.932	0.010	0.022	1.492	Dec. 2001	0.134	1.160	0.133	0.076	3.935
Jan. 2002	−0.105	1.110	−0.086	−0.034	−1.425	Jan. 2003	−0.027	1.233	−0.011	−0.012	−1.121
Feb. 2002	0.069	1.083	0.070	0.038	2.098	Feb. 2003	−0.060	1.212	−0.048	−0.032	−5.751

Mar. 2002	0.022	1.115	0.024	−0.015	−0.952	Mar. 2003	−0.013	1.199	−0.011	0.014	1.962
April 2002	−0.001	1.119	−0.005	−0.009	−0.791	April 2003	0.104	1.212	0.127	0.013	1.297
May 2002	0.099	1.125	0.066	0.001	0.065	May 2003	0.040	1.227	0.044	0.000	−0.019
Jun. 2002	0.038	1.068	0.056	0.021	1.334	Jun. 2003	0.181	1.210	0.166	−0.009	−0.432
July 2002	−0.016	1.092	−0.032	−0.014	−1.370	July 2003	−0.003	1.115	0.062	−0.073	−0.607
Aug. 2002	0.069	1.086	0.056	0.006	0.399	Aug. 2003	0.034	1.133	0.046	−0.019	−0.766
Sep. 2002	0.122	1.080	0.234	0.005	0.110	Sep. 2003	0.162	1.147	0.158	−0.024	−0.419
Oct. 2002	−0.044	1.127	−0.028	−0.002	−0.298	Oct. 2003	0.088	1.129	0.104	0.055	1.968
Nov. 2002	−0.022	1.129	−0.015	−0.040	−4.451	Nov. 2003	−0.174	1.125	−0.131	−0.055	−3.998
Dec. 2002	0.016	1.228	0.002	−0.016	−2.099	Dec. 2003	−0.136	1.013	−0.100	−0.045	−1.728
Jan. 2004	0.123	1.012	0.072	0.075	5.231	Jan. 2005	0.087	1.060	0.089	−0.015	−0.514
Feb. 2004	0.011	1.025	0.028	−0.053	−2.593	Feb. 2005	0.038	1.047	0.058	−0.054	−2.891
Mar. 2004	0.046	1.023	−0.001	0.016	0.793	Mar. 2005	0.021	1.054	0.089	−0.024	−0.633
April 2004	−0.059	1.014	−0.035	−0.073	−3.596	April 2005	0.042	1.056	0.093	−0.006	−0.169
May 2004	0.081	1.025	0.298	0.008	0.081	May 2005	0.055	1.057	0.051	0.017	0.676
Jun. 2004	0.029	1.097	0.090	0.023	0.521	Jun. 2005	−0.020	1.049	−0.035	−0.060	−2.175
July 2004	0.066	1.093	0.117	0.007	0.258	July 2005	0.073	1.189	0.067	0.036	1.291
Aug. 2004	−0.061	1.099	−0.051	−0.053	−4.306	Aug. 2005	0.046	1.177	0.039	0.016	0.996
Sep. 2004	0.055	1.118	0.112	0.081	2.195	Sep. 2005	0.119	1.188	0.121	−0.045	−1.979
Oct. 2004	0.054	1.047	0.067	0.024	1.105	Oct. 2005	0.033	1.114	0.053	0.029	1.214
Nov. 2004	−0.023	1.059	−0.045	−0.012	−0.407	Nov. 2005	−0.098	1.101	−0.117	−0.030	−1.804
Dec. 2004	0.005	1.054	−0.018	−0.055	−2.777	Dec. 2005	−0.193	1.241	−0.202	−0.026	−1.410
Jan. 2006	0.101	1.270	0.198	0.119	3.978	July 2006	0.037	1.315	0.062	0.042	2.617
Feb. 2006	0.033	1.366	0.067	−0.054	−2.704	Aug. 2006	0.002	1.282	0.010	−0.030	−2.282
Mar. 2006	0.023	1.362	0.071	0.022	1.100	Sep. 2006	0.077	1.296	0.114	0.045	2.269
April 2006	0.000	1.358	−0.021	0.020	1.189	Oct. 2006	0.029	1.284	0.045	−0.073	−1.245
May 2006	−0.027	1.367	−0.036	−0.020	−1.311	Nov. 2006	0.116	1.285	0.029	−0.015	−0.401
Jun. 2006	−0.042	1.328	−0.027	−0.005	−0.296	Dec. 2006	−0.020	1.183	−0.026	−0.012	−1.093

Source: Research data in 2008

A total of 131 months are included in the analysis. The equation used to examine the risk-return relationship is as follows:

$R_{p,t}=\gamma_0+\gamma_{1t}\beta_{p,t-1}+\mu_{p,t}$

February 1999, August 2000 and December 2004 showed results that varied widely from those of the other months. Altogether, there are 47 significant months, accounting for approximately 36% (Table 3, Panel B) of the total number of months. The results for the remaining 64% of the months showed that there is no relationship between risk and return in the CSE. It also proves that the beta does not have the power to explain the common stock return in the CSE. The maximum numbers of significant months, 6 were recorded in 2000 and 2004. The smallest number of significant months, 2, was recorded in 1997. As can be seen from Table 2, there is a tendency

Table 2 Relationship between risk and return in the analysis of significant months

Serial no.	Month/Year	R_m	$\bar{\hat{\beta}}_{p,t-1}$	$\bar{\hat{R}}_{p,t}$	$\hat{\gamma}_{1t}$	$t(\hat{\gamma}_1)$	Total no. of significant months in each year
1	May 1996	−0.005	0.906	−0.007	0.026	2.030	4
2	Jun. 1996	−0.089	0.898	−0.062	0.026	2.030	
3	July 1996	−0.071	0.908	−0.063	−0.056	−3.007	
4	Aug. 1996	0.007	0.897	0.024	0.034	2.302	
5	May 1997	−0.010	1.043	−0.006	−0.038	−2.454	2
6	Aug. 1997	−0.067	1.074	−0.014	−0.055	−2.350	
7	Mar. 1998	0.025	0.981	0.001	0.022	2.835	4
8	April 1998	0.088	0.989	0.051	0.037	2.005	
9	Jun. 1998	−0.175	0.966	−0.092	−0.070	−2.266	
10	Aug. 1998	−0.202	0.866	−0.124	−0.111	−5.738	
11	Jan. 1999	−0.043	0.847	−0.003	−0.062	−2.245	5
12	Feb. 1999	−0.006	0.881	0.008	−0.060	−2.313	
13	Mar. 1999	−0.065	0.878	−0.039	−0.088	−3.674	
14	Jun. 1999	−0.056	0.896	−0.032	−0.038	−3.537	
15	July 1999	0.094	0.885	0.072	0.069	2.822	
16	Mar. 2000	−0.095	0.789	−0.066	−0.031	−3.616	6
17	April 2000	−0.038	0.798	−0.024	−0.041	−2.165	
18	July 2000	−0.006	0.928	−0.012	−0.040	−2.831	
19	Aug. 2000	−0.028	0.916	0.005	0.046	2.287	
20	Oct. 2000	−0.059	1.077	−0.048	−0.045	−3.314	
21	Nov. 2000	−0.137	1.053	−0.084	−0.040	−2.835	
22	Jan. 2001	−0.018	0.981	−0.027	−0.020	−1.992	5
23	Mar. 2001	−0.044	0.968	−0.021	−0.045	−3.264	
24	Jun. 2001	0.017	0.872	0.049	0.033	2.637	
25	Oct. 2001	0.202	0.972	0.228	0.171	3.771	
26	Dec. 2001	0.134	1.160	0.133	0.076	3.935	
27	Feb. 2002	0.069	1.083	0.070	0.038	2.098	3
28	Nov. 2002	−0.022	1.129	−0.015	−0.040	−4.451	
29	Dec. 2002	0.016	1.228	0.002	−0.016	−2.099	
30	Feb. 2003	−0.060	1.212	−0.048	−0.032	−5.751	4
31	Mar. 2003	−0.013	1.199	−0.011	0.014	1.962	
32	Oct. 2003	0.088	1.129	0.104	0.055	1.968	
33	Nov. 2003	−0.174	1.125	−0.131	−0.055	−3.998	

34	Jan. 2004	0.123	1.012	0.072	0.075	5.231	6
35	Feb. 2004	0.011	1.025	0.028	−0.053	−2.593	
36	April 2004	−0.059	1.014	−0.035	−0.073	−3.596	
37	Aug. 2004	−0.061	1.099	−0.051	−0.053	−4.306	
38	Sep. 2004	0.055	1.118	0.112	0.081	2.195	
39	Dec. 2004	0.005	1.054	−0.018	−0.055	−2.777	
40	Feb. 2005	0.038	1.047	0.058	−0.054	−2.891	3
41	Jun. 2005	−0.020	1.049	−0.035	−0.060	−2.175	
42	Sep. 2005	0.119	1.188	0.121	−0.045	−1.979	
43	Jan. 2006	0.101	1.270	0.198	0.119	3.978	5
44	Feb. 2006	0.033	1.366	0.067	−0.054	−2.704	
45	July 2006	0.037	1.315	0.062	0.042	2.617	
46	Aug. 2006	0.002	1.282	0.010	−0.030	−2.282	
47	Sep. 2006	0.077	1.296	0.114	0.045	2.269	

Source : Research data in 2008

Significant at the 5% level in 47 months

In the analysis, the beta value is always positive, and in a few cases market return and portfolio return show an inverse relationship. When the portfolio return is negative, market return is positive for one case. On the other hand, when the portfolio return is positive, market return is negative for two months. Except for these three cases, the remaining 44 months followed the same direction with market return. Twenty months show a positive risk-return relationship, and 24 months indicate a negative risk-return relationship. The equation used to examine the risk-return relationship is as follows :

$$R_{p,t}=\gamma_0+\gamma_{1t}\beta_{p,t-1}+\mu_{p,t}$$

for the average portfolio beta to be increased in recent years. Therefore, very few months showed a significant relation between risk and return in portfolios in the developing markets. The developed markets in Asia, such as Japan, showed a significant relation between portfolio beta and return for all months of the sample periods (Hodoshima et al. (2000)).

Panel A of Table 3 presents the independent test results for significant months during the sample period. Test results provide evidence of the dependency of the average portfolio return ($\bar{\hat{R}}_{p,t}$) and market return (R_m) of the sample data. The value of χ^2 is equal to 35.76, and it is significant at the 1% level. Panel B provides the data of the significant months as a percentage of total months. The biggest percentage is shown in the negative significant months, accounting for 18% of the total number of months. In contrast, the number of positive significant months is 20, thus accounting for approximately 15% of the total number of months. Outside of the two main extreme cases, the mixed significant months represent 2%. The mixed results are composed of one negative portfolio return value with positive market return and two positive portfolio return values with negative market return. As can be seen in Table 3, the average portfolio return and

Table 3 Independent test results and summary data of monthly risk return relationship

Panel A			
Market Return (R_m)	$\bar{\hat{R}}_{p,t}$		
	Positive	**Negative**	Total
R_m-Positive	20	1	21
R_m-Negative	2	24	26
Total	22	25	47
χ^2	35.76		
Panel B			
Total number of months from 1996 to 2006	131		
	Number of Months	As a % of Total Months	
% of Significant Total Months	47/131	35.86[1]	
% of Significant Positive Months	20/131	15.27	
% of Significant Negative Months	24/131	18.32	
% of Significant Mixed Months	3/131	2.29	

Source: Research data in 2008

[1] Forty-seven months (47) out of 131 months show a significant relationship between average portfolio monthly beta and returns.

market return have a close relationship. The table also reveals that a conditional risk-return relationship provides more meaningful results than does an unconditional risk-return relationship.

It is interesting to note that the monthly-basis risk-return test results provide some insights into the relationship between risk and returns with the market return.

To provide perspective on the risk and returns of the CSE in the annual-basis test, Table 4 shows the mean and standard deviation of the portfolio return and beta from 1996 to 2006. In the portfolio formation period, every stock is ranked based on estimated beta and is divided into 10 portfolios. Portfolio 1 consists of the stocks with the highest beta, while portfolio 10 has the stocks with the lowest beta. Table 4 indicates the time series average and standard deviation of portfolio betas and portfolio returns. The highest average portfolio return of 0.030 is reported by portfolio 7 for the whole period from 1996 to 2006. Portfolio 7 is accompanied by the highest levels of risk as measured by standard deviation. It is the largest number in comparison to standard deviations of returns of other portfolios in the sample period. The minimum average return is indicated by portfolio 1, and the minimum standard deviation of return is shown by portfolio 6; the values are 0.015 and 0.018, respectively. There is a quite a wide dispersion in the average returns of the portfolios, ranging from 0.015 to 0.030. The average return of the high beta portfolio is about 0.015, whereas the average return of the low beta portfolio is 0.018.

Table 4 Summary statistics of the portfolio average returns and betas (February 1996–December 2006)

Return	Portfolio									
Average	1	2	3	4	5	6	7	8	9	10
1996–2006	0.015	0.023	0.017	0.019	0.028	0.021	0.030	0.020	0.023	0.018
1996–2000	−0.010	0.003	0.002	0.005	0.010	0.005	0.004	0.001	0.007	−0.004
2001–2006	0.035	0.041	0.031	0.030	0.042	0.034	0.053	0.036	0.036	0.036
Standard Deviation										
1996–2006	0.032	0.026	0.022	0.020	0.022	0.018	0.034	0.024	0.023	0.027
1996–2000	0.010	0.008	0.020	0.015	0.017	0.010	0.018	0.016	0.020	0.012
2001–2006	0.029	0.023	0.013	0.015	0.013	0.012	0.026	0.018	0.017	0.021
Beta										
Average										
1996–2006	2.171	1.554	1.338	1.168	1.035	0.916	0.798	0.681	0.537	0.069
1996–2000	1.812	1.390	1.215	1.078	0.963	0.855	0.744	0.633	0.488	−0.057
2001–2006	2.471	1.690	1.441	1.242	1.095	0.967	0.843	0.721	0.577	0.174
Standard Deviation										
1996–2006	0.376	0.196	0.146	0.121	0.113	0.109	0.107	0.104	0.113	0.248
1996–2000	0.166	0.086	0.065	0.058	0.059	0.056	0.054	0.049	0.049	0.076
2001–2006	0.155	0.148	0.105	0.110	0.116	0.120	0.124	0.124	0.140	0.298

Source: Research data in 2008

The sub-sample period showed the same changing pattern of average portfolio returns. The results do not show a strong relationship between average portfolio return and beta within the sample period. Figure 1 is a scatter diagram obtained from the average portfolio return, and the average portfolio beta in 10 portfolios in the total sample period is indicated at Table 4. The figure shows that there is no relationship between beta and realized returns for the full sample period. The value of R^2 in the cross-sectional regressions is 0.082. The obtained slope coefficient is not significant at any significant level. This result is inconsistent with the SLB model as well as with the findings of Samarakoon (1997). In summary, these findings show that the relationship between risk and cross-sectional returns does not vary across the sub-periods or the entire sample period.

The results shown in Table 5 for every year are consistent with the full sample period. For the overall sample period, the slope coefficient ($\hat{\gamma}_{1t}$) takes a negative value, and it is not significant at

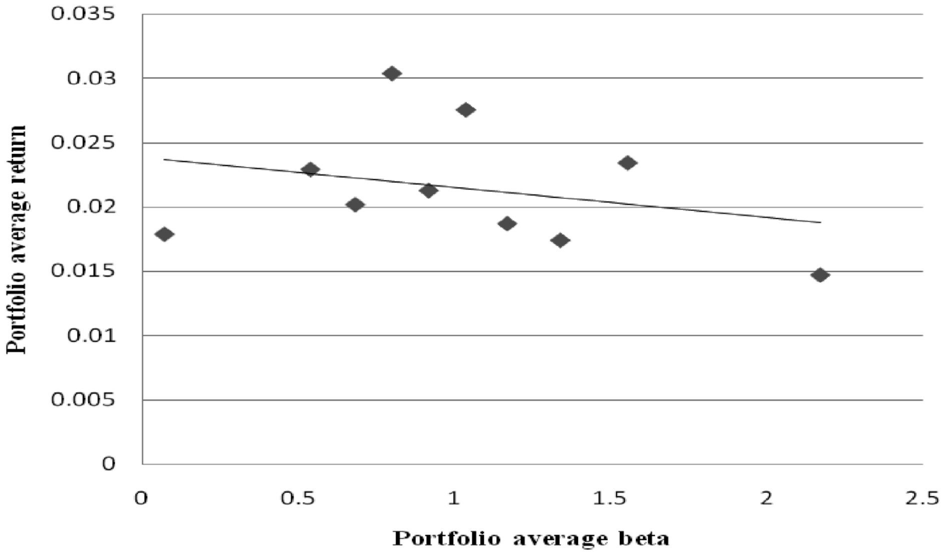

Figure 1 Relationship between risk and return for the entire sample period
Source: Research data in 2008

Table 5 Cross-sectional regression results of the risk-return relationship test

Period	R^2	$\hat{\gamma}_{1t}$ Positive	$\hat{\gamma}_{1t}$ Negative	$t(\hat{\gamma}_1)$	P-value
Overall	0.082		−0.002	−0.843	0.424
1996-2000	0.059		−0.003	−0.710	0.498
2001-2006	0.022		−0.002	−0.421	0.685
1996	0.157	0.008		1.220	0.257
1997	0.080		−0.007	−0.832	0.430
1998	0.059	0.006		0.708	0.499
1999	0.224		−0.014	−1.521	0.167
2000	0.246		−0.006	−1.615	0.145
2001	**0.467**	**0.016****		**2.650**	**0.029**
2002	0.165		−0.005	−1.259	0.244
2003	0.117		−0.014	−1.032	0.332
2004	0.000	0.000		0.011	0.991
2005	0.205		−0.012	−1.434	0.189
2006	0.061	0.005		0.721	0.491

Source: Research data in 2008
** Significant at the 5% level

any level of significance. Two sub-sample periods follow the same direction and show negative slopes. The overall period slope coefficient ($\hat{\gamma}_{1t}$) is approximately −0.002, while those for the sub-periods are approximately −0.003 and −0.002, respectively. The T value for the slope coefficient $t(\hat{\gamma}_1)$ for the full sample period is −0.843, and those for the sub-sample are −0.710 and −0.421, respectively. In fact, six years show a negative slope coefficient and five years show a positive slope coefficient in the regression computation (Equation (4)). These slope coefficients ($\hat{\gamma}_{1t}$) are always insignificant, except in 2001. The R^2 values are ranged from 0.00 to 0.47. Figure 2 exhibits a significant positive relationship between risk and return in 2001. This is the only one interesting result during the sample period. The obtained value of the R^2 is 0.47, which indicates that changes in portfolio beta explain 47% of the variation in average portfolio returns. The estimated slope coefficient shows the positive value of 0.016 and reflects a positive relationship between risk and return in 2001. This is significant at the 5% level. In 2001 the key macroeconomic variables showed no exceptional trend. The economic growth rate of the country was −1.5% (gross domestic product (GDP) growth rate) in 2001, and there was a decreasing trend in the interest rates.

Overall, these results show that there is no relationship between risk and return. The two parameter portfolio model indicates that there is a positive relation between risk and return. Risk-averse investors expect higher return for higher risk. In the case of the CSE, Figure 1 shows low return for high beta portfolios. Determining the risk of a security does not give a complete measure of the risk, and there should be other measures of the risk of securities in the CSE. The next step, therefore, involves testing factors other than beta that can affect the security, such as size and book to market equity ratio. Simultaneously, we hope to analyze the conditional risk and return relationship.

Table 6 indicates the trend of betas of 10 portfolios during the sample period 1996–2006. The

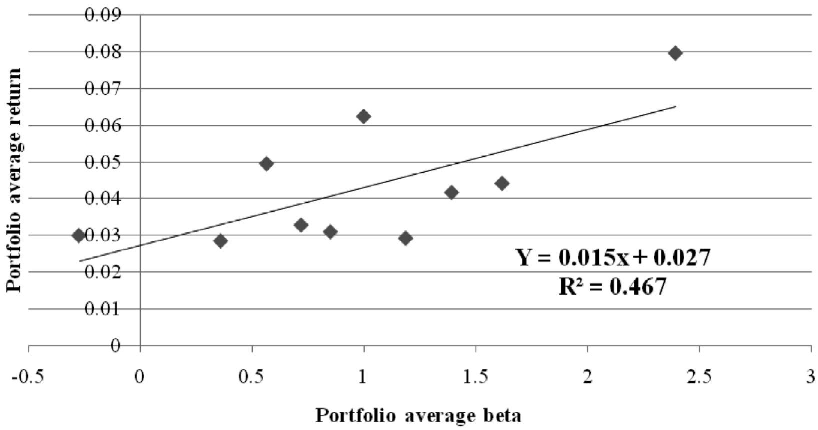

Figure 2　Relationship between risk and return in 2001
Source: Research data in 2008

results for the entire sample and the two sub-periods are presented in this table. The portfolio betas for the three periods are different from each other. The largest fluctuation of beta coefficients is in the 1996-2000 period, which ranged from 1.812 to −0.057. The average value of betas of the entire sample period and first sub-period lie some-where between the beta of portfolios 5 and 6. These are the middle two portfolios of the 10 portfolios. In the second sub-period, the mean value of portfolio beta can be seen between portfolios 4 (1.242) and 5 (1.095). Collectively, these results indicate that the portfolio betas do not show any irregular trend during the sample period.

The R^2 is a statistic that will give some information about the goodness of fit of a model. The R^2 of 1.0 indicates that the regression line perfectly fits the data. The goodness of fit measures obtained by the R^2 in the cross-sectional regression Equation (4) of the risk-return relationships are shown in Table 7. The values of R^2 show that the goodness of fit is very weak in several cases,

Table 6 Portfolio betas for the period 1996-2006

Portfolio	1996-2006 Beta	1996-2000 Beta	2001-2006 Beta
1	2.171	1.812	2.471
2	1.554	1.390	1.690
3	1.338	1.215	1.441
4	1.168	1.078	1.242
5	1.035	0.963	1.095
6	0.916	0.855	0.967
7	0.798	0.744	0.843
8	0.681	0.633	0.721
9	0.537	0.488	0.577
10	0.069	−0.057	0.174
Mean	**1.027**	**0.912**	**1.122**

Source: Research data in 2008

Table 7 R^2 values of cross-sectional Equation (4)

Sample period	R^2	Sample period	R^2
1996-2006	0.082	2000	0.246
1996-2000	0.059	2001	0.467
2001-2006	0.022	2002	0.165
1996	0.157	2003	0.117
1997	0.08	2004	0.000
1998	0.059	2005	0.205
1999	0.224	2006	0.061

Source: Research data in 2008

such as in 1997, 1998, 2004 and 2006. The obtained value of the R^2 indicates that changes in portfolio beta explain only a very small part of the variation in average portfolio returns. This portion is immaterial and shows the very weak relationship between risk and return.

B. Seasonal behavior of risk and return

A number of empirical studies have found that the relationship between risk and return depends on the monthly behavior of returns. This means that the seasonality has been shown to affect the estimated risk-returns tradeoff. This phenomenon has been documented by Tinic and West (1984), Penttengill et al. (1995), and Hodoshima et al. (2000) in different equity markets. Particularly the month of January has been shown to be an exceptional case. To examine this seasonality pattern further, we separated the data by calendar month. We then analyzed the seasonality effect between risk and returns by using Equation (4). The average values of the estimated slope coefficients of cross-regression as calculated by Equation (4) in accordance with seasonality are reported in Table 8. The third column gives the slope coefficient ($\hat{\gamma}_{1t}$) of Equation (4). When all 131 months are observed from February 1996 to December 2006, the relationship between risk and returns is not significant at any significance level. We could not reject the null hypothesis of no risk-return tradeoff in the CSE. The test result indicates that the relation

Table 8　Seasonality in the cross-sectional regression analysis using Equation (4) (1996-2006)

Month	Number of months	$\hat{\gamma}_{1t}$	$t(\hat{\gamma}_1)$	P-value
All months	131	−0.002	−0.843	0.424
All months but January	121	−0.003	−0.986	0.353
January	10	0.006	0.892	0.398
February	11	−0.016	−3.438	0.009***
March	11	−0.006	−1.303	0.229
April	11	−0.002	−0.253	0.807
May	11	−0.002	−0.178	0.863
June	11	−0.005	−0.570	0.584
July	11	0.002	0.124	0.905
August	11	−0.014	−2.331	0.048**
September	11	0.010	0.978	0.357
October	11	0.016	1.801	0.109
November	11	−0.015	−2.524	0.036**
December	11	−0.002	−0.304	0.769

Source: Research data in 2008

*** Significant at the 1% level, and ** Significant at the 5% level between beta and return is positive in four months and negative in eight months. However, only one negative coefficient is significantly different from zero at the 1% significance level in February, and two negative coefficients are significant at the 5% level in August and November, respectively. Examination of these results further shows the rejection of the null hypothesis of a no risk-return relationship for the month of October at the 10% level with a positive mean coefficient. This test result leads us to conclude that the relationship between risk and return is inconsistent during the calendar year. Further, 8 out of 12 months show a negative slope coefficient, which implies, that there is no risk-return relationship, as predicted by the two-parameter portfolio model.

The regression results in Table 8 show that the slopes in February, August and November are −0.016, −0.014 and −0.015 with *t*-statistics of −3.438, −2.331 and −2.524, respectively. Like the slope coefficient ($\hat{\gamma}_{1t}$) in Table 2, these slope coefficients are more than two standard errors from 0. These are the midpoints of the first, third and fourth quarters of the year, respectively. This quarterly seasonality may reflect the activity of investors who tend to rebalance their portfolios mid-quarter. Interim dividends are announced mid-quarter also reflect this seasonality behavior.

V Conclusion

The two-parameter portfolio model clarifies that the return on any asset is linearly related to its market risk. The early empirical research on the risk-return relationship by Black et al. (1972) and Fama and MacBeth (1973) showed that there is a positive flat relation between risk and return in the NYSE. Although the scatter diagram obtained from their research is more flat than what is predicted by the theoretical basis of the test of risk-return relationship of the two-parameter portfolio model, it is regarded as supporting the zero-beta risk-return relationship of Black et al. (1972). Approximately 10 years later, Reinganum (1981) and Lakonishok and Shapiro (1986) reported that this positive relation between risk and return was no longer valid in the NYSE. Though an expected positive risk-return tradeoff between beta and return as predicted by the model is theoretically valid, it is not an important criterion for capital market equilibrium. Fama and French (1992) showed that their result also does not provide a valid framework for the risk-return relationship during more recent years. Numerous studies suggest that the conditional risk-return relationship can explain the failures of this simple unconditional relation between risk and returns.

For this research, we investigated whether there is a relationship between the average return and the risk of portfolios of common stocks traded on the CSE. We showed that the risk-return relationship of the two-parameter portfolio model does not provide a valid framework to predict common stock returns on the CSE for the total sample period from 1996 to 2006. The year 2001 is an exception in that there is a significant positive linear relationship between risk and return in the data for that year. During the other 10 years of the sample, the two-parameter model fails to predict common stock returns on the CSE. The evidence in this research therefore seems to be a rejection of the positive risk-return relationship in the CSE.

In terms of goodness of fit, the R^2 for the entire sample period is approximately 0.082 and provides weak fitness in the empirical findings. This value of the R^2 indicates that changes in portfolio beta explain only a very small part of the variation in average portfolio returns. This portion is immaterial and shows the very weak relationship between risk and returns.

In general, we can conclude that our test results show that the risk-return relationship in the CSE is weak and that the two-parameter portfolio model does not provide adequate explanations for the risk-returns behavior in the CSE. Therefore, it is clear that beta and average return are simply not correlated and beta appears to be of no use to investors. The above findings can be taken as evidence that because of its theoretical basis the two parameter portfolio model is not a powerful model and that to meet with some success in being applied it would have to be modified by, for example, using conditional risk-return (Penttengill et al. (1995)) in the CSE.

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