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Measuring the Risk and Return Relationship of Manufacturing Sector in Colombo Stock Exchange

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Abstract

This paper attempts to test fundamental theory of finance which is risk and return relationship. For this purpose the manufacturing sector listed in Colombo Stock Exchange was selected. The researchers used marked model to measure the risk factor of the selected companies. The sample period was 2000 to 2006. As the proxy to calculate market return for the market model the ASPI was applied. The finding was the beta that is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole is not stable through time. Another interesting finding is the systematic risk component is below the market risk of most companies. Therefore beta is not a proper indicator of company systematic risk factor. These findings will be important to various stakeholders especially for prospect investors, share brokers, managers and regulatory bodies etc.

Key words: Risk, Return, Systematic risk, Market model

Introduction

The economic development of any country depends on the degree of investment capabilities and capacities prevailing in the country. The investments basically can be made locally and foreign. The investors have a common expectation that is satisfactory return on their investments. In Sri Lanka both local and foreign investors mobilize their funds in various projects. Before making investment decisions in any company the investors look for the degree of risk that they have to take on their investment. Basically theory states that there is positive relationship between risk and return. It means that if there is a high return on investment, risk is also high vice versa. Risk can be defined as the variability of returns from those that are expected as well return can be defined as the income received on an investment plus any change in market price, usually expressed as a percent of the beginning market price of the investment. Total Risk equals Systematic Risk plus unsystematic theoretically. Systematic Risk is the variability of return on

stocks or portfolios associated with changes in return on the market as a whole. Unsystematic Risk is the variability of return on stocks or portfolios not explained by general market movements. It is avoidable through diversification.

Related empirical links between stock market returns and various notions of variance risk have been informally explored by finance professionals. For example, Bondarenko (2004) documents that many equity-oriented hedge funds actively trade variance risk in the highly liquid OTC variance swap market (Gangahar, 2005). Similarly, Beckers and Bouten (2005) report that a market timing strategy based on the ratio of implied to historical volatilities results in doubling the Sharpe ratio relative to that of a constant S and P 500 exposure.

Even though bulk of empirical findings internationally in this respect in Sri Lanka there is no reliable findings that can use in investment decision in the securities traded in the Colombo Stock Exchange (CSE). Therefore it is vital to study the relationship between risk and return especially in investing securities in the CSE. However this study focuses only one of business sectors in the CSE. CSE comprises twenty business sectors. The manufacturing sector was selected for this study as it is one of the largest sectors listed in CSE. As far as economic contribution is concerned it creates many job opportunities and it plays significant role in our economy. Findings of this study will be important to various stakeholders especially for prospect investors, share brokers, managers and regulatory bodies etc.

Literature reviews

Capital Assets Pricing Model(CAPM) Sharpe (1964), Lintner (1965) has been used in previous research to examine the risk-return relationship in the same Asian economies see, for example, Wong and Tan, (1991), Cheung et al., (1993). The empirical evidence to date on the performance of the CAPM is disappointing with little, if any relationship found between systematic risk (â) and the Cross- section of stock returns.

During the 1980s and 1990s researchers began to look at other characteristics of stocks besides their betas. Several deviations from the CAPM, or "anomalies" were discovered.

First, Banz (1981) reported the size effect, that small (low market-value) stocks have higher average excess returns than can be explained by the CAPM. Small stocks do have higher betas and higher average returns than large stocks, but the relationship between average return and beta for size-sorted portfolio is steeper than the CAPM security market line. Fama and French (1992) drew further attention to the size effect by sorting stocks by

both size and beta and showing that high- beta stocks have no higher returns than low-beta stocks of the same size.

Second, several authors found a value effect that returns are predicted by ratios of market value to accounting measures such as earnings, the book value of equity Basu (1983), Rosenberg et al., (1985), Fama and French (1992), the share of equity in new finance Nelson (1991) .

Third, Jegadeesh and Titman (1993) documented a momentum effect that stocks with higher returns over the past three to twelve months tend to outperform in the future. This is related to the findings of DeBondt and Thaler (1985), that stocks with low returns over the past three to five years outperform in the future.

Methodology

The Model

This study uses the market model (Sharpe, 1963) to measure the systematic risk (â - Beta) of the company[1]. The market model is estimated using ordinary least square (OLS) regression. Market returns during the estimation period are treated as independent variable while dependent variable is the returns of the firm for the purpose of running the regressions. Regression analysis produces estimates of regression intercept (á – Alpha) and regression slope (â - Beta), the Beta (â) will be used to measure the systematic risk.

The market model is specified as, $R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$
Where,
R_{it} = the rate of return on company i on day t
R_{mt} = the rate of return on a market portfolio of stocks (ASPI) on day t.
α_i = the intercept term (alpha)
β_i = the systematic risk of stock i (beta) and
ϵ_{it} = the regression error term.

Calculation of Stock Returns (R_{it}) and Market Returns (R_{mt})

Before using the 'market model' to estimate systematic risk of selected companies time series of daily return for each event under consideration has to be computed since return data on the CSE stocks are not readily available. This study calculates daily returns for the sample of companies by using collected daily closing prices.

Stock returns

$$R_{it} = LN (P_t / P_{t-i})$$

Where,

R_{it} = the rate of return of firm i on day t
LN = Natural Logarithm
P_t = closing share price on day t (current date)
P_{t-1} = closing share price on day t-1 (previous trading date)

Theoretically return from a share should include dividend received as well. However return of this study has not been included dividends as monthly share prices have been used to calculate return in this study this will not affect the results seriously. Reason is during the observation period there might be only one dividend payment or more possible rare for dividend payment.

Since, the market model is used in forecasting market returns; they are calculated using the formula given below.

Market returns

$$R_{mt} = LN (ASPI_t / ASPI_{t-1})$$

Where,
R_{mt} = return of the All Share Price Index (ASPI) for $_t^{th}$day
LN = Natural Logarithm
$ASPI_t$ = ASPI for $_t^{th}$ day (current day)
$ASPI_{t-1}$ = ASPI for the day $_t^{th}$ day (previous day)

Determining Standard Deviation (Risk Measure)

It needs to measure the each company's individual total risk on its return. The researchers use standard deviation for that. Standard Deviation, **?**, is a statistical measure of the variability of a distribution around its mean. It is the square root of variance. Using excel we calculate standard deviation.

Coefficient of Variation

It requires measuring the relative risk among the selected companies to know the highest and low risky investment companies to get valid findings. For that we calculate Coefficient of Variation. It is the ratio of the *standard deviation* of a distribution to the *mean* of that distribution. It is a measure of relative risk. Using excel Coefficient of Variation was calculated.

Where CV › 1 = Risk is high

Where CV ‹ 1 = Risk is Low

Sample formation

A stable market period is essential for collecting samples. Otherwise, the empirical results may be contaminated by the other factors such as market volatility. Therefore, the period from 2000 to 2006 years is considered as the time period to be covered for this study. We consider the sample period as the stable years in recent periods, as at this period market was running smoothly.

In this study reasonable care was exercised in order to select a large sample to derive more valid findings. A sample consists of the optimum set of units that was obtained given the selection criteria. A company was selected as eligible for the study only when the following selection criteria were satisfied. Thus we have selected 16 manufacturing companies for this study. We eliminated all the thin traded stocks. All the stocks in the sample are stocks which have traded more then 10 days per month.

Data Collection

A sample of 16 manufacturing companies, which have listed for the period of 2000-2006, is selected. Before selecting the sample, ASPI[2] and Closing stock prices were collected as the basic data for selecting a sample from all listed companies of the CSE. Since, returns data of the CSE stocks are not available; in order to calculate beta monthly stock returns have to be computed for the sample firms by using trading prices. The CSE provides monthly stock prices and market index data for this study, which means that the required data were obtained from the financial database, which is maintained in magnetic form by CSE.

Data Analysis

Table 1 shows the calculation of risk and returns for the selected sample period. **Standard deviation** (STD) represents risk on investment of each selected company. Blue Diamond wants to bare 20% risk to earn 0.9% of return and Lanka Walltile wants to bare 14.3% to earn 2.1% and so forth. Those results prove that each company has to bare different risk level based on their investments. GRAIN ELEVATORS, DANKOTUWA PORCEL, ROYAL CERAMICS, and CEYLON GLASS gain a loss at a significant risk rate. Especially CEYLON GLAS takes a 30% risk rate to gain -2% returns. And also BLUE DIAMOND has to bare 20% risk to earn 0.9% return. They are contradictory with the principle of risk and return relationship.

Table 1: Risk and return measures for each security (2000-2006)

COMPANY NAME	Return%	STD%	CV
BLUE DIAMONDS	0.9	20**	21.8
GRAIN ELEVATORS	-0.6	14.4**	-22
LANKA WALLTILE	2.5	14.3**	6
ACME	1.3	18**	13.5
PELAWATTE	2.5	14.8**	6
ACL	2.0	12.4**	6.9
DIPPED PRODUCTS	0.7	13.5**	18
TOKYO CEMENT	1.5	9	6
DANKOTUWA PORCEL	-0.3	11**	-27
LANKA TILES	2.0	10**	5
BOGALA GRAPHITE	1.4	19.3**	14
LANKA ALUMINIUM	1.3	12.8**	10
ROYAL CERAMICS	-1.7	27	-15
REGNIS	0.5	11.4**	22
CALTEX	0.3	11.6**	38
LANKA CERAMIC	1.0	15**	14.6
CEYLON GLASS	-2.0	30***	-17

Significant level at 5% and 10% is ** and *** respectively.
Source: Survey data (2008)

Coefficient of Variation (CV) measures the relative risk among companies. The table depicts each company's relative risk (CV), CALTEX shows the highest relative risk (CV) compared to other companies. It is the largest risky company in investing your money. As well as CEYLON GLASS shows the lowest relative risk (CV) among them, which is -27, means that an investor has a low risk in investing in that compared to others. Nevertheless, it gains a negative earning (- 0.3%) at 11% risk and it is statistically significant at 5% level. Therefore we must be careful in investing at lower risky companies.

The Table 2 shows the beta, T-test and return of the 16 sample companies. The results are for the period between 2000 and 2006.

The beta of the companies represents the systematic risk component of stock investment. Based on beta the stocks can be divided into three components such as high risky, moderate risky and low risky stocks.

Beta › 1 High risky stocks
Beta = Moderate risky stocks
Beta ‹ Low risky stocks

Table 2: Systematic risk and Returns of the selected sample companies (2000-2006)

COMPANY NAME	Beta	T-test	Return%
BLUE DIAMONDS	1.5	6.2*	0.9
GRAIN ELEVATORS	1.4	9.2*	-0.6
LANKA WALLTILE	1.2	7.5*	2.5
DIPPED PRODUCTS	1.0	5.9*	1.3
ACME	0.9	3.7*	2.5
PELWATTE	0.9	4.4*	2.0
ACL	0.9	0.2*	0.7
TOKYO CEMENT	0.9	9.7*	1.5
DANKOTUWA PORCEL	0.8	6.3*	-0.3
LANKA TILES	0.8	6.6*	2.0
BOGALA GRAPHITE	0.7	2.7*	1.4
LANKA ALUMINIUM	0.7	4.1*	1.3
ROYAL CERAMICS	0.6	1.6***	-1.7
REGNIS	0.6	3.5*	0.5
CALTEX	0.5	2.9*	0.3
LANKA CERAMIC	0.5	2.0**	1.0
CEYLON GLASS	0.3	0.7	-2.0

Significant level at 1%, 5% and 10% is *, ** and *** respectively.
Source: Survey data (2008)

Based on the above criteria we can observe that most of the stocks in the manufacturing sector are low risky stocks compared to market risk. Only three stocks are more risky compared to market risk. It is important to note that Beta factor of GRAIN ELEVATORS is grater than 1 and it is statistically significant at 1% level. However its rerun is negative and its total risk (STD) 14.4%. It reveals that the company wants to take a 14.4% of risk to gain a lost of 0.6 return. At this situation investment in this company is highly risky. However this company relative risk (CV) shows -22. It reveals that investing in this company is low risky. It is contradictory with total risk and systematic risk.

In other words these stocks are not much exposed to macro risk factors like inflation, global oil prices, GDP growth etc. The company specific risk factors will be significant risk factors for these stocks.

The other extension of this paper is the testing of the stability of beta over time. For this purpose another regression runs for two years data (Table 3) with the market model. It shows that there is a significant change of beta over time. This finding challenges the credibility of CAPM because the fundamental assumption of the CAPM is the stability of beta. Observe table

2 and 3 they show the differences of beta for five year period and two year period. This finding is consistent with the findings of David and Mullins (1982).

Table 3: Systematic risk and Returns of the selected sample companies (2000-2001)

COMPANY	Beta	T- test	Return%
BLUE DIAMONDS	1.7	3.1*	4.6
GRAIN ELEVATORS	1.4	4.4*	-0.4
LANKA WALLTI	0.9	2.4**	0
DIPPED PRODUCTS	1.0	5.1*	0.2
ACME	0.2	3.7	0
PELWATTE	0.8	4.4*	0.5
ACL	0.2	0.5	-0.4
TOKYO CEMENT	1.0	9.7*	0.09
DANKOTUWA PORCEL	0.7	2.9*	0.04
LANKA TILES	0.8	2.3**	0
BOGALA GRAPHITE	0.5	2.7*	-0.07
LANKA ALUMINIUM	0.5	2.5*	0.01
ROYAL CERAMICS	0.2	1.6***	0.2
REGNIS	0.5	3.5*	0.4
CALTEX	0.9	2.9*	0.9
LANKA CERAMIC	-0.9	2.0**	0.2
CEYLON GLASS	1.0	1.7*	0.5

Significant level at 1%, 5% and 10% is *, ** and *** respectively.
Source: survey data (2008)

The main focus of this paper was to study the risk and return relationship. The last columns of the tables show the total five year returns of all the companies. It can be observed that when the beta coefficient changes the return also get changed in all most all the companies.

Conclusion

Based on the findings it is concluded that the principle of risk and return relationship in investing securities is inconsistent with manufacturing sector in CSE. Interesting finding is the systematic risk component is below the market risk of most companies. In other words these stocks are less risky compared to market risk. It also found that the beta is not constant. It varies time to time. As a result beta cannot be used as a risk measure of these companies.

End notes

[1] Pettit (1972) stated "the market model posits a linear relationship between return of individual securities and return on the market."

[2] All Share Price Index (ASPI)
The ASPI measures the movement of share prices of all listed companies. The ASPI is based on market capitalization. Weighting of shares is conducted in proportion to the issued ordinary capital of the listed companies, valued at current market price (i.e. market capitalization).

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