Beta and returns: Evidence from Colombo Stock Exchange

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Abstract

Capital Asset Pricing Model (CAPM) is utilized to determine a theoretically suitable required rate of return of an asset and values the asset's sensitivity to non-diversifiable risk. This paper investigates the conditional relation between beta and returns in individual stock returns between January 2011 and December 2019 on the stocks listed in the Colombo Stock Exchange (CSE) using the approaches suggested by Fama & MacBeth (1973) and Pettengill et al., (1995). The population of this research includes all the companies listed in CSE and the top 50 stocks with a large market capitalization have been selected as the sample.The unconditional test procedure results show that there is no statistically significant risk-return relationship found in any test period in individual stock returns. Thus, this result is similar to the previous literature findings. The conditional tests results show that there is no significant positive (negative) risk-return relationship in individual stock returns in CSE during up (down) market months. But findings indicate a significant positive risk-return relationship in individual stock returns in upmarket periods; whereas, a significant inverse risk-return relationship is not provided in down market periods.

Keywords: capital asset pricing model, Colombo Stock Exchange, conditional relation and unconditional relation

Introduction

Capital Asset Pricing Model (CAPM) is one of the most essential models in the finance literature, which assumes a positive linear relationship between the required rate of return and systematic risk on stocks. CAPM is frequently used in the business world, but the model's validity in its unconditional form is repeatedly rejected by empirical tests. Pettengill et al has developed an alternative conditional CAPM approach where the unconditional test procedure developed by Fama and MacBeth (1973) is improved by taking up and down market conditions into consideration. this conditional beta return relationship in portfolio stock returns has been supported in different markets, but very few studies have tested the conditional relationship on individual stock returns. Therefore, this study will examine the conditional and unconditional relations between beta and returns on individual stocks listed in CSE.

Literature Review

The Sharpe-Lintner-Black (SLB) model that is predicated based on the assumption of a positive risk-return tradeoff, the expected return on any asset, is a positive function of three variables: the beta (covariance of asset return and market return), the risk-free rate, and the expected market return. Fama and MacBeth (1973)in the New York Stock Exchange (NYSE) tested the relationship between average return and risk for common stocks. To check the SLB model, they followed a three-stage process. In the first step, portfolios were formed for individual firms, based on the estimated beta. They tested three research implications: (1) the beta return relationship on the stock in any portfolio is linear, (2) systematic risk of a stock is a full measure of the risk of that individual stock in the efficient portfolio, (3) higher the risk higher the return. They stated that there was a positive flat relationship between systematic risk and return. However, could not dismiss the linearity hypothesis between security portfolio risk and its expected return, as suggested by the two-parameter model. At the same time, they tested the additional risk, which cannot be calculated by beta, and found that no risk assessment, besides portfolio risk, systematically affects average returns. A considerable number of researchers tested the empirical relationship between risk and return, following Fama and MacBeth (1973).

Pettengill et al., (1995) suggested that the conflicting results of the beta-average-return equation may have contributed to the convergence of returns through up and down-market periods. They argued that the relationship between beta-return should be favorable in up markets and negative in down markets. In line with this statement, the relationship between beta and expected return during up (down) markets is significant and favorable (negative). In other words, this study, unlike previous studies, found a clear and highly significant relationship between beta and cross-sectional portfolio returns. The critical distinction between this experiment and previous studies is the understanding that the SLB model's projected optimistic return-to-beta relationship is based on expected instead of realized returns. On the stocks listed in Tokyo Stock Exchange (TSE), Nimal (2006) investigated the conditional relationship between beta and return suggested by Pettengill et al., (1995) and proved that the conditional relationship between beta and return could even be seen in individual stock returns. The conditional cross-sectional CAPM relationship between portfolio beta and return on the Colombo Stock Exchange (CSE) has been evaluated by Sriyalatha (2010) using the approach of Pettengill et al., (1995). The results show that the conditional CAPM is a dominant method for measuring a relationship between risk and return. Statistically significant results can be seen in risks and returns between up and down markets; however, there is a steeper

negative slope in down markets. This steeper negative relationship seems to have played a major role in the negative relationship in CSE's average portfolio returns. Therefore, Sriyalatha (2010) concluded that the conditional relationship is generally a better match than the unconditional CSE test. The results from the study indicate that market beta still has a legitimate role to play as a market risk indicator. Anuradha (2011) has examined the unconditional and conditional relationship between beta, size, B/M, E/P and returns in the CSE from 1995 to 2006 and found that there is a positive(negative) relationship between beta and individual stock returns in up(down) market periods.

Methodology

The population of this research includes all the companies listed on CSE in Sri Lanka. Top 50 stocks with large market capitalization with a complete relative price history in the test period, have been selected as the sample. The monthly return data are adjusted for dividends and stock splits. Theriou et al., (2010) The 91 days of Treasury bill rate has been taken as the risk-free rate, and the value-weighted market return index (All Share Price Index-ASPI) has been considered as the proxy for the market return. Excel has prepared the data for the analysis, and analysis has been performed both with E-views 08 and Excel. Most of the empirical tests on the CAPM's positive beta return relationship have been carried out by using a two-pass regression approach. The first pass excess return market model that is used for the estimation of the beta coefficient of stocks is as follows:

$$\boldsymbol{E(R_{it}) - R_{ft} = \propto_i + \beta_i(E(R_{mt}) - R_{ft}) + e_{it}} \quad \textbf{(1)}$$

Where,$E(R_{it})$ is the expected return for stock i,R_{ft} is the risk-free rate, β_i is the beta coefficient and $E(R_{mt})$ is the expected return of the market.Equation (2) has been used to calculate γ_{1t}

$$\boldsymbol{\left(R_{it} - R_{ft}\right) = \gamma_{0t} + \gamma_{1t}\widehat{\beta}_i + u_{it}} \quad \textbf{(2)}$$

Following conditional relationships has been used to test the conditional relationships during up and down markets.

$$\boldsymbol{\left(R_{it} - R_{ft}\right) = \gamma_{0ut} + \gamma_{1ut}\widehat{\beta}_i + u_{iut}} \quad \textbf{(3)}$$

$$\boldsymbol{\left(R_{it} - R_{ft}\right) = \gamma_{0Dt} + \gamma_{1Dt}\widehat{\beta}_i + u_{iDt}} \quad \textbf{(4)}$$

where, γ_{1u} is the upmarket excess returns and γ_{1D} is the downmarket excess returns. If the mean value of the coefficient, γ_{1U} is greater than zero, there is a positive relationship during up markets and if the mean value of the

coefficient γ_{1D} is less than zero; there is a negative relationship between beta and returns during down markets. To estimate stock betas and calculate stock returns, a two-step approach has been employed, and FM cross-sectional regression test has been employed to evaluate the relationship between individual stock beta return. Stock betas are estimated by regressing the first three years' monthly excess return of stocks (from January of year t-3 to December of year t-1 (t=2014-2019)) on the monthly value-weighted excess return of the market index. Equation (1). Those stock betas are constant throughout the next one year test period, from January to December of year t. To evaluate the relationship between stock beta and stock return, monthly excess returns for each security has been taken for each month of the test period. (i.e., from January to December of year t.). As the final stage, stock betas have been recalculated at the end of December of each test period and continued procedure, as mentioned earlier until the end of 2014. Data from January 2011 to December 2019 has been taken for this test. The nine years of the sample period has been divided into six 4-year periods, as reported in Table 1.

Table 1. Separation of sample period - Stock Beta and Stock Return

Estimation period (Beta calculation)	Test Period
01/2011-12/2013	1/2014-12/2014
01/2012-12/2014	1/2015-12/2015
01/2013-12/2015	1/2016-12/2016
01/2014-12/2016	1/2017-12/2017
01/2015-12/2017	1/2018-12/2018
01/2016-12/2018	1/2019-12/2019

Every 4-year period is subdivided into a 3-year beta calculation period and a 1-year test period. The securities can be included in the 4-year sample period only if they have been traded during the sample period. That means no missing values and no suspensions and have a complete relative price history in the test period. According to the above table, the first stock beta estimation period is from January 2011 to December 2013. Then stock returns for each stock for each month are taken for a one-year holding period, from January to December of 2014. The second beta estimation period is from January 2012 to December 2014, and the one-year test period is from January to December 2015, and so on. In such a way, stock returns and stock betas have been taken for each month from January 2014 to December 2019 for each security. Therefore have 72 observations for monthly individual stock betas and individual stock returns.

Results and Discussions

Table 2. FM Cross-Sectional Regression result

Period	Mean	Std.	*t*	P-Value	Months
	Unconditional Test-All months (Equation 02)				
Total period (2014-2019)	0.006644625	0.035026957	1.6096	0.1119	72
Period 01 (2014-2016)	0.009992484	0.040660614	1.4745	0.1492	36
Period 02 (2017-2019)	0.003296766	0.028504159	0.6939	0.4923	36
Period	Mean	Std.	*t*	P-Value	Months
	Conditional Test-Panel A: Up Markets (Equation 03)				
Total period (2014-2019)	0.027225791	0.035884043	3.4768	0.0023	21
Period 01 (2014-2016)	0.025956400	0.041542060	2.3378	0.0360	14
Period 02 (2017-2019)	0.029764573	0.023277164	3.3831	0.0148	7
	Conditional Test-Panel B: Down Markets (Equation 04)				
Total period (2014-2019)	-0.001829973	0.031240265	-0.4183	0.6777	51
Period 01 (2014-2016)	-0.000166372	0.037538573	-0.0207	0.9842	22
Period 02 (2017-2019)	-0.003092015	0.026116906	-0.6375	0.5293	29

(Mean is the average of γ_1t, Std. is the standard deviation of γ_1t, and t has been calculated by dividing the mean by its standard error. The number of months in each test has been presented in the last column.)

As reported in Table 2, the results show that the mean slope in all months are not significantly positive in any period suggesting that beta and average return are not positively related. According to Panel A and B of Table 2, a positive relationship between stock beta and stock returns can be observed during up markets, and a negative relationship can be observed during down markets, respectively. Mean slopes of up markets are statistically significant in total period and two sub-periods. Nevertheless, mean slopes of down markets are not significant in the total period and two sub-periods. In other words, there is an insignificant negative relationship between beta and returns in down markets. Therefore, it is suggested that a conditional relationship between beta and return is not seen in CSE's individual stock returns.

Conclusions

This paper examined the conditional relationship between the beta and returns in individual stock returns on the stocks listed in CSE using the approach suggested by Pettengill et al., (1995). Tests on individual stock returns have found no positive (negative) relationship between beta and returns during up (down) markets. This result is not consistent with Sriyalatha (2010)and Anuradha, N. (2011). Thus the aggregation of positive and negative

relationships during up and down markets has not contributed that beta as a useful measure of market risk.

By examining the relationship between beta and returns in individual stock returns, it has greater importance to academics, researchers, and investors. Beta is one of the important factors that mainly affects the returns of stocks though there are noticeable arguments with empirical evidence. This study will give guidelines to investors to improve their understanding of markets. The companies will be able to make sound decisions on the returns of their portfolios. The information on the beta return relationship would be useful to future researchers who want to advance the knowledge and literature in CAPM.

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