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Assessing and Testing the Capital Asset Pricing Model (CAPM): A Study Involving KSE-Pakistan

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Abstract - The current research study tests the CAPM, (Capital Asset Pricing Model) in Pakistan's stock market, Karachi Stock Exchange KSE. Capital Asset Pricing Model explains the links present between risk and return in efficient markets. Therefore the current study has focused on the calculation of Beta of ten companies registered on KSE, and actual and expected returns have been compared. The data analysis revealed the limited applicability of CAPM to the KSE, 100-index. Further studies may be conducted to check the applicability of the model, by taking a large sample of companies, especially in Pakistani stock exchanges.

I. INTRODUCTION

The Capital Asset Pricing Model (CAPM) gives an easy, yet a significant explanation of the relationship existing between risk and return in efficient markets (Laubscher, 2002). The capital Asset Pricing Model (CAPM) has effectively contributed to the finance theory by changing the way of thinking of academicians and investors (Harrington, 1993). But still, besides being widely tested, some scholars have acknowledged (Lau & Quay, 1974) the capital asset pricing Model (CAPM), while others (Eatzaz & Attiya, 2008), (Hanif, 2009) have criticized it.

Many scholars and researchers contributed to the development of CAPM, but the initial development is attributed to the work of Sharpe (1964), by Bradfield, Barr and Affleck-Graves (1988). Later on, Lintner (1965) and Black (1972) also, contributed to the improvement and enhancement of capital asset pricing model (CAPM).

This research study is concerned with Pakistani companies, listed in KSE, covering five years period from (2006 to 2010). The study, basically aims to investigate and test the validity of the capital asset pricing model (CAPM), in Pakistani context, with special reference to Karachi Stock Exchange (KSE).

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The methodology used for this study, was to find out the expected returns using CAPM by calculating beta (β) through Slope, using Microsoft excel, version 2003. Similarly, the actual and expected returns were compared. Findings and results of this research study advocated the accuracy of CAPM, but for a very small period, and for merely a few companies. A total of ten companies were observed for period of five years (2006-2010) each, and out of these results very few supported CAPM, whereas, most of the results did not support the CAPM, resulting in the inapplicability of CAPM in Pakistani institutions. The results of this study thus supported and were found to be in line with the findings of Eatzaz and Attiya, (2008) and Hanif, (2009) in Pakistani context, Hui and Christopher, (2008) Japan and USA, Groenewold and Fraser (1997) Australia, Quo and Perron, (2005), United States.

The study has been divided into sections, i.e. the section two is concerned with literature review, and methodology is explained in section three, whereas the section four gives the results and section five focuses on conclusions.

II. LITERATURE REVIEW

In today's world, the investors are interested in high returns for their investments, even if the investment is done in riskier securities or business projects. For this purpose, the investors constantly try to find out and calculate the risk existing behind their investments, and thus they use different models for their calculations. The capital asset pricing model (CAPM), in this regard has been widely used by the investors or finance managers, for finding out the risk and return of their investments (Jagannathan & Wang, 1993).

It has been stated by Blume (1993) that the CAPM provides a model, explaining the equilibrium risk/return relationship, also, that the CAPM is based on the concept, that there is a linear relationship between the systematic risk (non-diversifiable), measured by beta and the expected returns. This linear relationship is described by security market line (SML), which compares the systematic risk of a share and the return, along with the risk of the market and risk-free rate of return (Watson and Head, 1998).

Like other models, the CAPM too, has some assumptions (Van Horne, 2006). Higher the risk (systematic risk), higher will be the return; unsystematic

risk can be minimized almost completely, through diversification of the portfolio; investors are to be compensated for the systematic risk of the securities, that can't be diversified away (Lau & Quay, 1974). The systematic risk is measured by beta (β), which is in positive correlation with return. The CAPM, uses beta for finding out the risk, and also uses beta for determining the expected returns (O'Brien and Srivastava, 1995).

Beta enables us to find out the fluctuations in price of a share, along with determining the relative movement of share portfolio to the market portfolio (Jones, 1998). After the enhancement of the CAPM, the use of beta has been noticed to increase, especially in investment community for finding out risk (Blume, 1993). Many researchers have tried to test the validity of CAPM, in different setups, and also were able to give different results with significant empirical evidence.

The CAPM model was tested in Japanese setup, by applying the model to Tokyo stock market, where the results supported the model, and the investors were compensated for the systematic risk (Lau & Quay, 1974).

Similarly, this model was applied to the Swedish stock market by Bjorn and Hordahl, (1998), and proved that their results showed a difference from international evidence regarding CAPM.

The results of Bossaert et al (1999), as cited in Levy et al (2000), initially, did support the CAPM, but later on the statistical tests, discarded the model, due to either market thinness or time constraints. Further experiments by Levy, Levy and Solomon (2000), using microscopic simulation (computer-based study), led them to give results, supporting the CAPM.

The CAPM, was tested with reference to US securities from S&P 500 index by Gomez and Zapatro, (2003), whereby their results supported the two Beta model, also, the researchers came up with same results, supporting the CAPM in UK, most probably due to the similarities in both US and UK setups.

In South African context, the researchers Keogh, (1994), found the fluctuations in beta, negatively affecting the significance of beta and CAPM, especially in South Africa. Whereas, the results provided by Bradfield, Barr and Affleck-Graves's study (1988) supported the CAPM, and declared it to be a useful model, in the context of JSE.

The validity of CAPM was also brought to test in Greek stock markets, by Grigoris and Stravos (2006), where the results of their study didn't support the concept of high risk and high return. For the sake of further investigation and testing, the CAPM, was tested in two different setups, US and Japan, at the same time, where the results showed the inability of CAPM to explain returns when applied to the stock markets of both countries (Hui and Christopher, 2008).

Similarly, to test the validity of CAPM, different studies have been conducted in Pakistan, which

involved KSE, Karachi Stock Exchange by Eatzaz and Attiya, (2008), where the results of their study supported the traditional CAPM in explaining the risk and return relationship, but their results were satisfying only for few years. Later on, another study conducted by Hanif, (2009), showed the inapplicability of the CAPM, in his study, which had taken the tobacco industry into account for four years of time.

The capital asset pricing model has been criticized on many grounds, i.e. the investigating power of CAPM, has been found low, as it depends on a single beta for decision and uses market returns for calculation of returns (Hanif and Bhatti, 2010). Watson and Head, (1998) and Harrington, (1987), have considered the many assumptions of CAPM, to be the reason for the shortcomings of this model, and thus have considered them unrealistic and impractical. Whereas, Moyer et al, (2001) and Reilly and Brown, (1997) have declared the CAPM has somehow fulfilled many of its assumptions, and the generally, the unrealistic assumptions do not have any prominent negative effect on its applicability. Some researchers considers CAPM as unable to consider all the factors that affect the returns, which then made them to develop a multi-factor model, i.e. Arbitrage Pricing Theory (APT), which was put forward by Ross, (1976), as cited in Laubscher (2001). But the relationship of risk and return has still kept the model of CAPM, very helpful to the investors and is still considered for research studies, especially in analysis of risk and return.

III. RESEARCH METHODOLOGY

The research question for this study is that, whether CAPM provides valid, precise and correct results, when taken into account for study involving the KSE-Pakistan, and does it prove to be helpful to the investors, while pricing the securities and assessing the risk? This study has primarily focused on the calculation of Beta of ten different companies for finding the expected return and then by comparing it to the actual return, for testing the CAPM for its validity. The KSE website proved very efficient, as it provided with the list of companies and its symbols. It also helped in providing the secondary data for the analysis. The sample taken for this study is not covering all the companies listed at KSE, as only ten (10) companies have been considered for this study. Early studies have been conducted Eatzaz and Attiya, (2008) and Hanif and Bhatti (2010) with different number of companies and different time period, but this study has covered the five years of period from (2006-2010), which has not been covered in other studies involving KSE- Pakistan. Additionally, this study has taken into account companies, that are different from the companies studied in previous studies. The data analysis tool, used for this study is the MS excel (2003). The formula used for finding out the required rate of return is given as;

$$R_j = R_f + \beta(R_m - R_f)$$

Where

R_j = Required rate of return on security j

R_f = Risk free rate of return

β = Beta of the security(measure of systematic risk)

R_m = Average return on market portfolio.

The stock price or the share prices of the companies, considered for this study, have been taken from the website of KSE. Then the return was calculated by taking the closing prices, subtracting the closing price from the opening price and dividing it by the opening price. Similarly, the formula was applied to the market index, for calculating the returns. Beta was

calculated by applying slope $\beta = \text{slope}(y,x)$, where the 'y' represents the company returns and 'x' represents the market returns. The risk free rate used in the analysis was the rate of national saving certificate, taken from the website of state bank of Pakistan.

IV. FINDINGS AND RESULTS

After the collection and analysis of data of five years period for ten different companies, the results showed a very limited applicability of CAPM, to the KSE (100-index). The table I shows the companies that showed a slight difference in their expected and actual returns, providing with the limited applicability of CAPM.

S No	Company Name	Year	Beta (β)	Expected return (By CAPM)	Actual Return	Difference	Undervalued/overvalued
1	(LUCK)	2009	1.551	0.931	0.971	0.040	Under valued
2	(FCCL)	2009	-0.090	0.074	0.097	0.023	Under valued

V. DISCUSSION

By comparing the results of this study with previous research findings, it has been clearly viewed that in certain years, the difference between expected and actual return is less, whereas, in most of the results the difference is witnessed to be high. Similarly, the table I, shows the results of CAPM, showing the slight difference between actual and expected return, but the beta values are different (i.e. aggressive, defensive), rejecting the results of Huang (2000), where he declared

that, CAPM is applicable in lower risk securities and not in the high risk securities. This study authenticates the results and findings of Eatza and Attiya (2008), Hanif and Bhatti (2010), concluding the inapplicability of CAPM to the stock markets of Pakistan. The table II gives the total results, including the results with higher differences in expected and actual returns. Thus the comparison of the results of this study with previous studies has shown that CAPM, fails to give accurate results most of the time.

S No	Company Name	Year	Beta (β)	Expected return (By CAPM)	Actual Return	Difference	Undervalued/overvalued
1	DG Khan Cement (DHKC)	2006	1.293	-0.278	-0.645	-0.368	Over valued
		2007	1.238	0.105	0.352	0.2471	Under valued
		2008	1.048	-0.870	-1.347	0.0644	Under valued
		2009	1.088	0.692	0.323	0.3237	Under valued
		2010	1.865	0.391	0.078	-0.313	Over valued
2	Oil and Gas (OGDC)	2006	1.560	0.506	-0.026	-0.532	Over valued
		2007	0.945	0.302	-0.020	-0.322	Over valued
		2008	1.076	0.908	-0.750	-1.657	Over valued
		2009	1.417	0.862	1.058	0.196	Under valued
		2010	0.649	0.214	0.440	0.225	Under valued
3	(ACPL)	2006	0.673	0.254	-0.204	-0.458	Over valued
		2007	0.669	0.488	0.283	-0.206	Over valued
		2008	0.821	-0.564	-0.863	-0.299	Over valued
		2009	2.225	1.278	0.789	-0.490	Over valued
		2010	0.991	0.264	0.165	-0.099	Over valued
4	(LUCK)	2006	1.183	-0.183	-0.463	-0.279	Over valued
		2007	1.834	-0.297	0.741	1.037	Under valued
		2008	1.385	-1.322	-1.132	0.190	Under valued
		2009	1.551	0.931	0.971	0.040	Under valued
		2010	1.110	0.281	0.119	-0.163	Over valued

5	(CHCC)	2006	0.076	0.767	-0.919	-1.686	Over valued
		2007	0.855	0.363	-0.078	-0.441	Over valued
		2008	0.887	-0.653	-1.123	-0.470	Over valued
		2009	0.708	0.523	-0.073	-0.596	Over valued
		2010	0.442	0.185	-0.251	-0.436	Over valued
6	(DCL)	2006	1.075	-0.090	-0.550	-0.460	Over valued
		2007	2.319	-0.623	0.568	1.191	Under valued
		2008	1.587	-1.595	-1.142	0.454	Under valued
		2009	3.767	2.072	0.485	-1.588	Over valued
		2010	2.031	0.415	0.095	-0.320	Over valued
7	(KOHK)	2006	0.402	0.487	-0.864	-1.351	Over valued
		2007	0.637	0.509	0.670	0.160	Under valued
		2008	0.711	-0.416	-1.014	-0.598	Over valued
		2009	3.155	1.757	0.221	-1.536	Over valued
		2010	0.287	0.162	0.038	-0.124	Over valued
8	(GLPL)	2006	0.164	0.691	-0.646	-1.338	Over valued
		2007	0.578	0.549	0.137	-0.411	Over valued
		2008	-0.133	0.719	-0.119	-0.838	Over valued
		2009	-0.780	-0.270	-0.623	-0.352	Over valued
		2010	0.689	0.220	0.032	-0.188	Over valued
9	(ATRL)	2006	-0.065	0.887	-0.857	-1.744	Over valued
		2007	1.681	-0.193	1.450	1.643	Under valued
		2008	1.245	-1.134	-1.319	-0.186	Over valued
		2009	2.088	1.207	1.465	0.258	Under valued
		2010	1.795	0.381	0.207	-0.174	Over valued
10	(FCCL)	2006	1.140	-0.146	-0.430	-0.285	Over valued
		2007	1.165	0.153	-0.005	-0.159	Over valued
		2008	0.775	-0.503	-1.144	-0.641	Over valued
		2009	-0.090	0.074	0.097	0.023	Under valued
		2010	1.182	0.292	-0.169	-0.462	Over valued

VI. CONCLUSION

The basic aim of this study was to check the applicability of CAPM to KSE- Pakistan, (Karachi Stock Exchange), whether it gives accurate results. After the analysis of ten different companies listed on KSE, for the period of five years (2006-2010), it was found that the Capital Asset Pricing Model, (CAPM), failed to give accurate results. Though very slight evidence was seen, regarding the applicability of CAPM, but it was only in traces. These findings help in concluding that CAPM is not fully applicable to the KSE-Pakistan. A strong rejection has been seen, regarding the acceptance and applicability of CAPM (Levy, 1997). Even though significant evidence has been put forward against the use of CAPM, still it remains a good tool for finding out the cost of capital, investment performance evaluation, and studies of efficient market events (Moyer et al, 2001; Campbell et al, 1997). CAPM has provided knowledge, about the capital market and market conditions (Karnosky, 1993).

In short, CAPM is not an effective model to measure risk and required return, and investors, therefore may not depend or rely on it in their investment decisions. Future studies, may consider a detailed comparison of results from CAPM for KSE-Pakistan, and

other stock markets of developing and developed states. These studies may also consider the use of more sophisticated tools (i.e. GARCH), and models like the multifactor models, Arbitrage Pricing Theory (APT). It is suggested that in future studies, CAPM should be tested individually and along with the multi-factor model (APT), for the better understanding of the risk/return relationship and pricing mechanisms.

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