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

Muhammad Ibrahim Khan[1] and Noorul Mudassar Khan[2]

[1] National Defence University Islamabad

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.

Index terms—

1 Introduction

he 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).

The methodology used for this study, was to find out the expected returns using CAPM by calculating beta (?) 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) 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.

2 II.

3 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 (?), 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' ??rien 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 in applicability 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 itsassumptions, 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.

4   III.

5   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; Rj = Rf + ?(Rm-Rf) Where Rj = Required rate of return on security j Rf = Risk free rate of return ? = Beta of the security(measure of systematic risk) Rm = 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 ? = 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.

6   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.

V.

7   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 **??**uang (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 Eatzaz 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.

8   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. [1] [2]

Figure 1:

152 [Laubscher ()] 'A review of the theory of and evidence on the use of the capital asset pricing model to estimate
153   expected share returns'. E R Laubscher . *Meditari Accounting Research* 2002. 10 p. .

154 [Gomez ()] 'Asset pricing implications of benchmarking: a two-factor CAPM'. Zapatro Gomez . *The European*
155   *Journal of Finance* 2003. 9 (4) p. .

156 [Bradfield et al. ()] D J Bradfield , G D I Barr , J F Affleck-Graves . *Macroeconomic identification of the pricing*
157   *factors on the Johannesburg Stock Exchange*, 1988. 19 p. .

158 [Sharpe ()] 'Capital asset prices: a theory of market equilibrium under conditions of risk'. W F Sharpe . *Journal*
159   *of Finance* 1964. 19 (3) p. .

160 [Black ()] *Capital market equilibrium with*, F Black . 1972.

161 [Laubscher ()] *Capital market theories and pricing models: Evaluation and consolidation of the available body of*
162   *knowledge, MCom dissertation*, E R Laubscher . 2001. Pretoria. University of South Africa

163 [Quo ()] 'Estimating and testing structural changes in multivariate regressions'. Perron Quo . *Journal of*
164   *Econometrics* 2005. 12 (8) p. .

165 [Karnosky ()] 'Global investment in the CAPM framework'. D S Karnosky . *The CAPM controversy: Policy and*
166   *strategy implication for investment management*, 1993. (ICFA)

167 [Horne ()] Van Horne . *Fundamentals of financial management*, 2006. Prentice hall publisher Ltd. (12th edition)

168 [Reilly and Brown ()] *Investment and analysis and portfolio management*, F K Reilly , K C Brown . 1997. Dryden,
169   Orlando, Florida. (5th edition)

170 [O'brien and Srivastava ()] *Investments: A visual approach-modern portfolio theory and CAPMtutor*, J O'brien
171   , S Srivastava . 1995. South Western, Cincinnati, Ohio.

172 [Jagannathan and Wang ()] & Jagannathan , Wang . *CAPM is alive as well*, 1993. 23 p. .

173 [Jones ()] C P Jones . *Investments: Analysis and management*, (New York) 1998. Wiley. (6th edition)

174 [Harrington Korajczyk (ed.)] *Laubscher Continuing Education*, D R Harrington, R A Korajczyk (ed.) (New York)
175   p. .

176 [Mclaney ()] E J Mclaney . *Business finance: Theory and Practice*, (Pitman, London) 1997. (4th edition)

177 [Levy et al. ()] *Microscopic simulation of financial markets-from investor behavior to market phenomena*, M Levy
178   , H Levy , S Solomon . 2000. San Diego, California: Academic Press.

179 [Harrington ()] *Modern portfolio theory, the Capital Asset Pricing Model and Arbitrage Pricing Theory: A user's*
180   *guide*, D R Harrington . 1987. Englewood Cliffs, New Jersey: Prentice-Hall. (2nd edition)

181 [Moyer et al. ()] R C Moyer , J R Mcguigan , W J Kretlow . *Contemporary financial management*, (South-
182   Western, Cincinnati, Ohio) 2001. (8th edition)

183 [Hui ()] 'Return Volatility Is Priced in Equities'. Christopher Hui . *Financial Management Association Interna-*
184   *tional* 2008. 37 (4) p. .

185 [Levy ()] 'Risk and return: An experimental analysis'. H Levy . *International Economic Review* 1997. 38 (1) p. .

186 [Greonewold ()] 'Share prices and macroeconomic factors'. Fraser Greonewold . *Journal of Business Finance and*
187   *Accounting* 1997. 24 p. .

188 [Hanif ()] *Testing Application of CAP Model on KSE-Pakistan: A Case Study on Tobacco Sector*, M Hanif .
189   `http://ssrn.com/abstract=1494906` 2009.

190 [Eatzaz ()] 'Testing Multifactor Capital Asset Pricing Model in case of Pakistani Market'. Attiya Eatzaz .
191   *International Research Journal of Finance and Economics* 2008. 25 p. .

192 [Grigoris ()] 'Testing the Capital Asset Pricing Model (CAPM): the case of emerging Greek securities market'.
193   Stravos Grigoris . *International Research Journal of Finance and Economics* 2006. 4 p. .

194 [Bjorn ()] 'Testing the conditional CAPM using multivariate GARCH-M'. Hordahl Bjorn . *Journal of Applied*
195   *Finance Economics* 1998. 8 p. .

196 [Blume ()] 'The Capital Asset Pricing Model and the CAPM literature'. M E Blume . *The CAPM controversy:*
197   *Policy and strategy implications for investment management. ICFA Continuing Education*, D R Harrington,
198   R A Korajczyk, Amir (ed.) (New York) 1993. p. .

199 [Harrington ()] 'The CAPM controversy: An overview'. D R Harrington . *The CAPM controversy: Policy*
200   *and strategy implications for investment management, ICFA Continuing Education*, D R Harrington, R
201   A Korajczyk (ed.) (New York) 1993. p. .

202 [Campbell et al. ()] *The econometrics of financial markets*, J Y Campbell , A W Lo , A C Mackinlay . 1997.
203   Princeton, New Jersey: Princeton University Press.

204 [Keogh ()] *The stability of beta and the usability of the Capital Asset Pricing Model in the South African context,*
205   *MEcon dissertation*, W J Keogh . 1994. Bloemfontein. University of the Orange Free State

206 [Lau and Quay ()] 'The Tokyo stock exchange and capital asset pricing model'. & Lau , Quay . *The Journal of*
207   *finance* 1974. 29 (2) p. .

208 [Linter ()] 'The valuation of risk assets and the selection of risky investments in stock portfolios and capital
209   budgets'. J Linter . *Review of Economics and Statistics* 1965. 47 (1) p. .

210 [Hanif ()] 'Validity of Capital Assets Pricing Model: Evidence from KSE-Pakistan'. Bhatti Hanif . *Finance and*
211   *Administrative Sciences* 2010. 20 p. . (European Journal of Economics)

212 [Watson and Head ()] D Watson , A Head . *Corporate financeprinciples & practice, Financial Times/Pitman,*
213   (London) 1998.