

## Validity of CAPM in Capital Markets of Pakistan An Empirical Analysis with Critical Perspective

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### Abstract:

*For pricing different securities and ascertaining the returns on different stocks CAPM is the most extensively used model. As CAPM is the most basic method to find a relationship in speculated return and risk associated with a particular security. This model tries to identify the value of the risk. Having a wide range of criticism by renowned researchers' different factors such as size and value of the firm has been added in the basic CAPM to produce different alternative capital asset pricing models. The researchers mostly criticized CAPM due to its reliance on some assumptions as it emphasizes only on the systematic part of the risk. So they introduced various factors in the basic CAP model in order to enhance its validity and reliability. Surprisingly CAPM can be included in the list of asset pricing models as one of the most believed and overruled model. Researchers from Pakistan have tested both the basic and the conditional CAPM. These conditional CAP models also produced contradicting results. This paper reviewed criticisms on basic CAPM and the resultant conditional capital asset pricing models and their applicability in*

*Pakistani context. This paper evaluated that if various situational factors are introduced in the basic CAP model then it may produce better results.*

**Key words:** CAPM, SML, Risk, Return, KSE

## **1. Introduction**

People are interested to maximize their wealth. This is the basic saying of finance which is based on rationality. Those who agree, try to find different ways to build up their wealth. In order to maximize their resources, people invest in different assets. Investors want to know which investment would be safer and good enough to have a handsome increase in investor's wealth. Investors have different priorities for investment opportunities and these priorities are based on different criteria. For example, they may value the asset on the basis of the return they expect to receive as dividends, cash flows and appreciation in the original value of the asset. Meanwhile, they can evaluate the entire firm by calculating the present value of the firm's operations or hypothesizing a simple connection between an expected rate of return and systematic risk of investment security. Similarly, investors can value the asset on the basis of some independent factors in spite of evaluating on the basis of one single factor of systematic risk. Whatever the method is being used by investor to evaluate different investment opportunities, the main purpose of evaluation is to grasp that investment opportunity from the available opportunities which can increase wealth in the future. Here another question arises that how many chances are there to receive the projected returns. The greater the chance of receiving proposed returns the security will be less risky. In order to evaluate the level of risk opportunity CAPM is used most widely.

The Capital Assets Pricing Model (CAPM) is introduced by (Sharpe 1964), (Lintner 1965) and (Jensen, Black et al.

1972). It basically conveys the idea that the prices of the securities are adjusted in a way that expected returns will pay off for the expected risks. CAPM is basically the main systematic tool for clarifying the association between expected return and risk (Milionis 2011). Capital Assets Pricing Model (CAPM) is a model which tries to assess the worth of the risk. CAPM has some assumptions (Van Horne James 2002). It stresses that if some specific statements or assumptions are considered as given, than by the CAPM model we can compute or assess the expected returns from the invested assets (Jarlee, 2007). Bodie, Z., Kane, A., Marcus, A.J. (2005), Horne. (2006), and Copeland, Weston, & Shastri. (2007) stated that the assumptions which CAPM considers can be grouped as follows:

- Investors as a whole do not like risk; they will make best use of the projected usefulness of their end of the wealth period. So the implied meanings of the model are: The model is a one period model.
- Identical estimated yield and covariance matrix of return on stock is being used by all the investors in order to form the optimal risky portfolio. We can say that these are similar anticipations (beliefs) about asset returns. Resultantly; At one time similar information is used by all the investors.
- Investors can borrow or lend at a rate that is fixed and risk-free and they can borrow whatever amount they desire on the same interest rate.
- Within one period number of stock and the quantities available for those stocks are fixed. All these available stocks can be divided exactly and are priced in a perfect competitive market. Implied meanings are: Education sector organizations providing educated human resource, private organizations, and assets financed by the government which are non business organizations like town halls and international airports.

- Market imperfections are not there. So we can imply that taxes, trading costs or regulations are not there.

(Blume 1993) states that CAPM provides a model, which explains the equilibrium risk/return association, also, according to CAPM, a linear relationship exist between systematic risk (non-diversifiable), which is measured by beta and the expected returns. We can explain this linear relationship by security market line (SML), which equates the systematic risk of a share and the return, along with the risk of the market and the risk-free rate of return (Watson and Head 2010). (Ansari, Naeem et al. 2005) consider that CAPM explains the risk in a way that market rewards risk bearing and we know people are usually risk averse. The collective risk premium for all risky assets must be encouraging to persuade people to have the whole amount of risky assets in a financial system.

Bodie, Kane and Marcus (2003) stated that the risk is divided into two parts; Unsystematic risk and Systematic risk. Firm specific risk is unsystematic risk, which can be related to some specific industry or security as well. This unsystematic risk can also be termed as diversifiable risk or specific risk. We can eliminate unsystematic risk using diversification. While the systematic risk is concerned with the overall market or entire financial system. We can also state it as un-diversifiable risk or market risk e.g. Interest rate, wars or recessions. This systematic risk directly affects all market and diversification cannot eliminate it.

Systematic risk is measured by Beta and we can positively correlate it with the return. (Van Horne, 2006). In any underlying security this systematic risk can be avoided using portfolio diversification. However, with this diversification we cannot eliminate systematic risk (Bodie et al., 2003). The forecasted return expected by the investor would be greater if there is greater systematic risk(Lau, Quay et al. 1974). In 2012 (Masood, Saghir et al. 2012) revealed that The

CAPM implication is this that high risks are accompanying with high return.

As CAPM argue that investors should hold a portfolio which is so well diversified that it may lead to a zero unsystematic risk at no cost of diversification so they should be concerned about the systematic risk part of total risk of a portfolio only. So, for total risk of the portfolio the systematic risk will be only active part. Jones (1998) stated that variations in share prices and the changes in share portfolio relative to market portfolio can be ascertained by beta.

According to CAPM for investors in determining the expected return and the risk premium on any investment opportunity beta is used as a measure of systematic risk even it is undoubtedly linearly related to the expected return without considering how much total risk a security has. According to the principle of risk premium investors have no option except taking a higher beta to raise a higher return from an investment opportunity. But, experimental indications have found weak or no statistical relationship between beta and higher return (Banz (1981); Basu (1983); (Fama and French 1996) and others).

## **2. Literature Review**

The CAPM is based on portfolio theory and can be considered as an extension of it. Moreover, it implies that for describing the cross section return of any investment security at any specific time interval beta alone is sufficient. For finding out risk CAPM uses beta and at the same time uses beta for calculating expected returns (O' Brien and Srivastava, 1995).

Afterward, many researches to test the validity of CAPM has been made but observed test results produced many unsolved queries about the true practical results of this model in different markets present the world.

(Jensen, Black et al. 1972) conducted a research on the stocks of the New York Stock Exchange during the period of 1931-1965. They observed a linear relationship between beta and portfolio return. This means that high returns can be gained on higher beta security. (Fama and MacBeth 1973) From time series regression estimated beta on the basis of monthly data over the time period of 1935-1968. To compute the risk premium for each month they performed a cross-sectional regression for twenty portfolios of assets. They resulted with their research that in CAPM the coefficient of beta is statistically significant. Afterward, (Tinic and West 1984) accomplished a study comprising all stocks listed on NYSE during the time period of 1935-1982 for checking the validity of basic relationship between expected return and risk. Their research resulted in a positive relationship among risk and return for the month of January while, no significant relationship for the remaining eleven months was found. These results contradicts with those of (Fama and MacBeth 1973).

(Hansson and Hordahl 1998) applied CAPM to the Swedish stock market. They ended with a difference in results from evidences presented by international researches regarding CAPM. (Levy, Levy et al. 2000) cited the results of (Bossaerts and Plott 2000) initially supported the CAPM, but some statistical tests performed later on discarded the model, these results may be due to market thinness or differences due to time constraints. (Levy, Levy et al. 2000), enhanced their study using microscopic simulation (A computer –based technology), which produced results that supported CAPM. Further The CAPM, was tested by (Gómez and Zapatero 2003) for data based on US securities from S&P 500 index. They suggested two Beta model and it was supported by their results. The researcher Keogh (1994), found negative fluctuations in beta, this affected the significance of beta and CAPM, particularly for South Africa. Whereas, the results provided by (Bradfield, Barr et al. 1988) study supported the CAPM.

Whereas conditional CAPM is strongly recommended by (Jagannathan and Wang 1996). That is the situation when betas and expected return are permitted to fluctuate over time by considering that the CAPM holds in each period. A linear and positive relationship was resulted between beta and expected return while, using monthly stock return data by the research of (Clare and Priestly 1998). Their sample was collected from the data of UK markets over the period of 1980-1993. In 1992 Sauer and Murphy's research confirmed that for describing German Stock Market CAPM is the best model. The positive relationship between risk and return was rejected by (Al Refai 2009) research while analyzing CAPM's validity on the emerging markets. They used monthly data for the period of December 1999 to September 2008 to examine the relationship between return and risk on the industrial portfolios of the financial market of Jordan. A research conducted by (Nimal and Horimoto 2005) in Tokyo Stock Exchange (TSE) revealed that beta and average return is not having a significant relationship for all months. Secondly, they also found that this relationship is negatively significant even for non-January months during some periods. While, analyzing the data of three South East Asian stock markets; Hong Kong, Malaysia and Singapore (Clare and Priestly 1998) presented that in these south Asian markets beta has significant positive relationship with average stock returns. The results of (Gursoy and Rejepova 2007) supported the CAPM assumption stating beta as a considerable factor in explaining the returns of portfolio in Turkey. They generated these results by regressing the beta coefficients of 20 portfolios against weekly risk premiums while each portfolio includes 10 stocks. They took the sample from 1995 to 2004.

### **3. Research Question**

- Is CAPM applicable in Pakistani Market in its original form?

- What are different factors that may require to be added in basic CAPM to predict the relationship between risk and return?

#### **4. Research Gap**

Various researches have been conducted to validate the applicability of CAPM in Pakistan. Most of the researches ended with non-confirming relationship of risk and return predicted on the basis of CAPM. Even the conditional CAP models also produced contradicted results. This empirical analysis tried to dig out the reasons behind these contradicted results which are still unexplored.

#### **5. Debates in Pakistan**

To test the validity of CAPM, different studies have been conducted in Pakistan, which involved KSE, Karachi Stock Exchange considering as a leading stock exchange of Pakistan. Though KSE started work in 1991, but it remained a thin market till the start of 2002. (Gul 2013) stated that after 2002 due to increased foreign investments the market activity increased till 2008. Due to world financial crisis and political instability market activity started deteriorating. But it again started strengthening itself thus increasing investors' confidence. Currently, there are 579 companies listed in KSE under 33 different sectors. Most of the research conducted is based on the data from KSE-100 index. More than 85% of the total market capitalization of the companies listed on the Exchange is tracked through KSE-100 index.

The suitability of CAPM for stock exchange of Pakistan was examined by Iqbal & Brooks (2007). For explaining the cross section of stock return on the Karachi Stock Exchange starting from September 1992 to April 2006. To check the applicability of CAPM, the tests were carried out not only on



individual stocks, but on portfolios sorted on the base of sizes and on industry portfolios as well. They used daily, weekly and monthly data for these tests. They also calculated beta for thin trading (A situation in which the trading activity is low because of a lack of buy or sell orders). This study was contrary to earlier studies that were held on emerging markets i.e. the expected signs resulted for beta risk and the skewness. However, the relationship between return and risk resulted to be non-linear.

(Khan, Gul et al. 2012) found that CAPM did not give expected results. They accessed CAPM by calculating beta of ten companies listed in KSE. They also compared the expected and actual returns. These Same results were revealed by (Bhatti and Hanif 2010) when they checked the applicability of CAPM on 60 firms registered in KSE during 2003-2008.

(Asalya and Shah 2013) Also tested CAPM in KSE. They selected 10 companies from KSE-30 index. Their sample covered the period from February 2009 to January 2013. (Asalya and Shah 2013) Used weekly data of returns on stock. They ended with their findings that beta is not the only risk factor in Pakistan's emerging market as is stated by CAPM.

Uzair and Muhammad (2010) tested CAPM in institutional framework of Pakistan. Their results didn't support CAPM as from 360 observations only 28 observations were in favor of CAPM. Their sample consisted of 60 organizations under KSE-100 index. They covered 6 years starting from 2003 to 2008.

Traditional CAPM was supported by the research of (Javid and Ahmed 2008), when they found the relationship between returns and risks. This finding was not adequate for longer period. Hanif, (2009) tested the validity of CAPM on tobacco industry and taken the sample data for the period of years.

(Rizwan, Shaikh et al. 2013) suggested CAPM is not applicable on the Pakistan Stock Markets (KSE) in full extent.

As investors cannot use the rate of returns produced by CAPM for decision making purpose. They took the sample of 10 companies from KSE-100 index and used the data of 5 years from 2006-2010. Their findings showed larger variations which comprises of 90% of the sample.

(Masood, Saghir et al. 2012) Found that unique risk factors are there which contribute to risk premiums. These unique factors are in addition to market risks. They tested CAPM on 20 companies listed under KSE-100 index and covered the time period starting from 16 December 2008 to 26 February 2010.

Unexpectedly CAPM is both most accepted and rejected model of asset pricings as it has been extensively tested and examined. CAPM captured a notable place among the financial economist's research since its birth (1964) and still it is the part of curriculum of finance in most of the leading business schools around the world.

(Fama and French 2004) Mainly criticized CAPM. They considered other important factors like size factor, value factor apart from single factor of market or systematic risk. (Fama and French 2006) Concluded that size of the company and B/M ratio is compensated in the form of higher returns instead of beta.(Rafique and Taj 2013) Tested this model in Pakistani market. They checked the sensitivity of stock returns with the size, market risk premium, momentum factors and effect of value which is represented by book to market ratios. They used the sample of 102 stocks listed under KSE-100 index covering the period from 2005 to 2012. Their study revealed no alarming impact of these variables on stock returns. Liquidity of the companies was added as another factor to explain the required returns by(Pastor and Stambaugh 2001). In Pakistan (Khan, Ali et al. 2012) checked the impact of leverage on the basis of stocks having low and high debt to equity ratio and size on the basis of market capitalization on the required returns of portfolios. Their study suggested that market and size

contributes in determining stock returns as compared to leverage. (Ross 1976) also criticized CAPM while contributing to 'Arbitrage Pricing theory' (APT). As according to APT returns on the assets are linearly associated on a set of indexes. Many researchers proposed different alternative situational factors to analyze the relationship between risks and returns.

Here the question arises that whether CAPM is dead in real sense, or it has been misinterpreted by most of the researchers as is stated by fan in 2004. (Guo 2004) Explained this as produced results should not be a shock as CAPM is based on some strong assumptions, the model will certainly fail if any one of the assumptions is not met. Discussing about the assumptions (Guo 2004) Considers CAPM is a static model because expected returns on stock is considered to be constant. (Guo 2004) says that if we consider expected returns on stocks as time-varying, rather considering them static, as is shown by (Merton 1973) and (Campbell 1992) that the return on an asset is determined by the covariance of return on asset with the returns of stock market along with the covariance of stock return with the variables which speculate the market returns. While CAPM considers only the covariance of return on an asset with the returns of stock market. (Guo 2004) found that the failure of CAPM is mainly due to ignoring the covariances with forecasting variables in determining the stock market returns. (Guo 2004) concluded that the CAPM failure is connected to time varying expected returns that was in consistent with (Campbell and Vuolteenaho 2003).

In 2008 (Javid and Ahmad 2008) found that Sharpe-Lintner CAPM is not an appropriate for describing the relationship between market risk and expected return. They tested that in order to exemplify the risks that are used against rewards in stock markets they used macroeconomic variables along with market returns. Their notable study ended with the finding that for explaining and illuminating the relationship between risk and return conditional Capital Asset Pricing

Model (CAPM) with the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model in combination explores slight betterment when implemented at the Pakistan Stock Market for a specified time period. They selected their sample of stocks for the period between 1993-2004 on the basis of KSE's overall turnover for the year 2000 based on the criteria of each stock's 90% contribution in an overall turnover of the KSE for the year.

(Gul 2013) Compared standard CAPM with Fama and French three factor model CAPM model. They revealed that CAPM is preferable to be used for Pakistani capital market. The results of their study contradicted with recent researches done in the same context as done by (Mirza 2005, Javid and Ahmad 2008). (SARWAR, HUSSAN et al.) Also tested CAPM on non-financial sector. Their study confirmed the noise trading theory for Pakistani markets involving the sentiments of investors for the trading volume of stocks. (Shahzad, Zakaria et al. 2014) used KSE-100 index sampling 117 firms based on the data from 2005 to 2012 under different data frequencies and time frames. This study resulted that data frequencies and time periods impacts the capacity of CAPM to predict the cost of capital or return on investments. To check the validity of CAPM in different trading volumes for Pakistan's emerging market (Shah, Dars et al. 2014) reveals that basic CAPM produces inaccurate results in down markets and suggest some additional factors in determining the stock return in addition to beta.

## **6. Recommendations**

As per above discussion, the validity of basic CAPM for an emerging market like Pakistan is still in question. This is mainly due to the assumptions on which CAPM rely. Most of the situational factors has been introduced by many researchers in basic CAPM. These additional factors resulted in

various forms of conditional CAP models. Even after the introduction of various factors these conditional CAP models presented contradicting results. These results may be due to the reasons that researches carried out for validity of CAPM in Pakistan mainly used mixed samples, selecting from KSE-100 index based on different criteria mostly on the basis of market capitalization. If we look at previous researches conducted worldwide we can check that CAPM produces different results for the companies even in the same sector. Considering Pakistani market as emerging and volatile market it is suggested that non standardized form of CAPM should be tested to predict the stock returns on individual sectors and for the portfolios of firms having similar characteristics.

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