Application of CAPM in the Chemical and Fertilizer sector: A case study of the Pakistan Stock Exchange

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Abstracts

This study aims to examine the Capital Asset Pricing Model (CAPM) for Chemical and Fertilizer sector firms listed on KSE-100 from January 2010 to December 2020. The research used monthly returns of firms in the chemical and fertilizer sectors and formed three different portfolios to test the model through time series regression. KSE-100 index monthly returns are used as a proxy of market returns for this study. The findings of this study related to individual stocks support the theory's basic statement that the risk and returns of stock are positively related to each other. Also, the portfolio of the chemical sector's firm supported the theory. However, the portfolio of the fertilizer sector's firms and the combined portfolio are not supportive of the theory of CAPM.

Keywords: CAPM, KSE-100, Chemical sector, Fertilizer sector, Pakistan Stock Exchange

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Introduction

Efficiency is the core of management practices to make such decisions where output gets over to the input with stable predictions (Markowitz, 2010). Financial experts focus on determining portfolio returns within an uncertain macro-environment. Investors use methods and mechanisms to compensate for the almost unpredictable risks they take on their investments. However, no specific theory and model can be used for all types of investments with the accurate empirical valuation of risky assets (Wijaya & Ferrari, 2020).

Financial literature claims that variation of average return can be minimized through a diversified portfolio with uncorrelated risky assets. Markowitz's theory of Mean-variance-efficient portfolio was one of the initial models to support that claim and help form a better-balanced investment. With this foundation letter, Black, 1972; Fama & French, 1993; 1996; Lintner, 1965; Mossin, 1966; Sharpe, 1964 developed this model by identifying different factors to form and improve the Capital Asset Pricing Model (CAPM). The CAPM argument of a simple linear relationship between stock risk and expected return is one of the possible reasons for its being widely used (Pham & Phuoc, 2020).

CAPM measures stock returns in alignment with market performance and price volatility with beta. The model has a principal image in finance and is extensively used for security valuation, investment management, and capital budgeting. Empirical studies from the late sixties, through the seventies, to the early eighties supported the CAPM, but later studies regarding the model concluded that a single risk factor (β) is not sufficient to represent the expected risk premium (Raza et al., 2011). Later studies discussed other factors that have a significant effect on the risk-return relationship. Henceforth, Fama and French (1993) introduced the three-factor model of an extension of CAPM, adding firm size named “size-effect” and the book-to-market ratio of the firms in the original equation of the CAPM. The same authors Fama and French (2015), introduced a five-factor model by adding two more factors profitability and investment, to the three factor model.

Empirical studies on CAPM have been conducted in almost all the markets in the world and are not accurately aligned with its assumptions and claims, but the model is most generally accepted in theoretical and practical life. The classical CAP Model has been tested by using data from China, by Chen, 2022; Xuejie & Mingyang, 2019; Xuepeng, 2020 in India by Bhatt & Chauhan, 2016; Chaudhary & Chaudhary, 2010; Pravin & Dhananjay, 2019, and in Pakistan by Ashfaq & Tang, 2020; Jan et al., 2021; Wu, et al., 2017 and they found mixed results mostly in partial support of the model. Apart from these numerous studies, there is a limited number of research on single sectors of an economy. This study aims to test the model on chemical and fertilizer sector firms listed on the KSE-100 index at PSX. As far as concerned these two sectors are among the most attractive as agriculture is the second most contributor to the GDP of the country and the chemical sector contributes ˜4.5% in exports and ˜12% in imports with 234 (PKR billion) market capitalization of listed companies in 9MFY21 (PACRA, 2021). The present study aims to find the answer to the question of whether the CAPM is a good predictor of returns of the chemical and fertilizer sectors.

The practical findings of this study can contribute to the confidence of investors in CAPM usage while predicting the expected behavior of returns of chemical and fertilizer sector firms in the Pakistan Stock Exchange (PSX) and, they use it as a tool for the prediction of returns. It will provide knowledge about the behavior of these two sectors' stock returns concerning the market returns. Finally, it will support the CAPM and its applicability and validity.

The present study aims to test the standard CAPM on the KSE-100 index of the Pakistan capital market. The plan of this paper is as follows: Section II discusses the empirical test of CAPM in different markets around the world in different periods, Section III exhibits research methodology, followed by Section IV the results of the study and at the end Section V concludes the procedures, findings, and discussion.

Literature Review

The CAPM was introduced by Sharpe (1964); Lintner (1965) and describes the relationship between the expected return and the associated risk with an investment. The model claims that the relationship between risk and expected return is linear and positive with the addition that to predict the risk premium of risky assets with a risk predictor beta (β). It provides methods to calculate the return that an investor expects from associated risks involved in an investment decision. The model measures the riskiness of assets with beta and compensates for that risk with a risk premium. The CAPM of Sharpe (1964), and Lintner (1965) is based on the theory of the mean-variance efficient model of Markowitz (1952).

According to Lintner (1965), there is no method or manner of diversification that sufficiently eliminates all the unsystematic risks on common stock holdings, and at least some independent variance remains unaccounted for even at the general level of business in a given state. But the objectives of diversification are to make a choice where the combination of risk and return is favorable to a particular investor and that choice is called an "efficient portfolio". If all the assumptions of CAPM hold, then that efficient portfolio is the market portfolio regardless of the degree of risk aversion of individual investors and the amount that they invest in the risky assets. The systematic risk of an investment in a particular individual stock is measured by β (beta) which is the covariance of returns of asset *i* relative to the market or index returns. Thus, diversification of risky assets minimizes the unsystematic risk while beta measures the systematic risk that cannot be eliminated but compensated. Beta is proportional to each dollar invested in risky asset *i*, it forms a linear relationship between risk and returns on the capital market line. The capital market line is an upward-sloping line where an investor can combine risk-free lending and borrowing, with risky assets according to their degree of risk aversion but the weight of risky assets in the risky portfolio remains the same regardless of the amount invested and risk aversion of an investor (Sharpe, 1964). This assumes that the market is efficient, and all information is available for investors without any cost.

The CAPM works through a set of assumptions. The model starts by posing the question "what if" to create a simplified and seemingly unrealistic world and then comes with the addition of complexity to hypothesize an investment environment and see how it can amend the outcomes. Bodie, Kane, and Marcus (2005) assert that in the testing of the model, researchers are aware of its being ceteris paribus and validity within a set of assumptions, which are as follows.

- The market is perfectly competitive, and all investors are price-takers, so they cannot affect the market price individually by their trade.
- All investors have investment plans for a single identical holding period, and they are short-sighted regarding future events, after the holding periods.
- The universe of trading just includes financial assets (stocks, bonds, unlimited borrowing, lending at a risk-free rate, etc.)
- Investors' incomes from their investments are tax-free and have no cost of transactions.
- All investors in the market are rational, which means they desire high returns with minimum risk, (mean-variance optimizer).
- All investors can analyze securities and related information at the same level. In the end, they will reach the same choice of a portfolio, which is mean-variance efficient.

The classical theory of CAPM can be represented by the following linear equation.

$$E[Ri]=Rf+\beta i[E(Rm)-Rf]$$

Where, $E[Ri]$ = Expected return on asset i

Rf = Risk-free rate

βi = Beta of the asset (security) i

$[Rm-Rf]$ = Market premium

The theory of CAPM is theoretically a perfect measure of risk premium also widely used and being used in financial markets all around the world, but empirical investigation found flaws in the model and questioned its applicability for every market. Investigation of the CAPM applicability in the Chinese stock market, Qing and Dongfeng (2015) Shanghai Stock Exchange and Guan (2019) China's real estate listed companies found a linear and positive correlation but Chen (2022) found that the classic model could not be applied because the assumptions of balance information, perfect regulation, arbitrage, and maturity of investors are not fulfilled. Also, the young Chinese stock market's, information asymmetry, and irrational speculation caused the application of the model (Chen, 2022). Thus, the application of CAPM is not fully effective (Jiaxuan, 2017), nor well reflected (Xuejie & Mingyang, 2019; Yixuan, 2020), and not suitable (Xuepeng, 2020) for the Chinese Share market. The same situation exists in the Indian stock market where empirical studies on CAPM cannot provide a concrete argument for its application. The beta is not significant enough to produce a higher return. Although diversification and portfolio development enhanced the precision of the beta supported the linearity of the risk-return relationship (Chaudhary &

Choudhary, 2010) and the difference between risk and actual return exist (Bhatt & Chauhan, 2016), and expected rate of return is not directly proportional its Beta with the market return (Pravin & Dhananjay, 2019). Thus, the model does not apply to the Indian market because there is a contradiction in the linear relation between risk and return and beta alone is not a determinant of portfolio returns (Shinde & Mane, 2019). Most of the assumption of the CAPM holds in UK's security market except alpha is statistically significantly different from 0 for a stock, which provides arbitrage opportunities to beat the market (Peng, 2021), an association of higher risk with a higher level of return does not hold in the Cameroun Douala Stock Exchange (Offiong et al,. 2020). Financial markets and institutions in Pakistan are more volatile due to their immaturity and infrequent trading. It creates greater risk for investment and results in significant challenges for predictive theories. To test the applicability of CAPM studies on PSX found that the relationship between risk and return is no-linear at the Karachi Stock Exchange (Iqbal & Brooks, 2007), and the CAPM is not fully applicable to measure risk premium of risk (Hanif & Bhatti, 2010; Hanif 2010), because market risk is not a sole determinant of excess return (Yasmeen et al., 2012), while other factors like size and market value play a significant role to describe the expected returns (Jan et al., 2021). Expected returns through CAPM do not relate to actual returns in PSX (Wu et al., 2017). On the other hand study by Raza et al. (2011) supports CAPM application in short-term investment but in the long-term, the model is less predictive, also Ashfaq and Tang (2020) also give a supportive argument for the model on asset management organization in KSE-100.

The above discussions and cited studies regarding the empirical validity and applicability of the simple CAPM have varying findings. Mostly indicated that the accuracy of CAPM is doubtful in predicting future returns. All empirical studies discussed not fully denied the model, nor supported it with full spirit. As the empirical results are mixed, this study aims to test the applicability and validity of the model on chemical and fertilizer stocks listed in the KSE-100 index of PSX.

Methodology

This research used the positivist philosophy where the role of the researcher was an independent and objective analyzer. The general idea of this study is to test and verify the CAPM's applicability to the KSE-100 index.

The study covers the period from January 2010 to December 2020. The selection of data is based on the focus of sectors to analyze. Karachi Stock Exchange (KSE-100) index is a market capitalization-weighted index containing 100 firms from all sectors with the highest market capitalization. This study just focused on the chemical and fertilizer sectors. In each sector, five firms were listed in the KSE-100 index in September 2022, which makes a total of ten firms. One firm from the fertilizer sector is excluded because of the unavailability of data. Therefore, nine firms were selected to test the CAPM. The study uses monthly closing prices adjusted for all corporate actions (dividends, stock splits, mergers, and other corporate actions) of all nine companies' stocks for eleven years from January 2010 to December 2020. The data are collected from the website of PSX. Capital markets in developing countries like Pakistan are not mature and involve infrequent trading. Thus, using daily or weekly returns is very noisy and might end with inefficient estimation. To compare the riskiness of individual stocks with market portfolios this study used KSE-100 as a proxy for the market. Hence, monthly data for132 months is formed to test the model. Calculating monthly returns assumes that continuous compounding of returns takes place,

$$Rit = LN(Pt/Pt\text{-}1) *100$$

For a more precise risk-free rate, the three-month Market Treasury Bills (MTBs) rate for the period from January 2010 to December 2020 is used. The annualized returns of MTBs are converted into monthly returns by =R/12 months. To test the validity and applicability of CAPM on KSE-100 listed stocks time-series regression analysis. CAPM is tested with two different sorts of mechanisms. First, time-series regression of all nine individual stocks' excess returns with market excess returns is applied. Secondly, three portfolios of excess returns, a chemical sector firm's portfolio, a fertilizer firm's portfolio, and a combined portfolio of all nine firms, are regressed with the market excess returns. The realized stocks and portfolio's returns are calculated by the following CAPM formula:

$$(Ri - Rf) = \alpha+\beta\ (Rm - Rf)$$

Where, Ri = required rate of return of security or stock

Rf = Prevailing risk-free rate in the market

β = Systematic risk associated with the stock, and

Rm = Return on market

The rationality of CAPM is confirmed by the alpha (α) which is the intercept that should be equal to zero. Further, a 95% confidence level and t-value = 1.96 is used to confirm the power of market premium to predict portfolio returns. For time series regression analysis, data are processed on Stata to run the regression and analyze the results.

Results

Table 1 reports the means, standard deviations, and maximum and minimum values of returns for all nine stocks. These nine stocks have variations in rates of return. The mean of returns ranges from -0.06% to 1.4% for the chemical sector, -0.08% to 0.01% for the fertilizer sector and a combination from -0.08% to 1.4%. Similarly, the case of the standard deviation of the rate of returns shows a different level of risk ranging from 8.7% to 11.1% for the chemical sector, 6.7% to 10.4% for the fertilizer sector, and in combination from 6.7% to 11.1%. The last columns of the table show that the minimum returns of all stocks are negative, and the maximum returns are positive.

Table-1. Descriptive Statistics of Stocks

Sectors	S. No	Firms	Observations	Mean	Std. Dev.	Min	Max
Chemical	1	ARPL	131	.002	.096	-.21	.392
	2	COLG	131	.014	.087	-.202	.336
	3	EPCL	131	.002	.111	-.24	.447
	4	ICI	131	.003	.102	-.323	.279
	5	LOTCHEM	131	-.006	.102	-.278	.288
Fertilizer	6	ENGRO	131	.001	.104	-.338	.289
	7	FATIMA	131	-.002	.089	-.213	.332
	8	FFBL	131	-.008	.098	-.41	.226
	9	FFC	131	-.003	.067	-.174	.215

Note: The total number of monthly observations is 131. The table reports the mean, standard deviation, and minimum and maximum values of stock returns for the period of January 2010 to December 2020.

Table 2 reports the means, standard deviations, and maximum and minimum values of portfolio returns. Each portfolio has a different level of the mean for the rate of return. The chemical sector's mean is 0.03% and the fertilizer sector's mean is -0.03%, which consequently offset each other and result in a 0% average return for the combined portfolio. The standard deviation for the chemical sector is 6.5%, for the fertilizer sector it is 6.4%, and for the combined portfolio returns the standard deviation is 5.7%. Like the returns of individual stocks, the last column of the table shows negative minimum returns of all portfolios, while the maximum returns are positive.

Table 2 Descriptive statistics of portfolios

S. No	Variable	Observations	Mean	Std. Dev.	Min	Max
1	Chemical Sector	131	.003	.065	-.177	.2
2	Fertilizer Sector	131	-.003	.064	-.177	.152
3	Combine Sectors	131	0	.057	-.167	.137

Note: The total number of monthly observations is 131. The table reports the mean, standard deviation, minimum and maximum values of the portfolio's returns for the period of January 2010 to December 2020.

Table 3 shows the correlation between stock returns over time. The highest level of correlation in absolute terms is 0.576 between FFBL and FFC, both are fertilizer sector firms. The lowest level of correlation is 0.001 between FFBL and COLG. Only FATIMA and FFC have a negative correlation. Further, COLG and other stocks have a positive correlation with each other.

Table 3 Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ARPL	1.000								
(2) COLG	0.236	1.000							
(3) EPCL	0.263	0.173	1.000						
(4) ICI	0.374	0.145	0.434	1.000					
(5) LOTCHEM	0.164	0.112	0.503	0.351	1.000				
(6) ENGRO	0.184	0.111	0.497	0.333	0.369	1.000			
(7) FATIMA	0.172	-0.006	0.237	0.270	0.200	0.144	1.000		
(8) FFBL	0.242	0.001	0.393	0.413	0.404	0.452	0.289	1.000	
(9) FFC	0.204	-0.068	0.165	0.368	0.329	0.364	0.338	0.576	1.000

Note: The matrix of correlations is calculated by using excess returns of stocks, from January 2010 to December 2020.

Table 4 displays the results of the estimation for the CAPM through time-series regression by using data from January 2010 to December 2020 of individual stocks listed in the KSE-100 index at PSX. The table reports the estimates of the alpha(intercept), coefficient, t-statistic, and P-value of each stock along with the R-square. For ARPL stock the coefficient 0.567 shows that a 1% change in the market premium changes the stock return by 0.567%, which is statistically significant at a 5% level of significance with t=4.22, and P=0.000. The R-Square 0.121 shows that the market prices explain a 12.1 % variation in the stock returns of ARPL. The results of COGL stock with a coefficient of 0.461 show a 0.461% relation with the market return at a 5% significant level, t=3.77, P=0.000, and R-Square 0.099. Returns of EPCL are significant with t=7.88, P=0.000, and R-Square 0.352 showing that market excess return can explain a 35% variation in stock returns. With t=7.91 and P=0.000, the market returns can predict the returns earned by ICI. Moreover, the coefficient of 0.98 indicates that the ICI earns identical returns equivalent to the market returns. The R-Square 0.326 shows that the market prices explain a 32.6 % variation in stock returns of ICI. The relation of LOTTE stock returns with the market is 0.925% at t=7.20, P=0.000, R-Square 0.286 at a 5% significant level. For ENGRO the coefficient 1.07 shows that a 1% change in the market premium changes the stock return by 1.07%, which is statistically significant at a 5% level of significance with t=8.82, and P=0.000. The R-Square 0.376 shows that the market prices explain a 37.6 % variation in the stock returns of ENGRO. Moreover, the results are significant for FATIMA fertilizers too with coefficient = 0.54, t=4.41, P=0.000, R-Square 0.131 at a 5% significant level.

The FFBL with a coefficient of 0.939 shows that a 1% change in the market premium changes the stock return by 0.939%, which is statistically significant at a 5% level of significance with t=7.89, and P=0.000, and R-Square 0.325. FFC stock returns with coefficient 0.620, t=7.39, and P=0.000 are related to the market returns at a 5% significant level and 0.297 R-Square. The intercept, coefficient, t-statistic, and P-value of each portfolio along with the R-square are reported in Table

5. It presents the results of regression on portfolio returns. For the Chemical sector, the coefficient 0.801 shows that a 1% change in the market premium changes the portfolio returns by 0.801%, which is statistically significant at a 5% level of significance with t=12.01, and P=0.000. The R-Square 0.527 shows that the market prices explain a 52.7 % variation in portfolio returns of the chemical sector. For the Fertilizer sector portfolio, the coefficient is -0.126 but it is statistically insignificant at a 5% level of significance with t=-1.32, and P=0.189. The R-Square 0.0134 shows that the market prices explain 1.34 % variation in portfolio returns of the fertilizer sector. The fertilizers' returns do not support the CAPM, it may have been caused by the negative returns of all stocks except for ENGRO. ENGRO's large size may make it able to earn more than its

Table 4 Stocks return time series estimation of CAPM

Serial No.	Stocks	α (alpha)	Coefficient (β)	R-square
1	ARPL	0.0034 (0.04) [0.966]	0.567 (4.22) [0.000]	0.121
2	COLG	0.0123 (1.72) [0.082]	0.461 (3.77) [0.000]	0.099
3	EPCL	-0.0015 (-0.19) [0.851]	1.07 (7.88) [0.000]	0.325
4	ICI	-0.0009 (-0.1) [0.990]	0.98 (7.91) [0.000]	0.326
5	LOTTE	-0.0089 (-1.18) [0.240]	0.925 (7.20) [0.000]	0.286
6	ENGRO	-0.0029 (-0.42) [0.678]	1.07 (8.82) [0.000]	0.376
7	FATIMA	-0.00419 (-0.58) [0.566]	0.544 (4.41) [0.000]	0.131
8	FFBL	-0.0118 (-1.69) [0.094]	0.939 (7.89) [0.000]	0.325
9	FFC	-0.005 (-1.02) [0.312]	0.620 (7.39) [0.000]	0.297

Note: () represents the t-statistics, and [] represents the p-value. P-value is considered significant at a 5% level. The data used for estimation are monthly stock returns for the period from January 2010 to December 2020.

competitors. Also, the returns for two firms, FATIMA and FFC, which are fertilizers are negatively correlated with COLG which a chemical firm is reflecting that they are moving against each other. These factors including the small size of three fertilizer firms compared to ENGRO can be influential in affecting the validity of CAPM on the fertilizer portfolio. Likewise, for the combined sectors, the coefficient -0.0170 was statistically insignificant at a 5% level of significance with t=-0.20, and P=0.842. The R-Square 0.0003 shows that the market prices explain only 0.03 % variation in portfolio returns of combined sectors. The combined sectors portfolio does not support the CAPM, because both portfolios combined show different results individually. The chemical sector's mean returns are oppositely equal to the fertilizer sector's mean returns, which are offsetting each other, and the combined sectors' mean is zero as shown in Table 2.

Overall, the individual stocks' time series data supporting the CAPM including the chemical sector portfolio. The fertilizer sector portfolio and combined sectors portfolio did not support the model applicability and validity at KSE-100 from January 2010 to December 2020.

Table 5 Portfolios return time series estimation of CAPM

Serial No.	Portfolios	α (alpha)	Coefficient (β)	R-square
1	Chemical sector	0.00048 (0.12) [0.901]	0.801 (12.01) [0.000]	0.527
2	Fertilizer sector	-0.00259 (-0.46) [0.647]	-0.126 (-1.32) [0.189]	0.0134
3	Combine sectors	0.00070 (0.14) [0.889]	-0.0170 (-0.20) [0.842]	0.0003

Note: () represents the t-statistics, and [] represents the p-value. P-value is considered significant at a 5% level. The data used for estimation is monthly stock returns for the period from January 2010 to December 2020.

Discussion

The study results on sector wise stock valuation came out to be supportive of the theory of CAPM as the study of Ashfaq and Tang (2020) found on asset management organizations in Pakistan. However, it presents a contradiction with Hanif (2010) and Shaikh, Shaikh, and Shaique (2017) on the Tobacoo and Cement sector respectively, and with Raza et al. (2011) where 27 out of 30 supported the model. The mixed results suggest a careful analysis requirement while using CAMP as a valuation model for different sectors at PSX. The results of Hanif and Bhatti (2010) argue that the CAPM is not a fully applicable model to KSE. Additionally, the study on the Bombay Stock Exchange by Diwani (2010) claims different results for the same stocks in different time period. Thus, different studies on PSX and other markets deny the full applicability of the CAPM to all sectors and all time periods. However, different results in different time periods and different sectors of a particular market, as Peng (2021) argues that the CAPM can be a useful tool for asset valuation and decision-making in some cases, but its users should consider the inaccurate predictions and unrealistic assumptions of the model.

Conclusion

This study tests the applicability and validity of the standard CAPM in the KSE-100 index using chemical and fertilizer firms' monthly data from January 2010 – December 2020. Individual stock returns of five chemical sectors and four fertilizer sectors are used to test the model, as well as three portfolios formed by combining the stocks of each group. Using the time-series approach, each stock's market excess returns are regressed on stock excess returns. The time-series approach for each stock shows that the CAPM is an accurate predictor of returns in the KSE-100 index for the study period. At a 5% significance level, the P-values for each stock show a significant relationship between the stock's returns and the market returns. The same techniques are applied to the portfolios, and the results confirm that the portfolio of the chemical sector supports the CAPM, but the portfolio of the fertilizer sector's firms and the combined sector did not support the CAPM. In the case of portfolios in the chemical sector, the market returns are significant in explaining the stock returns, but in the other two, they were not.

The findings of this study show that the standard CAPM's performance in KSE-100 for the period of January 2010 to December 2020 as a predictor of future returns is mixed. It performs well for individual stocks, but in the case of portfolios, it is only a good predictor for the chemical sector. These findings are helpful for investors, managers, and other participants to use the model for the prediction of stock returns for single stocks in the chemical and fertilizer sectors listed on PSX. From a theoretical perspective, the study suggests that the CAPM needs improvement and should be tested with other factors. Its success on single stocks and failure in portfolios raise questions about whether other factors like size and book-to-market value may play a decisive role in scale premium (Jin, Xia, & Quiju, 2020) and need separate attention. Thus, the theory, because of its simple usage, can be used to calculate capital cost and expected return, but other more effective models must be used to ensure accurate predictions.

This research includes only chemical and fertilizer sector firms listed on the KSE-100 index; it does not include other sectors of the KSE-100 index. Thus, this study is limited to the chemical and fertilizer sector, and we cannot generalize the results to other sectors. Furthermore, the listed firms in this study are not permanent parts of the index, as other firms can replace them with high market capitalization. Due to the short sample data period, we cannot claim that this result is enduring, as a larger sample period may provide different results. This study only measures the risk and return relation with just one factor of beta. Other factors, such as firm size, book-to-market value, investment, and profitability, can affect the outcomes.

Future research can use other factor models to evaluate the risk and return relationship of the same sectors. Also, they can include other related and unrelated sectors to test the CAPM. The researcher can extend the sample period of the study, which may improve the outcomes. In the future, different sector-wise or size-wise portfolios may be formed to test the model. The researchers may test the effects of every single factor of the stock returns in isolation."

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