Non-Standardized Form of CAPM and Stock Returns

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Abstract

Emerging markets like Pakistan confront with the problem to validate the CAPM in its original form. Since standard form of this model has unrealistic assumptions, different non-standardized forms have been introduced by different researchers. This paper also introduces a non-standardized form of CAPM to validate whether it is applicable in Pakistan. The data of 20 companies of different sectors, covering the period of 2007 to 2008 were collected. One year KIBOR is taken in replacement of T-bill rates. Beta 3 is calculated using an equation to show the negative relationship between interest rate and market returns. The results of regression analysis reveal mixed results. For instance, mean return of companies in cement and chemical sector is linearly related to its beta risk while other sectors have volatile results.

Key Words: CAPM, Corporate Finance, Market Return

1. Introduction

Every one, in this world, wants to maximize one's wealth. This is the basic axiom of finance which is based on rationality. Those who do accept this axiom as true, find ways to maximize their wealth in different ways. They invest in different assets so that they can maximize their resources. Here one critical question arises that in which asset to invest so that wealth can be maximized. In particular, investors have to make decisions in which stock to invest money as the safer and good investment. Before they make decision, they value assets in different ways. For example, they can value assets by the amount they expect to receive in terms of dividends, cash flows and accounting earnings (Discounted cash flow model) or they value the entire firm by estimating the present value of its operations (Corporate valuation model, FCF) or postulate a simple relationship between expected rate of return and systematic risk of a security or portfolio (CAPM) or value the asset based on several independent factors rather than a single factor of systematic risk (APT) or they can value firms by using accounting multiples and numbers or company valuation can be done (Comparable company valuation, CCV). Whether they use any method to value any asset or companies, the main purpose is to find securities which can maximize his or her wealth in future.

1.1 Underlying principle of Capital Asset Pricing Model (CAPM)

The CAPM conveys the notion that securities are priced so that the expected returns will compensate investors for the expected risks. There are two fundamental relationships: the capital market line and the security market line. These two models are the building blocks for deriving the CAPM. The capital market line specifies the return individual investors expect to receive on a portfolio. The security market line expresses the return an individual investor can expect in terms of a risk free rate and the relative risk of a security of portfolio. The model is an extension of Markowitz's (1952) portfolio theory. Sharp (1965), Linter (1965) and Black (1972) are the researchers who developed the CAPM based on the assumptions and notions of portfolio theory. They suggest that high expected returns are linked with high levels of risk. In other words, the model demonstrates that expected return on a stock above the risk free rate has linear relation with non-diversifiable risk as measured by stocks' beta. Although there have been a number of researches on the validity of the model over the past 40 years, there are still some doubts on its ability to explain the actual movements of asset returns.

1.2 Non-standardized form of CAPM

Because standard capital asset pricing model is second moment (mean-variance) model, researchers and investors, on the basis of conflicting results, were motivated to use higher order moments like third moments (skewness) and fourth moments (kurtosis). Since the variance or standard deviation failed to capture fully the true risk of the distribution of stock market returns, the role of higher moments has become increasingly important.

For example, if investors prefer right skewed portfolios, then more reward should be given to investors willing to invest in left skewed portfolios.

Since one of the assumptions of CAPM is the efficient market which is not met in the emerging market, the risk-return relationship cannot be assumed as linear. Furthermore, the standard CAPM assumes that there are homogeneous expectations of all investors. This is not true in real world where everyone has his own choice based on which they select different portfolios. The model also assumes that there is always a risk free investment option to all investors. Therefore, there is a need to test this model with non-standardized form, assuming that investors do not have homogeneous expectations, the market is not efficient and there is no risk free investment available to investors so that it can be validated in the emerging markets. The main objective of this study is to examine empirically that how well the non-standardized CAPM can explain the risk-return relationship in case of Pakistani emerging market like KSE.

1.3 The Industrial Background of the Sample Companies

Banking Sector

This is a well growing and emerging sector of the economy of Pakistan. Increasing number of banks ensure that investors can take the stocks of banks in their portfolios.

Insurance Sector

This is another service oriented sector. Its growth is evidenced the inclusion of its stock in the portfolio of investors.

Fuel & Energy Sector

There are both public and private companies in this sector. This sector is classified into two Fuel and Energy sections. Fuel sector collects cash at spot and energy sector collects cash from the monthly billings which lead to determine the liquidity position of the companies. On the other hand, cash disbursement is also very high when they have to pay to Pakistan Refinery and Oil and Gas Development Authority.

Cement Sector

This capital intensive sector is heavily dependent on energy which is the most important input in the production of cement. Other elements of cost include transportation and packaging which increase the cost of goods sold and hence reduce the profit. Because companies in this sector collect cash at spot or before purchase, their liquidity position is very strong.

Chemical Sector

This is another capital intensive sector. Research and Development Expenditure is a major element of cost of production.

2. Literature Review

There has been numerous research on the CAPM developed by Sharpe (1964) and Lintner (1965) used for the purpose of asset valuation. The CAPM is based on portfolio theory developed by Markowitz (1952), a concept of portfolio efficiency in terms of the combination of risky assets that minimizes the risk for a given return or maximizes return for a given risk. Using variance of expected returns as the measure of risk, the author shows a locus of efficient portfolio that minimizes risk for a given rate of return. The CAPM is an extension of portfolio theory. According to the CAPM, beta alone is sufficient to explain the cross section return of any security at any given point of time. CAPM has been tested in different countries at different times to find out the return of the stocks.

Lau & Quay (1974) employed the CAPM on Tokyo Stock Market and summarized that the model is valid to the Tokyo Stock Market and sheds the accurate results with the sample size of 100 companies covering the period of 1964 to 1969. The validity of the model was tested and found different results, based upon the magnitude of risk. Huang (2000) studied the validity of CAPM with sample size of 93 firms, covering the period of 1986 to 1993. The data was segregated into two classes of risk i.e. high risk and low risk. Data of high risk contradicted the model whereas low risk validated the model. This paper concluded that the model is still not valid because the return calculated by the model did not interpret the actual position and could not be relied upon.

Capital Asset Pricing Model is a second moment model and depends upon a single risk factor, Beta. It was tested at different point of time in different markets but results were contradictory. Kraus and Litzenberger (1976) make the first move to highlight the higher order moments of CAPM in the NYSE from January 1926 to December 1935. The paper extended the CAPM to take account of the effect of skewness on asset valuation. This study concludes that investors have a preference for positive skewness. They estimated betas and gammas (skewness) which were ranked and composed into portfolio. They present an evidence of significant risk-premiums for skewness. According to their study, a third moment CAPM gives a more effective asset pricing process than the basic two moment mean-variance CAPM. This model is one of the cores of finance and because of which is applied and tested everywhere.

Johansson (2005) tested this model in Swedish Stock Market by introducing skewness and Kurtosis risk, meaning a four moment CAPM. They found that the model improves when augmenting the standard CAPM with both skewness and kurtosis risk which bring statistically significant risk premiums. This result is consistent with results concluded by Kraus and Litzenberger (1976) as stated above. Both studies were carried out in two different markets but the results were similar. In other words, the model is applicable if skewness and kurtosis is also considered while calculating the return of any security. Javid and Eatzaz (2008) conducted a study to test the validity of CAPM by using four moments CAPM in Karachi Stock Market. They covered the period of July 1993 to December 2004 with the sample size of 49 firms, which covered 90 percent to the total turnover of KSE in the year 2000. They found that the model with two moments is inadequate for Pakistani equity market. They further discussed that the asset returns in Pakistani equity market do not follow normality, indicating that investors are concerned about the higher moments of return distribution. Here again the study of Kraus and Litzenberger (1976) validated in case of KSE because results are consistent with their results.

Zhou (1993) refused the mean-variance efficiency given the normality assumption. This paper further concluded that the efficiency of the two moments model cannot be rejected when using alternative distributions, thus the normal is the most efficient one of the used distribution. Christopher and William (1990) introduced ARCH effects in daily stock returns. The paper concluded that ARCH may be assumed as a symptom of the daily time dependence in the rate of information arrival to the market for individual stocks. A liquidity based asset pricing model was introduced by (Bent and Jean, 2001). They developed a model which is driven by a corporate demand for liquidity meaning that consumers do not hold any bonds or other assets that sell at a premium. The paper employed a standard agency model wherein part of the returns from investments of a firm cannot be pledged to outsiders, hence raising a demand for long term financing like liquidity.

3. Methodology

The standard capital asset pricing model assumes the normality in the returns of an asset. Since the Pakistani stock market is not so efficient, it may be assumed that returns do not follow this assumption. The standard equation of CAPM shows the relationship between cost of capital and market returns and takes the following from.

$$E(R_{it}) = R_f + \beta_i (E(R_{mt} - R_f) \quad \text{(i)}$$

Where $E(R_{it})$ is the expected return on *i*th asset at time t, R_f is the risk free rate, R_{mt} is expected return on market portfolio at time t and β is the measure of risk or market sensitivity parameter.

The equation 1 indicates that the expected rate of return on asset *i*, is equal to the rate of return on the risk-free asset plus a risk premium. This equation 1 may also be stated using excess return as

$$E(R_{it)} = \beta_i (R_{mt}) \quad \text{(ii)}$$

Where $E(R_{it)}$ is the excess return on asset *i* at time t and R_{mt} is the excess return on market portfolio at time t over the risk free rate.

Analysis starts with the estimation of mean return of all sample firms which is used as dependent variable in the regression analysis. The regression is run to estimate the betas of stock return of each sample firms i.e. beta of KIBOR (beta 1) and beta of Market Premium (beta 2). Once these betas are estimated, beta 3 is calculated by using the equation 3 (see Appendix A for the equation).

$$R_{it} = -\beta_3 \text{Kibor} + \beta_2 R_m \quad \text{(iii)}$$

Where

$\beta_2 R_m$ = risk of market premium

β_3 = risk of Kibor less risk of market premium

The equation 3 assumes that β_3 will be negative, showing that there is a negative relation between interest rate (Kibor) and market premium. Stock return of each sample firms is calculated by applying equation 4

Stock Return = $KSE100_t - KSE100t_{-1} / KSE100_{t-1}$ (iv)

4. Sample Size and Data Collection

The daily data of KSE 100 index and stock prices are collected from the website of business recorder, covering the period of 2007 to 2008. After adjusting holidays, the data of KSE 100 index is left with 348 observations. Where the KSE 100 index does not exhibit any change in both days (current and last day), stock return becomes zero and hence is not included in the analysis. This further reduced the total number of observation to 97. Mean return of each stock return is calculated on these 97 observations. The regression is run with 97 observations to estimate the betas of two independent variables i.e. Kibor and Market Premium

There are 20 companies from different industries which are selected on the basis of highest market capitalization for this study**.** The purpose of selecting companies on this basis is to validate the CAPM model in KSE. If the results are significant then this may be assumed that this Non-standardized form of CAPM is valid in emerging markets like KSE. All companies are listed in KSE for the years under consideration. Since the data is collected on daily basis, stock return is calculated by only capital gain. One year Kibor rate is taken in replacement of T-Bill rate. The reason is that T-bill rates do not change on daily basis but Kibor does.

4.1 Hypothesis

Since there is negative relationship between interest rate and stock market return, it is assumed that the model developed in this paper will show negative beta of kibor and positive beta of market premium. Base on the previous researches, the following hypothesis is developed.

"Non-standardized form of CAPM is valid in Pakistan"

5. Empirical Findings

The discussion on results starts from the summary statistics which are reported in table 1. The Non-standardized form of CAPM is tested by daily data of 20 individual stocks from different industries traded at KSE during July 2007 to June 2008. The mean return of the sample companies ranges from 0.22% lowest to 0.1.75% highest with their standard deviation from 1.641% to 2.537% respectively. Among them, ATRL has maximum, positive and significant mean return (1.75%). It can be seen from this results that no single stock has the negative mean return. Companies which have lowest mean return do not possess lowest standard deviation. For instance, OGDC has the thirteenth lowest mean return but its standard deviation is of $18^{th.}$

The results of regression are reported in table 2. Beta of Kibor and Rm is calculated using equation 3. Adjusted R^2 is reported in the last column. Out of 20 companies, only 14 companies have significant betas and hence presented in table 2. CAPM assumes that higher risk must be compensated by higher return. The results in table 2 do not support it. Following is the sector wise analysis.

Banking Sector

This sector includes private banks except NBP which is a government bank. NBP has the maximum beta risk of market (1.840) and its return is also at the maximum which elucidates that higher risk is compensated with higher returns. This also reveals that private banks also have attraction to investors as compare with government banks. As shown in the figure 1, there is negative relation between Kibor and Market Premium. Second highest betaRm is of Bank Alfalh which is 1.594 and also comes on second number in terms of mean return. It may, therefore, be assumed that higher risk is compensated with higher return in case of banking sector.

Fuel & Energy Sector

This sector also comprises of private as well as government firms. In this sector KESC has the largest betaRm (1.331) but it comes in the last in terms of mean return. Similarly, PPL has the maximum mean return but its betaRm falls in the second number from lowest to highest. It actually illuminates that higher risk is not compensated with higher returns. Furthermore, companies in this sector have volatile returns because information plays a pivotal role to estimate the stock returns. Market usually receives different news about these companies and determines the stock prices based on the prevailing news.

Financial statements of this sector also reveal that this sector has substantially reduced its dividend payment in 2008 as compare to 2003. This shows that investors do not like to buy the shares of this sector. Its current as well as fixed assets have been showing declining trend. Current assets reduced because the sector has paid off its liabilities. Fixed assets reduced because there is no addition in assets from 2003 to 2008 but it further reduced because of depreciation. Total gross sales have substantially dropped in 2008 as compare with 2003. ROA and EPS have also reduced. These may be the possible reasons because of which this sector has no attraction to investors for investment. The figure 2 bellow supports the notion that there is negative relation between Kibor and Market Premium, calculated from equation 3. Based on the results and analysis, it may be assumed that higher risk is not compensated with higher return in case of Fuel and Energy sector.

Cement Sector

Visual examination of the results of this sector reveals that higher risk is compensated with higher returns. For instance, LPCL has the maximum mean return (0.0154) and its betaRm is also at the maximum (1.594). Similarly, FCCL has the lowest mean return and its s betaRm (1.005) also comes in the last. This sector has attracted more investors because of some reasons. The last six year history of this sector suggests that dividend payments have been increased because of which investors liked to buy stocks of this sector. The sector has paid off its liabilities, improved its ROA and EPS. Although it is negative, it is improved. As shown in the figure 3, there is negative relation between Kibor and Market Premium as calculated from equation 3. Based on the results and analysis it may be assumed that higher risk is compensated with higher return in case of cement sector.

Chemical Sector

The results of this sector also support the notion of CAPM that higher risk is compensated with higher returns. For instance FFBL has the highest betaRm (1.311) with the higher mean return (.0110). On the other hand, ENGRO has the lowest mean return and its beta (.776) is also less than FFBL. In all sample firms, FFBL is the exemption that its betaKibor is more than betaRm which shows that its return with respect to market in less volatile. All betas are significant at 5% significant level except FFBL with 10% significant level. The last six years history of this sector reveals that dividend payments have been reduced, bonus share increased and operating profit increased. Total assets have been reduced as compared with 2003. ROA and EPS both have shown declining trend. Cash position of the sector also shows the declining trend which shows that the sector not only paid dividend payments but also paid off its liabilities substantially.

As shown in the figure 4, there is negative relation between Kibor and Market Premium. Based on the results and analysis it may be assumed that higher risk is compensated with higher return in case of chemical sector. All companies which have positive beta3 are significant at 10% level. The reason behind this is that all these companies have different corporate governance practices.

In the last column of table 2 adjusted R^2 is given. The Non-standardized form of CAPM explains 61.7% variability in the stock return of NBP which is the maximum percentage of adjusted R^2 in the sample firms. Interestingly, there are two other banks in the sample but the second highest adjusted R^2 (57.4%) is of OGDC . Similarly, DGKC and FCCL fall in the same industry (cement industry) but as per sequence from highest to lowest the beta of DGKC is on fourth and FCCL is on 12^{th} number. The lowest adjusted R^2 is of KESC which is 11%. The results in table 2 elucidates that the Pakistani stock market is very volatile. Companies within one industry do not necessarily possess same risk. This may be because of debt level in the particular firm or age of the organization.

The relationship between beta Kibor and beta Rm is shown in figure 5, taking all sample firms.

6. Conclusion and Recommendations

This paper intents to validate the Non-standardized form of CAPM in the emerging market like Pakistan. Standard model has unrealistic assumptions because of which researchers focused on non-standardized form. A portfolio was developed by selecting different stock pertaining to different leading industries of Pakistan. In this paper, beta 3 is calculated by using equation 3 to show whether there is negative relation between Kibor and market Premium. Based on the results, it may be concluded that Pakistani stock market is a volatile market. Even companies in the same sector do not have same beta risk. It is, therefore, recommended to conduct future research to identify the factors as to why companies in the same industry do not have same beta risk.

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Appendix A

$R_{it} = \beta_{1Kibor} + \beta_2 (R_m - Kibor)$ then

$R_{it} = \beta_{1Kibor} - \beta_2 Kibor + \beta_2 R_m$ then

$R_{it} = (\beta_1 - \beta_2) Kibor + \beta_2 R_m$

If there is negative relation between interest rate and market return then β_2 must be greater than β_1. In this case the final equation will end on

$$R_{it} = -\beta_3 Kibor + \beta_2 R_m \quad (3)$$

Appendix B

List of Companies

Banking Industry

ABL	Allied Bank Ltd.
BAFL	Bank Alfalah
NBP	National Bank of Pakistan
UBL	United Bank Ltd.
BAHL	Bank Al-Habib

Insurance Industry

AICL	Adamjee Insurance

Fuel & Energy Sector

ATRL	Attock Refinery Ltd.
KAPCO	Kot Addu Power Co. Ltd.
OGDC	Oil & Gas Development Corp.
POL	Pak Oilfields Ltd.
PPL	Pak Petroleum Ltd.
HUBC	Hub Power Company
KESC	Karachi Electric Power Supply Corp.

Cement Industry

DGKC	D.G.K. Cement
FCCL	Fauji Cement
LPCL	Lafarge Pakistan
LUCK	Lucky Cement

Chemical Industry

ENGRO	Engro Chemical
FFBL	Fauji Fert Bin Qasim
FFC	Fauji Fertilizer Co..

Appendix C

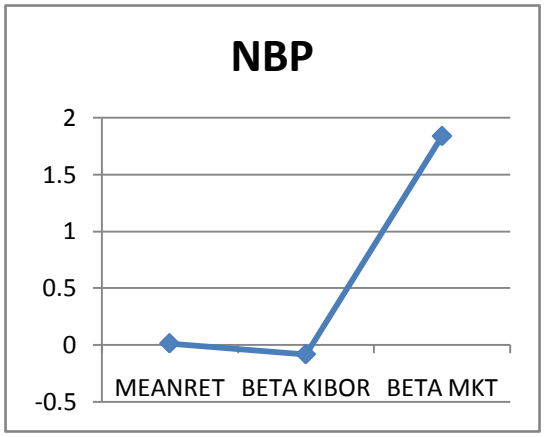
Table 1: Summary Statistics of Daily Stock Return

Company	Mean	St.Dev
ABL	.0131	.01864
AICL	.0141	.02223
ATRL	.0175	.02537
BAFL	.0133	.01907
BAHL	.0022	.01641
DGKC	.0147	.01732
ENGRO	.0096	.01367
FCCL	.0065	.01309
FFBL	.0110	.01477
FFC	.0076	.01142
HUBC	.0113	.01485
KAPCO	.0052	.01750
KESC	.0069	.02423
LPCL	.0154	.02964
LUCK	.0147	.01944
NBP	.0141	.01488
OGDC	.0112	.01188
POL	.0123	.01350
PPL	.0146	.01359
UBL	.0113	.01907

Table 2: Regression Results

Company Name	Mean Returns	Beta		Adjusted R^2
		Kibor	Rm	
AICL	.0141	-.0110	1.258	.316
BAFL	.0133	-.0590	1.591	.407
DGKC	.0147	-.0240	1.418	.484
ENGRO	.0096	.0020	.776	.362
FCCL	.0065	-.0560	1.005	.274
FFBL	.0110	-.0480	1.311	.444
KESC	.0069	-.0920	1.331	.110
LPCL	.0154	-.0390	1.594	.241
LUCK	.0147	-.0230	1.409	.417
NBP	.0141	-.0820	1.840	.617
OGDC	.0112	-.0390	1.250	.574
POL	.0123	.0560	.560	.466
PPL	.0146	.0390	.886	.569
UBL	.0113	-.0100	1.025	.288

Figure 1



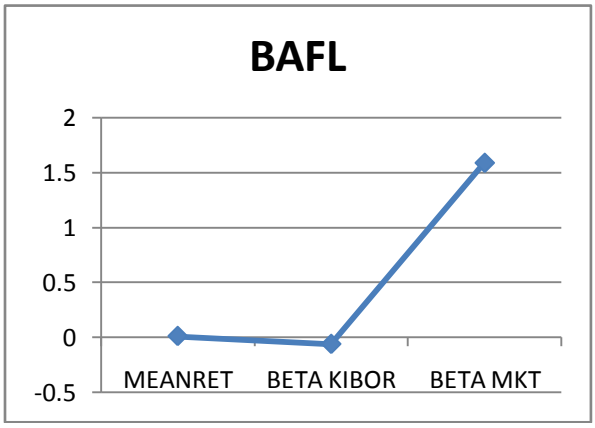
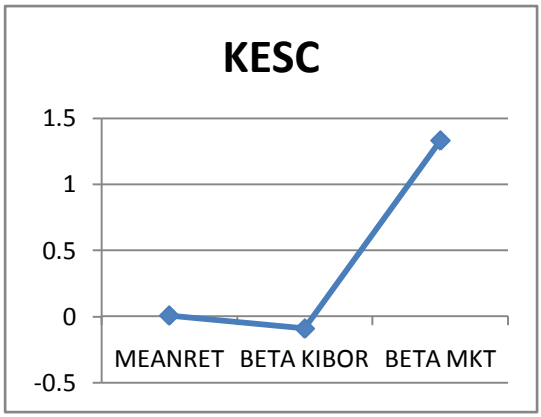


Figure 2



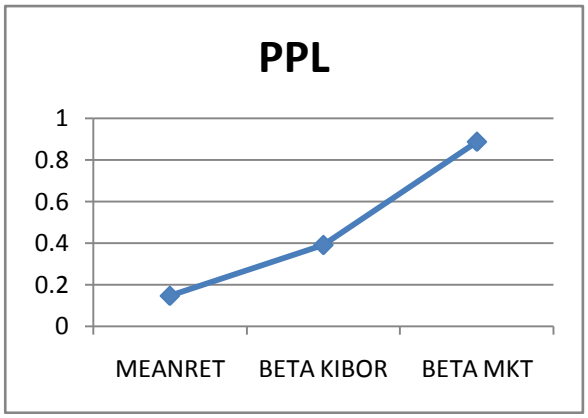
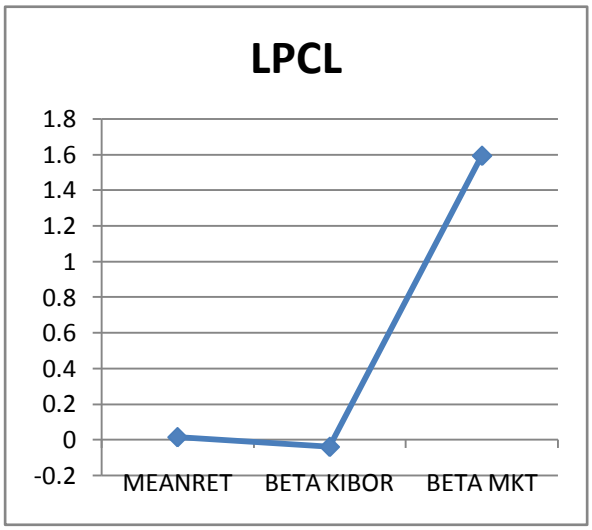


Figure 3



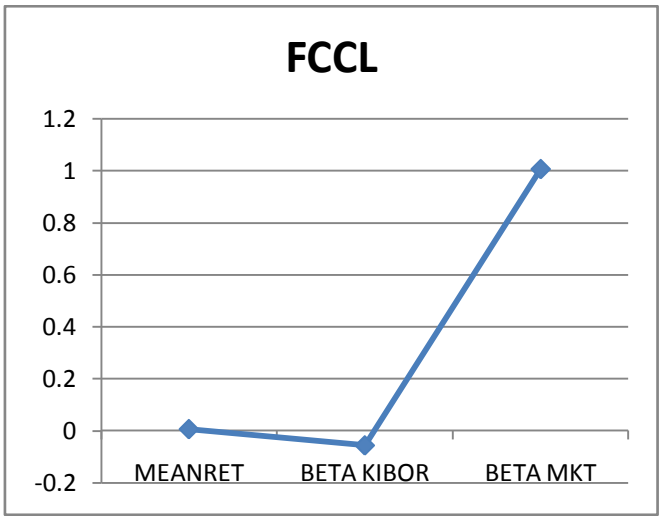
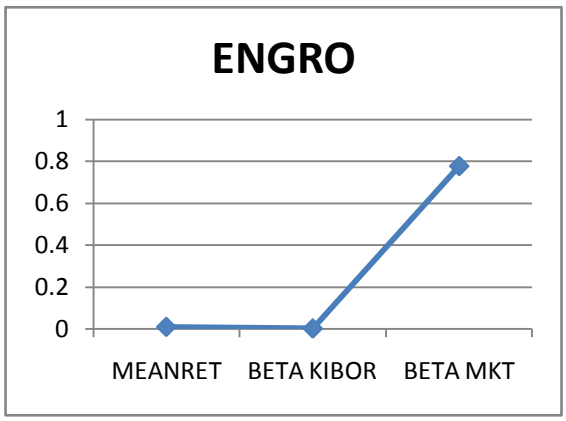


Figure 4



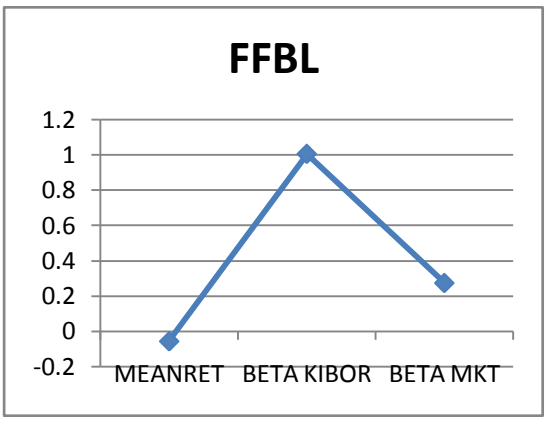
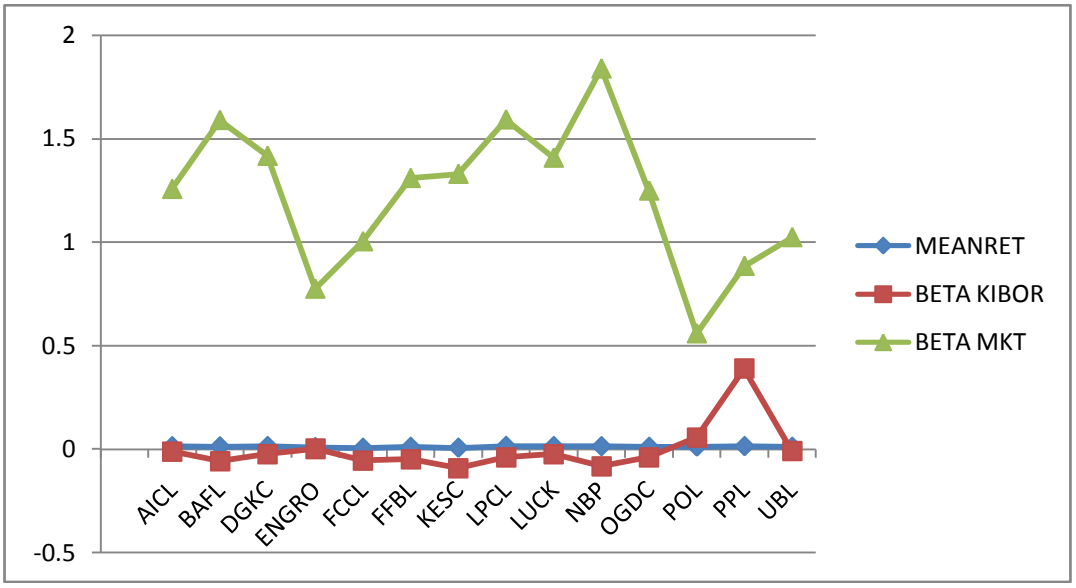



Figure 5