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STOCK MARKET SENSITIVITY TO MARKET RISK: AN EMPIRICAL ANALYSIS USING CONDITIONAL BETA IN PAKISTAN

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ABSTRACT

In order to find the impact of conditional beta on Pakistan stock exchange we establish some research questions. The data used in the research is taken from Pakistan stock exchange, State bank of Pakistan and other different sources like www.opendoor.com etc. The data was collected on daily base from year 2004 to 2014. The model used in the research is SLB model used by Pettengill, Sundaram, and Mathur (1995). Study found an insignificant relation between beta and stock return in up market and in down market. Study found significant result with negative sign which mean negative relation. In the total sample we have significant relation with positive sign. This study uses *CAPM* model in negative market condition, which is showing efficient result according to the theory. Study concluded that in negative market condition risk is negatively related to return, and beta is the measure of market return. This study focused only on Pakistan further studies should be made keeping in view the limitations. Develop and stable economies should have a great research gaps which should be filled by relating the existing studies to other field like corporate governance role and also in cost of capital. Furthermore, comparison and comparative studies must need to be done in this field.

Keywords: Conditional beta, Pakistan stock exchange, SLB model, Stock return, Up market, Down market, CAPM model, Condition risk, Market return.

1. INTRODUCTION

A noteworthy bit of research in fund zone is committed to see how a speculator can assess the insecurity of fiscal resources and the premium joins to insecurity. In spite of the fact that it is basic learning that greater the risk upper would be the profits however the inquiry remains that what sort of insecurities are remunerated & what was the price of that specific risk. The CAPM was right off the bat presented by Sharpe, Lintner, and Mossin in 1961.But after that it was refined and redesigned by Black in 1961. The CAPM model is still one of the famous models that is used globally for calculating the riskiness of an asset and to find out the expected returns. The Capital Asset Pricing Model shows the relationship and connection between the risks which cannot be diversified i.e. the Systematic risk and Expected Return. This model is being used by significant researchers for Expected rate of return, for assets as well as for securities. So the basic thinking behind the CAPM model to investor is that investor can be compensated in two ways. The first one is that the investor is taking risk due to investment in other firm so he will be rewarded with risk premium and the other one is the Time value of money because we all know that a dollar today is worthy then tomorrow. The time value of money is drawn from RF rate i.e. Rf. The Rf was taken from Treasury bills or T bills or government bonds like U.S. Treasuries.

The underlying observational trial of Capital Asset pricing Model by (Clarke,1973) and (Macebeth, 1973) discovered help for Capital Asset pricing Model on the grounds that higher returns were related with higher betas. A few analysts contend on the legitimacy of CAPM and are agreeable to measuring precise responsiveness to a few macroeconomic factors (Chen, Roll, and Ross, 1986). In any case, different analysts have discovered exact confirmation that security returns are measure covered with changed measures of unsystematic risk. (Lakon, Ishok and Shapiro, 1986).

Beta measures the systematic risk, or the exposure of each individual asset to the fluctuations in the returns of the market portfolio, usually represented by a properly weighted and well diversified market index. In this way, precise gauging of stock or portfolio betas assumes a vital part in _finance, including resource valuing, portfolio

designation, and risk management. A fund with a beta forecast of one is said to follow the broad market, whereas a fund with a beta forecast of zero is said to market neutral. Although the CAPM test has been hugely used to inspect the profitability of the shares, their application in the trusts. Conditional CAPM and the indication of cross return and beta as per few researchers, for example, Shape (1966), Jenson (1970).

Shamshair and Anoar (1996) in their research found that the normal profits for interests in unit trusts were well beneath showcase restores, the degree difference of the portfolio was underneath desires and, in this way, the yield was not reliable with time. Pakistan Stock Exchange (PSX) isn't stable market so investors can feel regular changes in stock cost and must be prepared for these changes. Trade shares in Psx had part of various connections amongst risk & return. There is fluctuation in trading and stock prices goes up and down regularly due to instability. In December 2008, in the Pakistan stock trade, 100 files were down to 3300 focuses from 9187 focuses to 5865 focuses in only 13 exchanging sessions. Following two months, the 100 file of Pakistan stock trade was up to 2638 focuses from 5707 focuses to 8345 focuses in only 19 exchanging sessions. The fundamental issue of PSX for financial specialists and portfolio directors is to evaluate the risk related with securities expected profit for bearing this risk. Subsequently, the primary target of this investigation is to decide how precisely the capital resource valuing model predicts the normal come back from PSX.

There has been a lot of work done on the CAPM model in which some of them are supporters and some of them criticize the model. But the main aim of this study is to find out the behavior of Capital asset pricing model while testing it on both the positive market as well as on the negative market trend. So, this paper also find that what will be the results when CAPM model is applied on negative market condition.

2. Literature Review

(Pettengell, Sundram and Muthur, 1995) found positive connection is constantly anticipated amongst beta and expected returns, yet this connection is restrictive available overabundance returns when real returns are utilized for tests. An orderly connection exists amongst beta and returns for the aggregate example time frame and is steady crosswise over crosswise over different periods(Months), and found positive relationship between Beta & normal portfolio returns.

(Fama, MacBeth, 1973) As indicated empirical trial of the attestation, utilizing normal acknowledged comes back to intermediary for expeted & security returns as an intermediary of showcase returns, at first upheld the legitimacy of the SLB display.

(Tinic, West, 1984) additionally dismiss the legitimacy of the SLB demonstrate in view of intertemporal irregularities. Utilizing month to month information, they locate a positive and noteworthy incline while relapsing portfolio on portfolio beta where the whole year information were incorporated. Tenic & Whst are, be that as it may, unfit to dismiss the invalid theory of no distinction in returns crosswise over portfolio if return information from the long stretch for the month of Jan are prohibited. Furthermore, during year, negative effect of coefficients were found. This conflicting help for the SLB display crosswise over long stretches of the year drove them to infer that their outcomes "... give occasion to feel qualms about genuine the legitimacy of the two-parameter model..." and "... to the degree that the risk return tradeoff appears just in January, a lot of what now constitutes the got form of present day fund is brought into question".

(Brown, Walter, 2013) clarifies that It merits emphasizing that the CAPM is in a general sense an ex stake idea that furnishes us with a mindset about the risk– return exchange off, with regards to effectively differentiated arrangement of speculations.

(Dempsey, 2013) contends that the experimental confirmation against the CAPM is compelling to the point that it ought to be deserted, maybe being supplanted by a supposition that speculators expect a similar profit for all advantages.

(Sebastian Schneider, Manfred Steiner, 2005) says that any empirical implementation of the conditional CAPM represents a test of a joint hypothesis about the conditional CAPM and a model to predict time variation in betas and the market risk premium respectively. Instead of traditional way (using model and hypothesis) they use technique known as Group Method of Data Handling (GMDH).

Their outcome demonstrates that an exceedingly non-direct impact of slacked instruments on both contingent alphas and betas. They foreordaining a structure for utilitarian connections between restrictive alphas and also betas and slacked instruments may prompt a critical misspecification of advantage estimating models.

(Sacco, Gianluca Michelangelo (2014) research report empirically examines the three models which were used to find the accuracy of the cost of equity on Johannesburg stock exchange. These three models were (a) The traditional model also known as (CAPM) Capital Asset Pricing Model, Lintner & Black; (b) 1993 Fama, French 3 factors model and (c)The model of Carhart 1997 four factors model which was the enhanced version of French, Fama 3 factors model.

To find accuracy of those 3 models shares are dispersed into portfolios based on expected return for the purpose of comparison. There final results were that the CAPM is unable to reflect a cost of equity. It is observed that three factor model of Fama French and Carhart 4 factor model make great strides towards developing an asset pricing model.

(Javid & Ahmad 2008) study focuses to empirically examine the equilibrium of market by using SLB model to find the risk return association in situation of Pakistan's stock marketplace. They tested the conditional average and Fama French three factor/influences model for the level of firm data both monthly and also daily, wherever book-to-market worth is used as a variable in its place of portfolio fixed on these two features of the organizations. Second, for extra vision, the investigation is done for different time pauses as the marketplace has a diverse sentimentality in diverse periods and third the info groups used for conditioning the models are diverse and different.

They set standard CAPM as their benchmark. To check the robustness of the model, two-step approximation technique was castoff as projected by Fama and McBeth; (a) Generalized Method of Moment approach (GMM); (b) Generalized Least Square (GLS). Their final result shows that systematic risk-return trade-off is not continuously optimistic. Their consequences expose that there is no nonlinearity in the association and nonsystematic risk has certain impacts and influences on the assets average return. Their key motive of insufficiency of typical CAPM for KSE is that this marketplace is incompetent due to info obstacles and other prevalent insufficiencies in substructure.

(Zhang, 2014) used different variance and covariance models in the context of two pricing models, the (CAPM). They used two existing methods for beta estimation; (a) the constant ordinary least squares (OLS) and (b) DCC/GARCH model for time-varying betas.

To find out the trend of beta, we utilize these beta estimates out-of-sample as inputs into the asset pricing models for the subsequent period. Then measure the implied expected returns, compare them to the actual realized returns, and evaluate the effectiveness between two models. Their final results says that contraction periods produced significant negative returns due to the bursting of many financial crises and expansion periods produced positive returns as economic growth spiked. Therefore, we selected contractions as representation of bear market and expansions as bull market.

2.1 Hypothesis

On the basis of the above literature study, we develop the following hypothesis: While β_1 is probable in times with positive market surplus returns, the probable mark of this coefficient is positive. Hereafter, the subsequent hypotheses are verified,

Ho: $\hat{\boldsymbol{\beta}}_1 = \boldsymbol{0}$

 $H_1: \hat{\boldsymbol{\beta}_1} > \boldsymbol{0}$

While β_2 is probable in times with negative market surplus returns, the probable mark of this coefficient is negative. Hereafter, the subsequent hypotheses are verified

Ho: $\hat{\boldsymbol{\beta}}_2 = \mathbf{0}$ H₁: $\hat{\boldsymbol{\beta}}_2 < \mathbf{0}$

A methodical conditional association among beta and comprehended returns is sustained if, in both situations, the H0 which is null hypothesis are rejected in errand of the H1 or alternate.

3. METHODOLOGY

The model used in the research is SLB model used by Pettengill, Sundaram, and Mathur (1995). They used three basic models. I.e.

1) Model for positive market condition

2) Model for negative market condition

3) Finally the combination of both 1 and 2 model.

3.1 Data and Sampling Techniques

The data used in the research is taken from Pakistan stock exchange, State bank of Pakistan and other different sources like <u>www.opendoor.com</u> etc. The data was collected on daily base from year 2004 to 2014. Top 100 companies were selected, from each sector of the Pakistan stock exchange.

Firstly returns were calculated from the data for each individual company and then β by using regression model. After that portfolio returns were find out through average of ten companies each. These companies were grouped from lower to higher returns; in each group we have 10 companies. And then again we regress that data to find out the result which leads us to the finding of results of negative market condition.

3.1. Variables

The main variables are $E(R_p)$, the $E(R_p)$ showed the expected return of the portfolio "p", while the current risk-free rate is denoted on R_f , is the current risk-free rate, while β_p show the covariance among the return portfolios and the return of market's is divided by the variance of the marketplace, and the expected of the marketplace is denoted by $E(R_m)$. And the term (E(Rm) - Rf) must be positive, the expected return to any risky portfolio is a positive function of beta.

3.2. Model

The following model will be used to find the beta in positive market condition:

$$\begin{split} E(R_p) &= R_f + \beta_p \times (E(R_m) - R_f) \quad (1) \\ E(R_p) &= \ln(P_1/P_0) \quad (2) \end{split}$$

In order to check the relationship among variables we use the following Equation

$$R_{it} = \beta_{0t} + \beta_{1t} * \sigma * \beta_i + \beta_{2t} * (1 - \sigma) * \beta_i + \varepsilon_{pt}$$
Where
$$(3)$$

Where $\sigma = 1$, "if $(R_{mt} - R_{ft}) > 0$ (i.e., when market excess returns are positive)", and $\sigma = 0$, "if $(R_{mt} - R_{ft}) < 0$ (i.e., when market excess returns are negative)". "The above

relationship is examined for each month in the test period by estimating either β_1 or β_2 , depending on the sign for market excess returns".

4 Analysis and Findings

This study used regression technique to analyze my data. In first stage the regression were run on equation (1), on each individual company for all 10 years data and β were calculated shown in table in table 1. Firstly we use the model for positive market condition after that used the model for negative market condition and then finally the combination of both Positive and Negative market condition model was used. All the three models were run through regression, and their results are stated below in the following three tables.

In table 1 examination of these results shows that we do not rejection of the null hypothesis which mean that very week or no risk-return relation in the up market (t = 1.555) and (p= 0.1198), only for 1st portfolio (t = -2.38) and 2nd (t = -2.01). From 3rd to 10th portfolio it shows the relation between risk and return. Portfolio 3 and 5 shows an inconsistent risk-return relation and portfolio 4 and 6 to 10 shows positive relationship.

when we compare our result with Pettengill, Sundaram and Mathur, 1995 shows similar results.

Portfolio	Intercept	Beta	T stat	P value
of 10				
Companies				
Up market	-0.0004	0.0383	1.555	0.1198
sample				
1	0.000708	-0.00178	-2.38855	0.016998
2	0.000572	-0.0011	-2.01224	0.044315
3	0.000348	-0.00081	-1.17598	0.23973
4	-0.00072	0.001243	1.964911	0.049549
5	6.53E-05	-1.8E-05	-0.03275	0.973881
6	-0.00054	0.001021	1.348523	0.177627
7	-0.00063	0.001206	1.8817	0.060007
8	-0.0017	0.002569	2.738989	0.006212
9	-0.00215	0.003214	3.374104	0.000753
10	-0.00514	0.008961	9.71043	7.33E-22

 Table 1 Estimates of Slope Coefficients for Up Markets

In order to meet and check 2nd condition which is the requirement for consistency in

relationship among risk & return during up and down of the market. Which is through comparison of β_{0t} and β_{1t} from the given Equation (3) for the for the up market. Table 1 showed the value of mean of β_{0t} (0.0007) and β_{1t} (-0.0017) for up market. Given the expected same in signs for portfolio 1 to 5, these values reflect a week consistency and given the expected difference in signs for portfolio from 6 to 10, these values reflect a strong consistency in the relation between beta & return.

The results show in Table 2 rejection of the null hypothesis which mean that we have risk-return relation in the dawn market (t = -3.52) and (p= -0.041) but it is negative relation. when we analyze the individual portfolio result, we find that only for 1st portfolio (t = 0.00177), 2nd (t =2.388), 4th (t=-1.96), 7th (t=-1.88), 8th (t=-2.73) and 9th (t=-3.37). Portfolio 3rd, 5th, 6th and 10th shows relationship between beta and systematic return. Portfolio 3rd shows in consistent relation. Estimates of Slope Coefficients for Dawn Markets

r_{11} por pit 0 pi p2t (1-0) pi cpt (3)						
beta	T stat	P value				
0.001779	2.388547	0.016998				
0.001098	2.012236	0.044315				
0.000813	1.175976	0.23973				
-0.00124	-1.96491	0.049549				
1.82E-05	0.032745	0.973881				
-0.00102	-1.34852	0.177627				
-0.00121	-1.8817	0.060007				
-0.00257	-2.73899	0.006212				
-0.00321	-3.3741	0.000753				
-0.00896	-9.71043	7.33E-22				

Coefficients for Dawn Markets	
$R_{it} = \beta_{0t} + \beta_{1t} * \sigma * \beta_i + \beta_{2t} * (1 - \sigma) * \beta_i + \varepsilon_{pt}$	(3)

 Table 2 Estimates of Slope Coefficients for Dawn Markets.

To examine through comparison of β_{0t} and β_{1t} from Equation (3) for the up market. the mean values in table 2 shows β_{0t} (0.00107) and β_{1t} (0.001779) for up market. Given the expected same in signs for portfolio 1 to 4 and 6 to 10, these values reflect a week consistency and given the expected difference in signs for portfolio from 5 only, these values reflect a strong consistency in the relation between beta and returns. In Table 3 we use total population and run the regression on equation 3,we know the systematic relationship between beta and returns, a positive risk-return tradeoff requires that i) market excess returns, on average be positive, and ii) the risk-return relation be consistent for the whole data (i.e., periods of positive and negative market excess returns). The following discussion examines the results from the tests of the above requirements.

Estimates of Slope Coefficients for total data	a
$\mathbf{R}_{it} = \beta_{0t} + \beta_{1t} * \sigma * \beta_i + \beta_{2t} * (1 - \sigma) * \beta_i + \varepsilon_{pt}$	(3)

Portfolio of 10	Intercept	Beta	T stat	P value
Companies				
Total	-0.0001	0.050	6.3197	0.00044
sample				

1	-0.0002	-0.11608	-4.39284	1.17E-05
2	5.76E-			
	06	-0.05954	-3.06872	0.002176
3	-7.8E-05	-0.02458	-0.99924	0.317786
4	-0.0029	-0.0029	-0.1288	0.897529
5	5.08E-			
	05	0.014468	0.730803	0.464976
6	-6.3E-06	0.03726	1.383008	0.166801
7	-3.3E-06	0.052612	2.307258	0.021132
8	-			
	0.00036	0.077664	2.326239	0.020095
9	-			
	0.00049	0.175663	5.200499	2.17E-07
10	-			
	0.00051	0.4556	14.19067	8E-44

Table 3 Estimates of Slope Coefficients for total data

The second condition required for a positive tradeoff is a consistent relation between risk and return during up markets and down markets. This is examined by comparing β_{0t} and β_{1t} from Equation (3) for the for the up market. Table 3 reports the mean values of β_{0t} (0.0627) and β_{1t} (-0.2255) for total population. Given the expected difference in signs for portfolio, these values reflect a strong consistency in the relation between beta and returns.

TABLE 4: 100 companies Beta

RAVT	-0.16207	EMCO	-0.07112	PPL	-0.04258	ZTL	-0.00771
TRG	-0.16053	GATI	-0.06975	ECOP	-0.0415	BERG	-0.00621
SMTM	-0.14617	REWM	-0.06679	CSIL	-0.0342	MLCF	-0.00561
QUICE	-0.11862	CLOV	-0.06111	MFFL	-0.03133	NATF	-0.00482
GWLC	-0.11687	JDMT	-0.05644	PKGS	-0.02885	JSCL	-0.00458
FECM	-0.10866	DADX	-0.05537	BOP	-0.02007	SEARI	-0.00457
OTSU	-0.10449	GADT	-0.05533	PCAL	-0.01544	MZSM	-0.00125
SEPCO	-0.0878	THALL	-0.05467	SEPL	-0.01197	KOHE	0.000744
UBL	-0.08213	GHGL	-0.05265	HINO	-0.01087	GLPL	0.001894
MERIT	-0.07346	MCB	-0.05215	YOUW	-0.00903	SIEM	0.003086
SHSML	0.003108	FRCL	0.029395	IBFL	0.045732	NIB	0.060804
GHNL	0.004268	WAHN	0.029809	TELE	0.047978	DFSM	0.062433
HABSM	0.006226	SAZEW	0.031447	MWMP	0.048355	FEM	0.06388
JPGL	0.012375	CPMFI	0.03145	RICL	0.049297	KSBP	0.065704
ULEVE	0.013973	TSPL	0.034983	JOPP	0.051799	EFU	0.077801
BATA	0.014544	KOHC	0.037317	EFUL	0.052655	PNSC	0.080518
ESBL	0.018506	NCL	0.042837	MIRKS	0.052985	TSMF	0.08475
OLPL	0.019127	TRIPF	0.044633	PAKD	0.057518	KOIL	0.089056
WTL	0.024275	DCL	0.045334	JVDC	0.059079	MARI	0.094649

SITC	0.02828	NESTLe	0.045393	CEPB	0.060721	BHAT	0.09704
DSIL	0.127125	JOVC	0.336799	HADC	0.165864	PIOC	0.48311
PSYL	0.127628	BILF	0.368716	LEUL	0.171374	РТС	0.48974
GENP	0.132782	ENGRO	0.369623	DWSM	0.182179	FABL	0.50679
SKRS	0.138127	NICL	0.385553	KTML	0.270305	PMI	0.55036
GTYR	0.158058	LUCK	0.472982	KEL	0.283193	FCCL	0.59231

To examine if average market excess returns are positive, the mean excess returns for the total sample period. In table 3 examination of these results shows that we rejection of the null hypothesis which shows risk-return relation for the whole sample (t = 0.050) and (p=0.00044). for individual portfolio we get the following results we rejection of the null hypothesis of risk-return relation for 1st, 2nd and 7th to 10th portfolio. We do not reject the null hypothesis for 3rd to 6th portfolio which mean that we have a week relation between beta and return.

Conclusion

This study found that there is a week relation between beta and returns during up markets, the reason for the week relation is non-availability of the data and some other factor which is affecting the risk and return relation. The down markets portfolio is showing similar type of result but the relation is negative between beta and return. From the total sample we concluded that we reject the null hypothesis which means that we have a positive relation between beta and return.

This study concluded with the following findings.

There is an insignificant relation between beta and stock return in up market and in down market we have significant result with negative sign which mean negative relation. In the total sample we have significant relation with positive sign.

Can the use CAPM model in negative market condition which is showing efficient result according to the theory. This study concluded that in negative market condition risk is negatively related to return, and beta is the measure of market return.

Recommendation

Researchers study focused only on Pakistan further studies should be made keeping in view the limitations. Develop and stable economies should have a great research gaps which should be filled by relating the existing studies to other field like corporate governance role and also in cost of capital. Furthermore, comparison and comparative studies must need to be done in this field.

Advance and future studies can investigate by using multi factor model for comparison. i.e. Fama and French by using value and size along with market premium.

Limitations

Different studies done in Pakistan which shows that beta and return is level in regression. Which shows that beta is not useful and suitable for pricing financial assets. However in time series and conditional beta setup shows that still it is useful. This study focused only on Pakistan further studies should be made keeping in view the limitations. Like difficulties in collections of data and data availability.

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