Pak. j. eng. technol. sci.
Volume 4, No 1, 2014, 13-27
ISSN: 2222-9930 print
ISSN: 2224-2333 online

The Conditional Relationship between Risk and Return: Evidence from an Emerging Market

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Received on: May 22, 2013; Accepted on: Aug 2, 2013

ABSTRACT

This paper examine whether the conditional relationship between beta and return proposed by Pettengill et al. (1995) exist in an emerging stock market namely Pakistan. We applied this approach to Karachi Stock Exchange (KSE-100) returns data over the period of 1992-2008, and found that there is a flat unconditional relationship between beta and return which is consistent with previous research. And when we split our sample into up market and down market return months, our result supported the conditional relationship.

Key Words: Unconditional relationship, Conditional relationship, Up market, Down market

1. INTRODUCTION

In early 1960's, one of the premier model of Finance "The capital assets pricing model' CAPM was introduced by Sharpe (1964), Lintner (1965) and Mossin (1966). These economists modernized the theory and practice of investment by simplifying the portfolio selection problems.

CAPM has been widely used in explaining cross section of expected return and the beta (systematic risk) was supposed to be the only measure of risk for a stock, however in later decades, some researcher found proxies for risk other than beta like size (ln(ME)) proposed by Benz (1981), Leverage by Bhandari (1988), book value of equity (BE) and market value of equity (ME) by Stattman (1980) and Reid and Lanstein (1985). In early 1990, the usefulness of beta as a risk measure

was challenged by the study of Fama and French (1992), in which they used 50 years US stock return data and found a flat relationship between beta and return. After this many researchers found empirical evidences of weak relationship between beta and expected return in emerging and developed equity markets. This study of Fama & French (1992) changed the whole scenario and the researchers started to re-examine the significance of beta.

Interest in CAPM has recently being increased because of an alternative approach proposed by Pettengill et al. (1995). The difference between the two CAPM's is that Pettengill's model is conditional on the realized return while the unconditional CAPM uses ex-ante returns in their test. They documented a conditional relationship between risk and return that depends on the excess market return whether it is positive or negative. Pettengill et. al (1995) suggested dividing the data into two parts when the excess market return is positive (up market) or when the excess market return is negative (down market). The assertion of Pettengill et al. (1995) study is that when the excess market return is positive (negative), there should exist a positive (negative) relationship between beta and return. This is because high beta stocks will be more sensitive to the negative market excess return and have a lower return than low beta stocks.

Pettengill et al (1995) research found significant positive relationship between beta and return in up market and significant negative relationship between beta and return in down market months in US capital market. Fletcher (1997, 2000) and Elasa (2003), found this conditional positive relationship in up market months and negative in down market months between beta and return in UK, and German markets, respectively. There are not many studies focusing on asset pricing models in Pakistan stock market, especially unconditional vs. conditional relationship have not been discussed yet in detail. Therefore the main aim of this study is to test the validity of CAPM for emerging market especially for Pakistan, and the reason is that emerging markets have speculative characteristics like high volatility, low liquidity and thin trading. Moreover this study will be fruitful for those international investors, who are not taking interest for investing in emerging markets because of these problems.

This research paper investigates the conditional and unconditional relationship between beta and return in Karachi Stock Exchange (KSE), Pakistan market, between August 1992 and December 2012, by using Pettengill et al. (1995) methodology.

This paper is organized as follow: Literature review is in Section 2, Section 3 describes the methodology and Data. Empirical findings are discussed in Section 4. Section 5 summarizes and concludes.

2. LITERATURE REVIEW

Recent studies propose that risk and return relationship can be improved by the conditional approach proposed by Pettengill et al. (1995). They offer an alternative approach to explain the conditional relationship between beta and risk. Pettengill et al. (1995) developed a conditional test of the CAPM in which they used realized return instead of ex-ante return. They investigated the conditional approach in which the whole sample period is divided into two parts: up market months and down market months (concept was first introduced by Lakonishok and Shapiro, 1984). Up market months are those for which the risk premium is positive and down market months are when risk premium is negative. This approach suggests that there should be positive relationship between beta and return when the risk premium is positive (up market) and negative relationship exist between beta and return when the risk premium is negative (down market). They argue that high beta stocks will be more sensitive and have lower return as compared to low beta stocks.

Pettengill et al (1995) applied this conditional approach on the US capital market data between 1936-1990 and found evidences that conditional beta exists in US capital market and there is positive relationship between beta and return for up market and negative relationship for down market. Following Pettengill et al. (1995) approach, many researchers explored statistical significant conditional relationships between beta and return. Fletcher (1997) studied the unconditional vs. conditional CAPM on UK stock market for the period between January 1975 and December 1994 and found that unconditional CAPM does not work on UK market but when the data was split in up and down market, the relationship between portfolio beta and return appeared positive in up market and negative in down market, however they explored that in down market the relationship was much stronger than up market.

Fletcher (2000) found consistent results with those of Pettengill et al. (1995), for the international stock returns of 18 developed markets for the period between January 1970 and July 1998.

Tang and Shum (2004) discussed low risk return relationships for unconditional CAPM for Singapore between April 1986 and December 1998, where the conditional CAPM showed strong significant positive and negative relationship between beta and return during up and down markets, respectively.

Pettengill, Sundaram and Mathur (2002) showed that the conditional approach proposed by Pettengill et al. (1995) still offers sufficient evidences of significant relationship between beta and return even including size and book-to-market equity. Tan and Liu (2006) explored the unconditional and conditional relationship on Shanghai stock market over the period 1993-2002. They captured conditional relationship in down market but the unconditional relationship did not exist in Shanghai stock market. Moreover they suggested that in up market, size and book-to-market effects were present but found absent in down market.

3. METHODOLOGY & DATA DESCRIPTION

I. Methodology:

Following Pettengill et al. (1995), we investigated two assertions: The conditional relationship between beta and risk and Positive long-run tradeoff between beta and risk. To test the systematic relationship between beta and return, here we used the two pass regression approach proposed by Fama and Macbeth (1973) [now onward refer to as FM]. The two pass regression methodology of FM has been widely used in examining positive risk premium on beta. By following this methodology, in the first step, beta is estimated from the following regression model:

$$R_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} + \epsilon_{it} \quad (1)$$

Where α_i, β_i, R_{mt}, R_{it} and ϵ_{it} denote the constant term, estimated beta of asset i, market return in period t, monthly return on asset i, and an error term respectively.
In the second step, a cross sectional regression model is estimated each month as:

$$R_{it} = \hat{\eta}_{0t} + \hat{\eta}_{1t}\beta_i + e_{it} \quad (2)$$

Where β_i is estimated from equation (1) and e_{it} is a random error term. This equation (2) is estimated through Ordinary Least Squares (OLS), and the monthly average values of coefficients are calculated to check the significance of coefficients by using the t-test of FM. Equation 2 can also be used for portfolio beta of stocks.

Following Pettengill et al. (1995), the main objective of this study is to investigate the conditional relationship between beta and return for the KSE-100 index of Pakistan. The implication of this research is that there should be positive relationship between beta and return when excess market returns are positive and a negative relationship when the excess market returns are negative.

To test this, we first split the whole data into two parts: up market (when excess market return (RM-RF) is greater than zero and down market (when excess market return (RM-RF) is less than zero. $\hat{\eta}_{2t}$ defined as the monthly risk premium estimates in up market months and $\hat{\eta}_{3t}$ as the monthly risk premium estimates in down market months. The regression coefficients for a systematic relationship between beta and returns can be tested by the following model examined by Pettengill et al. (1995).

$$R_{it} = \hat{\eta}_{0t} + \hat{\eta}_{2t}\,\Omega\,\beta_i + \hat{\eta}_{3t}\,(1-\Omega)\beta_i + \epsilon_{it} \qquad (3)$$

Where W = 1, if (RM - RF) > 0 (i.e., when market excess returns are positive), and W = 0, if (RM - RF) < 0 (i.e., when market excess returns are negative). For each month, $\hat{\eta}_{2t}$ or $\hat{\eta}_{3t}$ is estimated which depending on the sign for market excess returns. Since h_2 is estimated in periods with positive market excess returns, the expected sign of this coefficient is positive.
Hence, the following hypotheses are tested:

$$H_0 : \overline{\eta}_2 = 0$$

$$H_1 : \overline{\eta}_2 > 0$$

Since h_3 is estimated in periods with negative market excess returns, the expected sign of this coefficient is negative. Hence, the following hypotheses are tested:

$$H_0 : \overline{\eta}_3 = 0$$

$$H_1 : \overline{\eta}_3 < 0$$

Where $\overline{\eta}_2$ and $\overline{\eta}_3$ are the average values of the coefficients $\hat{\eta}_2$ and $\hat{\eta}_3$. FM t-test can be used to test them.

Pettengill et al. (1995) argued that "If a systematic, conditional relationship between beta risk and returns exists, a positive reward for holding beta risk will occur if two conditions are met: i) market excess returns are, on average, positive; and ii) the risk-return relationship is symmetrical between periods of positive and negative excess market returns". For the first condition, average excess market return of full sample is used to test that "on the average, excess market returns are positive" by using FM t-test. For the second condition, symmetry of the coefficients of h_2 (up market) and h_3(down market) are compared. To make easy the comparison, Pettengill et al. (1995) reversed the sign of down market coefficient h_3 and recalculate its average value. For the condition of symmetry, the following hypothesis is tested by using the standard two population t-test.

$$H_0 : \overline{\eta}_2 - \overline{\eta}_3 = 0$$

$$H_1 : \overline{\eta}_2 - \overline{\eta}_3 \neq 0$$

II. **Data Description**:

In this paper, we used the monthly continuously compounded stock returns from DataStream database on 231 stocks from the Karachi Stock Exchange (KSE) for the period from October 1992 to June 2008. The sample period span 13 ″ years and includes 162 monthly observations. The risk free rate RF is the 30 days repo rate, also obtained from DataStream database.

To check the robustness of expected risk premium for beta, we examine the time series averages of coefficients by regressing monthly return on full sample beta and then portfolio returns on portfolio beta. Portfolio construction is followed by Fama & French (1992), all the KSE stocks are sorted into five size quintiles according to their size. The stocks within each size quintile further grouped into five beta quintiles according to pre ranking betas of KSE stocks. The pre-ranking betas estimated by using 24 to 60 monthly return ending in December of each year t.

Each month equally weighted returns were then calculated for 25 size-beta portfolios. The same procedure is repeated for subsequent years and obtained 162 monthly returns between January 1995 and June 2008, for each portfolio.

The average monthly return (%) on 25 size-beta portfolios is presented in Table 1. The monthly average portfolio returns are in a range from -0.04% to 1.08%, which shows a wide variability in portfolio returns.

Table 1: Average Returns (%) of 25 size-beta portfolios

	B1	B2	B3	B4	B5
S1	0.344	0.513	0.504	0.496	0.786
S2	0.456	0.806	0.738	1.584	-0.045
S3	0.068	0.456	-0.469	0.758	-0.401
S4	-0.027	1.080	0.361	0.510	1.031
S5	0.769	0.488	0.986	0.302	0.287

The post ranking betas for 25 size-beta portfolios are displayed in Table 2. The betas were obtained by regressing the 25 size-beta portfolio return on constant and market return (RM) for the period between January 1995 and June 2008.

Table 2: Portfolio Betas of 25 size-beta portfolios

	B1	B2	B3	B4	B5
S1	0.546	0.863	0.584	0.640	0.533
S2	0.652	0.484	0.362	0.406	0.619
S3	0.523	0.607	0.396	0.458	0.429
S4	0.401	0.554	0.486	0.456	0.586
S5	0.494	0.609	0.540	0.579	0.535

4. EMPIRICAL RESULTS

I. Unconditional CAPM:

To investigate the positive linear relationship between beta and return, first we estimated the month by month FM regression coefficients for individual stocks from equation 2 and then we regressed the 25 size-beta portfolio returns on portfolio betas. The portfolio betas were estimated by regressing the portfolio returns on market return for full time period between January 1995 to June 2008. Table 3 displays the results. The coefficients $\overline{\eta_0}$ and $\overline{\eta_1}$ are the time series averages, those were used as LS estimators of h_1 and h_2 to test that the estimated coefficients are significantly different from zero. Panel A of Table 3 illustrates the averages of month by month regression coefficients for 162 months, and Panel B refers to the averages of portfolio regression of 25 size-beta portfolio returns on portfolio betas. According to the CAPM, h_1 should be equal to the expected excess return on the market portfolio and since the investors are risk averse it should be positive

Table 3: Cross sectional regressions of individual stocks and Portfolio returns

Panel A: Regression of monthly return on full sample beta		
	Intercept $\overline{\eta_0}$	Beta $\overline{\eta_1}$
Coefficient	0.004	0.0002
t-statistic	1.06	0.05
Panel B: Regression of portfolio return on portfolio beta		
	Intercept $\overline{\eta_0}$	Beta $\overline{\eta_1}$
Coefficient	0.004	0.001
t-statistic	0.005	0.003

*Significant at the 5% level

The results of Table 3 reveal that although the relationship between beta and return is positive at both level but it is not significant. On the average the estimated risk premium on beta is 0.000205 with the t-statistic 0.05 in Panel A and 0.0012 with t-statistic 0.003 in Panel B. It is evident from Table 3 that there exists a flat positive relationship in Pakistan's stock market,

KSE. These findings are consistent with Fama and French (1992), Jagannathan and Wang (1996) Pettengill et al. (1995) and Strong and Xu (1994) for developed market and also in line with Karacabey and Karatepe (2004) and Abdullah (2011) for emerging markets.

II. Conditional CAPM:

Pettengill et al. (1995) argued that these insignificant results are biased because of the combined effect of positive and negative excess market return periods; therefore they used the conditional approach and tested the dual hypotheses for up and down markets as stated above. To test these hypotheses, we examined the monthly regression for full sample beta and portfolio beta coefficients $\hat{\eta}_2$ (up market) and $\hat{\eta}_3$ (down market) of Equation (3). Table 4 displays the time series averages of and with corresponding t-statistics and the number of up and down market is reported in parenthesis. Panel A reports monthly regression coefficients of individual stocks return on full sample beta and Panel B illustrates the averages of portfolio regression on portfolio betas.

Table 4 : Estimates of Slope coefficients for up market and down market:

	$\overline{\eta}_0$	$\overline{\eta}_2$ Up Market	$\overline{\eta}_3$ Down Market
Coefficient*	0.006	0.063	-0.076
t-statistic*	1.909	7.656	10.410
P-value*		0.051	0.067
Coefficient**	0.003	0.064	-0.067
t-statistics**	0.528	3.999	-3.438
P-value**		0.053	0.059

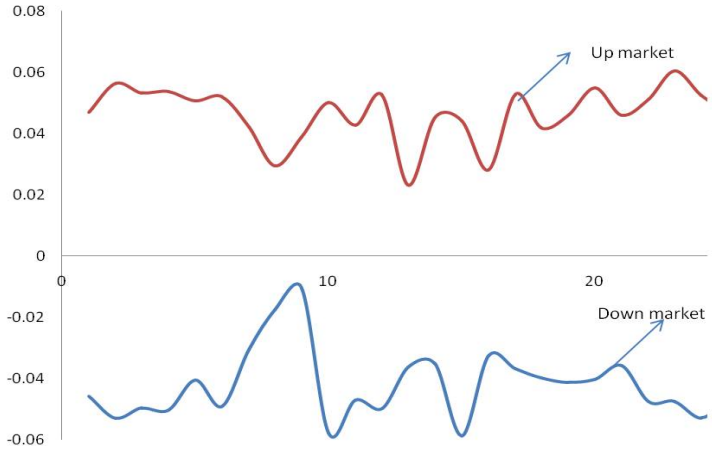
* Panel A : Regression of monthly return on full sample beta

**Panel B: Regression of portfolio return on portfolio beta

Investigation of Table 4 explores that strong conditional relationship is exist between beta and return in Pakistan's stock market. The slope coefficient of h_2 is estimated for each of 86 up market months where the excess market return is positive. As expected the sign of the slope coefficient of h_2 is positive, and its value is 0.063 which is significantly different from zero at 5% level of significance with t-statistic 7.65. This is evident from the results that high beta portfolios receive a positive risk premium during up markets in KSE.

The average slope coefficient of h_3 is estimated for each of 76 down market months where the excess market return is negative. As expected the sign of the slope coefficient for h_3 is negative with the value of -0.076 which is also significantly different from zero at 5% level of significance with t-statistic -10.41. The significant relationship is stronger in down market months as compared to up market months; therefore we can conclude on the basis of these results that high beta portfolios earn lower returns during down markets than low beta portfolios in KSE. These findings are consistent with Pettengill et al (1995), Fletcher (1997), Karacabey and Karatepe (2004) and Abdullah (2011). Figure 1 shows the average portfolio returns during up and down market.

Figure 1: Average portfolio returns for up market and down market



The figure agrees with the evidence of conditional relationship between beta and portfolio returns with small deviation.

III. Positive tradeoff

As Pettengill et al. (1995) state that there are two requirements of positive risk return trade off: on the average, market excess return should be positive and symmetrical relationship be consistent between up and down market. To investigate the positive excess market returns, the average excess market return is estimated for full sample and test the hypothesis that excess market return is zero against the alternative of positive excess market return. The estimated average value of RM-RF and standard t-test value is displayed in Panel A of Table 5. The results of Panel A reveals that on the average excess market return is not significantly different from zero at 5 % level. This is inconsistent with Pettengill et al. (1995), who observed significant positive excess market return.

Table 5: Positive Tradeoff

Panel A: Average excess market return for full sample:	
Average	0.002
Standard Deviation	0.097
t-statistic	0.332

Panel B: Symmetrical Relation between up and down market: $\bar{\eta}_2 - \bar{\eta}_3 = 0$		
	For Full Sample Beta	For Portfolio Betas
Coefficients	-0.013	-0.003
t-statistics	-0.183	-0.022

*Significant at 5% level

The second requirement of symmetrical relationship during up and down market is examined in Panel B of Table 5. The results compared the average values of h_2 and h_3 from Table 4 for the total sample period at both levels. Following Pettengill et al. (1995), I used a two population standard t-test with the adjustment of sign (as discussed in methodology), which confirms the symmetrical relationship during up market and down market and supports the Pettengill at el. (1995) expectation of a positive reward for holding risk.

5. CONCLUSION

This paper has investigating the conditional relationship between beta and return proposed by Pettengill et al. (1995) in KSE, Pakistan for the period between October 1992 and June 2008. The unconditional relationship between beta and return is positive but not significant, which is consistent with the study of Fama and French (1992) and many others studies.

Following Pettengill et al. (1995), when the whole sample data split into two parts: up market (when the excess market return (RM-RF) is greater than zero) and down market (when excess market return (RM-RF) is less than zero), there was a strong support for positive beta return relationship during up market months and negative relationship in down market months. This is consistent with Pettengill et al. (1995, 2002), and Fletcher (1997, 2000) in developed markets and also with Karacabey and Karatepe (2004) and Abdullah (2011) for emerging markets. Overall this paper suggests that Beta is strongly related to returns with the expected sign. Thus, beta is still a reliable measure of market risk in the emerging market namely Pakistan.

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