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DETERMINANTS OF SYSTEMATIC RISK

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Abstract

The objective of this study is to explore the relationship among financial variables and systematic risk. Eight financial variables are explored as determinants of systematic risk. Results of 93 non-financial firms listed in Karachi Stock Exchange from 2005-2009 show that liquidity, leverage, operating efficiency, dividend payout and market value of equity are inversely associated while profitability, firm size and growth are positively related with systematic risk (beta). The significant association of liquidity, operating efficiency, profitability, firm size, dividend payment and market value of equity are similar with earlier studies. Findings are fruitful for investors and financial policy makers to maximize the returns.

Keywords: Systematic risk (Beta), Financial Variables, Listed companies, Karachi Stock Exchange.

INTRODUCTION

In estimation of financial securities, a very important aspect associated to risk is systematic risk, which has been discussed in financial theories and also examined empirically in previous studies. The best renowned factor that measures the risk associated with financial decision is systematic risk. Systematic risk is estimated through beta. Beta factor has vital role because it makes association among company decisions and stock market.

There is a supposition that if firm's financial officers make erroneous choice, it disturb the expectations of investors regarding the stock valuation (Eldomiaty et al., 2009). Due to variations in stock prices of any firm, systematic risk also changes that might cause negative impact on investors as systematic risk disturb the value of the stock inversely.

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Risk associated with investment defines the return that an investor wants from his/her investment. There is a direct association among risk and expected return. It means that if uncertainty on any investment is higher it will also increase the expected return of that particular investment. Information of systematic risk is beneficial for investors to analyze the nature of risk associated with investment (Gu and Kim, 2002). Another most important aspect to determine the financial variables which are associated with systematic risk or beta is to help the firm's executives. Finance officer consider the systematic risk at the time of making policies and strategies in order to enhance the investor's wealth. Breen and Lerner (1973) argued in the context of decision making that variations in financial and operational decisions could change the stock returns and may enhance the uncertainty regarding investment. Mao (1976) also argued in context of decision making that finance manager of the firm be able to control business and financial uncertainty.

The effect of different financial variables on systematic risk has been determined by several previous studies. Some studies concluded significant effect of systematic risk on financial variables in different industries (Beaver et al., 1970, Lee and Jang, 2006 and Gu and Kim, 2002). Logue and Merville (1972) estimated significant results with profitability, debt ratio and company size. The details of all determinants have been discussed in the section of literature review. Systematic risk might change from one industry to another industry. Different studies have incorporated different industries for determining the financial variables that have impact on beta. Lee and Jang (2006) incorporated US airline industries and concluded significant results with systematic risk. Rowe and Kim (2010) used the data of casino industries for estimating the association among beta and financial variables. Gu and Kim (2002) worked on determinants of beta by using the data of restaurant industry. Patel and Olsen (1984) described financial determinants on "real estate investment trusts". Olib et al. (2007) found the association among beta and international diversification.

Current study has attempted to incorporate the non-financial companies that are listed in Karachi Stock Exchange. The main objective of current study is to explore the determinants of systematic risk in listed companies of Karachi Stock Exchange. This study could be valuable for investors and financial policy makers as it delivers some understandings regarding the effect of financial variables on systematic risk (either this effect is positive or negative). According to my finest information, it is only study which covers association of systematic risk (beta) and financial variables in Pakistani listed companies that can resolve the problems of investors and policy makers as well. As far as an investors point of view is concerned, they want to maximize the returns and reduce the risk and on the other hand persons who make financial policy they also need to boost the profitability and efficiency of the firm and they also want to diminish the level of risk so that investors attract towards the company and make an investment. Eight financial determinants liquidity, leverage, operating competence, profitability, and size of the firm, growth, dividend payout and market value of equity have been focused in existing study. In next section literature regarding systematic risk and eight determinants has been discussed and model and methodology are discussed in third section, analysis and discussion of results is done in fourth section, conclusion and future recommendations have been discussed in fifth and last section of the paper.

LITERATURE REVIEW

Capital asset pricing model (Sharp, 1963) suggested that two types of risks are associated with all companies' i.e. systematic risk and an unsystematic risk. Systematic risk is related with market while unsystematic risk is linked with an individual firm (Rowe and Kim, 2010). Systematic risk is denoted as beta (ß), it means that change in stock due to change in market or more comprehensively it is covariance of stock returns of capital market (Gu and Kim, 2002). Systematic risk cannot be eliminated from any security by applying diversification technique while unsystematic risk can be removed or lower down with the help of diversification. Systematic risk (Beta) is reflecting the market's evaluation of any firm's financial, production and marketing policies (Logue and Merville, 1972). In CAPM, systematic risk is a relevant factor instead of unsystematic risk to determine the required return of an investor (Gu and Kim, 2002). Mathematical representation of CAPM is as follows;

$$\mathbf{R}i = \mathbf{R}fr + ßo\,(\,\mathbf{R}m - \mathbf{R}fr) \quad \text{(I)}$$

Where R*i* = expected return
R*m* = Market return
R*fr* = Risk free rate
ßo = systematic risk

However, there are some assumptions of capital assets pricing model mentioned by Logue and Merville (1972). First assumption is that investors should be risk averse. Second, investor should have same guess about upcoming returns. Third, investor may provide or borrow according to risk free rate. Fourth, there should not be any transactional cost or any type of tax charges. Fifth, every security is flawless isolatable. Sixth, investor's expected utility should be higher.

Beta measures the slope of regression line among the market return and expected return on security (Lee and Jang 2002), and mathematically represented as:

$$\mathbf{R}i = ßo + ßi\,\mathbf{R}m + \mathbf{e}i \quad \text{(II)}$$

R*i* indicates return of a company that have linear function with market return **R*m*** and *ei* indicates the disturbances. So through this equation beta is calculated by following formula:

$$ßi = \mathbf{Cov}\,(\mathbf{R}i\,,\,\mathbf{R}m) / \mathbf{Var}\,(\mathbf{R}m)$$

Where, B*i* is systematic risk of *i*th security, R*i* return from *i*th security and R*m* is market return. Logue and Merville (1972) argued that predicted beta is similar to the true beta, which cannot be observed. A very important question was raised by Lee and Jang (2006) that the predicted beta which is derived from historical returns, whether it is comparable with true beta or not. Beta obtained from time series data that presents unbiased consequences only, if predicted beta is stationary (Breen and Lerner 1973). Finally it was concluded by Logue and Merville (1972) that predicted beta is suitable extent of systematic risk because it depends on all matters by which companies may be associated.

DETERMINANTS OF SYSTEMATIC RISK

To detect the influence of financial policies on systematic risk, different types of variables have been used in prior studies (Logue and Merville ,1972; Kim et al., 2002; Gu and Kim, 2002; Lee ang Jang, 2006; Hong and Sarkar, 2007; Eldomiat et al., 2009; Rowe and Kim, 2010). In current study liquidity, leverage, operating efficiency, profitability, dividend payout, firm size, growth, tax rate, market value of equity and financial risk has been used to determine the systematic risk. These variables are very essential from investor's point of view because they can make inter firm assessment.

Liquidity

According to prior studies, liquidity has both positive and negative impact on systematic risk. Jensen (1984) disclosed a positive relationship among systematic risk and liquidity. He contended that with increase in liquidity agency cost of free cash flows of the firms also increase and this also increases systematic risk. Most investors use liquidity ratios at the time of investment to forecast the current position of any firm. However, most studies concluded a negative relationship between systematic risk and liquidity. Logue and Merville, (1972); Moyer and Charlfield, (1983); Gu and Kim, (1998) and (2002); Lee and Jang, (2006); Eldomiaty et al., (2009) found negative relationship among systematic risk (Beta) and liquidity. They argued that with increase in liquidity of the firm, the systematic risk decreases. Liquidity of the firm is calculated by quick ratio.

Quick Ratio = Current Asset – Inventory / Current liabilities

Leverage

In capital structure, when a firm increases its debt portion, it causes upturn of risk (Modigiliani and Miller 1958). Milicher (1974) as cited by Gu and Kim (2002), found positive and nonlinear relationship between leverage and systematic risk. Lee and Jang (2006) argued "high leverage usually makes firm highly susceptible to financial risk". Hong and Sarkar (2007) found the beta as increasing function of leverage. Frequent studies (Amit and Livnat, 1988; Kim et al,. 2002; Lee and Jang 2006; Mnzava et al., 2009) hypothesized the positive relationship among leverage and beta. Debt ratio is used to calculate the leverage. Logue and Merville (1972) measured short term liabilities and long term liabilities separately because few firms use short term liabilities as everlasting part of the capital structure. Olib et al., (2008) used leverage in their study as control variable and found positive relationship between leverage and systematic risk.

Debt Ratio = Total Debt / Total assets

Operating Efficiency

More operating efficiency means generating more profit and due to more profit the systematic risk is reduced (Gu and Kim, 2002). Generally researchers show the negative impact of operating efficiency on beta. Gu and Kim, (1998 & 2002) concluded the relationship of high efficiency and low systematic risk. Eldomiaty et al,.(2009) also found negative relationship in nonfinancial sectors between systematic risk and operating efficiency. Operating efficiency can be measured by asset turnover ratio.

Asset Turn over = Total Revenue / Total assets.

Profitability

Success of any firm depends upon profitability and in profitable firms the chances of systematic risk reduce (Logue and Merville 1972). Previous findings of Scherrer and Mathison, (1996); Gu and kim, (2002); Lee and Jang (2006); Rowe and Kim (2010) indicated a negative relationship between profitability and systematic risk. However, in some particular industries this relation goes inversed. Borde et al. (1994) concluded positive relationship of profitability and systematic risk in insurance companies and gave the reason that in finance companies more profit lead towards greater risk and reason behind this greater risk is that finance companies become more profitable when they take more credit risk. For calculating the profitability, return on asset is used.

ROA = Net Income / Total Assets

Firm Size

Olib et al., (2008) argued "all things equal, large firms should have lower systematic risk due to economics of scale". According to former researches the negative relationship has been

found (Logue and Merville, 1972; Breen Lerner, 1973; Gu and Kim, 2002). Slliven, (1978) as cited in Gu and Kim, (2002) contended that in large companies systematic risk is low because the large firms have the ability to lesser the effect of economic changes. Another argument was given by Titman and Wessels (1998) that big firms have more chances for diversifications and due to diversification bankruptcy rate lower down and chances of systematic risk will also reduce. Firm size is measured by taking the natural logarithm of total assets. Logarithm conversion condenses the effect of skewness.

GROWTH

Beta is a diminishing function of growth (Hong and Sarkar, 2007). Rapid growth in companies increases systematic risk (Gu and Kim, 2002). Negative and positive relationship has been found among growth and systematic risk. According to Roh (2002), growth is positively related with systematic risk. He argued that companies with high growth want more possessions or resources and for getting these resources firm need extra financing. Annual percentage change in earnings before interest and taxes is used to compute the growth of any firm.

DIVIDEND PAYOUT

Agency cost can be reduced with high dividend (Ang et al., 1985). Impact of high dividend payout is negative on systematic risk because investors perceived more certainty in flow of returns from dividends as compared to the returns from higher stock prices (Logue and Merville, 1972). Gu and Kim (2002) has declared inverse relationship between systematic risk and high dividend payout. Former studies Beaver et al. (1970), Breen and Lerven (1973), Bord (1998) and Gu and Kim (2002) have concluded negative impact of dividend payout on systematic risk. Dividend payout can be calculated by dividend payout ratio.

Dividend Payout = Annual dividend Payment / Net Income

MARKET VALUE OF EQUITY

Borner and Smidt (1977) found the inverse relationship between systematic risk (beta) and market value of equity. They contended that beta at time "t" has opposite association with market value of earlier year "t-1". Mnzava et al. (2009) also found negative coefficient between beta and market value but their outcomes were insignificant. Market value of the firm is calculated by taking natural logarithm of market value of equity.

METHODOLOGY AND HYPOTHESIS DEVELOPMENT

Sample

Population of current study is 653 listed companies in Karachi Stock exchange. We used the data of 93 non-financial companies from (2005 – 2009) by using convenient sampling. Data used in current study is available on website of Karachi Stock Exchange, Yahoo finance and Balance sheet analysis through State bank of Pakistan official website. All financial companies are excluded from the sample due to different capital structure.

Hypothesis

On the basis of literature review we have developed eight hypotheses;

H1: Liquidity is inversely associated with systematic risk (Beta).

H2: Leverage is positively associated with systematic risk (Beta).

H3: Operating efficiency is inversely associated with systematic risk (Beta).

H4: Profitability is positively associated with systematic risk (Beta).

H5: Firm size is inversely associated with systematic risk (Beta).

H6: Growth is inversely associated with systematic risk (Beta).

H7: Dividend payout is inversely associated with systematic risk (Beta).

H8: Market value of equity is inversely associated with systematic risk (Beta).

Calculation of Variables Systematic Risk (Beta)

Beta is calculated by regressing monthly average returns of companies against monthly average returns of market. Returns are derived by following formula;

Return = Ln (Pt / Pt-1)

Beta for each firm has been estimated by linear regression equation for five years. Estimated beta is derived by following regression equation:

$Y = \beta o + \beta 1 X$

Where Y is monthly average returns of company; X is monthly average returns of market while coefficient β1 is estimated beta on yearly bases.

Insert table 1

DATA ANALYSIS

Panel data is used in current study. Panel data has combined effect of times series and cross sectional data. For estimating the hypothesis common effect model has been used. The equation is as follow:

$$\beta_{it} = \alpha_0 + \alpha\, LIQ_{it} + \alpha\, LIV_{it} + \alpha\, OE_{it} + \alpha\, PROF_{it} + \alpha\, FS_{it} + \alpha\, Growth_{it} + \alpha\, DP_{it} + \alpha\, MVE_{it}$$

Where;
LIQ = Liquidity
LEV = Leverage
OE = Operating efficiency
PROF = Profitability
FS = Firm Size
Growth = Growth of firm
DP = Dividend Payment
MVE = Market Value of equity

Descriptive Statistics

Insert table 2

Explanation of Descriptive Statistics

Table I demonstrate the descriptive statistics of systematic risk (beta) and eight independent variables for 93 listed companies for five year period of 2005- 2009. Mean value of beta is 0.745. This mean value of beta is less than market beta that is always consider equal to 1 and also indicates that sample of listed companies are less riskier than market. In the same way liquidity has mean score of 1.158 with std. deviation of 2.568 and leverage has 0.746 averages with deviation of 0.587. Arithmetic means of operating efficiency, profitability, firm size, growth, dividend payment and market value of equity are 1.154, 0.061, 7.98, 2.27, 1.69, and 5.87 respectively.

Insert table 3

Correlation among variables

Pearson correlation has been used for examining the relationship among all variables. Detection of correlation among explanatory variables is very useful for Multicollinearity. Most researchers have mentioned in their studies that if the correlation among explanatory variables is 0.9 or more, it will cause the problem of Multicollinearity. Table II shows the correlation among all variables and it indicates that there is no problem of multicollinearity. Just firm size and market value of equity are highly correlated.

Results of Common Effect Model

Insert table 4

DISCUSSION

Table 3 shows the relationship between financial variables and systematic risk. Common effect model is significant at the level of 5 percent with six significant variables i.e. liquidity, operating efficiency, profitability, firm size, dividend payment and market value of equity. R square and adjusted R square is 0.18 and 0.17 respectively that is low and it indicates that other variables may also be included for determining the beta while f-statistics is reasonably significant that shows the model fitness. Leverage and growth are not found to be significant.

According to first hypothesis of study, liquidity is inversely associated with beta. Result shows that with increase in one unit of liquidity it will decrease 0.408 units of systematic risk and the results are also significant. Lee and Jang (2007) have also found negative coefficient between liquidity and systematic risk (beta) but their results are not significant. Second hypothesis states that there is positive relationship between leverage and liquidity but according to our results the coefficient sign of leverage is negative and this relation is insignificant, it shows that with increase in debt it will decrease the beta. As far as third hypothesis is concerned, operating efficiency is negatively associated with systematic risk, results show significant and the coefficient are indicating that with increase of operating efficiency it will decrease systematic risk. Gu and Kim (2002) have also same results in their study. Fourth hypothesis of our study is stated that profitability is increasing function of systematic risk our results are statistically significant. Many previous studies such as Melicher, (1974), Borde et al., (1994) have also

same conclusions. Firm size is showing inverse sign which is against the financial theory but the same conclusion were found by Gu and Kim (2004) and Lee and Jang (2007). It means that increase in firm size, beta of firm will also increase. Sixth hypothesis is that the growth has inverse relation with the systematic risk but our result is found to be inverse and also insignificant. Roh (2002) and Gu and Kim (2002) have also positive coefficients of growth and they argued that high growth need more resources and for getting more resources more financing is need, it will increase systematic risk. Seventh hypothesis is that dividend payout is inversely associated with systematic risk and the hypothesis is accepted. Preceding studies have also same conclusions that have discussed in second portion of study. Last hypothesis is also accepted which as market value of equity is inversely related with systematic risk. It means if companies enhance their market value of equity it will decrease the systematic risk. Mnzava et al., (2009) have also found inverse relation between systematic risk and market value of equity.

CONCLUSION

Most essential purpose of a company is to escalation its returns for investors. The return can be maximizing by reducing the portion of risk. Complete understanding of factors related to systematic risk is very fruitful for investors and financial policy makers. Investor's prospects are very important and financial policy makers should take them into account at the time of policy making. Current study employed the relationship among systematic risk and financial variables. Eight financial variables (Liquidity, leverage, operating efficiency, profitability, firm size, growth, dividend payout and market value of equity) found as the determinants of systematic risk. Five year data of 93 non-financial companies (2005-2009) listed in Karachi Stock Exchange has been used for estimation. On the bases of previous studies eight hypotheses have assumed. Common effect model has been used for estimation. Results show that six variables liquidity, profitability, operating efficiency, firm size, dividend payout and market value of equity are found statistically significant while two variables leverage and growth are not statistically significant.

There is no doubt that this study is very essential for investors and finance managers but still there are some limitations that sample size is small and only non-financial firms are used for analysis. Due to convenient sampling it may not be generalized on whole population. There are many studies which have found determinants of systematic risk by using the data of different sectors. According to my best knowledge there is not any research conducted on different sectors regarding to systematic risk. It is a positive point for future researchers. They can find out more financial variables with increase sample size on different sectors for more generalized answers. Future researchers may also incorporate the financial companies for analysis.

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Table 1

Independent Variables:

Name of Variable	Measurement
Liquidity (LIQ)	Quick Ratio = Current asset – Inventory / Current liability
Leverage(LEV)	Debt ratio = Total Debt / Total Assets
Operating Efficiency (OE)	Asset Turnover = Total revenue / Total Asset
Profitability (PROF)	Return on Assets = Net income / Total Assets
Firm Size(FS)	LN(Total Asset)
Growth	Percentage change in earnings before interest and taxes
Dividend Payout (DP)	Annual dividend payment / Net income
Market value of equity(MVE)	LN(Market value of equity)

Table 2
Descriptive Statistics

	Beta	LIQ	LEV	OE	PROF	FS	Growth	DP	MVE
Mean	0.745	1.158	0.746	1.154	0.061	7.98	2.27	1.698	5.876
SD	2.873	2.568	0.585	0.996	0.265	1.62	18.71	4.108	1.639
Min	-22.99	-0.12	0.014	0.000	-0.327	3.71	-92.2	-2.484	2.603
Max	22.72	25.20	4.153	7.021	3.235	12.0	175.6	36.986	10.78
N	93	93	93	93	93	93	93	93	93

Table 3
Correlation among variables

	BETA	LIQ	LEV	OE	PROF	FS	Growth	DP	MVE

BETA	1								
LIQ	-0.334	1							
LEV	-0.004	-0.297	1						
OE	-0.016	-0.138	0.069	1					
PROF	0.108	0.053	-0.114	0.130	1				
FS	0.077	-0.139	-0.293	0.123	0.011	1			
Growth	0.015	0.038	-0.078	0.073	0.229	0.197	1		
DP	-0.078	-0.036	-0.111	0.221	0.146	0.152	0.118	1	
MVE	0.000	-0.062	-0.194	-0.097	0.066	0.831	0.219	-0.041	1

Table 4
Results of Common Effect Model

	Coefficients	*Standard Error*	*t Stat*
Intercept	0.9450	0.7964	**1.19**
LIQ	-0.4083	0.0519	**-7.86***
LEV	-0.3603	0.2403	**-1.50**
OE	-0.3486	0.1375	**-2.54***
PROF	1.8622	0.4913	**3.79***
FS	0.5551	0.1639	**3.39***
Growth	0.0035	0.0069	**0.50**
DP	-0.1126	0.0323	**-3.49***
MVE	-0.5814	0.1547	**-3.76***
R Square	0.18	Adjusted R Square	**0.165**
F Statistics	**3.01211E-16***	**Observations**	**465**

*Significant at the level of 5%.