CAPM Based Quantification of Bankruptcy Risk; A Heuristic Approach

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ARTICLE DETAILS	ABSTRACT
History *Revised format: April 2020* *Available Online: May 2020*	This paper builds on Capital Asset Pricing Model (CAPM) and its ability to validate market and firm specific risk. The effort is aimed at ascertaining the role of bankruptcy risk in determining the cost of capital in firms and its impact on corporate valuation. We also attempt to replace and analyze disparity of systematic and unsystematic components of risk with bankruptcy and risk of future liquidity. A similar study has recently been carried out in Indian market by Shirur (2013) for checking the validity of beta and cumulative risk measurement for identifying the presence of bankruptcy risk. This research may be the first attempt at analyzing such semantics with data from Pakistan. Therefore, the current study attempts to investigate the role of bankrupt0063y risk in determining the cost of capital in corporate valuation and the need of segregating systematic risk and unsystematic risk into liquidity risk and bankruptcy risk. The findings of this study suggest that unsystematic risk shall be eluded while investing in a well-diversified portfolio, but after investing in a specific firm, the unsystematic risk needs to be incorporated in total corporate valuation.
Keywords *CAPM; Bankruptcy risk Cost of Capital; Liquidity risk, Firm valuation*	
JEL Classification:	

1. Introduction

An investor faces a number of risks while investing in a company or a portfolio. The primary concern of investor is not only to know what return he is getting on his investment but the type and magnitude of the risk he will be facing on a certain investment. According to recent study by Shirur in 2013, the important risks which the investor faces are liquidity risk and bankruptcy risk and He, in the context of stock, further defined 'Liquidity risk' as the time taken by the stock to get back to its original price as it was at its

purchase time and 'bankruptcy risk' as the condition where the prices of the stock declines at a level where there are not many chances of stock to regain its former value.

Capital Asset Pricing Model was proposed by Sharpe (1964) and Linter (1967) and was based on the work of Markowitz (1986) on diversification and Modern portfolio theory. Since then, a lot of work has been done on the development of this model by the researchers but it has also been under severe criticism. Chong, Jennings, & Phillips (2018) state that the Capital Asset Pricing Model (CAPM) is used to calculate the required rate of return of asset that is being added in a diversified portfolio, for a known market risk/systematic risk which is represented by 'Beta' and it is determinant of the effect of risk related to individual stock on the risk of a diversified portfolio. CAPM is theoretically an ex ante model but, in terms of its application, it is generally done on ex-post data because its coefficient cannot be observed (Wiese, 2010)

Several studies have also highlighted the flaws for calculating beta and index which is used in the current methodology of CAPM. (Fritsch & Franco, 1991; Choudhry, 2001; Javid & Ahmad, 2011 ; Verma, 2011; Barai, 2015).

On the basis of the findings, which were applied on Indian market, Shirur (2013) has proposed that risk shall be classified into bankruptcy and risk of future liquidity instead of the classic systematic and unsystematic risk. This technique helps in the pricing of the unsystematic risk in total risk while determining the total cost of capital.

1.1 Problem Statement
As per the rationale and discussions above, the problem is that the Capital Asset Pricing Model only takes the systematic risk into account and ignores unsystematic risk. In case of investing in a well-diversified portfolio it can be ignored, but in context of a specific firm, the unsystematic risk gets relevant for investors as well as corporate finance managers so it needs to be incorporated in total risk valuation.

1.2 Research Questions
- Is the present method of measuring the total risk by using beta right?
- Is the corporate valuation significant if bankruptcy risk calculation is ignored?

1.3 Research Objectives
The objectives of this research are as follows:
- To investigate the validity of beta as per the current methodology of CAPM.
- To investigate the role of bankruptcy risk in determining the cost of capital in corporate valuation.
- To examine the possibility of replacing and analyzing systematic risk and unsystematic risk with liquidity risk and bankruptcy risk.

1.4 Contribution to the existing literature/ Research gap
The research has recently been carried out in Indian market by Shirur (2013) for checking the validity of beta and cumulative risk measurement for identifying the presence of bankruptcy risk. This research may be the first attempt at analyzing such semantics with data from Pakistan. Therefore, the current study attempts to investigate the role of bankruptcy risk in determining the cost of capital in corporate valuation and the need of segregating systematic risk and unsystematic risk into liquidity risk and bankruptcy risk.

1.5 Significance of the study
The results and findings of current study will guide the researchers and econometricians to develop such a model which could assimilate bankruptcy risk in corporate valuation. The other beneficiaries of this study

would be policy makers, investors and corporate managers who want to measure the total risk associated with firms accurately.

1.6 Hypothesis

H_o: Current methodology of CAPM to calculate beta is able to capture a consistent decrease in the stock prices.
H_1: Current methodology of CAPM to calculate beta is not able to capture a consistent decrease in the stock prices.

2. Literature Review and Theory Formation

There has been a lot of criticism on the assumptions of CAPM and researchers have raised questions on the basis of CAPM. Stieglitz (1967) provided contradictory evidence to one of the CAPM's assumptions that investors are always rational and risk averse and same set of information is available with the investors stating that investors intrinsically show unreasonable attributes by becoming risk takers when suffering losses but while earning profits they turn into risk averse. There has been a lot of work done on CAPM and some of the major developments were done by Lintner (1965) and Merton (1987) related to heterogeneous beliefs and by Black, (1972) related to removing the probability of risk-free borrowing and lending. Moreover, the other major extensions on CAPM were of Mayers (1973) and Breeden (1979) regarding non marketable assets, multiple time period and different investment opportunity for different time period.

Grossman & Stiglitz (1980) conducted a study and found that it was costly for investors to be informed and hence can adjust risk and earn high returns as compared with an uninformed investor. The study of Stulz, 1981) and Adler & Dumas (1983) extended the Capital asset pricing model by introducing the concept of International Investing. Ross (1989) states that the beta in Capital asset pricing model would be able to estimate the systematic risk only if the investment is properly diversified. Perold (2004) suggests that in order to diversify, the investors apportion their wealth among different risky portfolio, which contributes in the making of market portfolio as it is impossible to attain a single optimal portfolio of risky assets for every investor. The researcher further concluded that if CAPM is used to calculate cost of equity, several important decisions needs to made regarding the selection of market proxy, risk free rate, beta and time interval to calculate returns, which are based on logical judgment and experience of the practitioner (Wiese, 2010).

Duffie & Lando (2001) developed a framework where risk on corporate debt increased due to incomplete information. In case of highly levered and distressed firms, their findings further revealed that in adverse economic conditions the market risk premium have an inverse relation with the risk associated with the firm. Zaretzky & Kenton Zumwalt (2007) attempted to measure relative financial distress of firms and investigated that small size firms which are facing losses and are exposed to higher bankruptcy risk shows lower book to market values and earn lower returns with a consistent low risk premium

Sharp ratio and Treynor ratio has ignored bankruptcy risk and the only ratio which takes into account the bankruptcy risk is Sortino ratio developed by Sortino in 2010. Moreover, this ratio is an extension of Sharpe ratio and it includes only the standard deviation of negative assets return.

Liljeholm & O'Doherty (2012) in their study conclude that the conditional CAPM capture the under-performance of stocks of distressed firms and stated that during bad economic conditions the distressed firms have low exposure to systematic risk. There have been several studies conducted to examine the stability of beta over the past twenty years. The study of Fama, French, Booth, & Sinquefield (1993) has proposed that beta is unable to properly explain the change in expected returns.

The study conducted by Das & Barai (2016) provides evidence in literature which proves beta to be instable over time, stating that it can only be estimated as it is unobservable due to its dynamics. The study attempts to measure industry beta in Indian market and found that market risk of industry is sensitive to changes in global market. Hamid, Abdullah, Mustafa, Abidin, & Ahmad (2015) conducted the study using monthly data of closing prices of 63 KSE listed companies from a period of 2000 to 2012.The results of the study showed a negative relation between risk and return by using mean-variance CAPM whereas by using the downside risk based CAPM, the results showed a positive relation between risk and return (although statistically insignificant) which are consistent with the underlying theory.

Conceptual Framework

Table 1: Conceptual Framework
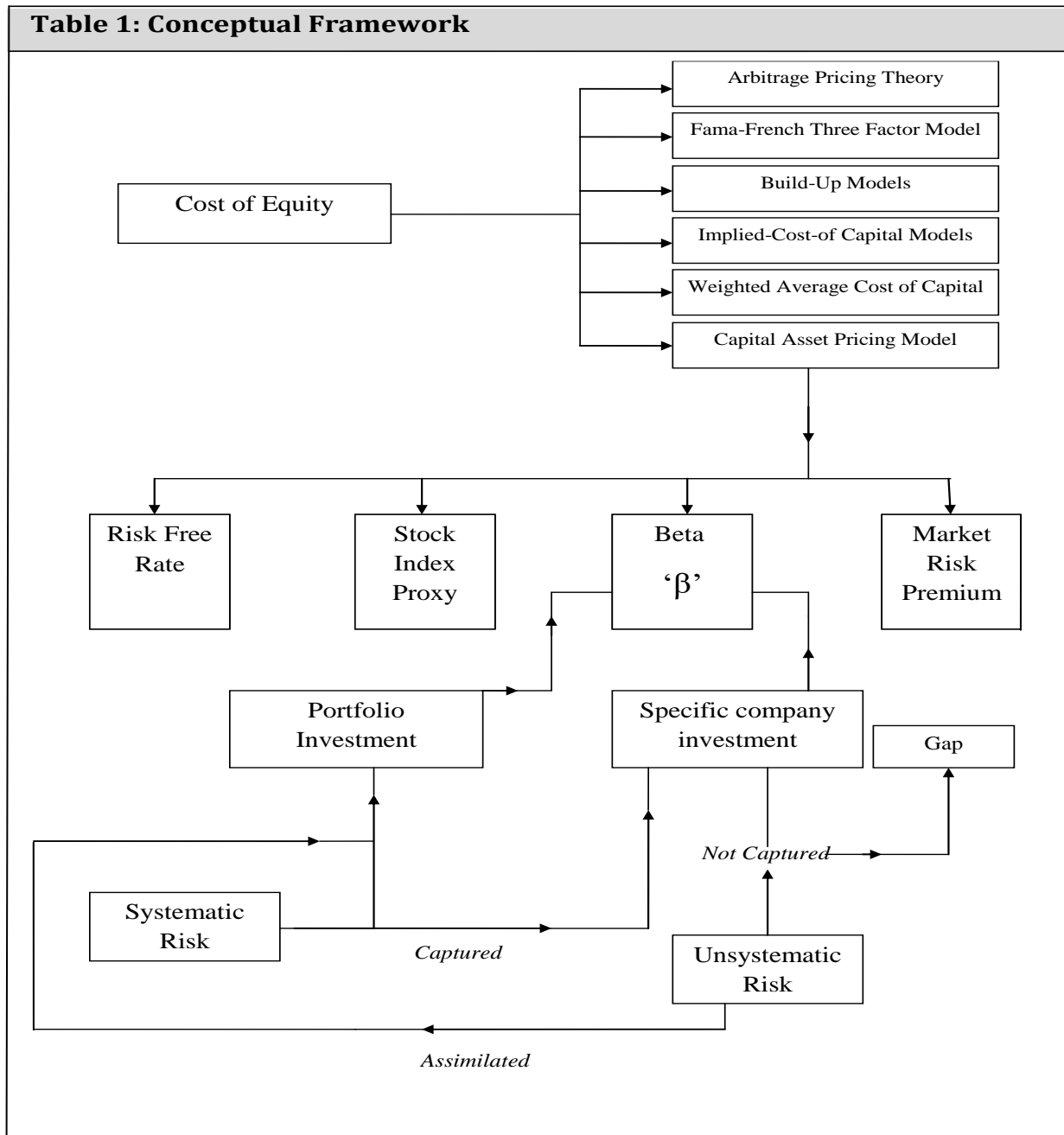
3. Research Methodology
3.1 Sample and Procedures
In order to examine and analyze the problem under study, secondary data of stock market consisting of

daily closing prices of the KSE-100 index and ten KSE listed companies from 2nd January 2006 to 3rd January 2011, with over 1050 observations, have been used. These ten companies have been facing high risk but were not already bankrupt. This study uses the statistical and econometric techniques of Shirur (2013)

Unit root test has been applied to check whether the companies under study were facing risk or not. Co-integration test and Causality test were then applied on companies to find unit root in their series. The validity of beta used in current methodology of CAPM has also been analyzed by computing the average weekly and monthly beta of companies under study and the results are compared with the previous findings. CUSUM test has been applied to segregate risk and to find the degree of exposure to liquidity risk or bankruptcy risk separately.

3.2 Unit Root Test:
The mean and variance of a stationary series do not change systematically over time, whereas it is said to have a unit root if the time series is not stationary (Gujarati, 2006). Company which does not have a stable change in prices is facing both types of risks. If the series is not showing stationary trend then it states that series have increasing mean, standard deviation and variance and are facing risk. In order to check whether the series is stationary or non-stationary, this study used Augmented Dickey-fuller (ADF) tests (Dickey & Fuller, 1979).

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{j-1}^{p} \left(\delta_j \, \Delta Y_{t-j} \right) + e_t$$

(*t* is the time index,*α* and *β* are *drift* and the coefficient on a time trend, *γ* is the coefficient presenting process root i.e. the focus of testing, *p* is the lag order of the first-differences autoregressive process, 'e_t' is the error process with zero mean and constant variance.)

Companies which are not facing liquidity risk or bankruptcy risk do have a change in prices which is quite stable. The change in prices can be measured by drift and the time trend of equation having AR (1), and the series will show stationary trend as the value of coefficient *γ* will be less than 1. Whereas if the companies are facing high risk of liquidity and or bankruptcy risk, they will have a unit root in their first order auto-regression equation and coefficient value equal to 1. In ADF unit root test, the null hypothesis is accepted if the t-value of Yt-1 is less than the critical value and the series is said to be stationary while if the t-value is larger than the critical value, it can be concluded that the series is non-stationary and have a unit root.

3.3 Co-integration Test:
The lack of cointegration of high bankruptcy risk companies in the index continuously diverges with the change in value. Whereas, Liquidity risk tends the stock prices of companies to converge to the variation in price of index because both the series are co-integrated. This study applies Johansen test famously developed by Johansen in 1991 to check if the stock prices of companies are co-integrated with index or not. If the series under study has a same unit root at first difference or second difference, the co-integration can be applied in order to check that if a group of some non-stationary time series data is co-integrated or not.

3.4 Causality Test:
This study makes use of Granger Causality Test (Granger, 1969) at 1st lag to check whether the index causes share prices or not. If the Index Granger causes company's stock price then it shows that the company is facing liquidity risk. If the Index Granger does not cause stock price of a company then it can be said that the company may be exposed to significant bankruptcy risk.

3.5 Beta Stability:

Beta used in the current methodology of Capital Asset Pricing Model does not assimilate the bankruptcy risk in it. This study will check and analyze the validity of beta by calculating the average weekly and monthly beta of the companies in the sample and will compare it with the results with previous findings.

3.6 Cumulative Risk Measurement:

This study uses the modified version of CUSUM test to divide total risk into bankruptcy and liquidity risk instead of systematic risk and unsystematic risk. In this test, stock prices were used to calculate risk rather than using return. The rationale for using stock prices was that bankruptcy risk is only analyzed with the trending of stock price and by using stock returns bankruptcy risk is completely ignored as lots of information is lost while calculating risk.

4. Data Analysis

KSE-100 is stock index which serves as a benchmark in order to compare stock prices on Karachi stock exchange over the time horizon of study. The index, with base of 1000 points, was launched in November 1991. The global crisis and other events which occurred after April 2008, led Karachi stock exchange to face severe downfall and the index dropped by more than one-third as it was in April 2008. Despite of such downfall, KSE index was able to quickly recover from those crises and reached new highs in 2009 and 2010. In order to examine the problem under study, ten companies have been selected which were facing either liquidity risk or bankruptcy risk after the market downfall in 2008. The companies understudy, along with their symbols, is shown in Table 2.

Table 2: Companies and their Symbols	
Symbol	**Name of the company**
IBFL	Ibrahim Fibre Limited
ACPL	Attock Cement (Pakistan) Limited
SEARL	The Searle Company Limited
FFBL	Fauji Fertilizer Bin Qasim Limited
BWHL	Baluchistan wheels limited
SMTM	Samin Textile Limited
OLPL	Orix leasing
SBL	Samba bank
NIB	NIB
TELE	Telecard

4.1 Companies and the Nature of Risk

Searl Company Limited, Attock Cement Pakistan Limited, Ibrahim Fibre Limited and *Fauji Fertilizer Bin Qasim Limited* have been a part of KSE-100 index but were dropped from the index due to high fluctuation is prices after 2008. All these companies were financially strong as their nature of risk can be seen in the Table 3. The reversal in prices of these firms after crisis (mid-2008) can be seen where all these four companies were able to regain their former price and were able to move with the index which shows that these companies were facing liquidity risk.

Table 3: Significant Reversal of Prices							
Searl Company Ltd		**Attock Cement**		**Ibrahim Fibre Limited**		**Fauji Fertilizer Bin Qasim Limited**	
Date	*Price*	*Date*	*Price*	*Date*	*Price*	*Date*	*Price*
Jan 2 2006	42.4	Jan 2 2006	85.05	Jan 2 2006	38.8	Jan 2 2006	25
Jul 3 2006	30	Jul 3 2006	88.55	Jul 3 2006	39.2	Jul 3 2006	28.35
Oct 30 2007	44.85	Jun 26 2007	125.75	Mar 13 2008	71.1	Jul 11 2007	42.75
Nov 23 2007	61.05	May 8 2008	88.97	Aug 27 2008	39.3	Jul 16 2008	28.23
Dec 31 2007	45.45	Sep 8 2008	44.40183	Mar 4 2009	19.32	Dec 24 2008	14.55
Jan 14 2008	62.3	Jan 30 2009	31	Sep 17 2009	37.42	Jan 14 2010	28.95
Feb 7 2008	74.7	Sep 29 2009	87.18	Dec 31 2010	42.14	Dec 28 2010	37.14
Mar 20 2008	61	Dec 9 2009	46.8				
Apr 9 2008	76.5	Apr 23 2010	76.78				
Apr 15 2008	92.9						
Apr 22 2008	104.05						
May 5 2008	89.4						
May 12 2008	77.5						
Jun 4 2008	90.09						
Aug 1 2008	76.72						
Jan 5 2009	61.66						
Feb 26 2009	44.24						
Apr 14 2009	60.5						
Jun 22 2009	44.88						
Sep 14 2009	63.09						
Mar 4 2010	48.45						
Jun 29 2010	59						
Nov 3 2011	45.85						

Whereas *Samin Textiles Limited, ORIX Leasing Pakistan Limited, Samba Bank, Baluchistan Wheels Limited, Telecard* and *NIB Bank* which have been a part of KSE-100 index, were dropped from the index due to constant decrease in prices. This consistent decline in stock prices after the crisis in mid 2008 can be seen in Table 4. Companies were facing bankruptcy risk in addition with liquidity risk which made it hard for them to move with the index after such conditions.

Table 4: Significant Decline of Prices													
Samin Textiles Limited		Orix Leasing		Samba Bank		Baluchistan Wheels Limited		Telecard		NIB Bank	
Date	*Price*	*Date*	*Price*	*Date*	*Price*	*Date*	*Price*	*Date*	*Price*	*Date*	*Price*
Jan 2 2006	6.95	Jan 2 2006	29.80	Jan 2 2006	15.75	Jan 2 2006	56.00	Jan 2 2006	16.85	Jan 2 2006	35.85
Jul 3 2006	16.25	Jul 4 2006	25.50	Mar 30 2007	18.00	Dec 3 2007	84.00	Jul 3 2006	10.85	Jul 3 2006	19.50
Jul 25 2006	24.40	Jan 12 2009	12.00	Jul 11 2007	24.40	Aug 20 2008	56.05	Jul 5 2007	14.50	Jul 15 2008	9.70
Oct 5 2006	32.00	Jan 29 2009	6.40	Jul 18 2008	9.94	Mar 26 2009	28.80	Nov 19 2007	10.05	Jan 1 2009	4.89
Jun 13 2007	43.05			May 7 2009	4.49			Jul 22 2008	5.20	Aug 30 2010	2.45
Sep 6 2007	49.29										
May 22 2008	40.28										
Jun 10 2008	32.00										
Aug 5 2008	23.78										
Aug 25 2008	16.38										
Dec 30 2008	8.69										

4.2 Criteria for Recording the Changes in Stock Prices:

The fluctuation and the decline in prices of stocks have been recorded in Table 3 and Table 4. Since the period under study is from 2nd January 2006 to 3rd January 2011, so each price reversal i.e. changes in price up to approximately 50 percent in either direction, has been recorded. The rationale to show such reversal in stock price was to examine the nature of risk these companies were facing.

4.3 Unit Root Test of Share Prices

As per Table 5, KSE-100 index and all the companies under study have been found to have ADF test statistics less than critical value at 90% confidence interval i.e. -2.5686, which showed that series are non-stationary and has increasing mean and volatility over time. The finding suggested that the companies were either facing liquidity risk (if there is significant fluctuation in stock prices) or they were facing bankruptcy risk (if there is a constant decline in the stock prices).

Table 5: Unit Root Test of Share Prices		
Value of Parameters	**ADF test Statistic**	**Prob.**
kse-100	-1.4511	0.5582
Ibrahim Fibre Limited	-1.7028	0.4296
Attock Cement (Pakistan) Limited	-1.7043	0.4288
The Searle Company Limited	-2.2315	0.1952
Fauji Fertilizer Bin Qasim Limited	-1.1800	0.6849
Baluchistan wheels limited	-0.8310	0.8093
Samin Textiles Limited	-0.9251	0.7806
Orix leasing	-1.1272	0.7070
Samba bank	-0.6656	0.8531
NIB	-1.2255	0.6654
Telecard	-1.3778	0.5945
Critical Values at 10%	*-2.5686*	

Table 6: Unit Root Test on First Difference of Share Prices		
Value of Parameters	**ADF test Statistic**	**Prob.**
kse-100	-32.9078	0.0000
Ibrahim Fibre Limited	-36.3734	0.0000
Attock Cement (Pakistan) Limited	-35.4581	0.0000
The Searle Company Limited	-29.6004	0.0000
Fauji Fertilizer Bin Qasim Limited	-19.6111	0.0000
Baluchistan wheels limited	-28.6906	0.0000
Samin Textiles Limited	-32.3170	0.0000
Orix leasing	-38.2854	0.0000
Samba bank	-35.8893	0.0000
NIB	-19.0640	0.0000
Telecard	-30.7004	0.0000
Critical Values at 1%	*-3.4348*	

4.4 Unit Root Test on First Difference of Share Prices:

As per Table 6, the ADF test statistic value of KSE-100 index and all the companies under study were higher than the critical values at 1% i.e. -3.4348, which showed that series are stationary at first difference of share price. The findings also showed that the company's stock returns may come out to be stationary even if they are facing high variance and considerable amount of risk as the stock returns are relative first difference of stock price.

4.5 Johansan Co-integration Test:

In order to establish level of cointegration of companies' stock prices with KSE-100 index, 'Johansan Co-integration Test' was applied on all the companies under study. As per Table 7, the results provided evidence that the companies, which were expected to be facing liquidity risk during this time period, were co-integrated with the KSE-100 index. The trace statistics of Searl Company Limited, Attock Cement Pakistan Limited, Ibrahim Fibre Limited and Fauji Fertilizer Bin Qasim Limited is higher than the critical value at 5% level showing that the share prices of these companies do converge with the change in the KSE-100 index.

Table 7: Johansan Co-integration Test (January, 2006 to January, 2011)				
Value of Parameters	**Eigen value**	**Trace Statistics**	**Critical Value at 5%**	**Prob.**
Ibrahim Fibre Limited & KSE-100	0.023673	28.84839	15.49471	0.0003
Attock Cement (Pakistan) Limited & KSE-100	0.019221	23.12195	15.49471	0.0029
The Searle Company Limited & KSE-100	0.013568	19.38504	15.49471	0.0123
Fauji Fertilizer Bin Qasim Limited & KSE-100	0.01389	15.36402	13.42878	0.0423
Baluchistan wheels limited & KSE-100	0.011497	10.51456	15.49471	0.2432
Samin Textiles Limited & KSE-100	0.004483	5.654961	15.49471	0.7359
Orix leasing & KSE-100	0.004585	5.670421	15.49471	0.7341
Samba bank & KSE-100	0.002692	2.833804	15.49471	0.9739
NIB & KSE-100	0.002713	3.603752	15.49471	0.9329
Telecard & KSE-100	0.004656	6.065548	15.49471	0.6878

4.6 Validity of Beta:

As exhibited in Table 9, the week on week mean beta of Fauji Fertilizer Bin Qasim Limited is 0.9732, for The Searle Company Limited it is 0.7564 and in case of Attock Cement (Pakistan) Limited it is 0.7529. Out of the entire sample understudy facing liquidity risk, only Ibrahim Fibre Limited showed a lower value for weekly average beta i.e. 0.4586. It can also be seen that out of the six companies which were facing bankruptcy risk, only NIB bank (1.2619) and Telecard (1.6275) were able to show a relatively higher weekly average beta.

By comparing the weekly average beta of companies which were facing liquidity risk and bankruptcy risk, it can be seen that Searl Company Limited (0.7564), Attock Cement Pakistan Limited (0.7529) and Fauji Fertilizer Bin Qasim Limited (0.9732) have a higher beta values than Baluchistan Wheels Limited (0.4416) , Samin Textiles Limited (0.2325), ORIX Leasing Pakistan Limited (0.5190) and Samba Bank (0.4359), even though the prices of these companies have declined more than the companies which were facing liquidity risk. It can also be seen from Table 9 that the findings remained same even if companies' monthly average betas were compared instead of weekly average beta. So, according to the results and above comparison, it can be concluded that the standard beta only incorporates liquidity risk in it and ignores the risk of bankruptcy.

Table 8: Degree of Stability of Beta (January, 2006 to January, 2011)		
Companies Name	**Weekly Average Beta**	**Monthly Average Beta**
Ibrahim Fibre Limited	0.4586	0.4173
Attock Cement (Pakistan) Limited	0.7529	0.7208
The Searle Company Limited	0.7564	0.6481
Fauji Fertilizer Bin Qasim Limited	0.9732	0.9521
Baluchistan wheels limited	0.4416	0.3085
Samin Textiles Limited	0.2325	0.3119
Orix leasing	0.5190	0.5938
Samba bank	0.4359	0.4654

| NIB | 1.2619 | 1.5120 |
| Telecard | 1.6275 | 1.5743 |

4.9 Cumulative Risk Measurement:

Cumulative risk measurement test, which is a modified version of CUSUM test, was applied and two periods were used to estimate both types of risks for the companies under study. First period is from *2nd Jan' 2006 to 3rd Jan' 2011*, while the second period is from *2nd Jan' 2006 to 1st July' 2008*. Volatility before the bearish drive as a result of negative shock was considered to be liquidity risk and change in volatility over the period of time after the bad news was considered as bankruptcy risk.

As per table 10, the companies facing only liquidity risk have fairly high standard deviation in both the periods but the volatility/mean, which is a measure of liquidity risk, has not changed much over the two periods, indicating that these companies are only facing liquidity risk. The change in volatility/mean over the two periods for Searl Company Limited is (4.9097-4.8542) 0.0555, in case of Attock Cement Pakistan Limited it is (7.2738-6.9761) 0.2977, for Ibrahim Fibre Limited it is (2.3461-2.0592) 0.2870 and for Fauji Fertilizer Bin Qasim Limited it is (2.2802-2.1531) 0.1271 which is negligible and it can be concluded that these companies are only facing liquidity risk.

Table 9: Cumulative Risk Measurement							
Companies Symbol	**Jan 2006- Jan 2011**			**Jan 2006- June 2008**			**Change In Volatility/Mean**
	Mean	**Standard Deviation**	**Volatility/Mean**	**Mean**	**Standard Deviation**	**Volatility/Mean**	
IBFL	39.7324	9.6550	2.3461	45.3685	9.6655	2.0592	0.2870
ACPL	77.2471	23.7040	7.2738	86.5390	24.5704	6.9761	0.2977
SEARL	52.7931	16.0996	4.9097	37.4809	13.4885	4.8542	0.0555
FFBL	30.1112	8.2860	2.2802	33.3912	8.4790	2.1531	0.1271
BWHL	48.9222	20.7882	8.8334	67.6296	11.1891	1.8512	6.9822
SMTM	18.1098	15.7643	13.7225	29.6053	15.2807	7.8871	5.8355
OLPL	14.4138	10.0177	6.9624	27.7225	2.6559	0.2544	6.7079
SBL	8.0042	7.3597	6.7672	17.3413	3.9027	0.8783	5.8889
NIB	9.4207	8.4883	7.6482	21.7722	2.3002	0.2430	7.4052
TELE	4.9811	3.9955	3.2049	10.7482	1.4185	0.1872	3.0177

The lower half of the Table-10 shows initial variance and the change in variance of the companies facing bankruptcy risk, in addition to liquidity risk, over these two periods. This change in variance of all the firms facing bankruptcy risk was significantly high as compared with the change in variance of companies facing only liquidity risk. It can therefore be concluded that the results were in accordance with the previous findings and these six companies which are Samin Textiles Limited, ORIX Leasing Pakistan Limited, Samba Bank, Baluchistan Wheels Limited, Telecard and NIB Bank were facing bankruptcy risk after the market crisis in mid-2008.

5. Findings

After applying unit root test on all the firms under study, it was found that the series were non-stationary and were facing high risk. Out of those ten companies selected, Searl Company Limited, Attock Cement Pakistan Limited, Ibrahim Fibre Limited and Fauji Fertilizer Bin Qasim Limited were facing liquidity risk while Samin Textiles Limited, ORIX Leasing Pakistan Limited, Samba Bank, Baluchistan Wheels

Limited, Telecard and NIB Bank were facing bankruptcy risk. The nature of risk, faced by these companies, can be seen in Table 3 and Table 4. Co-integration test and Granger Causality test were applied to check whether the results of these tests are consistent with the previous findings and it was found that companies, which were exposed to risk of liquidity, converge with the change in index whereas the companies, which were exposed to risk of bankruptcy, diverge with the change in index.

The research hypothesis of this study anticipates that beta in CAPM is not able to capture a consistent decrease in the stock prices. In order to check its righteousness, average weekly and monthly beta were estimated for companies facing both types of risks. Since the decline in prices is more for companies facing bankruptcy risk as compared to companies facing liquidity risk which suggest that their values of beta should also be greater. After calculating average weekly and monthly beta of these companies, the results showed that beta is unable to capture a consistent decline in stock prices. Thus, it can be concluded that the present method of beta estimation is not efficient in explaining the total risk and measuring cost of equity through CAPM is not significant enough if bankruptcy risk is ignored.

Moreover, instead of segregating risk into systematic and unique risk categories, a recent study by Shirur (2013) highlighted the need to segregate it into liquidity risk and bankruptcy risk. So, in order to explore such possibility, a modified version of CUSUM test (Brown, Durbin & Evans, 1975) was applied on the ten companies understudy and an inter comparison was conducted between them. CUSUM test not only helps in identifying the nature of risk a company is facing, but also helps in finding the extent of that risk which companies face. The results of the test were consistent with the previous findings and the companies, which were facing bankruptcy risk, had a significant change in variance covariance matrix over both periods under study, while in case of companies facing liquidity risk had moderate change in coefficient of variance over the two periods.

6. Conclusion

The purpose of this study was to highlight the importance of capturing bankruptcy risk in cost-of-equity to make CAPM a more significant model in terms of its estimation. By using different statistical and econometric techniques mentioned in this study, the nature of risk can be identified and the extent of that risk can also be measured by using the modified version of CUSUM test in which risk is segregated into risk of future liquidity and bankruptcy risk. The advantage of using such technique is that it helps the unsystematic risk to get priced and the value of the firm can also be determined.

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