Chapter VI

SUMMARY OF FINDINGS, SUGGESTIONS, CONCLUSION AND SCOPE FOR FURTHER RESEARCH

6.1 KEY FINDINGS

FINDINGS REGARDING WITH DIFFERENT COMPARATIVE PERIOD

1. In one year comparison period, it is found that nearly 90 companies have the beta value of less than one in more number of comparative period and 30 companies have the beta value more than one in less number of comparative periods indicating that 70% of the companies show lower volatility whereas 30% of the companies show higher volatility. Out of 132 companies, no company shows the mixed response in terms of beta value indicating that the scrips are neither high volatile nor low volatile.

2. In two years comparison period, it is found that nearly 73 companies have the beta value of less than one in more number of comparative period and 54 companies have the beta value more than one in more number of comparative periods indicating that 55% of the companies show higher volatility whereas 41% of the companies show lower volatility. Out of 132 companies, 5 companies show the mixed response in terms of beta value indicating that the scrips are neither high volatile nor low volatile.

3. In three years comparison period, the value of beta exceeds one showing higher volatility in the context of 55 companies and 70 companies take the value of beta less than one during the period of comparison indicating that nearly 42% of the companies may be classified as aggressive stocks and 53% of the companies may fall under the defensive category. The total number of 7 companies show mixed response in terms of volatility.

4. In four years comparison period of beta value, it is inferred that as and when the comparison period is extended, the volatility with respect to the scrips also take place. In this comparative period, the higher volatility of the scrip is embedded with 62 scrips whereas the lower volatility is associated with 60 scrips showing the higher volatility and lower volatility come closer in the
context of four year comparison period. Almost 10 companies show mixed response in terms of volatility.

5. The five years comparison period of beta value shows that 59 scrips have lower volatility representing that 45\% of the companies show in terms of defensiveness whereas 62 companies show higher volatility representing that 46\% of the companies tend to have aggressiveness in nature. The mixed response showed by the companies is increased to 11 in number.

6. In six years comparison period, it is shown that the mixed response category tends to be high indicating that nearly 45 companies i.e. 30\% of the selected companies show neither high volatility nor low volatility for the given study period. The interesting point to be noted at this juncture is that the volatility shown by the companies at higher side when compared with previous years of comparative period.

7. In seven years period of comparison, the years are divided into two slots such as 1999-2005 and 2006-2012. From the comparison, it is found that the higher volatility shown by the companies belong to the later period of comparison i.e. 2006-2012 whereas the former period of comparison has more number of companies under lower volatility. More than 50 companies belong to the category of mixed response.

8. Beta shows the stability when the period of comparative years are extended as and when the number of years are taken into account for more than 8 years of comparison, the value of beta comes closer to 1 indicating that the beta is stable and this could be the reason for any researcher to examine the beta stability over the period of years.

9. The mean of the beta keeps on varying with respect to one year, two years, three years and four years period of comparison. The difference between the mean value among the years are higher in these period of comparison whereas the mean value of beta shows some sort of consistency in terms of sixth and seventh year of comparison and the range of the mean value also shows the minimum difference in terms of the longer period comparison indicating that the beta exhibits stability over the longer time horizon.
10. As far as beta values of select companies for cumulative years are concerned, nearly 79 companies shows higher volatility and 53 companies show lower volatility indicating that 60% of the company is aggressive in nature whereas 40% of the company is defensive in nature while the beta value are taken into account for cumulative years of comparison. In addition to that out of 132 companies, 11 companies i.e. nearly 10% of the companies show higher volatility in later period of comparison and 5% companies show lower volatility in later period of comparison.

**INDUSTRY WISE BETA ESTIMATION**

11. Auto industry shows the industry average beta 1.25 indicating that the industry has higher volatility of beta.
12. Auto Ancillary industry has the beta value 0.75 indicating that the industry shows the lower volatility.
13. The beta value of banking industry is close to the value of 1.00 indicating that banking industry shows the stability of beta to some extent.
14. Cement industry shows the stability of beta with the value of 1.00
15. Chemical industry has lower value of beta and the industry comes under defensive category.
16. Diversified industry has higher value of beta indicating that the industry belongs to the aggressive category.
17. Electrical industry has beta at lower level and the industry shows lower volatility.
18. Finance housing shows lower volatility and the industry is classified as defensive category.
19. Food processing industry comes under defensive nature since the beta value is less than one.
20. Infrastructure General industry shows the beta value more than one indicating that the industry falls under aggressive category.
21. Information technology industry has higher value of beta indicating that the industry comes under aggressive category.
22. Mining and minerals shows higher volatility and the industry is aggressive in nature.
23. Oil exploration shows the lower volatility since the beta value is less than one.
24. Personal Care industry with lower beta value shows the lower volatility.
25. Pharmaceutical industry has the beta value of 0.83 indicating that the industry has lower volatility.
26. Refineries industry shows the lower volatility and the industry comes under defensive category.
27. Steel large industry shows the beta value more than one indicating that the industry has higher volatility.
28. Term lending institution has the beta value at higher level indicating that the industry comes under aggressive category.

**DUMMY VARIABLE REGRESSION**

29. The co-efficient of \( \beta_1 \) stands significant in 82 companies out of 132 companies indicating that the beta is unstable. The beta will be regarded as unstable when at least one of the co-efficient shows significant in terms of t-value. Since more than 60% of the company shows significant co-efficient in terms of \( \beta_1 \) level, it becomes imperative to note that dummy variable regression shows instability of beta in terms of at least one of the co-efficient level.
30. The co-efficient of \( \beta_2 \) shows significant for 21 companies indicating the instability of beta is ensured for both the levels of \( \beta_1 \) and \( \beta_2 \).
31. 20 companies show significant at \( \beta_3 \) level indicating that the beta is unstable at \( \beta_1 \) and \( \beta_3 \).
32. Only 7 companies show significant at \( \beta_4 \) level indicating that beta is unstable at \( \beta_1 \) and \( \beta_4 \) level for these companies.
33. 15 companies have ‘t’ value at significant level of \( \beta_5 \) indicating that the companies show instability in terms of \( \beta_1 \) and \( \beta_5 \) level.
34. 17 companies have ‘t’ value at significant level of \( \beta_6 \) indicating that the companies show instability in terms of \( \beta_1 \) and \( \beta_6 \) level.
35. At \( \beta_7 \) level, 16 companies show significant indicating that these companies have the beta value unstable in \( \beta_1 \) and \( \beta_7 \) levels.
36. 14 companies show significant ‘t’ value at $\beta_8$ level so that the companies have instable beta at $\beta_1$ and $\beta_8$ level.

37. At $\beta_9$ level, 16 companies show instability in term of having significant ‘t’ value at $\beta_9$ indicating that these companies are instable with respect to beta value at $\beta_1$ and $\beta_9$ level.

38. Next to $\beta_1$ level, more companies show insignificant value at $\beta_{10}$ level. 23 companies have $\beta_{10}$ at insignificant level indicating that the companies show beta stability at $\beta_1$ and $\beta_{10}$ level.

39. 12 companies show stability of beta at $\beta_{11}$ level indicating that the companies have beta value stable in $\beta_1$ and $\beta_{11}$ co-efficient level.

40. 15 companies have significant ‘t’ value at $\beta_{12}$ level indicating that the companies show beta stability at $\beta_1$ and $\beta_{12}$ level.

41. 11 companies have significant ‘t’ value at $\beta_{13}$ level indicating that the companies show beta stability at $\beta_1$ and $\beta_{13}$ level.

42. 10 companies have significant ‘t’ value at $\beta_{14}$ level indicating that the companies show beta stability at $\beta_1$ and $\beta_{14}$ level.

43. The company Infosys shows significant ‘t’ value at $\beta_1$, $\beta_3$, $\beta_6$, $\beta_7$, $\beta_9$ and $\beta_{10}$ indicating that the company indicates the beta instability.

44. Satyam shows the instability of beta by having the ‘t’ value at significant level in $\beta_1$, $\beta_3$, $\beta_6$, $\beta_9$, $\beta_{10}$, $\beta_{12}$ and $\beta_{13}$ indicating that instability of beta is ensured.

45. Zee Enterprises shows the instability of beta by having the ‘t’ value at significant level in almost all co-efficient except $\beta_9$ indicating that the company is not in a position to maintain stability of beta.

46. Wipro has significant co-efficient at $\beta_1$, $\beta_2$, $\beta_6$, $\beta_7$, $\beta_8$, $\beta_9$, $\beta_{10}$ and $\beta_{13}$ indicating that the scrip shows instability.

47. Mphasis has significant ‘t’ value at all co-efficient level indicating that the scrip falls under the beta instability.

48. HCL Information Technology shows the ‘t’ value at significant level in almost all the co-efficient indicating that the scrip has instability of beta.
INDEPENDENT SAMPLES ‘t’ TEST

49. In independent sample t-test, it is found in one year comparison that the difference of the means is significant at 1% level of significance.

50. In two year period comparison, the difference of the means is significant indicating that the beta may not be stable across the comparative period.

51. In three year period comparison, the null hypothesis with respect to absence of significance difference of means is rejected to substantiate that the stability of beta is questioned.

52. In four year period comparison, rejection of null hypothesis in terms of indifference of means across the period makes the study to believe that the existence of instability of beta.

53. In five year comparison period, the null hypothesis of equal means of beta across the period is rejected to raise the question of stability of beta.

54. In six year comparison period, the significant difference in terms of means across the period is found so that the possibility of instability may occur.

55. In seven year comparison period, the result shows that the occurrence of instability with respect to beta on the basis of having significant difference in the means of beta across the period of comparison.

The above observations raise the suspicion that the beta values may not have been stable across the period and lead the researcher to further explore the phenomenon.

PRODUCT MOMENT CORRELATION

56. With respect to individual security, the correlation between the beta values seems to be low in the shorter period of comparison.

57. The correlation between the beta values in terms of individual securities is increased with respect to expansion of years indicating that the time interval plays an important role with respect to stability of beta.

58. The size effect is traced through the correlation technique in such a way to ensure that as and when the portfolio size is increased, the stability of the beta can be witnessed. In the analysis of size effect with respect to the study
indicates that even the portfolio size is increased in the shorter beta estimation periods, the correlation value between the beta values is low.

59. The time interval estimation is extended with respect to the portfolio size then it is witnessed that the correlation co-efficient increases apparently with portfolio size as the beta estimation period increases.

**TRANSITION MATRIX**

60. Transition Matrix helps to find the movement of beta from one quartile to another quartile. In Panel A, the element (4, 4) is the highest beta group and the element (1, 1) is the lowest beta group. 36% of all securities which are under highest beta class category stays in the same class of category in the next year whereas 19% of all securities which are under (4, 1) category moves from the highest class to lowest class category in the subsequent year. This shows that highest beta class category remains in the highest beta class in the subsequent year.

61. In Panel B, the highest beta category (4, 4) shows that almost 40% of all the securities remain in highest beta category in the subsequent year indicating that the stability of beta whereas only 20% of all the securities moves from the highest class to lowest class category in the subsequent year.

62. In Panel C, the extreme level beta category i.e. (1, 1) and (4, 4) remains stable in the consecutive year. The lowest beta category shows that almost 38% of all the securities remain in the same lowest beta category in the subsequent year indicating that the beta shows stability in terms of extreme low value category. Similarly the highest beta category shows that almost 40% of all the securities remain in the same highest beta category in the subsequent year indicating that the beta shows stability in terms of extreme higher value category. Intermediate betas do not show any stability and they don’t remain in the same class in the subsequent period indicating that the question of stability is raised in terms of intermediate beta.

63. In Panel D, almost 40% of the securities remain in the highest level of beta category in the subsequent year and 31% of the securities remain in the lowest level of beta category in the subsequent year indicating that the highest level
and lowest level of beta remain stable in subsequent period whereas the intermediate betas show instability with respect to their category.

**CHOW TEST**

64. The result of the Chow test shows that out of 132 companies more than 80 companies undergo with instability of beta by having ‘F’ value more than critical value. The null hypothesis of Chow test is rejected at 1% level of significance and the stability of beta of individual securities is questionable in the structural break period.

**WHITE’S TEST**

65. White’s test is used to find heteroscedasticity in terms of OLS beta. The selected companies are examined with White's test. The result shows that the rejection of null hypothesis and it is proved that the OLS betas have heteroscedasticity by having the white’s test value more than critical value of ‘P’ which in turn gives the suspicion on equal variance across the error term of return of the scrips.

66. Auto correlation co-efficient is used to test the series of return with respect to the randomness of their nature. The null hypothesis was formed in such a way that there is no auto correlation among the return of the selected scrips indicating that the movement of the scrips are purely based on random. When the test was carried out to find the randomness among the return of the scrips. It is found that the null hypothesis is rejected to prove that the return of the scrips do have auto correlation so that the future return can be predicted on the basis of past return. The auto correlation is tested with nine lags and all the ‘P’ value of the selected companies stands at significant level indicating that the returns are stationary.

**UNIT ROOT TEST**

67. Augmented Dicky-Fuller test is used to find the stationarity of the series with respect to their first level difference. The result shows that the statement of null hypothesis in terms of the series is rejected at 1% level of significance and it is proved that the returns do not have unit root indicating that the series are
stationary so as to predict the future return on the basis of past return. The selected companies show ADF at 1% level of significance.

68. GARCH (1, 1) model shows that the sum of co-efficient for 72 companies is near to unity indicating that the stationarity is not violated in the sense that these companies return show the absence of weak form of efficiency and further indicates that the influence of past return on current return seems to be more than the influence of recent information on current return so that there is possibility of that future return may depend on current return.

**POOLED VARIANCE t-TEST**

69. Pooled Variance t-test is conducted for the year 1999-2009, 1999-2010, 1999-2011 and 1999-2012. As per the result obtained by t-test in 1999-2009, the mean of $R^2$ aggressive stocks is greater than mean of $R^2$ defensive stocks. Hence the reliability of the aggressive stock is more than defensive stocks.

70. The same result is obtained for the year 1999-2010, 1999-2011 and 1999-2012 to prove that mean of $R^2$ aggressive stocks is greater than mean of $R^2$ defensive stocks. Hence it can be concluded from the above test that the reliability of aggressive stock is more than defensive stock indicating that the result of relying on aggressive stock in terms of beta co-efficient can be taken as evidence.

**SPEARMAN RANK CORRELATION**

71. Since Chi-square test on Transition matrix only looks for deviations from the expected frequencies and whether the deviations imply persistence or reversal which can be traced with the help of Spearman Rank Correlation. In order to find out the persistence or reversal in terms of stability or instability, the SRCC is applied and it is found that the correlation co-efficient increases as and when the period of comparison are extended. The table 5.19 shows that the value of co-efficient is significant almost across all the period of comparison.

The SRCC values are lower for one year estimation period. The values however increase as the beta estimation periods increase. This further substantiates that the beta values exhibit lower stability over shorter estimation periods and stability increases as the estimation period increases.
LINEAR REGRESSION

72. In the regression model it is found that nearly 50% of the variance of the independent variable is explained by the dependent variable. In addition to that the model is fit at 10% level of significance. The sign of the regression coefficient indicates that the relationship between beta and financial leverage is existed in such a way that the higher debt content in the capital structure of the company leads to have higher beta value.
6.2 SUGGESTIONS

The study of stability with respect to beta helps the investor in arriving at the decision to invest in the equity. Since the volatility is the major concern among the investor community, the study of volatility with the help of the beta co-efficient facilitates them to identify the scrip in terms of lower volatility and higher volatility. By analyzing the volatility, the investor can withdraw the fund from the market where the market shows higher volatility and they can park the funds when the market shows lower volatility. The study also guides them that the portfolio beta is more stable than individual beta so that investor community can have a portfolio of different scrips rather than having invested in single securities. The study explores that the time interval emerges as an important aspect in investing in the market because the longer the time, the higher the stability. This piece of information helps the investor to take a strong decision in holding the securities for a long time to get the advantage of stability of beta.

Since the study emphasizes that the individual securities do not show stability with the help of various statistical technique and the same is reflected in sector wise, it is advisable for the investor to keep different scrips from different industry. But, the industry like Banking and Pharma show lower volatility during the study period, the investor may take an advantage of the information and thereby they may invest in the industry category.
6.3 CONCLUSION

The study has made an attempt to explore the stability of beta in Indian context over the period of 14 years. The stability of beta has become a central theme of academicians and financial practitioners because the concept of beta gave birth to Capital Asset Pricing Model (CAPM) which in turn now is the most popular measure for cost of equity capital though certain issues relating with the model is still in the matter of debate. The measure of beta helps in forecasting the required rate of return of equity mandated by CAPM and the future return of scrip normally depends on past return of the scrip so that the past beta may be relied on forecasting the future beta in terms of evaluating systematic risk of the scrip. As long as the beta is stable over the period, the beta can be used for estimating the future with the help of forecasting techniques.

As far as the study is concerned, an initial attempt is made to test the stability of beta with respect to individual securities over the period of 14 years. The study divides the 14 years into seven different year period of comparison to find out the stability of beta. The stability of the beta is ensured when the cumulative period of years are extended. The study employs 't' test to find the significant difference in terms of means of beta with respect to comparative period and the result shows significant difference in terms of means of beta which in turn explores the instability. The study further uses the Dummy Variable Regression to find the stability of the beta and the result is obtained in such a way that nearly 40% of the scrip shows stability and remaining 60% of the scrip shows instability. The conventional wisdom of the beta stability is that the portfolio beta shows more stability than individual securities. By applying correlation technique, the study comes across that portfolio betas are more stable than individual securities and it is worth noted that individual securities too shows stability as the period of the correlated years are extended. The study also explores the extreme betas are more stable than intermediate betas with the help of Transition Matrix. It was found that the selected scrips shows lower volatility and further it is emphasized that the past return may be the determinant of future return and the recent incorporated information on current return may not be the major
impact on determining the future return. With this, the conclusion of the study is attributed to that the beta shows the stability in terms of portfolio size so that the size effect is reflected in terms of stability of beta. Further stability of the beta is ensured in extreme level and intermediate betas do not show stability. Even though the heteroscedasticity is seen in OLS beta there is no much difference between the OLS beta and GARCH beta but at the same time the error of residuals have been reduced. Whenever the scrip return is taken into account, the scrips of return are converted into stationary and the same is proved with Auto correlation and ADF. The appropriate GARCH model proves the lower volatility and the recent information on current return does not play major role in determining the future scrip return.
6.4 SCOPE FOR FURTHER RESEARCH

- The stability of beta can be estimated on the basis of daily or fortnight return or weekly return.

- Since selection of index becomes an important issue in the estimation of beta stability, the estimation can be done on different indices.

- Time interval plays an important role in determining beta stability so that different time interval can be taken into account while estimating stability of beta.

- Number of companies can be enhanced to estimate the beta stability.

- Different portfolio size can be adopted to estimate the beta stability and thereby it can be proved that portfolio betas would be more stable than individual beta.

- The possibility of estimation of beta stability can be ensured through the concept of sub periods by way of taking into account of different phases of economy.

- A comparative study of beta stability can be estimated with the help of different return interval.

- On the basis of Wavelet theory, wavelet beta can be estimated and the stability can be traced.

- The impact of Business risk on the stability of beta can also be found with the help of certain key parameters like size, total assets, EPS etc.,

- With the help of beta estimation, the reliability of Capital Asset Pricing Model in the Indian context can be made as an attempt.

- In order to overcome the inherent weakness of OLS beta, adjusted beta, accounting beta and Levered beta can be used to test the stability of beta.