CHAPTER 5: Result and Discussion

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5.1 Introduction

The Result and Discussion chapter encompass the empirical calculation, analysis and discussion of the result. The hypothesis generated from a literature survey or in any method cannot be accepted without its empirical results and statistical test. In our environment, huge amounts of financial data are available, which are generated from business activity. But that data singly or jointly cannot be able to prove any hypothesis until they are collected, tabulated, converted, analyzed, and discussed in some reasonable way. These chapters serve the said objective of my research work. In the following paragraph, they are discussed serially.

5.2 Variables Selection:

Before conducting any research work variables selection is one of the important tasks. It is the first step in any research. Generally, variables are selected depending on the objectives of the research work. Some times previous literature studies also help to do so. In any research work, generally, variables are of two types. One is dependent variable and the other is independent variable. Dependent variable is that which value is estimated on the basis of independent variable and independent variables is that which affects dependent variables value. The selection of a dependent and independent variable is one of the critical tasks. One of the easiest ways of selecting the dependent and the independent variables is correlation or covariance analysis. But the problem with it is that many cases similar variables are present which are correlated with dependent variables and simultaneously highly correlated within independent variables. Annexure-I (1) shows the result of correlation among the independent variables of my selected variables. The use of highly correlated independent variables simultaneously in any regression equation creates the problem of multicollinearity. According to my research objective, I primarily had taken six independent variables (Financial risk, Interest coverage ratio, Operating risk, Debt equity ratio, Total risk, and Long term debt-equity ratio) as a proxy of internal corporate risk measures. To minimize the problem of multicollinearity and to find important independent variables from the six independent variables (interest coverage ratio, financial leverage ratio, debt-equity ratio, long-term debt-equity ratio, operating leverage ratio, and combine leverage ratio) the principal component analysis (PCA) was applied (Naes and Indahl, 1998). From table 1A result, it was found that three variables can be able to express the impact of the 6 variables easily. Table 1A below shows the result of PCA.

Table1A. Principal Component

Principal Component Analysis Computed Using Ordinary Correlations Eigenvectors			
Variable	PC1	PC2	PC3
FR (Financial risk)	0.697	-0.122	-0.015
ICR (Interest coverage ratio)	-0.037	-0.064	0.625
OR (Operating risk)	0.037	0.144	0.775
TR (Total risk)	0.665	-0.112	0.021
DER (Debt equity ratio)	0.137	0.689	-0.024
LTDER (Long term debt equity ratio)	0.088	0.687	-0.079

Table 1A above shows that 6 variables condensed into three components and their respective weight is shown in the above Table 1A. The result of the PCA said that in each component one or two variables are weightier than others. So the largest weighted factor is considered in each component and kept in the rest is ignored. From the above table 1A, it is found that in component 1(PC1) FR weight was larger than the others. So FR (financial risk) was taken first among the 6 variables. In this way, DER (debt-equity ratio) and operating risk (OR) were taken in component 2 (PC2) and component 3 (PC3) respectively. After extracting three variables from six variables (PCA method) VIF was used to test whether there is any multicollinearity problem or not, among the three independent variables. Table 1B below shows the result of VIF (Variance Inflation Factor).

Table 1B

Variance Inflation Factor (VIF)

Variance inflation factors Sample:7707 Included Observations:7707	Variable	Coefficient Variance	Un-centered VIF	Centered VIF
	OR	0.832636	1.734501	1.026951
	FR	0.039382	1.169033	1.039292
	DE	0.270024	1.189594	1.041418

Table 1B shows that VIF of independent variables were less than 2, so no multicollinearity problem among the three independent variables is present in the data set. After confirming that no multicollinearity among the three independent variables exists they were used simultaneously in the regression equation.

5.3 Basic and Descriptive Statistic:

Before conducting regression analysis descriptive analysis of the three extracted independent variables and five dependent variables were carried out to understand the nature of the data set. Table 2A, 2B, and 2C show the correlation analysis in different methods of the dependent and independent variables.

Table 2A Correlation Analysis
Covariance analysis:
Ordinary
Sample: 2001-2017
Included Observations: 7707

Correlation Probability	PER	PCEPS	PBV	MARKETCA	EVEBIDTA
PER	1.00	-----	-----	-----	-----
PCEPS	0.51 0.00	1.00	-----	-----	-----
PBV	0.12 0.00	0.07 0.00	1.00	-----	-----
MARKETCA	0.12 0.00	0.13 0.00	0.04 0.00	1.00	-----
EVEBIDTA	0.38 0.00	0.36 0.00	0.20 0.00	0.18 0.00	1.00
OR	0.006 0.57	-0.02 0.10	-0.04 0.00	-0.01 0.29	0.04 0.00
FR	0.09 0.00	0.13 0.00	-0.04 -0.00	-0.01 0.44	0.01 0.32
DE	-0.02 0.07	-0.02 0.02	0.01 0.33	-0.02 0.07	-0.05 0.00

Table 2B Correlation Analysis

Spearman Rank-order

Ordinary

Sample: 2001-2017

Included Observations: 7707

Correlation Probability	PER	PCEPS	PBV	MARKETCA	EVEBIDTA
DE	0.38 0.00	0.42 0.00	0.38 0.00	0.35 0.00	0.35 0.00
FR	0.50 0.00	0.45 0.00	0.51 0.00	0.54 0.00	0.43 0.00
OR	0.65 0.00	0.65 0.00	0.66 0.00	0.63 0.00	0.60 0.00

Table 2C Correlation Analysis

Kendall's Tau

Rank

Sample: 2001-2017

Included Observations: 7707

Correlation Probability	PER	PCEPS	PBV	MARKETCA	EVEBIDTA
DE	0.27 0.00	0.26 0.00	0.29 0.00	0.24 0.00	0.25 0.00
FR	0.36 0.00	0.35 0.00	0.30 0.00	0.28 0.00	0.38 0.00
OR	0.48 0.00	0.46 0.00	0.45 0.00	0.41 0.00	0.44 0.00

From Table 2A, 2B, and 2C above it is clear that there were correlation between the dependent and independent variables in some cases. In the next step, the descriptive statistics of the dependent and independent variables was calculated. Table 3 shows the results of descriptive statistics.

Table 3 Descriptive Statistic

Variables / Statistic	PER	PCEPS	PBV	M-CAP-Sal	EVEBIDTA	OR	FR	DE
Mean	27.54	16.72	3.08	4.96	12.71	1.33	2.62	1.07
Median	11.77	8.44	1.65	0.94	8.49	1.15	1.20	0.41
Maximum	4990	3871.92	266.67	4190.90	464.34	73.70	218.87	89.67
Minimum	-533.31	-2882.10	-113.25	0.00	0.00	1.01	1.00	0.00
SD	128.20	98.31	7.51	58.42	25.41	1.60	7.44	2.84
Skewness	20.94	8.30	13.12	52.30	9.21	27.40	15.88	14.35
Kurtosis	587.81	553.74	382.91	3500	115.22	982.08	343.49	327.15
Jarque-Bera prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	7707	7707	7707	7707	7707	7707	7707	7707

The result of table 3 says that Standard Deviation (SD), Skewness, and kurtosis of Market-cap-Sales and PER are higher than other variables. SD of OR is too low than other variables. But the value of kurtosis is relatively higher than other variables. The mean value of PER is relatively higher than other valuation ratios. On the other hand, the mean value of DER is relatively low than other independent variables'. The symmetry and lack of symmetry are measured by Skewness statistics. If a data set is symmetric its Skewness value will be zero. As the calculated value of Skewness statistic is positive for all variables' it means that the tail of the data set is on the right side. The kurtosis describes the shape of a data set. It measures whether the data set is light-tailed or heavy-tailed. The data sets with high kurtosis value means that heavy tails are present in the data set. It also helps to understand how pick or flat is the distribution of the data set. The J-B value indicates that Skewness and kurtosis indication of non-normality is statistically correct which means data does not come from a normal distribution. Fig. 1 below is the graphical presentation of the dependent and independent variables.

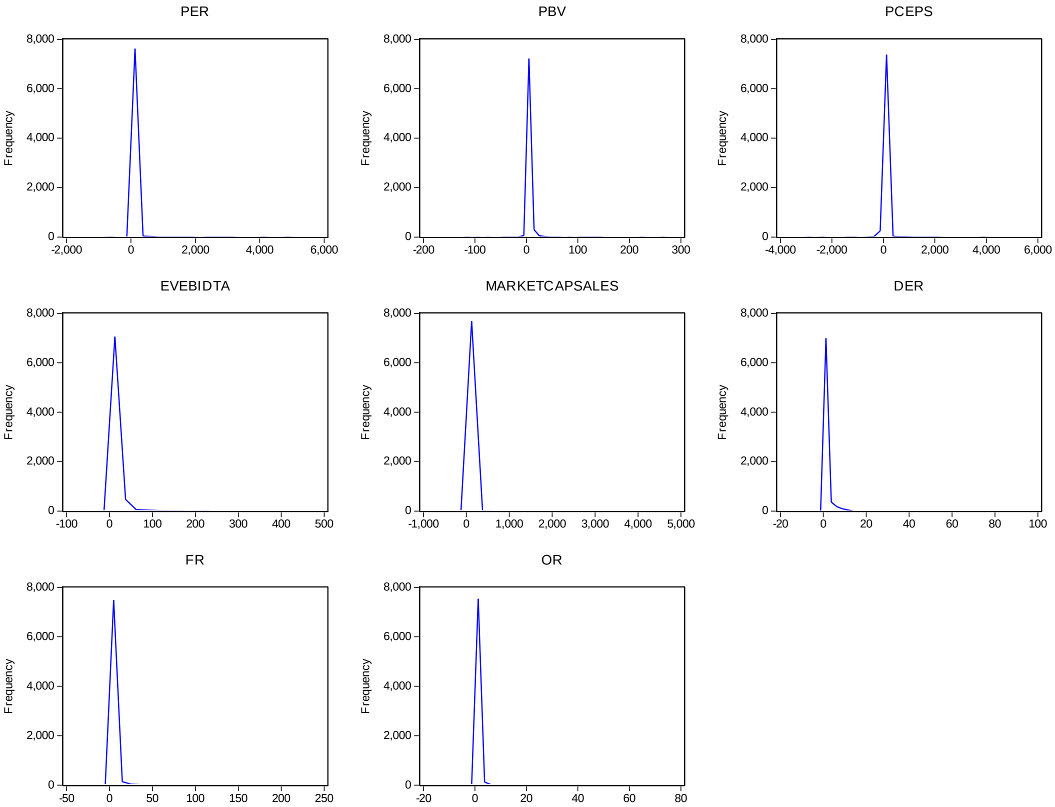

Fig.1 Histogram Polygon of Dependent and Independent Variables

Table 3 shows the Jarque-Bera test result where probability value is less than .05% which indicates that data are not normal. In fig.1 the graphical presentation also confirms the same result.

After conducting descriptive analysis, the stationary of the data series was checkd with the help of a panel unit root test. The results of the panel unit root test are given in Table 4.

Table 4 Panel Unit Root Test of Dependent and Independent Variables

Panel unit Root test Result			
Variables	Methods	Statistic	Prob.
EVEBIDTA	Levin, Lin and Chu t(common unit root)	-45.46	0.00
	Im, Pesaran and Shin W-stat(individual)	-11.80	0.00
	ADF-Fisher Chi-square	1554.77	0.00
	PP-Fisher Chi-square	1527.53	0.00
PCEPS	Levin, Lin and Chu t(common unit root)	-17.61	0.00
	Im, Pesaran and Shin W-stat(individual)	-8.91	0.00
	ADF-Fisher Chi-square	1686.09	0.00
	PP-Fisher Chi-square	1716.76	0.00
MARKETCAPSAL	Levin, Lin and Chu t(common unit root)	-1.14	0.00
	Im, Pesaran and Shin W-stat(individual)	0.99	0.00
	ADF-Fisher Chi-square	1206.79	0.00
	PP-Fisher Chi-square	1086.07	0.00
PBV	Levin, Lin and Chu t(common unit root)	-11.81	0.00
	Im, Pesaran and Shin W-stat(individual)	-8.46	0.00
	ADF-Fisher Chi-square	1487.48	0.00
	PP-Fisher Chi-square	1288.08	0.00
PER	Levin, Lin and Chu t(common unit root)	-142.24	0.00
	Im, Pesaran and Shin W-stat(individual)	-9.61	0.00
	ADF-Fisher Chi-square	1125.89	0.00
	PP-Fisher Chi-square	2061.07	0.00
DER	Levin, Lin and Chu t(common unit root)	-85.45	0.00
	Im, Pesaran and Shin W-stat(individual)	-63.14	0.00
	ADF-Fisher Chi-square	2500.23	0.00
	PP-Fisher Chi-square	3718.01	0.00
OR	Levin, Lin and Chu t(common unit root)	-181.10	0.00
	Im, Pesaran and Shin W-stat(individual)	-63.91	0.00
	ADF-Fisher Chi-square	5312.81	0.00
	PP-Fisher Chi-square	7297.74	0.00
	Levin, Lin and Chu t(common unit root)	-346.19	0.00

FR	Im, Pesaran and Shin W-stat(individual)	-94.12	0.00
	ADF-Fisher Chi-square	6988.27	0.00
	PP-Fisher Chi-square	10987.9	0.00

In the above Table 4 Levin, Lin and Chu common unit root test, Im, Pesaran and Shin, ADF-Fisher Chi-sq, PP-Fisher Chi-sq individual unit root test were conducted. The test results of each variable show that there was no unit root in the common and individual data set as each test of statistic value is not significant (P-value 0.00). So the null hypothesis of common or individual unit root present in panel data is rejected here. So it is concluded that the data series is stationary.

5.4 Development of Model:

5.4.1 Linear Model: After confirming the Stationarity of the data series primarily linear regression analysis with pool data and panel data (unbalance dated panel) were conducted.

5.4.1.1 Linear model with Pool data:

To find out the impact of independent variables' on the dependent variables' ordinary pool regression model was implemented primarily with the dependent and independent variables (including dummy variables). The results of the pool regression model are given in Table 5A.

Table 5A Regression Results Under Pool OLS

REGRESSION RESULTS								
Dependent(Y)	PER		PBV		PCEPS		EVEBIDTA	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Statistic								
R2	0.018	--	0.01	--	0.02	--	0.01	--

Adj. R2	0.016	--	0.01	-	0.02	--	0.01	--
F/Rn-sq statistic	10.93	0.00	11.93	0.00	15.13	0.00	8.6	.00
DW Stat	1.59	--	1.06	--	1.7	--	1.32	--
C_1	8.16	0.43	2.48	2.48	7.72	0.33	5.24	0.01
DE	-0.84	0.10	0.09	0.00	-1.00	0.01	-0.47	0.00
OR	0.64	0.47	-0.22	0.00	-1.09	0.11	0.73	0.00
FR	1.70	0.00	-0.02	0.01	1.79	0.00	0.04	0.22
D2D	11.29	0.27	1.31	0.03	4.66	0.56	5.89	0.00
D3E	13.67	0.29	0.76	0.31	10.85	0.27	3.37	0.14
D4F	48.97	0.00	-0.04	0.95	28.35	0.00	8.37	0.00
D5G	33.4	0.01	2.06	0.00	19.31	0.05	12.56	0.00
D6H	41.07	0.02	-0.04	0.96	15.75	0.24	21.55	0.00
D7I	12.26	0.33	0.05	0.94	19.31	0.04	5.61	0.02
D8J	2.08	0.84	-0.68	0.28	-1.37	0.87	7.44	0.00
D9K	39.73	0.00	2.38	0.00	20.55	0.02	10.47	0.00
D10N	26.25	0.17	0.00	0.99	-13.74	0.35	12.24	0.00
D11O	22.38	0.11	1.55	0.06	-4.88	0.65	8.96	0.00

After conducting ordinary least square regression on pool data it was found that the value of R^2 is too low and the value of explanatory variables' coefficient is significant in three cases of the dependent variables. FR has a significant positive impact on PER and PCEPS but a negative impact on PBV. On the other side DER has a significant positive impact on PBV but a negative impact on PCEPS and EVEBIDTA. Operating risk has no significant effect on any valuation ratio except EVEBIDTA. Industry dummy variables have a significant effect on the EVEBIDTA valuation ratio and some of the industry dummies have impact on the other valuation ratio also. It was also found that the D-W statistic value was less than 1.8 in most of the cases which means there was a positive autocorrelation problem in the data series. To find out the serial correlation problem the LM test was also done on the regression residual of the pool regression model. The result of the test is given in Table 5B, Fig. 2 and Annexure- I(2)(i), I(2)(ii).

Table 5B Serial Correlation LM test (PER dependent)

Breusch-Godfrey Serial Correlation LM test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	296.61	Prob.F(2,7691)	0.00
Obs*R-squared	551.89	Prob.Chi-Square(2)	0.00

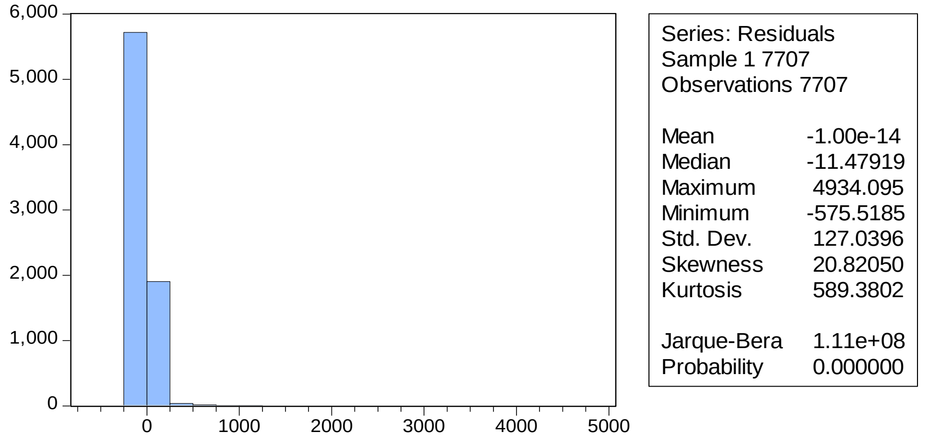

Fig.2 Histogram Normality Test of Residuals (PER Dependent)

In Table 5B, Fig.2, and Annexure – I (2)(i), I(2)(ii), the results of the LM test (serial correlation) and Histogram Normality test of residuals, show that there was a serial correlation problem among the data series. The autoregressive panel least-squared method was used in the next step to overcome the said problem.

5.4.1.2 Linear Model with Panel Data:

5.4.1.2.1 Panel Least Square:

In the previous model though some of the coefficient values were statistically significant and the value of R^2 was also significant, but its value was too low. The pool OLS methods of regression can be able to disclose only 1% to 2% variability of the dependent variables. Moreover, it was found that serial autocorrelation problem also affects the model. To overcome the said problem, the regression on panel data was conducted in the linear model to improve the result. Part-1 of the Tables 5C1, 5C2, 5C3, 5C4, 5C5 shows regression results under the Linear Panel-Least Square model. In the ordinary panel-Least Square method, the values of the coefficient of the independent variable are significant in some of the cases and the value of R^2 is improved with statistical significance. But there was hardly any improvement in the level of significance under the present model. Only 6% to 25% of variables could only be estimated through dependent variables. When the PBV, PCEPS and EVEBIDTA are dependent valuation variables then debt-equity has a significant effect on it but in the rest of the two cases it has no significant effect. The operating risk and financial risk has mixed results under the current model. The industry categories, under this model, also have some significant effects in the valuation of firm. The results of the regression under the different dependent variables are presented in the first part of Tables 5C1, 5C2, 5C3, 5C4, and 5C5 respectively.

Table 5C1 Regression Results Under Different Models (Dependent PER)

METHODS		Part-1 Panel-Least Square		Part-2 Robust-Least Square		Part-3 Panel-EGLS Cross-Section Weights	
Valuation ratio(Dependent)	Variable/ Statistic	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
PER	R2	0.068	---	0.35	---	0.43	---
	Adj. R2	0.066	---	0.35	---	0.43	---
	F/Rn-sq statistic	35.39	0.00	1512390	0.00	374.17	0.00
	D-W Stat.	2.03	---	---	---	2.13	---

	C_1	1.27	0.90	10.12	0.07	1.80	0.00
	DER	-0.67	0.19	-0.06	0.02	-0.28	0.00
	OR	0.64	0.49	-0.11	0.02	-0.19	0.02
	FR	1.75	0.00	-0.009	0.35	0.56	0.00
	D2D	9.14	0.38	1.71	0.00	4.33	0.00
	D3E	11.67	0.37	0.44	0.52	2.50	0.00
	D4F	41.48	0.00	0.33	0.61	4.31	0.00
	D5G	28.56	0.03	-0.11	0.87	12.16	0.00
	D6H	33.84	0.05	-0.31	0.74	11.24	0.00
	D7I	9.29	0.46	0.24	0.72	3.69	0.00
	D8J	0.53	0.96	0.20	0.73	0.25	0.57
	D9K	27.55	0.01	0.68	0.27	5.18	0.00
	D10N	21.25	0.27	0.16	0.87	11.91	0.00
	D11O	18.49	0.19	0.23	0.76	8.66	0.00
	X	10.12	0.07	2.16	0.08	4.87	0.07
	PER(-1)	0.22	0.00	0.76	0.00	0.54	0.00

Part 1 of the above table shows regression result when PER is dependent variable. Table 5C1 shows that the value of R^2 is 0.06 and it is significant. But in most cases the other coefficient has no significant effect on the PER of a firm. It was also found that only FR and industry category G, F and K have significant effect on the firm PER.

Table 5C2 below shows regression result when PBV is dependent.

Table 5C2 Regression results under different models (Dependent PBV)

METHODS		Part-1 Panel-Least Square		Part-2 Robust-Least Square		Part-3 Panel-EGLS Cross-Section Weights	
Dependent	Variable/ Statistic	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
PBV	R2	0.25	----	0.42	----	0.64	----
	Adj. R2	0.25	----	0.42	----	0.64	----
	F/Rn-sq statistic	165.79	0.00	400122	0.00	868.23	0.00
	DW stat	2.13	---	----	----	2.14	--
	C_1	1.02	0.07	0.14	0.05	0.34	0.03
	DER	0.02	0.29	-9.10	0.99	0.006	0.33
	OR	-0.14	0.00	-0.00	0.28	-0.04	0.00
	FR	-0.01	0.15	-0.003	0.02	-0.005	0.00
	D2D	0.76	0.17	0.13	0.06	0.34	0.00
	D3E	-0.44	0.53	-0.03	0.70	-0.06	0.28
	D4F	-0.12	0.85	0.07	0.39	0.01	0.88
	D5G	1.19	0.10	0.08	0.34	0.35	0.01
	D6H	0.04	0.96	0.05	0.65	0.28	0.12
	D7I	0.03	0.95	-0.08	0.35	0.07	0.46
	D8J	-0.36	0.54	0.00	0.95	-0.08	0.22
	D9K	1.29	0.03	-0.03	0.68	0.39	0.00
	D10N	0.12	0.90	-0.02	0.88	0.36	0.02
	D11O	1.04	0.17	0.01	0.86	0.51	0.00
	X	0.84	0.09	0.19	0.10	0.29	0.16

	PBV(-1)	0.48	0.00	0.83	0.00	0.76	0.03

Table 5C2 shows that independent variables estimate 25% variability of dependent variables PBV. The coefficient values of only two independent variables are significant under the present model. It was found that operating risk is negatively affecting PBV of firm and K industry has positive significant effect on the value of fund. In all other cases variables has no significant effect on PBV of the firm.

The same analysis was done in Table 5C3 when PCEPS is dependent variable and risk and industry nature are independent variables.

Table 5C3 Regression results under different models (Dependent PCEPS)

METHODS		Part-1 Panel-Least Square		Part-2 Robust-Least Square		Part-3 Panel-EGLS Cross-Section Weights	
Dependent	Variable/ Statistic	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob .
PCEPS	R2	0.05	----	0.40	----	0.48	----
	Adj. R2	0.05	----	0.50	----	0.48	----
	F/Rn-sq statistic	29.59	0.00	1836871	0.00	458.38	0.00
	DW stat	1.77	----	----	----	2.10	----
	C_1	3.09	0.70	0.60	0.12	1.34	0.07
	DER	-0.76	0.05	-0.039	0.05	-0.23	0.00
	OR	-1.01	0.16	0.01	0.63	-0.008	0.93
	FR	1.74	0.00	0.00	0.24	0.16	0.01
	D2D	3.85	0.63	0.95	0.01	2.09	0.00

	D3E	9.88	0.32	-0.22	0.65	1.00	0.04
	D4F	24.36	0.01	-0.03	0.94	3.02	0.00
	D5G	17.52	0.09	0.15	0.75	7.28	0.00
	D6H	12.90	0.35	0.08	0.89	6.96	0.00
	D7I	17.10	0.08	-0.20	0.66	2.34	0.00
	D8J	-2.19	0.79	0.17	0.66	0.56	0.08
	D9K	14.25	0.11	0.30	0.48	3.88	0.00
	D10N	-13.49	0.37	-0.16	0.82	4.10	0.16
	D11O	-4.35	0.69	0.06	0.89	3.44	0.00
	X	6.89	0.10	1.49	0.09	3.23	0.08
	PCEPS(-1)	0.18	0.00	0.81	0.00	0.61	0.00

In part one of table 5C3 above it was found 5% variability of dependent variables are estimated with the independent variables of firm. The Result shows that only DER, FR, and F industry have significant effect on value of firm. It was also found the DER and financial risk have negative effect on firm value when PCEPS is considered as valuation multiple.

Part-1 of Table 5C4 depicts the regression result when EVEBIDTA is considered as firm valuation multiple.

Table 5C4 Regression results under different models (Dependent EVEBIDTA)

METHODS		Part-1 Panel-Least Square		Part-2 Robust-Least Square		Part-3 Panel-EGLS Cross-Section Weights	
Dependent	Variable/ Statistic	Coefficient	Prob.	Coefficient	Prob .	Coefficient	Prob.
EVEBIDTA	R2	0.16	----	0.48	----	0.55	----
	Adj. R2	0.16	----	0.48	----	0.55	----
	F/Rn-sq statistic	92.85	0.00	316513	0.00	595.22	0.00
	DW Stat	2.05	----	----	----	2.15	----
	C_1	1.13	0.57	-0.25	0.33	0.57	0.16
	DER	-0.30	0.00	-0.03	0.00	-0.16	0.00
	OR	0.79	0.00	0.46	0.00	0.41	0.00
	FR	0.02	0.52	0.005	0.24	0.004	0.71
	D2D	3.37	0.06	0.76	0.00	1.70	0.00
	D3E	2.29	0.35	0.04	0.89	0.61	0.07
	D4F	5.46	0.02	0.09	0.76	1.23	0.02
	D5G	8.66	0.00	0.29	0.39	3.85	0.00
	D6H	15.29	0.00	0.26	0.56	3.62	0.00
	D7I	3.53	0.14	-0.21	0.51	1.30	0.00
	D8J	4.99	0.01	0.95	0.00	2.71	0.00
	D9K	6.60	0.00	0.23	0.43	2.18	0.00
	D10N	8.05	0.03	-0.21	0.66	4.04	0.00
	D11O	5.92	0.03	-0.04	0.89	2.52	0.00
	X	4.22	0.04	1.03	0.06	1.67	0.07
	EVEBIDTA(	0.38	0.00	0.83	0.00	0.67	0.00

	-1)						

When EVEBIDTA is a value multiple and the other variables are independent variables the regression equation can be able to estimate 16% variability of firm value under current model. Most of the coefficients were significant except FR and industry I, E, D respectively. From Part-1 of the Table 5C4 it was found that most of all independent variables have significant positive impact on value multiple (EVEBIDTA) except the DER of firm.

The M-Cap-sales is also one of important value multiple which shows firm valuation in respect of the eyes of stock market. Part one of the Table 5C5 shows regression result when M-cap-sales is dependent variables.

Table 5C5 Regression Results under Different Model (Dependent Market-Cap-Sal)

METHODS		Part-1 Panel-Least Square		Part-2 Robust-Least Square		Part-3 Panel-EGLS Cross-Section Weights	
Dependent	Variable/ Statistic	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
M-cap-sal.	R2	0.12	---	0.40	---	0.69	---
	Adj. R2	0.12	---	0.40	---	0.69	---
	F/Rn-sq statistic	70.67	0.00	5529	0.00	959.48	0.00
	DW stat	2.21	---	----	----	1.91	----
	C_1	18.92	0.79	17.80	0.00	0.52	0.14
	DER	-0.22	0.34	-0.003	0.26	-0.04	0.00

	OR	-0.20	0.64	-0.007	0.08	-0.04	0.00
	FR	-0.06	0.46	-0.003	0.00	-0.01	0.00
	D2D	-18.46	0.00	-17.67	0.00	-0.21	0.51
	D3E	4.09	0.49	-17.80	0.00	0.03	0.91
	D4F	-14.22	0.01	-17.77	0.00	-0.22	0.37
	D5G	-17.62	0.00	-17.75	0.00	-0.22	0.52
	D6H	-16.47	0.04	-17.82	0.00	0.10	0.73
	D7I	-15.89	0.00	-17.80	0.00	0.09	0.77
	D8J	-15.99	0.00	-17.73	0.00	0.00	0.98
	D9K	-12.80	0.01	-17.75	0.00	0.30	0.38
	D10N	-17.28	0.05	-17.66	0.00	0.03	0.91
	D11O	-16.11	0.01	-17.79	0.00	0.33	0.21
	X	2.77	0.05	0.10	0.06	0.34	0.06
	MARCApsal(-1)	0.34	0.00	0.73	0.00	0.65	0.00

Part one of table 5C5 above shows how independent variables impact dependent variables. The R^2 value under the present model was 12% which means the given independent variables were able to forecast 12% variability of MARCAPSAL valuation multiples. Part one of table 5C5 shows that DER or DE has negative effect on the said valuation ratio but it does not signify the negative effect on the firm value as the coefficient was not significant at 5% level. The OR and FR coefficient were also not significant. It means DER, FR and OR have no significant effect on the firm value when MARKETCAPSAL multiple is used for valuation purpose.

After conducting ordinary panel least square Method regression the residual were tested again to test Heteroskedasticity and outliner problem among the data series. Table 6 and 7 shows the panel Heteroskedasticity test result and figure 3A,3B,3C shows the graphical presentation of the regression residual. The Regression residual test under different dependent variables are shown in Table 6, 7 and Fig. 3A, 3B, 3C respectively.

Table 6 Heteroskedasticity test of Regression Residual under Market-Cap-Sales Valuation

Panel Cross-section Heteroskedasticity LR test				
Null	Residuals are Homoskedastic			
LR	value	104428.6	Probability	0.00
Panel period Heteroskedasticity LR test				
Null	Residuals are Homoskedastic			
LR	value	53837.87	Probability	0.00

Table 7 Heteroskedasticity test of Regression Residual under PCEPS Valuation

Panel Cross-section Heteroskedasticity LR test				
Null	Residuals are Homoskedastic			
LR	value	36206.87	Probability	0.00
Panel period Heteroskedasticity LR test				
Null	Residuals are Homoskedastic			
LR	value	8929.60	Probability	0.00

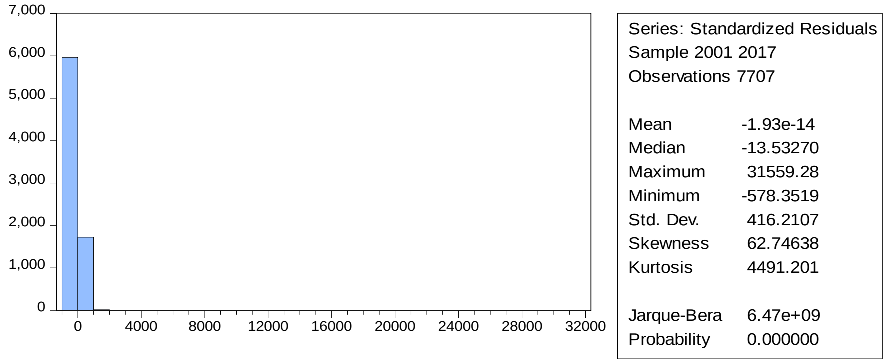

Fig. 3A Histogram of Regression Residual (PER Dependent) under Ordinary PLS Method

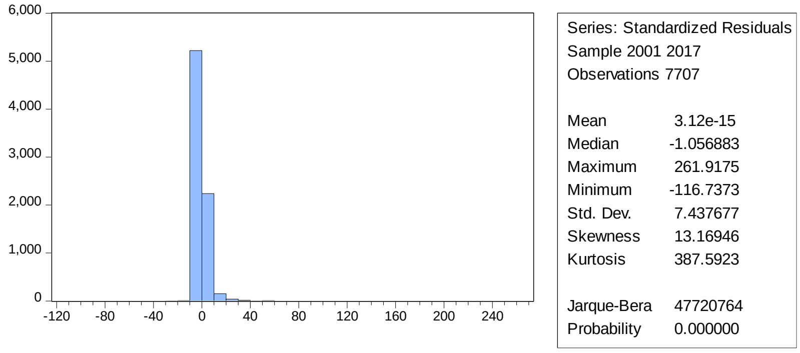

Fig. 3B Histogram of regression residual (PBV dependent) under Ordinary PLS Method

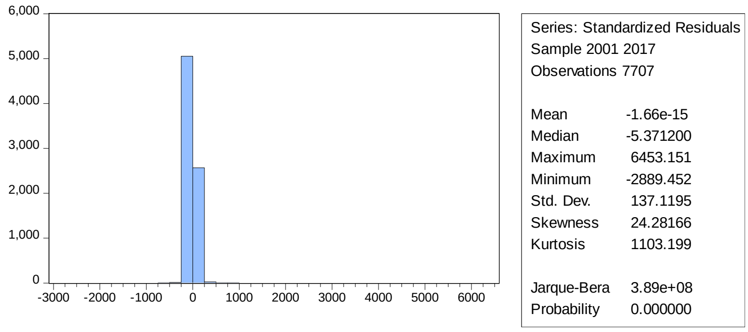

Fig. 3C Histogram of Regression Residual (PCEPS Dependent) under Ordinary PLS Method

Tables 6, 7, Fig.3A, 3B, and 3C show the result of LR test values and Histogram of regression residual. From the said table and picture it was found that LR statistic and JB statistic are not significant as probability value is less than 0.05%. It means the null hypothesis of Homoskedasticity is rejected and the alternative hypothesis is accepted. Therefore it means regression residuals are heteroskedastic.

After confirming Heteroskedasticity statistically in the panel least square regression model, it was confirmed that the simple panel least square regression model wouldn't be able to bring good results with the heteroskedastic data set. Normalization by taking a log and deducting outliner may bring good results in this model. But the normalization of the data series was not possible through the log as the data set contains some zero and negative value. Moreover, if we want to normalize data by omitting the negative and zero value data, the impact of that value would be neglected. On the other side, if we omitted many data fields with outlier then the degree of freedom will be lost as there are more than 2 outliers in each data series. The outlier of the data series is detectable through leverage plot and influence statics. Figure 2 and 3 show the graphical presentation of outliners through HAT matrix and leverage plot.

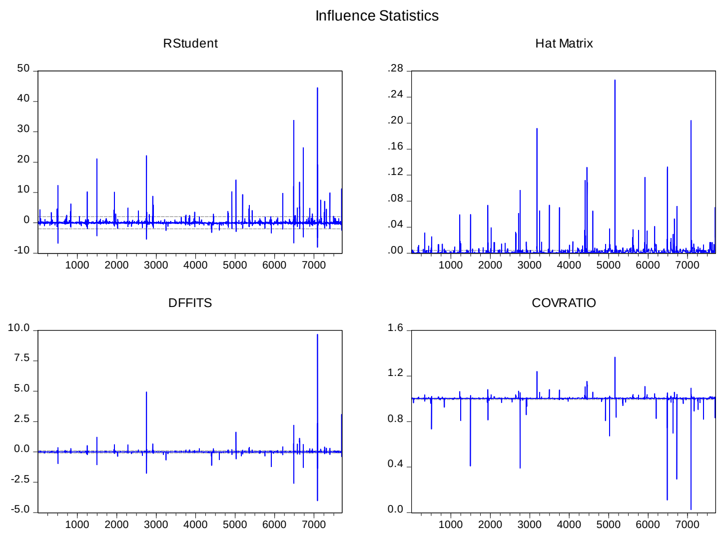

Fig 4A Regression Residual Influence Statistics

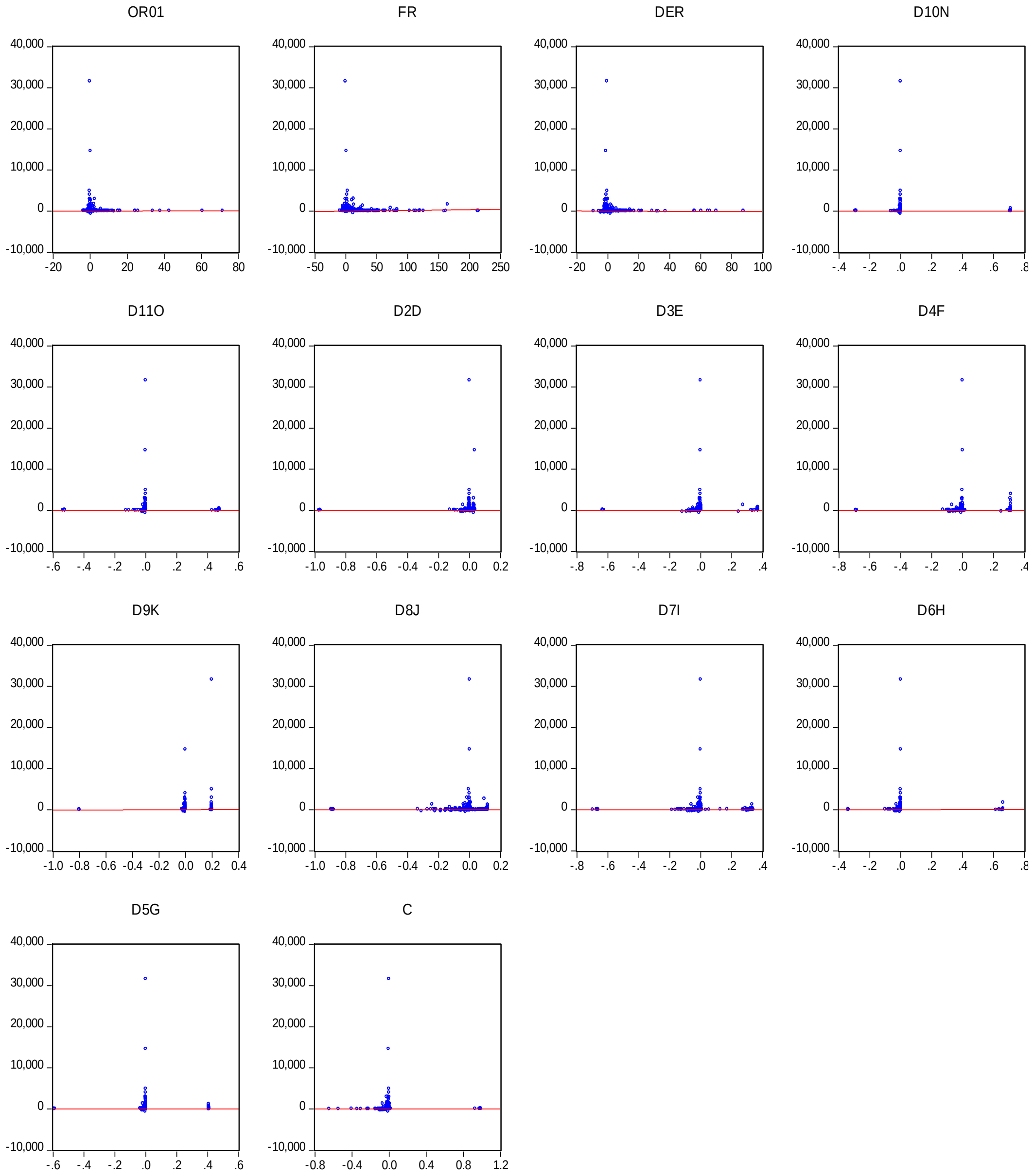

Fig. 4B Leverage Plot of Independent Variables

The above two figures 4A and 4B show Regression Residual influence Statistics and leverage plot of independent variables. The two figures show significant Heteroskedasticity in the variables. The outliner characteristic was detected in the below figure 5 below:

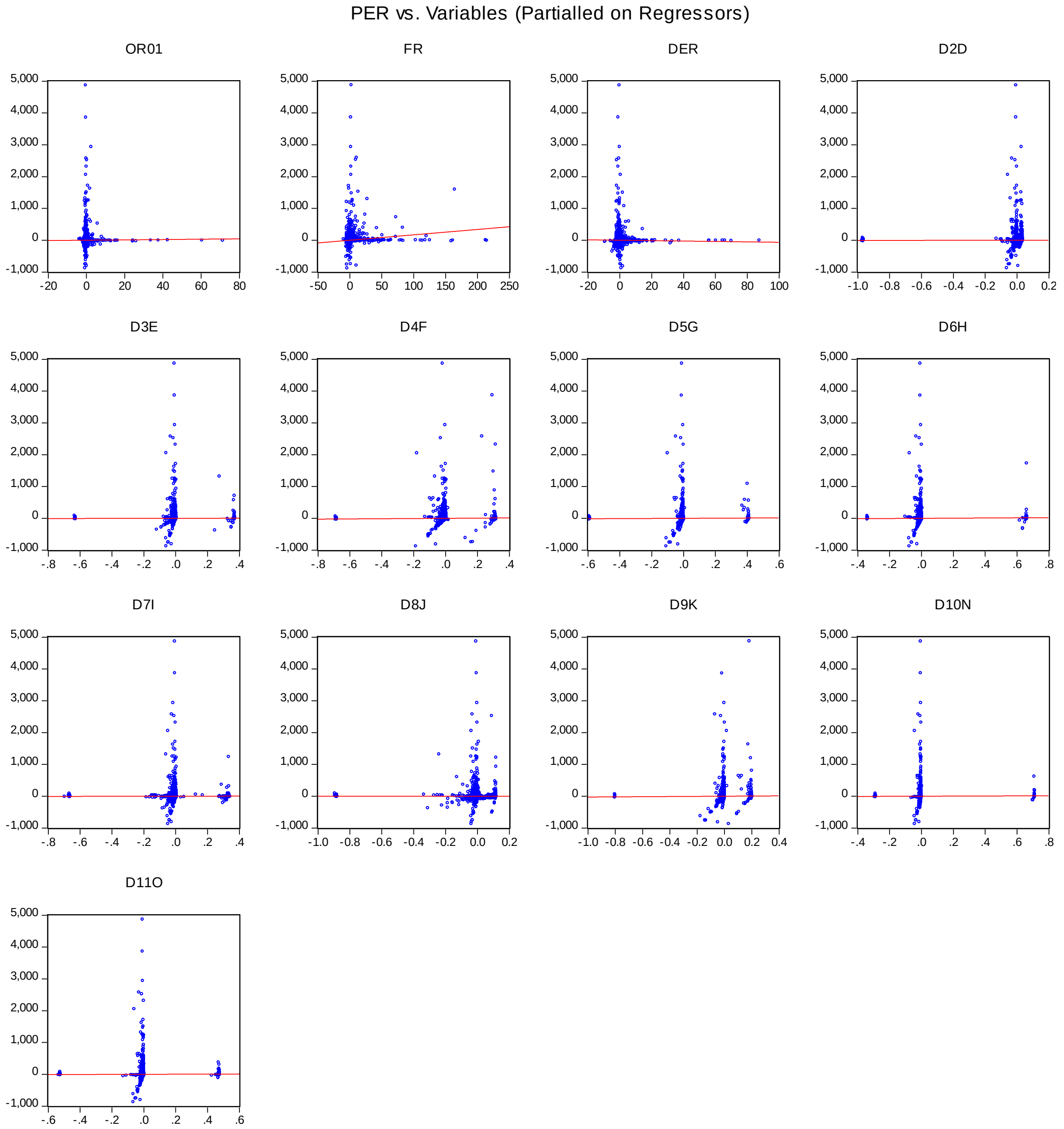

Fig.5 Outlier of Variables

So from the above figure it is clear that the characteristic of heterogeneity is debarring the liner Panel LS model to bring good estimation. The Econometric model that can scope up with the said characteristics can be able to bring good estimation of dependent variables.

5.4.1.2.2 Robust-Least Square:

According to the assumption of the Robust LS regression model, it provides an alternative to ordinary least squares regression which works with less restrictive assumptions. Specifically, it provides much better regression coefficient estimates when more than two outliers are present in the data series. Outliers violate the assumption of normality of the ordinary least squares regression model. It tends to distort the result. In such case, the value of the least-squares coefficient would be having more influence than they deserve. Robust regression model down-weights the influence of outliers if the data series have more than two outliers. Robust regression is an iterative procedure that seeks to identify outliers and minimize their impact on the coefficient estimates. Robust least square model is a more suitable method to disclose the impact of independent variables on dependent variables when there are more than two outliers in the data series according to the work of Lange *et al*. (1989), Andersen (2008), Breiman (2001). So a Robust least squares Regression model was implemented on the data set. E-Views provide three different methods for robust least-squares method which are M-estimation, according to Huber (1973), MM-estimation, Yohai (1987) and S-estimation according to Rousseeuw and Yohai, (1984) work. The Result of the model is disclosed in the second part of the above Tables 5C1, 5C2, 5C3, 5C4, and 5C5. Tables 5 shows that the values of R^2 have been improved and the significance of coefficient (independent variables) has also been improved. Though the explaining power of the model has improved, the coefficient of most of the independent variables was not significant in describing the impact of independent variables on dependent variables. So, there is scope of further analysis with more suitable model which may be more appropriate for the heterogeneous data set. For that purpose, the problem related to the long-run association of the dependent and independent variables has been checked. It is so because, sometimes long-run association may create spurious correlation which may misinterpret (sometimes engulf/overstated) the effect of independent variables on the dependent variables. If there is a long-run association among the dependent and independent variables the estimation will be a biased estimator. Pedroni Residual Cointegration Test or the Johansen Panel Cointegration test would help to detect Cointegration among the variables and it indicates the implacability of the VAR (vector auto regression) model. Long run or short-run equilibrium relationships may create a problem of spurious relation. Therefore the two Co-integration tests were conducted. Table 8A, 8B, and appendix I show the test result.

Table 8A Pedroni Residual Cointegration Test

Series: PER OR FR DE Include observation:7707 Cross-section Included: 426(73 dropped) Null hypothesis: No cointegration Trend Assumption: No deterministic Trend				
Alternative hypothesis: Common AR coifs. (within dimension)				
Name	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	23.75	0.00	-8.39	1.00
Panel rho-Statistic	11.86	1.00	1.63	0.94
Panel PP-Statistic	-35.60	0.00	-17.64	0.00
Panel ADF-Statistic	-16.84	0.00	-18.01	0.00
Alternative hypothesis: individual AR coifs. (between-dimension)				
Name	Statistic	Prob.		
Panel rho-Statistic	11.12	1.00		
Panel PP-Statistic	-17.84	0.00		
Panel ADF-Statistic	-15.09	0.00		

Table 8B Johansen Fisher Panel Cointegration Test

Series: PER OR FR DE Include observation:7707 Trend Assumption: Linear deterministic Trend

Lags interval (in first differences): 1 1 Unrestricted cointegration Rank Test(Trace and maximum Eigen value)				
Hypothesized No. of CE(s)	Fisher Stat (from trace test)	Prob.	Fisher Stat (from max-eigen test)	Prob.
None	13791	0.00	30371	0.00
At most 1	7133	0.00	5263	0.00
At most 2	5224	0.00	2498	0.00
At most 3	1166	0.08	1166	0.07

The Johansen cointegration test was done to find out whether the VAR model would be applicable or not. The VAR model would able to detect long run or short run cointegration or equilibrium among dependent and independent variables (Beckmann and Czudaj (2013); Lili and Chengmei (2013); Anand and Madhogaria(2012); Apergis (2014); Chang et al. (2013)). VAR model is of two types one is restricted VAR model and other is not restricted VAR model. When variables are co-integrated as per the Johansen cointegration test, then a restricted VAR model that is a vector error correction model (VECM) is applied. In this work, the VAR model is only used to detect long run or short run equilibrium among the variables. Both methods of VAR models bring good estimation when observed data series has a particular trend and there is no outlier or also there is no evidence of huge fluctuations. But as the data sets considered in this study have the said characteristics the long run and short run cointegration between the dependent and independent variables can be detected. The lag value of the data has been considered to assume the data as stationary. VECM is applied in this work as the Johansen cointegration test shows cointegration present in the variables. The result of the VECM model is given in Table 9A, 9B and Annexure--II.

In table 8A, 8B and Annexure- no I different panel cointegration test were done. The test result shows that there is cointegration relationship exists among the dependent and independent variables. Therefore in the next table 9A, 9B, and Annexure- II, regression coefficient were calculated under the VECM model. The tables are given below.

Table 9A VAR Model

Equation: D(PER)= C(1)*(PER(-1) -177.34*DER(-1) +10.11*FR(-1)- 2623.95*OR(-1) + 3599.31) + C(2)* D(PER(-1)) + C(3)* D(PER(-2)) + C(4)* D(DER(-1)) + C(5)* D(DER(-2)) + C(6)* D(FR(-1)) + C(7)* D(FR(-2)) + C(8)* D(OR(-1)) + C(9)* D(OR(-2)) +C(10)
R-squared 0.311 Mean dependent var 2.49 Adjusted R-squared 0.31 S.D. dependent var 142.13 S.E. of regression 118.02 Durbin-Watsons stat. 1.89

Table 9B VECM (PER Dependent)

Estimation Method: Least Squares Date: 02/01/20 Time: 20:27 Sample: 2001 2017 Included observations: 6211 Total system (balanced) observations 24844				
Coefficient	Coef. value	Std. Error	t-Statistic	Prob.
C(1)	-0.000402	0.000508	-0.790518	0.4292
C(2)	-0.611964	0.011630	-52.61919	0.0000
C(3)	-0.298862	0.011584	-25.79904	0.0000
C(4)	-0.205577	0.603926	-0.340400	0.7336

C(5)	-0.605504	0.574403	-1.054145	0.2918
C(6)	0.123649	0.187269	0.660275	0.5091
C(7)	-0.046101	0.188751	-0.244242	0.8070
C(8)	-0.326646	1.180093	-0.276797	0.7819
C(9)	-0.123674	0.891156	-0.138780	0.8896
C(10)	4.800436	1.499390	3.201592	0.0014

In the above equation of the VEC model where PER is the dependent variable and all other variables in the right-hand side are independent variables. In this model, the long-run causality running from independent to dependent variables is confirmed if the value of C (1) is negative. As the calculated value of C (1) was negative (table 9B) but not significantly so no long-run equilibrium is present among the PER and independent variables.

Further to examine whether there is any short-run causality or not, the Wald test of the coefficient was done. If the null hypotheses of equality of two corresponding coefficients are accepted then no short-run causality is found to run from independent to the dependent variable. Table 10 shows the result of the Wald test when PER is Dependent. The Wald test result showed a p-value of Chi-square statistics is more than .05 which means the null hypothesis is accepted. Therefore no short-run causality running from independent variables to PER was found in the data set of the corporate. Other VECM results and WALD test results are given in Annexure--II. From the Annexure- II(2) it is found that when PBV is a dependent variable then long-run causality arises from independent to dependent variables as C(1) is negative and significant. Short-run causality is also found from DER to PBV and OR to PCEPS. The result is shown in Annexure—II (2)(b) and II(5)(c).

Table 10 Wald Test (PER Dependent)

Wald Test			
Test Statistic	Value	df	Prob.
Chi-square	0.798	1	0.371
Null hypothesis: C(6)=C(7)			
Null hypothesis summary			
Normalized Restriction(=0)	value	Std.err.	
C(6)-C(7)	0.169	0.189	

Wald Test			
Test Statistic	Value	df	Prob.
Chi-square	0.078	2	0.961
Null hypothesis: C(8)=C(9)=0			
Null hypothesis summary			
Normalized Restriction(=0)	value	Std.err.	
C(8)	-0.326	1.18	
C(9)	-0.123	0.891	

Wald Test			
Test Statistic	Value	df	Prob.
Chi-square	1.112	2	0.57
Null hypothesis: C(4)=C(5)=0			
Null hypothesis summary			
Normalized Restriction(=0)	value	Std.err.	
C(4)	-0.205	0.603	
C(5)	-0.605	0.574	

5.4.1.2.3 Panel-EGLS Cross-Section Weights:

In most of the cases, risk variables had no long-run or short-run equilibrium in our data set. In this context, the relationship between independent variables and dependent variables has been experimented with linear panel Estimated Generalised Least Square (EGLS) model. Tables 6, 7 and Fig.3A, 3B, 3C show that Panel Cross-section Heteroskedasticity with more than two outliers was present in the data series. Therefore panel EGLS model with cross-sectional weight may bring good regression results with the data series. Table 11 shows the results of the Panel EGLS model. The result of Table

11 shows that the liner Panel EGLS regression model with cross-sectional weight has improved R^2 value and the significance of dependent variables has also improved. The F statistic values are also significant. Therefore Panel EGLS model is more improved than the previous model for the present data set.

Table 11 Panel-EGLS Model with Cross-Section Weights

Dependent(Y)	PER		PBV		PCEPS		EVEBIDTA		MARKET-CAP-SALS	
Variable / Statistic	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
R2	0.43	--	0.64	--	0.48	--	0.55	--	0.68	--
Adj. R2	0.43	--	0.64	--	0.48	--	0.55	--	0.68	--
F/Rn-sq statistic	374.17	0.00	868.23	0.00	458.38	0.00	595.22	0.00	1026.65	0.00
DW Stat	2.13	--	2.14	--	2.10	--	2.15	--	2.25	--
C_1	1.80	0.00	0.34	0.03	1.34	0.07	0.55	0.16	.0.57	0.14
DER	-0.28	0.00	0.006	0.33	-0.23	0.00	-0.16	0.00	-0.04	0.00
OR	-0.19	0.02	-0.04	0.00	-0.008	0.93	0.41	0.00	-0.04	0.00
FR	0.56	0.00	-0.005	0.00	0.16	0.01	0.004	0.71	-0.01	0.00
D2D	4.33	0.00	0.34	0.00	2.09	0.00	1.70	0.00	-0.21	0.51
D3E	2.50	0.00	-0.06	0.28	1.00	0.04	0.61	0.07	0.03	0.91
D4F	4.31	0.00	0.01	0.88	3.02	0.00	1.23	0.02	-0.22	0.37
D5G	12.16	0.00	0.35	0.01	7.28	0.00	3.85	0.00	-0.22	0.52
D6H	11.24	0.00	0.28	0.12	6.96	0.00	3.62	0.00	0.10	0.73
D7I	3.69	0.00	0.07	0.46	2.34	0.00	1.30	0.00	0.09	0.77
D8J	0.25	0.57	-0.08	0.22	0.56	0.08	2.71	0.00	0.00	0.98
D9K	5.18	0.00	0.39	0.00	3.88	0.00	2.18	0.00	0.30	0.38
D10N	11.91	0.00	0.36	0.02	4.10	0.16	4.04	0.00	0.03	0.91
D11O	8.66	0.00	0.51	0.00	3.44	0.00	2.52	0.00	0.33	0.21
X	4.87	0.07	0.29	0.16	3.23	0.08	1.67	0.07	0.34	0.06
LAG(Y)	0.54	0.00	0.76	0.03	0.61	0.00	0.67	0.00	0.65	0.00

In the above table 11 above, it was found that DER was negatively correlated with four valuation ratios and positively related to PBV. On the other side operation risks also have a negative significant effect on PER, PBV and MARKET-CAP-SALES but positive effect on EVEBIDTA base valuation ratio. A mixed effect of FR was found on the firm valuation. The industry dummy coefficients were also significant in most of the cases except MARKET-CAP-SALS. It is implied that nature of industry is also a determinant factor for some of the valuation ratios and obviously on firm value. The value of the dummy variable shows the effect of industry nature on the firm value. In table 11 above, it is found in some cases, industries categories have a significant positive effect on the value of a firm and some industry has too low effect on the value of the firm which signifies industry effect on the value of a corporate.

So from table 11 above, it is clear that whatever be the sign of the coefficient, internal risk and industry nature both have a significant effect on firm value. So from the above analysis it is observed that the null hypotheses are rejected and the alternative hypotheses are accepted.

In this context, it a pertinent question is why debt-equity, operating risk, and financial risk have a negative relationship with the firm value in some of the cases? Does it mean risk variables have a negative impact on the value of a firm in reality as well? Had there been such a relationship then why the firms are taking risk which reduces its value? To find this answer to this question further examination was needed. To find out the answer of the said question, firm value were regressed on categorical dummy independent variables. In that analysis, on the basis of the independent veriables value, the independent variable was divided into some classes (category) and it has been attempted to find out how this variable related with corporate value.

First of all, the debt-equity ratio (category wise) effect was checked on corporate valuation. The table 12 below shows the results of regression where the value is a dependent variable and different cluster of debt-equity are independent variables.

Table 12 Panel-EGLS Model with Cross-Section Weights

(Cluster-Wise Effect of DE)

Dependent(Variable)	PER		PBV		PCEPS		EVEBIDTA		MARKET-CAP-SALS	
Statistic	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
R2	0.34	----	0.59	----	0.44	------	0.55	----	0.65	-----
Adj. R2	0.34		0.59	----	0.44	------	0.55	----	0.65	------
F/Rn-sq statistic	476	0.00	1346	0.00	715	0.00	1121	0.00	1675	0.00
DW Stat	2.16	----	2.16	-----	2.13	-----	2.16	-----	2.17	------
C_1	5.99	0.00	0.55	0.00	3.54	0.00	3.05	0.00	0.32	0.00
D1DE	1.58	0.00	-0.04	0.56	1.70	0.00	1.52	0.00	0.63	0.00
D2DE	5.26	0.00	0.36	0.00	4.86	0.00	1.64	0.00	0.71	0.00
D3DE	3.52	0.00	0.21	0.00	2.38	0.00	0.88	0.02	0.33	0.00
D4DE	1.75	0.00	-0.05	0.31	0.39	0.12	0.01	0.97	0.09	0.00
D5DE	1.00	0.11	-0.01	0.78	0.38	0.17	-0.27	0.29	0.00	0.96
D6DE	0.39	0.39	-0.06	0.28	0.13	0.64	-0.34	0.06	-0.09	0.01
D7DE	-1.29	0.03	-0.15	0.05	-1.31	0.00	-0.88	0.00	-0.17	0.00
Y(-1)	0.55	0.00	0.77	0.00	0.61	0.00	0.68	0.00	0.79	0.00

Table 12 above shows that there was a significant relationship between different categories of DER and firm value. The relation between value and DER categorically was a significant maximum of cases. The R^2 values are also significant for different valuation ratios. After the regression result was found, the coefficient was tested to find out whether they were significantly different or not. To test it Wald statistic is used. The result of the statistic is given in Table 13.

Table 13 Wald Test (Cluster-wise Effect of DER)

Wald Test (categorical DER coefficient)			
Test Statistic	value	df	Probability
F-statistic	73.44	(7, 7770)	0.00
Chi-square	514.09	7	0.00
Null Hypothesis: C(1)=C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=0 Null Hypothesis Summary:			
Normalized Restriction (=0)		Value	Std.Err
C(1)		6.75	0.74
C(2)		13.54	0.78
C(3)		7.38	0.82
C(4)		3.84	0.8
C(5)		2.59	0.85
C(6)		1.04	0.79
C(7)		-0.98	0.9
Restrictions are linear in coefficients			

Table 13 shows that F-statistic and Chi-square Statistic P values were less than .05 which means the null hypothesis of equality of coefficient is rejected. Its means coefficients are significantly different from each other. From table 13, it is clear that the values of the coefficient increase on an average first and then decreases gradually.

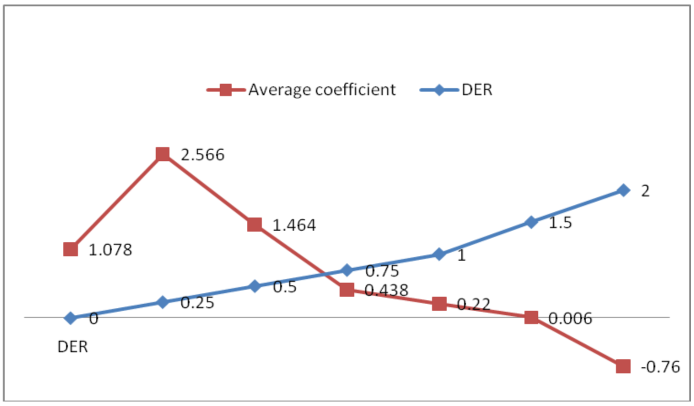

Fig. 6 Average Coefficient (DER and Value) and DER

In the next stage, the same analysis on operating risk and financial risk were conducted. Table 14 shows the regression results when OR are divided Cluster-wise to find out the cluster wise Effect of operating leverage on firm value.

14 Panel-EGLS (Cluster-wise Effect of OR)

Panel-EGLS Model With Cross-Section Weights										
Dependent(Y)	PER		PBV		PCEPS		EVEBIDTA		MARKET-CAP-SALS	
Variable / Statistic	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
R2	0.03	--	0.04	--	0.07	--	0.04	--	0.05	--
Adj. R2	0.03	--	0.04	--	0.07	--	0.03	--	0.05	--
F/Rn-sq statistic	94.00	.00	108.49	.00	203.00	.00	107.00	.00	150	.00
C_1	0.42	.02	1.05	.00	-1.41	.00	2.16	.00	1.14	.00
D1OR	17.68	.00	1.31	.00	14.63	.00	8.64	.00	1.37	.00
D2OR	18.23	.00	0.27	.03	8.62	.00	6.44	.00	-0.12	.46
D3OR	25.28	.00	0.36	.06	7.79	.00	12.38	.00	-0.08	.61

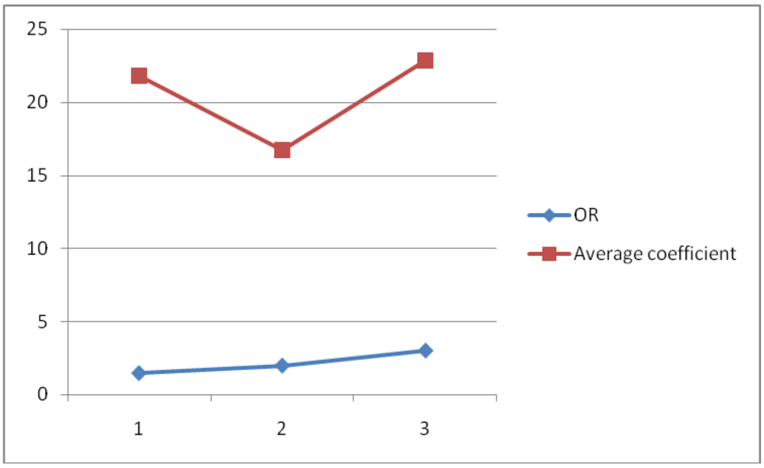

Fig. 7 Average Coefficient (OR and Value) and OR

In the above table and chart, it is clear that operating risk has a positive effect on firm value. But the effect is increasing with OR only in two cases PER, EVEBIDTA and decreasing in the rest of the three cases. The fact that higher operating risk has a more positive impact on firm value may not be always true for each valuation ratio.

Various class-wise effect of financial risk on the value of the firm was calculated in Table 15. Table 15 shows that among 5 dependent variables the relationship between FR and firm value are positive and decreasing. But the effect of financial risk on the other two cases is negative.

Table 15 Panel-EGLS Model with Cross-Section Weights (Cluster-wise FR Effect)

Panel-EGLS Model With Cross-Section Weights										
Dependent(Y)	PER		PBV		PCEPS		EVEBIDTA		MARKETCAPS-ALS	
Variable / Statistic	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
R2	0.02		0.20		0.06		0.06		0.10	
Adj. R2	0.02		0.20		0.06		0.06		0.09	
F/Rn-sq statistic	67	.00	653	.00	187	.00	165	.00	286	.00
C_1	8.18	.00	1.83	.00	2.71	.00	11.33	.00	3.60	.00
D1FR	9.96	.00	1.02	.00	10.67	.00	-1.59	.00	-0.97	.02
D2FR	5.20	.00	-0.31	.08	5.28	.00	-4.27	.00	-2.53	.00
D3FR	9.04	.00	-0.72	.00	8.63	.00	0.76	.40	-2.35	.00

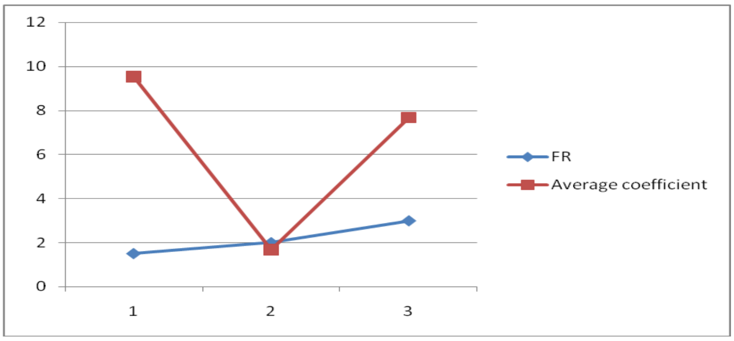

Fig.8 Average Coefficient (FR and Value) and FR

In Table 16 above, it is found that on an average the higher the financial risk the lower the positive impact of FR on the value of a firm. In some cases, the negative impact of FR was also found due to an increase in financial risk. The result of the above table shows that in maximum number of cases the financial risk has an adverse effect on the value of a firm. Though the overall negative relation was found when we categorically divide them into different categories a positive and negative effect was found during the study period.

Back Ground For Nonlinearity Assumption: In the above regression, it was observed that the relationship between the dependent and independent variables is not linear as in each case the average coefficient was significantly different from others. The Wald test (Table 13) shows that coefficients are significantly different. Therefore no linear regression equation would be suitable to examine the relationship between the dependent variables and independent variables. Therefore the linear regression model may not able to bring the best coefficient estimation from the data set. So for better estimation nonlinear model was applied in the next section.

5.4.2. Nonlinear model:

From the previous analysis, it is clear that the nonlinear regression model is appropriate to show a more robust relationship between the dependent and independent variables. From the above table and chart, it was confirmed that the relationship may be polynomial (curve) in nature. A polynomial model can be appropriate if it is seen that the slope of the effect of independent on dependent changes sign as frequency of independent variable increases. For many such models, the relationship between Xi and E(Y) can be more accurately reflected with a specification in which Y is viewed as a function of Xi and one or more powers of Xi, as in

$Y=c+ \beta_1 X_1 + \beta_2 X_1^2 + \beta_3 X_1^3 + \ldots + \beta_n X_1^n + e$

So in the current steps, independent variables were regressed on dependent variables in a polynomial autoregressive regression model with cross-sectional weight. Some Polynomial Models, with Quadratic Terms: [often referred to as quadratic models.] are given below.

Table 16 Some Polynomial Models, With Quadratic Terms

b1 positive, b2 positive; $Y = 2X + X^2$	b1 positive, b2 negative; $Y = 2X – X^2$
b1 negative, b2 positive; $Y = -2X + X^2$	b1 negative, b2 negative; $Y = -2X – X^2$
b1 zero, b2 positive; $Y = X^2$	b1 zero, b2 negative; $Y = -X^2$
$b_i = \beta_i$ = slope	

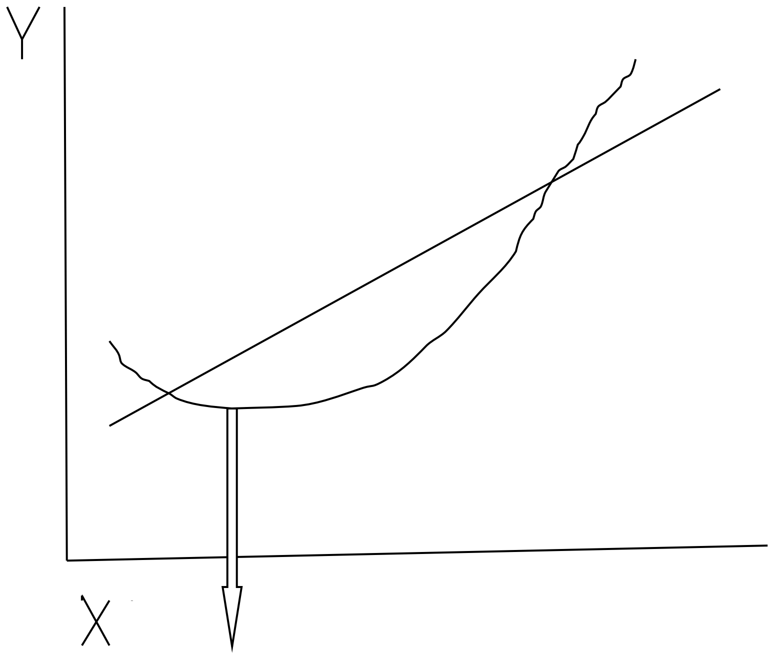

Fig.9A Polynomial relation when b1 positive, b2 positive: $Y=X+X^2$

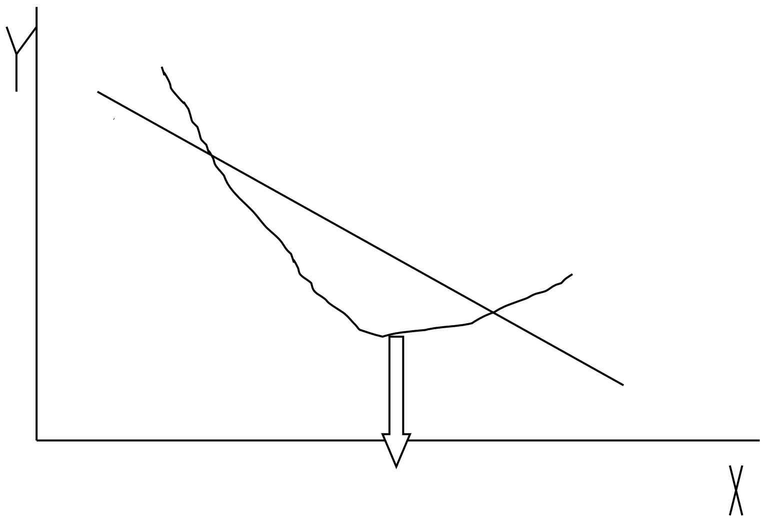

Fig.9B Polynomial relation when b1 negative, b2 positive: Y=-X+X^2

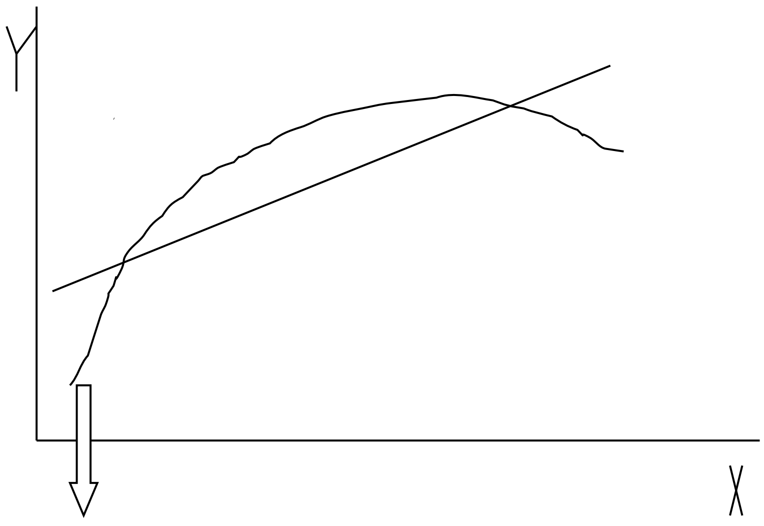

Fig.9C Polynomial relation when b1 positive, b2 negative: Y=X-X^2

The regression model under polynomial curve assumption is as under:

$Y = C - \beta_1 DER + \beta_2 DER^2 - \beta_3 DER^3 + \beta_4 DER^4 + \beta_5 OR - \beta_6 OR^2 + \beta_7 OR^3 - \beta_8 OR^4 + \beta_9 FR - \beta_{10} FR^2 + \beta_{11} FR^3 + \beta_i D_j + \beta_{22} X + \beta_{23} Lag(Y) + e$ where $i = 12$ to 21 and $j = 2$ to 11.

Before introducing dummy variables in the current model, Hausman Test was done (details given in Annexure- III(1), III(2), III(3)) on polynomial simple OLS (without cross-section weight) model (dependent-PER, PBV, MARKET-CAP-SALES) to find out whether random effect model was better than fixed-effect model. The test result shows that the fixed effect model was better than the random effect model as the p-value is less than .05 as per the test statistic. It means that the random effect is better to be rejected. Therefore fixed effect was given by introducing industry dummy in the polynomial model. The implication of the Company-wise Fixed effect by introducing 490 dummy variables creates a complex case with poor degree of freedom and the result may be invalid in reality. So 490 companies' data set have been categorized in to 11 broad categories as per NIC 2004 as available from Capital-line database Then regressions of independent variable on dependent variables were carried out. The gist of result of the current regression model is tabulated in table 17. Further the Wald test was also done to check whether the values of coefficient of dummy variables are equal to zero or not. Wald test also confirms that dummy variables were not equal to zero as p-value of the said test result is less than 0.05. It rejects the null hypothesis assumption that is coefficient equal to zero. The below table 17 shows the gist result. Details results given in Annexure- IV.

Table 17 Regression with Panel-EGLS Model with Cross-Section Weights

(Polynomial Curve Assumption)											
Dependent(Y)	PER		PBV		PCEPS		EVEBIDTA		MARKETCAPSALS		Ave.Coif.
Variable / Statistic	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	
R2	0.455	--	0.659	--	0.537	--	0.622	--	0.725	--	
Adj. R2	0.453	--	0.658	--	0.536	--	0.620	--	0.724	--	
F statistic	223.38	.00	517.48	.00	311.16	.00	440.46	.00	705.49	.00	

DW Stat	1.88	----	1.99	----	1.82	----	1.82	----	1.940	----	
C_1	-5.165	.00	0.760	.00	0.97	.30	-1.989	.00	1.057	.06	-.046
DER	-3.059	.00	-0.040	.02	-1.421	.00	-0.192	.40	-0.209	.00	-.955
DER^2	0.320	.00	0.008	.00	0.173	.00	0.008	.74	0.022	.00	0.098
DER^3	-0.006	.00	-0.000	.01	-0.004	.00	-0.002	.67	-0.001	.00	-.002
DER^4	4.03E	.00	1.04E	.06	2.53E	.00	2.42E	.55	3.16E	.00	#####
OR	4.280	.00	-0.337	.00	0.02	.96	2.658	.00	0.40	.00	0.945
OR^2	-0.411	.00	0.022	.00	-0.09	.19	-0.167	.00	-0.031	.00	-.066
OR^3	0.009	.00	-0.000	.00	0.003	.23	0.003	.00	0.001	.00	0.000
OR^4	-'6.70E	.00	3.34E	.00	-2.44E	.31	-'2.21E	.00	-5.97E	.00	#####
FR	3.23	.00	-0.072	.00	0.88	.00	-0.034	.60	-0.103	.00	0.410
FR^2	-0.074	.00	0.000	.00	-0.031	.00	0.000	.78	0.002	.00	-.004
FR^3	0.000	.03	-'1.45E	.00	0.00	.00	-'8.61E	.95	-2.46E	.00	#####
FR^4	-1.40E	.00	3.34E	.00	-1.14E	.00	-5.77E	.98	6.16E	.00	####
D2D	2.944	.00	0.430	.00	2.140	.00	2.054	.00	-0.082	.74	1.699
D3E	2.314	.00	-0.010	.89	1.167	.04	0.495	.20	0.161	.69	0.947
D4F	3.324	.03	0.097	.39	2.559	.02	1.324	.03	-0.034	.89	1.900
D5G	10.276	.00	0.461	.00	7.141	.00	4.278	.00	-0.153	.56	4.666
D6H	7.710	.03	0.365	.05	5.136	.00	3.010	.00	0.231	.48	4.736
D7I	2.861	.00	0.150	.13	1.840	.00	1.054	.03	0.222	.43	1.424
D8J	-3.266	.00	0.073	.32	-1.394	.03	4.278	.00	0.275	.29	0.272
D9K	4.229	.00	0.396	.01	3.422	.00	3.322	.00	0.305	.28	2.464
D10N	10.335	.00	0.571	.00	5.149	.07	4.196	.00	0..165	.33	4.121
D11O	6.883	.00	0.617	.00	3.281	.00	2.380	.01	0.3410	.61	2.956
X	3.700	.00	0.256	.19	2.618	.08	2.081	.09	0.395	.00	2.022
LAG1Y	0.404	.00	0.672	.00	0.450	.00	0.552	.00	0.640	.00	0.505
LAG2Y	0.231	.00	0.100	.23	0.236	.00	0.128	.02	0.226	.00	--

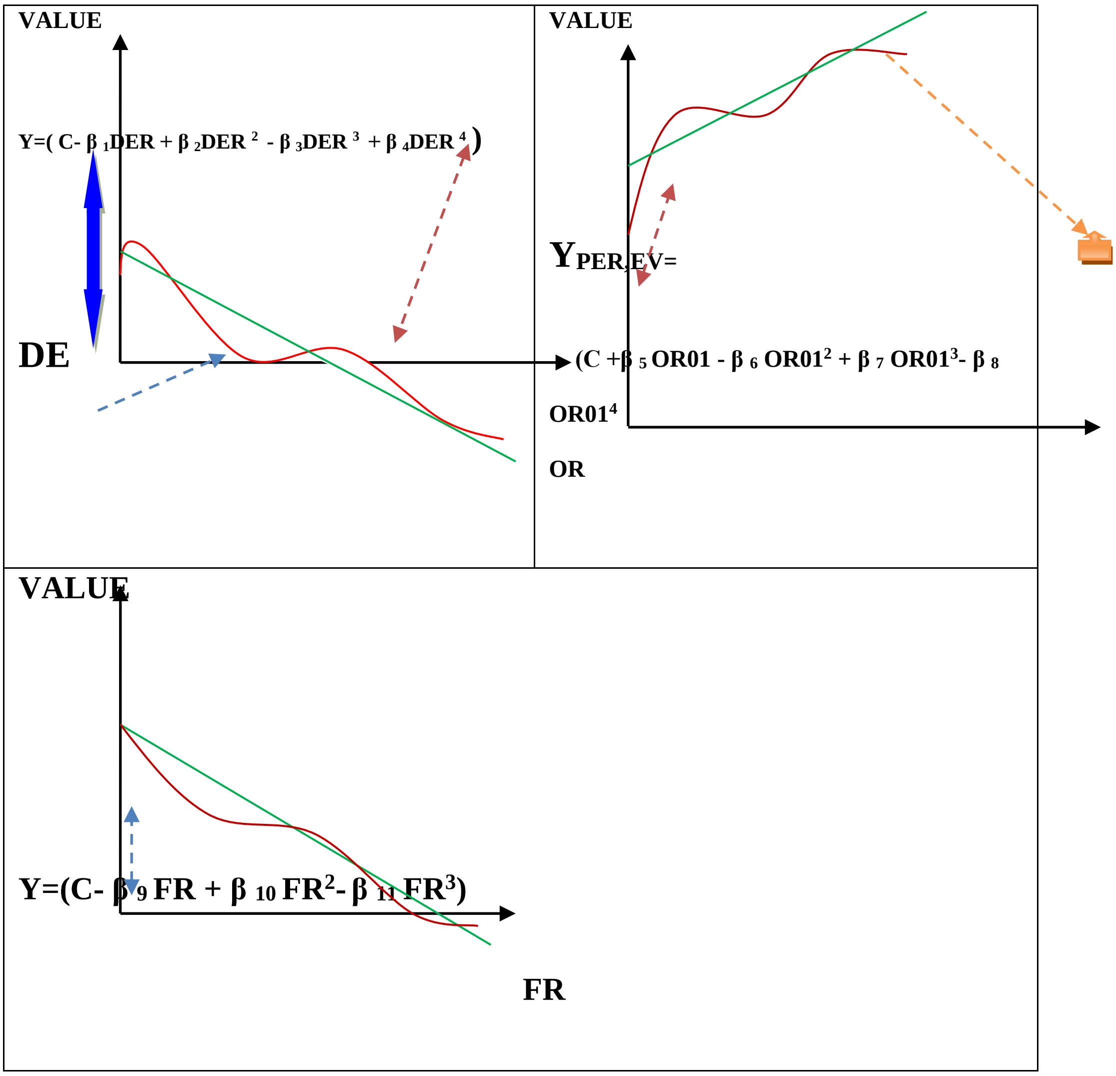

Fig.10 Regression of Three Independent Variables

From the above table, it was found that the operating risk has a positive impact on the two corporate valuation measure (PER , EVEBIDTA) and negative impact on the rest 3re valuation measure (PBV, PCEPS, MARKET-CAP-SALES). On the other hand financial risk have a positive impact on PER and PCEPS but the negative impact on PBV, EVEBIDT and MARKET-CAP-SALES. We have used the fixed-effect model (industry-wise fix effect) by introducing dummy variables. As per Wald test if p-values of co-efficient of dummy variables are higher than 0.05 the null hypothesis would considered significant and the null hypothesis would be accepted. But the p-value in the test conducted is less than 5%. It implies that the null hypothesis is rejected.Thus it is observed that fixed-effect model is better than the random effect model. Hausman test was also confirming the same result. In fig. 10 pictorial presentation of coefficient of each independent variables on an average (with polynomial curve assumption) are presented separately.

At last normality test of regression residuals were done to find out efficiency of the regression equation. The pictorial presentations of the said test are given in fig.11, 12, 13, 14, and 15.

Normality test of regression residual

PER Dependent

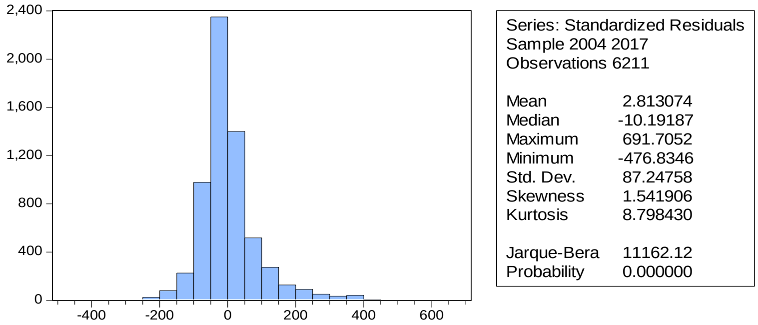

Fig 11(a) Histogram of Residual

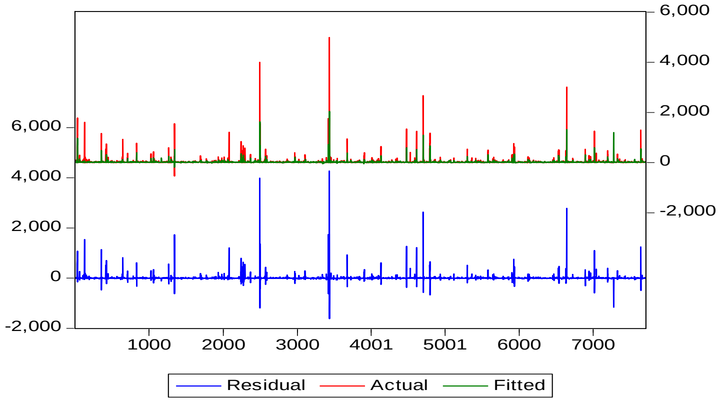

Fig. 11(b) Plot of Residual, actual, and estimated of Dependent Variables

PBV Dependent

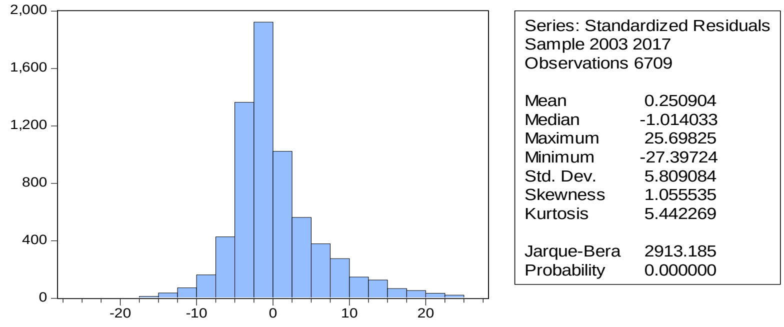

Fig. 12(a) Histogram of Residual

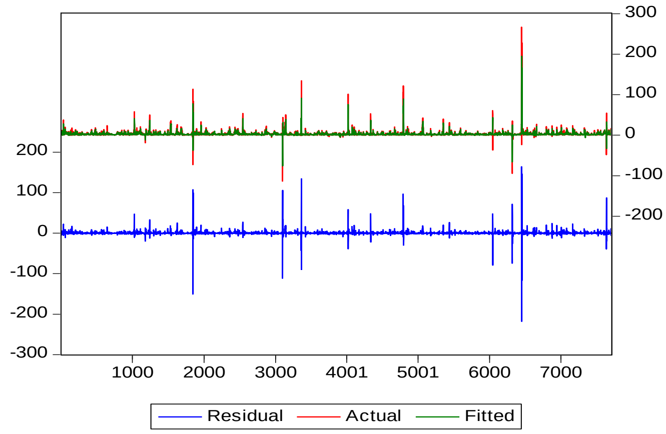

Fig. 12(b) Plot of Residual, actual, and estimated of Dependent Variables

Market-cap-sales dependent

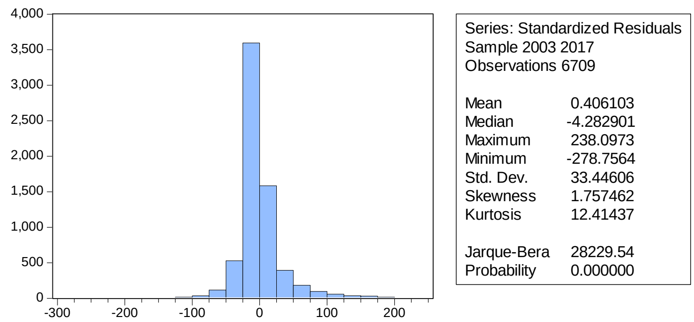

Fig. 13 Histogram of Residual

PCEPS Dependent

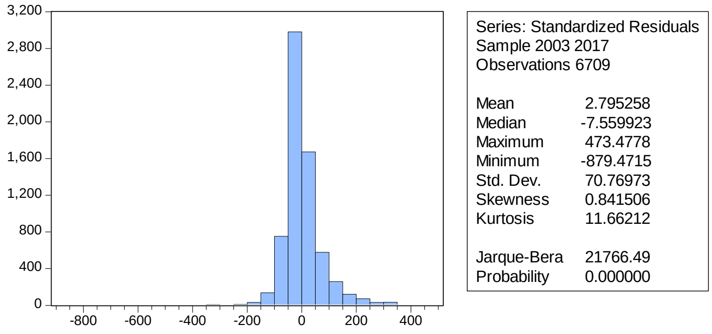

Fig. 14 Histogram of Residual

EVEBIDTA Dependent

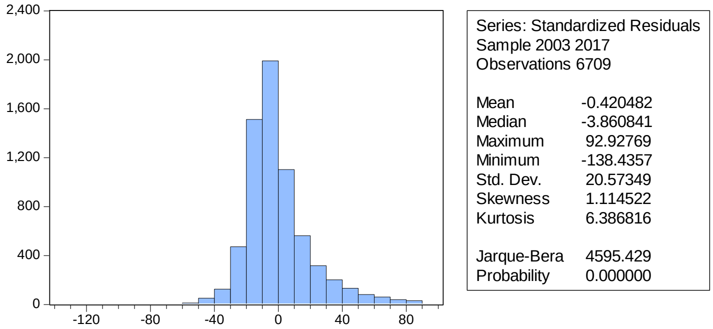

Fig. 15 Histogram of Residual

The above figure of regression residuals show that residuals were not normally distributed which means that the formulated regression with the given independent variables could not able to forecast firm value completely. But as my basic objective was to find out the impact of internal risk on firm value and not to find out best fit regression equation, so the purpose was fulfilled. Further, in my research work later I will try to introduce more independent variables so that problem of omitted variable can be tackled and the more robust regression equation can be developed which would be able to forecast firm value more efficiently.

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