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Cost Management during an Economic Slowdown: A case of Indian Industries

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Abstract- This paper does analysis of effective cost management during economic slowdown. Our paper also focuses on way companies do cost management before and after an economic slowdown has occurred. In this paper we have analysed various ratios, multiples and proportions which provides clear indication on company's effectiveness in cost management in its various stages of life and how vulnerable their capital structure is to sudden change in direction of economy. This paper does inter and intra industry analysis of cost, variables that add up to total cost.

Keywords: Leverage, Business risk, Market risk

I. INTRODUCTION

Slowdowns in an economy test the company's effectiveness of financial control efficient operations management, when they get out of financial downturn, when they come out stronger than before because weak competitors who focus on capturing the market by compromising on financial strength take a massive toll, example, company with a large amount of fixed cost and carrying a huge amount of debt have the risk of default. During economic slowdown economic activity reduces which in turn reduces the top and bottom line of companies but companies fixed expensed remain in place which in turn pushes company towards default. In this paper, we have tried explaining the change in the gross and net income of the company by the effect of fixed cost and interest expenses.

The economic slowdown definition for this research paper is explained by the growth rate of GDP, in this paper slowdown is defined as a decline in the growth rate of GDP for constantly 2 quarters.

Cost management plays a crucial role in the economy but in times of economic slowdown cost management techniques of a company can make or break the company and save them from going out of the business. In this research, we are focusing on some specific costs i.e. operating cost (Cost related to business operation) and Interest cost (Debt payment) as these two costs become a massive chunk of total cost and their analysis in times of economic downturn helps us understand companies long term sustainability. Matric in this paper used to quantify the effects of operating and financial costs is using leverage ratios. We have used the Degree of Financial Leverage (DFL), Degree of Operation Leverage, and Degree of Combing Leverage (DCL) to analyze our sample data. Our sample is also divided by sector to analyze whether it is different between different sectors. Our study takes deep dive into analysis between a correlation of various leverage ratios with topline and bottom line. We have also researched data to check whether current quarter leverage has an effect on next or future quarter and used it to develop forecasting model which takes leverage ratios of current quarters to forecast topline and the bottom line of future quarters. We have also found r^2 between ratios and forecast of revenues to find the strength of these variables to forecast revenue.

DFL = EBIT / EBT

DOL = Contribution / EBIT

DCL = Contribution / EBT

Illustration to explain this concept-

Particulars	Amount
Sales	**100**
(Less) Variable Cost	20
Contribution	80
(Less) Fixes Cost	50
EBITDA	30
(Less) Depreciation and Amortization	5
EBIT	25
(Less) Interest	5
EBT	20
(Less) Tax	5
PAT	15
Ratios	
DFL	1.25
DOL	3.2
DCL	4

We have tried to focus on capital intensive companies, as they are highly vulnerable to inflection in economic conditions as many of them are highly dependent on debt which makes their bottom line very sensitive to change in economic condition, which impacts companies in various aspects some of which are Revenue – as economic conditions slowdown sales takes down ward trend in many company, Working capital management- working capital management gets impacted due to debtors delaying payments and creditors tend to ask for payment earlier than intended as overall market faces credit crunch, Banks tend to become more stringent in financing business. Many of the weaker players tend to default which can many times results in large amount of bad debts and at the end affect financial position of all the companies within and across the industry.

Here are some of the important terms which will come across the research:

Leveragerefers to the amount of fixed costs a firm has. These fixed costs may be fixed operating expenses, such as building or equipment leases, or variability of the firm's after-tax operating earnings and net income. A given change in sales leads to greater change in operating earnings when the firm employs operating Leverage and will lead to a greater change in net income when the firm employs financial leverage.

Business Risk refers to therisk related with the firm's operating income and is the result of uncertainty about a firms' revenues and the expenditure necessary to produce that revenue. Business risk is the amalgamation of sales risk and operating risk.

- **Sales risk** is the vagueness about the firm's sales.
- **Operating risk** refers to the additional uncertainty about operating earnings caused by fixed operating costs. The greater the proportion of fixed costs to variable cost the greater is the firm's operating risk.

Financial risk refers to the additional risk that the firm's common stockholders must bear when a company finances its operations with debt

II. LITERATURE REVIEW

In order to go forward with our research, we needed research papers which had explored the field of economic slowdown, cost management and sub topics related to cost management. This would give us an idea about the approach other people have used in order to come up with the result.

The report by Gunarathna, 2016, covers financial leverage of 10 listed companies from hospitality sector and 5 listed companies from chemical and pharmaceutical company in Sri Lanka where the time period was from 2006-15. The method used was correlation and the findings revealed that more the financial leverage, more is the financial risk. The leverage risk has more impact in hospitality sector than in chemical and pharmaceutical industry. On the other side, the firm's size has negative effect on financial risk. So, the firm can change its capital structure when the market environment is favourable but it will seldom help if the firm itself is in downfall. The only problem with this research was that there was civil war going on in Sri Lanka till 2009 which this paper didn't consider.

Matsa, 2011, demonstrates how firms with high financial leverage manage their costs by reducing the quality of goods in order to preserve their cash flow by reducing costs with the example of the Supermarket industry in the US. In an industry where a customer cannot judge a slight degrade in quality, firms have an incentive to reduce the quality as it might not hamper their reputation in the short run and those funds can be used for the debt-service payments. The firms benefit from taking debts with increasing operating profit, less fixed costs and also expansion of current facilities leading to higher future growth.

Lord & Farr, 2003, illustrated motivation for collusion among the firms that use only equity financing. Variables like the average leverage for manufacturing firms, firm risk, the market-to-book ratio, market interest rate conditions, and firm profitability are studied for the research. Time series data on the financial leverage, inclusion of additional leverage by issuing convertible securities have been studied in the research paper. The research paper studies the response of price elasticity on the leverage of the firms in the steel industry. The result shows that by structuring a firm's capital structure it can support collusive arrangement.

Reinartz& Schmid, 2016 demonstrated how production flexibility impacts financial leverage through the illustration of the utility sector. The study finds that high production flexibility firms rely heavily on debt financing and higher financial leverage. This results in low operating leverage as fixed costs are low and variable costs are high. Supporting (Matsa, 2011), this study proves that firms choice of financing also depends on the environmental uncertainty and production characteristics.

Shrieves, 1981, in his study of 'Uncertainty, theory of production and optimal leverage', compared the firms operating leverage decision in a standard environment and when faced with uncertainty in terms of demand for its product. The study found that the level of environmental uncertainty contributes to whether only the fixed or the variable costs have to be lowered as high uncertainty leads to lower levels of output, decrease in the employment and other fixed costs leading to lower value for the firm and lower operating leverage.

Nuño& Thomas, 2017,in their paper tried to make a model to explain volatility of leverage in banks by building model. This model is used to replicate how leverage affected bank and their failure during crisis. This paper also explains pro cyclical effect of economy on banks leverage cycle"

Gomes, Jermann, & Schmid, 2016, have created a model which showcases effect of corporate debt on unanticipated change in inflation, which can cause debt overhang and ultimately affect production cycle and business decision. The model also sheds some on the slowdown following the 2008 financial crisis and possible monetary policy response.

Benink, 2020, analysed 30 years of data to check for effectiveness of international banking supervisors, to manage capital and liquidity standard of all active international banks. They also explain how good liquidity plays crucial role for banks to survive during crisis, due to rise of coronavirus there is rise in non-performing assets in balance sheet of banking company. This paper also explained importance of Basel Norm III which would have increased stability of banks during current crisis.

Opler & Titman, 1994,studied the effect of financial distress on asset sales, leverage of firm and its stock return. The research also studies the effect of leverage and industry economic distress on the survival of the firm and how it may not be measurable. It also studies extensively the sources of distress in the firm which can cause disruption. The positive relationship of financial condition and the firm performance in the industry downturns being evident in the research. It studies high leverage firms' performance in the distress and how firms gain because of its leverage parameter, also it gives a weight to the study on R&D expense in these firm and their performance.

Graham, Hazarika and Narasimhan, 2011,studied the firm level data from the Great Depression time for all the industries. It discussed basic factors of lower credit rating and high debt which typically quoted as trade-off theory of leverage. This research paper has detailed study of generic parameters like Leverage, Macroeconomic Factors, Size, Profitability, Investment and Volatility. The similar parameters had been studied on firms during the recession of 2008-09 which says higher leverage and lower bond rating results in more occurrences of financial distress.

In the article by Kizildag&Ozdemir, 2016, research was done on the factors which affect financial leverage of US hospitality and tourism companies during the period of 1990-2015. It found that capital leverage has strong positive relationship with the financial leverage. These companies need to increase their cash flow than the cost of borrowing in order to maintain the leverage. So, during the slowdown, hospitality companies need to lower their financial leverage and increase their retained earnings and use it to repay the debt.

The journal article by Adenugba, Ige, &Kesinro, 2016, discussed the financial leverage and its effect on Nigerian listed companies. They used ordinary least squared technique and hypothesis testing for finding the results. The study showed that there is a relationship between financial leverage and firm's value. For long term projects, financial leveraging is a better option than equity. But not optimizing the leverage can lead to firm's bankruptcy and lowering firm's value. So, they recommend firms to reduce the cost of debt till a point where the increasing weighted cost of capital affects the firm's value negatively.

In the paper written by Choudhary & Hamid, 2017, they covered the importance of cost management for a company to increase profits. They took FMCG companies to evaluate the problems from cost structure and their solutions. So, they took 5 FMCG companies and compared them to each other. The conclusion which came out from this research was that the company should focus on cost reduction methods followed by cash outflow delay and lastly speeding up cash inflow. To achieve more profits, the company should increase its revenue efficiency in order to increase profit margin,

III. RESEARCH METHODOLOGY

Hypothesis

Referring to the research papers of others, we came across the gap where Indian companies were not researching and it was regarding their cost management during an economic recession. So, we have chosen the hypothesis of Indian companies and their change in profitability before and after 2008 crisis. Therefore, the hypothesis will be:

H_1: There is a significant difference between the cost and the profitability of the company before and after 2008 crisis

H_0: There is no significant difference between the cost and the profitability of the company before and after 2008 crisis

From here we will test different cost factors of the company which affect the profitability of the company.

Data Selection:

To analyse the effect of bad economic period on the companies, we need to look at their nature of business, their financials, effect of the cost drivers on the profitability. To quantify these qualitative variables secondary data has been studied. Share price data is being avoided for this study since the future performance in terms of profitability is solely dependent on the internal revenue and cost drivers of the companies.

Consolidated Income Statements of the companies have been studied for this research. Annual Income Statements from year 2002 to the current year i.e. 2020 have been taken for 18 companies.

Panel Regression:

The collected data is income statements of 19 years. The income statement gives the information of profits, cost, types of cost of the company for the particular year.

Profit is dependent on the various costs that a company incurs. Here, we can intuitively say that Profit is the dependent variable. Cost is the independent variable. Cost is made up of many components and to run the business it will be incurred.

There are two kinds of panel regression, one is fixed effect and one is random effect panel regression.

Model: PAT = Intercept + Interest Expenses + Fixed Cost + Variable Cost + LongTermDebt/Equity + DOL + DFL + Index

Here the dependent variable Y is PAT of a company and independent variables are Interest Expense, Fixed Cost, Variable Cost, DOL *(i.e. Degree of Operating Leverage)*, DFL *(i.e. Degree of Financial Leverage)*, etc as X_1, X_2, …..X_6 respectively for every company. This is how multiple regression equation for individual companies are made.

The most commonly witnessed problem in the regression analysis is Multicollinearity and Heteroskedasticity.

Multicollinearity is the prime violation of assumptions of regression. Multicollinearityshould be avoided to get useful data for accurate results. In the process of data cleansing for our sample for panel regression we will check for the presence Multicollinearity and Heteroskedasticity in our regression equation for each company.

Multicollinearity:

The main reason behind regression analysis is to isolate the relationship between each independent variable and the dependent variable.

Multicollinearity arises when independent variables in a regression model are correlated. This correlation is a problem because independent variables should be autonomous. If the degree of correlation between variables is high enough, it can cause problems when you fit the model and interpret the results.

Panel Regression Analysis

Panel data permits you to control for variables you cannot observe or measure like cultural factors or variance in business practices across companies; that is factors that vary across entities. It accounts for individual heterogeneity.

Each entity has its own individual characteristics that may influence the predictor variables. Individual characteristics may be time-invariant. This time-invariant heterogeneity of individuals is taken care off (absorbed) in the Fixed Effect Model. We can assess the unbiased of the predictors on the outcome variable. If these individual characteristics are not fixed over time and is random, then we use the random effects model.If the factors are not varying over time then a Fixed effect model is estimated

To understand the fixed effect regression model, we may consider using dummy variables in the regression. Each dummy would capture the difference in PAT between the base variable and the i^{th} variable. In that way, the coefficient estimates of the dummies in the regression willcapture any variable specific difference in the PAT.

IV. Data Analysis and Interpretation

1. Multicollinearity:

Data of 15 companies have been taken after first filter. Every company's regression equation is defined in the following manner:

PAT = Interest Expenses + Fixed Cost + Variable Cost + DOL + DFL + Long Term Debt/Equity

For the good panel regression, it is must to avoid the Multicollinearity of the constituents of the final regression variables. To check for the multicollinearity, we run the above regression for all 15 companies.

We check for the F-stat to check for 'goodness of fit'. To get the accurate result this parameter should be considered since it describes the overall of working of regression.

Below is the table for all the F- stat significance for all 15 companies.

Company	Stat	Significance
1	Significance F	0.000
2	Significance F	0.000
3	Significance F	0.015
4	Significance F	0.098
5	Significance F	0.012
6	Significance F	0.012
7	Significance F	0.000
8	Significance F	0.000
9	Significance F	0.001
10	Significance F	0.000
11	Significance F	0.142
12	Significance F	0.000
13	Significance F	0.000
14	Significance F	0.000
15	Significance F	0.027

Companies are given name from 1 to 15 for simplicity. We can clearly see that majority of the companies are highly significant. Low number represents the significance is high and data does not have multicollinearity in most of the companies. It signifies that the regression equation model of individual companies is good. Since we need same variables in our final Panel Regression Model, we can consider these companies, and their variables for it.

Furthermore, we can articulate multicollinearity by correlation matrix of individual companies of their variables. The correlation of the individual variables should be low in account to produce regression which does not have multicollinearity violation assumption.

Below is the example of correlation matrix of one company. Other companies also follow similar results to consider these companies for final panel regression model. Other companies also show low correlation between independent variables.

Note: Correlation matrix should be interpreted from *'Interest Expenses'* row and column.

	PAT	*Interest Expenses*	*Fix Cost*	*Variable Cost*	*DOL*	*DFL*	*Long-Term Debt/Equity*
PAT	1						
Interest Ex	-0.30504	1					
Fix Cost	0.10852	0.641461406	1				
Variable C	0.614716	0.288111428	0.730402528	1			
DOL	-0.4197	-0.423753305	-0.680252017	-0.84060685	1		
DFL	-0.29179	-0.008591088	-0.431460343	-0.549453915	0.681764086	1	
Long-Term	-0.38047	0.576013811	0.505543489	0.000814951	0.064809576	0.316956042	1

2. Heteroskedasticity

Heteroskedasticity is another violation of the regression equation. We can conceptualize this in simple term as the relation between the error terms of individual regression of companies and the independent variables of the regression.

In process to clean our data sample of companies we are checking for heteroskedasticity.

Heteroskedasticity is being measured by the value of Adjusted R^2. The value of Adjusted R^2 lower than 0.3 signifies the absence of heteroskedasticity hence the data is homoscedastic. If the Adjusted R^2 values are above 0.3 then we need to run the Breusch Pagan test.

Firstly, the residuals of the regression of individual companies are collected. We are supposed to regress these residuals against our independent variables.

Below is the table of all 15 companies and their *Adjusted R^2* of the regression with *Residuals.*

1	Adjusted R Square	-0.068
2	Adjusted R Square	0.242
3	Adjusted R Square	0.409
4	Adjusted R Square	-0.257
5	Adjusted R Square	0.142
6	Adjusted R Square	-0.195
7	Adjusted R Square	0.173
8	Adjusted R Square	0.058
9	Adjusted R Square	-0.361
10	Adjusted R Square	0.133
11	Adjusted R Square	0.022
12	Adjusted R Square	-0.065
13	Adjusted R Square	-0.339
14	Adjusted R Square	0.018
15	Adjusted R Square	0.178

We can see that Company No. 3 and 13 show significant *Adjusted R^2* with *Residuals.* This means that these companies are violating heteroskedasticity assumption of regression model. Such result signifies to avoid these data points i.e. companies for final panel regression model. We will not consider these two companies for final panel regression.

3. Panel Regression

Since data is time series data for multiple variables with same characteristic, Panel Regression analysis has been taken on 13 companies from year 2002 to 2020.

In the panel regression as explained in research methodology earlier, we have random effect panel regression and fixed effect panel regression model. According to our characteristics of our data we are modelling the panel regression with fixed effect model.

Primarily we are taking all independent variables as our X variables and PAT as independent variable for our panel regression model with fixed effect. Following is the typical equation of panel regression with fixed effect:

$$Yit=0+1D1+2D2+3D3+.....n\text{-}1Dn\text{-}1+kXit+it$$

In the above equation,

Yit is dependent variable which is PAT,

Xit variables are independent variables,

0 is the intercept of our regression,

1, 2,….,n-1 are betas of each independent variable (including dummy variable)

D1,D2,….,Dn-1 are the dummy variables created

In process to form a panel regression model with fixed effect we are supposed to define the dummy variables. D1,D2,….,Dn-1 are the dummy variables we need to define. D1,D2,….,D12 are the 12 dummy variables that have been defined. Here we have taken the 13 companies as our filtered samples for panel regression with fixed effect. The total dummy variables need to be defined are n-1 which is 12.

Then we run the panel regression analysis in SPSS: IBM. Since Microsoft Excel limits us against regression with total number of variables beyond 16 we are using SPSS for analysis. In the SPSS we have defined dummy variables in their standard procedure and then run the regression with 10% significance.

We found that X variables, DOL and DFL is not much significant so in second test we avoid those variables and redefine model as done before. Now next model for panel regression with fixed effect been studied through regression in SPSS and following results were obtained.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	133625903698.286	18	7423661316.571	22.283	.000[b]
	Residual	75959254021.719	228	333154622.902		
	Total	209585157720.005	246			

a. Dependent Variable: PAT

b. Predictors: (Constant), Long-Term Debt/Equity, Fix Cost, DFL, DOL, D10, D1, D11, D5, D7, D2, D9, D3, D4, D6, D8, Interest Expenses, D12, Variable Cost

We can conclude that our model satisfies goodness of fit by significance of F test.

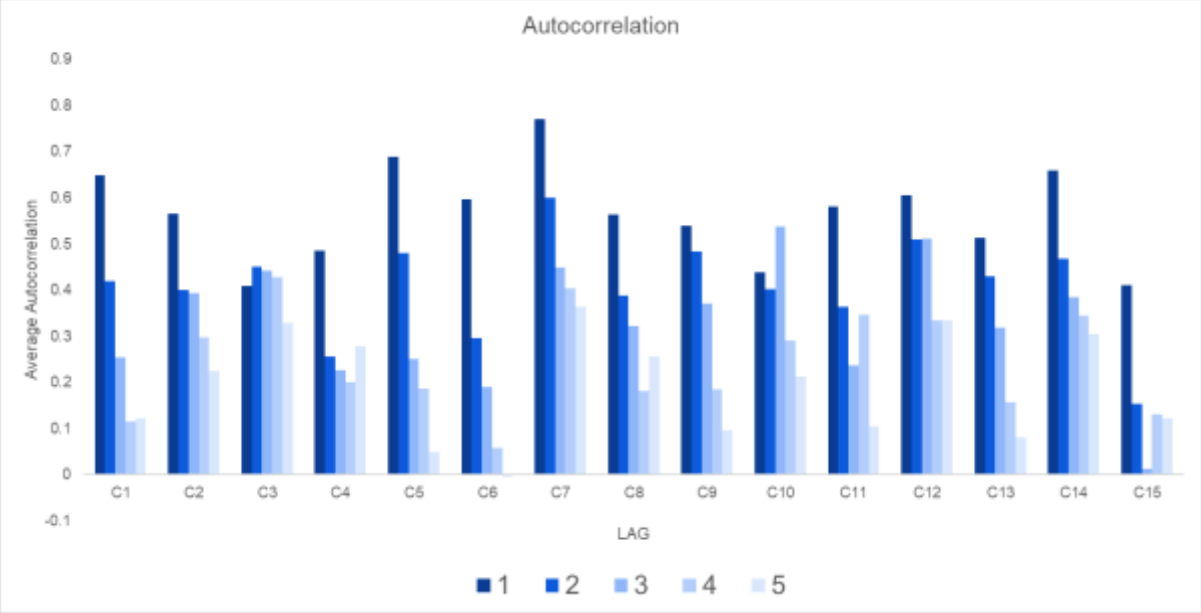
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1223.162	4582.047		.267	.790
	D1	-136.281	6025.764	-.001	-.023	.982
	D2	16345.133	7176.729	.150	2.278	.024
	D3	447.460	8742.860	.004	.051	.959
	D4	14740.891	6005.572	.135	2.455	.015
	D5	3745.489	6064.237	.034	.618	.537
	D6	14305.521	6202.412	.131	2.306	.022
	D7	4075.328	6094.365	.037	.669	.504
	D8	3433.330	6277.294	.031	.547	.585
	D9	474.557	6030.249	.004	.079	.937
	D10	1358.642	5992.295	.012	.227	.821

D11	-29.167	5947.259	.000	-.005	.996
D12	59745.198	9995.247	.547	5.977	.000
Interest Expenses	-.142	.238	-.045	-.594	.553
Fix Cost	.002	.006	.033	.294	.769
Variable Cost	.026	.008	.369	3.361	.001
DOL	27.112	396.132	.003	.068	.945
DFL	170.809	389.569	.018	.438	.661
Long-Term Debt/Equity	-36.440	21.829	-.079	-1.669	.096

We can observe that 'Variable Cost' and 'Long-Term Debt/Equity' are the significant independent variables to model PAT for the companies.

Further Analysis

It is evident that cost profile has significant impact on the company's profitability. Apparently companiescurrent profitability and cost are autocorrelated with the previous year/years profitability and costs. Here is a bar chart which gives declining autocorrelation with a successive lag of 1 year.



Number defines the year of lag. It is evident that current year profitability and cost affect next year profitability and costs significantly, since all companies show strong autocorrelation with lag 1. This means that a sudden shock in the financials of the company may change the relation of independent and dependent variable substantially after the shock. We have taken 2008, 2009 financial crisis as the shock on the financials and studied the change in the correlation of independent and dependent variables which is shown below:

Companies	1	2	3	4	5	6	7
PAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Expenses	0.61	0.70	0.94	0.37	0.66	1.18	1.56
Fix Cost	0.42	0.51	1.50	0.26	0.51	0.94	0.16
Variable Cost	0.84	0.49	1.06	0.50	0.56	0.16	0.03
Total Expenses	0.76	0.50	1.17	0.31	0.61	0.74	0.01
DOL	0.81	0.44	1.02	0.44	1.36	0.92	0.79
DFL	0.20	0.26	0.83	0.22	1.38	1.13	1.18
DCL	0.28	0.27	0.97	0.13	1.44	0.96	1.17
Long-Term Debt/Equity	0.53	0.91	0.74	0.01	0.66	0.20	0.79

Companies	8	9	10	11	12	13	14	15
PAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Expenses	1.35	0.01	0.67	1.20	0.67	0.79	1.29	0.61
Fix Cost	0.05	1.23	0.24	1.17	0.06	1.29	0.36	0.95
Variable Cost	0.05	1.69	1.28	1.09	0.01	1.29	0.01	0.92
Total Expenses	0.05	1.71	1.18	1.10	0.00	1.36	0.02	0.95
DOL	0.87	0.26	0.80	0.01	0.54	0.54	1.27	0.23
DFL	0.83	0.12	0.21	0.13	1.50	0.10	0.54	0.86
DCL	0.80	0.58	0.09	0.22	0.82	0.04	1.11	0.26
Long-Term Debt/Equity	1.40	0.76	0.30	0.80	0.04	0.67	0.38	0.07

This is the difference in absolute values for pre and post 2008 crisis.

Maximum difference would be 2. Difference is calculated as: Absolute of (Correlation before 2008 – correlation after 2009. So higher number signifies substantial change in correlation.

V. Conclusion

From the above analysis, we reject the null hypothesis and conclude that there is a significant difference between the cost and the profitability of the company. Furthermore, in the panel regression, we can also conclude that 'Variable Cost' and 'Long-Term Debt/Equity' are the significant independent variables. This is because variable cost can be changed according to the business cycle of the company and so, profits also change. Also, the long-term debt/equity ratio is significant to the profitability because of the leverage factor playing. The debt should be optimal with the equity so as to maximise the profit and unsustainable debt will affect the profitability of the company. Some companies issue more shares to repay the debt which would affect the ratio and also, the profits.

VI. Limitations

More research using economic variables such as unemployment rate can be taken to achieve deeper insights into human resource management of a company in a slowdown. The data set of the companies which have been taken into the consideration for this research paper are more of capital-intensive companies which require a very high amount of fixed cost component to operate. Further research can be undertaken to analyse the effect on other sectors such as service sector. The reaction of the company to an economic downturn also depends upon the mindset of the top management of the company and how they devise policies to tackle the headwinds in such a situation. This research does not take into consideration this competitiveness of the management. The advantages of taking the financial leverage have not been taken into consideration for the purpose of this research paper. There are certain short comings of fixed effect panel regression model and of multi-collinearity and heteroscedasticity which have been used in the analysis in this paper.

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