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## Editor's Desk

### “Standing on a Shaky Ground”

The Covid -19 has transformed life as we know it. India has seen a devastating second Covid-19 wave. In which most of us got affected in one way or another. This time has been physically and psychologically challenging for everyone even more than the first wave. The business got affected, growth rates slumped, the unemployment rate peaked. The corporate in the first wave faced a challenge in transitioning employees to a work from home model. But during the second wave, the focus shifted on employee health and safety. A lot of companies announced relief packages for staff affected by the Covid, which is a positive sign for the economy. We are living through history. Future generations may look back and take pride in how this generation stood on this shaky ground and came out strongly. The small articles, stories and art that ordinary people are creating now will tell the story of life during the pandemic in future time. Whether it is Instagram video or Facebook pictures or stories it is the footprint that we are creating for our future generations of historians. In my personal opinion any method of expression is therapeutic in nature, it helps to express our fears, hopes and joys.

We also need to understand, that lockdown does not mean an end to the learning, but the dimensions have changed and evolved. The first wave had an impetus on lot of online course but in second wave the pause in our life gave a lot of thinking opportunity towards life and people saw this as the best opportunity to attend to ourselves. During the days of quarantine and isolation, a lot of self-exploration happened. This has made people to become more self-reliant and also to be realistic about their expectations. Our home has become the new world across latitudes and time zones. And in the months since the onset of the Covid-19 pandemic, it's become clear that things may not return to the way they were. The Covid outbreak hasn't so much altered but in a way reaffirmed the future way of life.

We need to learn to cope up with this, it is a time to take a step back and go by using the following small things.

- Enjoy the solitude and use it to turn your focus inwards and explore your deepest (and most unsaid) thoughts, emotions, and aspirations.
- Think about how your day was, what you did well, what you learned, and how you developed as an individual.
- Meditation is a great way to connect with yourself. It helps you find a few moments of stillness and calm in an otherwise stressful life.
- Make a list of things you have never tried out. These could be skills you want to learn, places you want to visit, or new cuisines you would like to try.
- List your goals and aspirations in life and plan how you would like to shape your life and career.

What you learn from your struggles may translate into solutions outside them. With these lines, I would urge my colleagues to take care of themselves during this strange time.

(Ashok Sharma)

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# VALIDITY OF CAPM & FAMA FRENCH THREE FACTOR MODEL IN THE INDIAN EQUITY MARKET

Aniruddh Sahai\* Ravinder Kumar\*\*

**Purpose:** The research paper attempts to check the validity of Capital Asset Pricing Model (CAPM) and Fama French Three Factor Model (FF3) in the context of the Indian stock market for the period 1998-2020. The primary objective was to ascertain which model explains the variation in equity returns for the companies listed on the S&P CNX 500 Index. The presence of market risk premium, size effect and value effect were also evaluated.

**Design/ Methodology/ Approach:** For this purpose, the study used the Fama-Macbeth Methodology (1973) of two pass regression.

**Findings:** A linear relation was found between the excess portfolio returns & the market beta.  $R^2$  also improved while using Fama French Three Factor Model. Therefore, it was demonstrated that the three-factor model was better than CAPM at capturing the variation in stock returns. The market risk premium of CAPM independently failed to explain the variation in stock returns. However, when we consider the Fama French Three Factor Model, the size effect was found to be significant in the Indian equity markets; whereas the value effect existed but was not significant. This implied that investors could earn higher risk-adjusted returns by investing in the stocks of smaller companies and stocks of high BE/ME firms. It is noteworthy that the academicians prefer to use Fama French Three Factor Model due to its accuracy in predicting expected portfolio returns while the practitioners prefer Capital Asset Pricing Model because of its simplicity.

**Originality/ Value:** This study has been able to resolve the issue of relative efficacy of these two models in the Indian equity market whereas the other studies had provided conflicting results.

**Keywords:** Asset Pricing Models, CAPM, Fama French Three Factor Model, Size Effect, Value Effect.

**JEL Codes:** G11, G12, 016

Capital Asset Pricing Model (CAPM) was formulated by Sharpe (1964), Lintner (1965) and Mossin (1966). The Model explained the linear relationship between Excess Portfolio Returns and the Systematic Risk (or Market Risk Premium). It was an extension of the Modern Portfolio Theory given by Harry Markowitz. The equation for CAPM is as follows:

$$E(R_i) = R_f + \beta_i [E(RM) - R_f]$$

Where:

$R_f$  is the risk-free rate of return

$E(RM)$  is the expected market rate of return

$\beta_i$  is the sensitivity of asset's  $i$  return to market return

$E(R_i)$  is the asset's  $i$  expected rate of return

Fama and French found that market risk premium was not able to fully capture the excess returns on portfolio, so they considered two additional variables Small Minus Big (SMB) & High Minus Low (HML). This was known as the Fama French Three Factor Model (FF3). SML denoted the excess returns caused due to different sizes of firms using market capitalization and was referred to as the Size Effect. HML denoted the excess returns due to the difference between high Book / Market (BE / ME) firms and low BE / ME firms and

was referred to as the Value Effect. It was believed that smaller firms (with low market capitalization) and value firms (with high BE / ME), delivered superior returns compared to the Bigger firms and low BE / ME firms. The equation for expected returns on portfolio using Fama French Three Factor Model is as follows:

$$r = r_{ft} + \alpha_i + \beta_i (r_{mt} - r_{ft}) + \alpha_i SMB_t + \beta_i HML_t + \epsilon_{it}$$

Where:

$r$  is the portfolio's expected rate of return

$r_{mt} - r_{ft}$  is the market risk premium for month  $t$

$SMB_t$  is the SMB (size) factor for each month  $t$

$HML_t$  is the HML (value) factor for each month  $t$

The paper is divided into different sections. The Introduction (Section 1) is followed by the Review of Literature (Section 2).

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Next, the objectives (Section 3) and hypotheses (Section 4) of the research paper are stated. These sections are followed by Data & Research Methodology (Section 5) and Empirical Results & Discussion (Section 6). The final section consists of the Conclusions (Section 7). References and Tables are presented at the end of the article.

## I. Review of Literature

The evolution of asset pricing models started from the Modern Portfolio Theory given by Harry Markowitz (1952). He explained the process of portfolio selection in two parts – firstly to select an optimum combination of risky assets, and secondly to decide the fund allocation between risky and risk-free assets.

William Sharpe (1964), Lintner (1965), and Mossin (1966) made significant contributions that led to the formulation of Capital Asset Pricing Model (CAPM). They displayed a linear relationship between expected excess returns and market risk premium (Beta or Systematic Risk). This was followed by the testing of CAPM in different countries and for different asset classes. Many researchers have explored the implications of CAPM using time series and cross-sectional regression analysis (Fischer, Jensen and Scholes, 1972; Fama and Macbeth, 1973; Miller and Scholes, 1972; and Rosenberg, 1998).

After 1980, many studies found that other factors also have an impact on the expected returns - apart from Beta (market risk premium or systematic risk). The results varied according to the different countries and asset classes under consideration. Arbitrage Pricing Theory began emerging, which involved 'n' number of factors that could help explain the variation in stock returns. After CAPM, multifactor asset pricing models came to the forefront. These models tried to decipher the anomalies in asset pricing.

The most prominent concepts were introduced by Fama and French (1992, 1993, 1995, 1996) who found that asset pricing is multidimensional and includes three variables - size (market capitalization), value (book to market equity) and leverage (earnings to price ratio) in order to explain the variation in stock returns. They were testing the validity of CAPM in NYSE, NASDAQ and AMEX for the period 1963-1990 when they came across this observation. Another significant anomaly was noted by Banz (1981) who found a strong relationship between market equity and returns. Basu (1983) displayed that stocks with low Price to Earnings Ratio delivered higher returns in the US markets. This finding went against the CAPM.

Momentum and contrarian effect was investigated by de Bont and Thaler (1985). They established that stocks having low returns in the last three years were able to attain higher returns in the long term and vice versa. A positive relation was

observed between leverage and returns by Bhandari (1988). A positive relation was also found between returns and BE/ME ratio by Rossenberget al. (1985), Vishny et al. (1994) and Chen & Yeh (2002).

It was demonstrated by Fama and French (1993) using time series analysis as formulated by Fischer et. al. (1972) that five factors - beta, value, size, HML (high minus low), SMB (small minus big) - jointly explain majority of the variation in equity returns. Another deviation from CAPM was noted by Fama (1998) who established that the size effect was significant in 11 out of 16 markets and that the value stocks performed better than growth stocks in 12 out of 13 markets for the period 1975-1995.

Due to several anomalies and contradictory evidence for CAPM, researchers began testing Fama-French three factor models and some even noticed selection biasness, data snooping biasness, and survivorship biasness (Mackinley, 1995; Black, 1995, Kothari et. al., 1995). But several studies till date accept the superiority of Fama-French Factor model over CAPM. The significant presence of value, size and market beta factors in the Indian stock market for the period 1989-1999 was observed by Connor and Sehgal (2001). Markets in Korea, Thailand, Hong Kong, Malaysia, and Taiwan were studied by Chui & Wei (1998). Their findings supported the Fama French three factor model. Mallik & Bashar (2020) found Fama French three factor model to be superior than CAPM in the context of Dhaka Stock Exchange. The latest addition to the asset pricing models was the five-factor model developed by Fama & French (2014), which included profitability and investment apart from size, value and market risk factors. Similar research was conducted in India also with the most prominent being Connor and Sehgal, (2001); Mohanty, (2002); Sehgal and Tripathi, (2003); Tripathi (2008); Sehgal et al., (2012); Sehgal, Subramaniam and Morandiere, (2013); Sobti (2016); Durga (2020). The superiority of Fama French three factor model over CAPM was established in these studies. They even found a strong size premium (Sehgal and Tripathi, 2003). Tripathi (2008) evaluated 455 companies belonging to S&P CNX 500 for the period 1997-2007, and came to the conclusion that market capitalization and price to earnings ratio demonstrated statistically significant negative relation with equity returns while a positive relation was observed for BE/ME and debt equity ratios with stock returns. This paper evaluated the validity of CAPM and Fama French three factor model in the Indian stock markets for the period 1998-2020. Analysis was also performed to ascertain whether the market, size and value factors are able to explain the cross section of equity returns.

### Objectives

1. To test the validity of Capital Asset Pricing Model (CAPM) in the Indian context.

2. To test the validity of Fama-French Three factor model (FF3) in the Indian context.
3. To identify the better asset pricing model - CAPM or Fama French Three factor model.
4. To examine whether Size Effect exists in the Indian Stock market.
5. To explore whether Value Effect exists in the Indian Stock market.

#### Research Hypotheses

A statistically significant relation exists between the excess portfolio returns and the market beta in Indian stock market. Smaller companies' stocks outperform the large companies' stocks in the Indian stock market. High BE/ME stocks yield higher returns than low BE/ME stocks. Fama French Three Factor model is better at explaining the variation in excess stock returns compared to CAPM.

## II. Research Design & Methods

Data was obtained from CMIE Prowess IQ for S&P CNX 500 Index for the period 1998-2020. The 91-day T-Bill yield was considered as the risk-free rate.

#### Important Variables

$R_i$  = Individual company returns =  $(P_1 - P_0) / P_0$  where  $P_0$ ,  $P_1$  = Adjusted Closing Price

$R_m$  = Market return =  $(P_1 - P_0) / P_0$  where  $P_0$ ,  $P_1$  = Adjusted Closing Price for S&P CNX 500.

$R_f$  = Risk free rate = 91-day T-bill rate

Size- Market capitalization

Value – BE / ME ratio

#### Portfolio Formation

Six Portfolios were created by dividing the stocks into Small & Big (based on Market Capitalization) and subsequently into High, Medium and Low (based on P/B ratio). Thus, the six portfolios obtained were S/L, S/M, S/H, B/L, B/M, B/H on the basis of Size & Value.

where S= Small; B = Big; L= Low BE / ME; M = Medium BE / ME; and H = High BE / ME.

Next, the factor mimicking portfolios were created in order to compute SMB and HML factors. Small Minus Big (SMB) was a proxy for Size Effect and was calculated by taking the difference between the average returns of S/L, S/M, S/H and B/L, B/M, B/H for each year. High Minus Low (HML) denoted the Value Effect and was calculated using the difference in the average returns of S/H, B/H and S/L, B/L.

Methodology for Capital Asset Pricing Model (CAPM)  
Fama-Macbeth methodology (1973) of two pass regression was employed.

Step 1: First Pass Time Series Regression was carried out to estimate alpha and beta of the portfolios.

$$E [R_{Pt} - R_f] = \alpha_P + \beta_P (E [R_m] - R_f) + \epsilon_t$$

Step 2: Second Pass Cross Sectional Regression was performed for each period to estimate Gamma0 and Gamma1.

$$E [R_p(t) - R_f] = \gamma_0(t) + \gamma_1(t) \beta_p + \epsilon(t)$$

Step 3: t-test was used to check the presence or absence of abnormal returns and positive expected risk return trade off.

Hypothesis for CAPM:

H1 -  $\gamma(t) = 0$  - Presence of abnormal returns

H2-  $\gamma_1(t) = E(R_m - R_f) > 0$  - Positive expected risk return trade off

Methodology for Fama French Three Factor Model (FF3)

Fama-Macbeth methodology (1973) of two pass regression was employed.

Step 1: First Pass Time Series Regression was carried out to estimate alpha and beta1, beta2, and beta3 of the portfolios.

$$E[R_{pt} - R_f] = \alpha_P + \beta_1 P E [R_{mt} - R_f] + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_t$$

Step 2: Second Pass Cross Sectional Regression was performed for each period to estimate Gamma0, Gamma1, Gamma2, and Gamma3.

$$E[R_{pt} - R_f] = \lambda_0 + \lambda_1 \beta_1 + \beta_2 \lambda_2 SMB + \beta_3 \lambda_3 HML + \epsilon_t$$

Step 3: t-test was used to check the presence or absence of abnormal returns, positive expected risk return trade off, Size Effect and Value Effect.

Hypothesis for Fama French Three Factor Model:

H1 -  $\lambda_0 = 0$  - Absence of abnormal returns

H2-  $\lambda_1 M = E(R_m - R_f) > 0$  - Positive expected risk return trade off

H3 -  $\lambda_2 SMB = 0$  - Absence of Size effect

H4-  $\lambda_3 HML = 0$  - Absence of Value effect

## III. Results & Discussion

Table 1 reflects the descriptive statistics of the different portfolio including the mean, median, standard deviation, kurtosis etc.

Mean returns of different portfolios are in the following order:  
SV > SM > SG > BM > BV > BG

Standard deviation of the portfolios is in the following order:  
SV > SM > SG > BM > BV > BG

It is evident that the portfolio of Small Firms outperforms the portfolio of Big Firms. Additionally, it can be seen that the high BE / ME companies (value stocks) perform better than the low BE / ME companies (growth stocks).

**Table 1: Descriptive Statistics for different Portfolios sorted on the basis of Size & Value.**

Mean	SG-Rf	SM-Rf	SV-Rf	BG-Rf	BM-Rf	BV-Rf	SMB	HML
Mean	28.86668	37.83951	45.47527	15.84394	19.10627	16.16447	20.15002	8.426395
Standard Error	10.63951	13.15055	14.57825	8.288827	10.83616	10.83193	4.321644	5.738813
Median	18.80696	25.1841	31.24175	14.82116	9.73474	14.82381	17.4477	2.759916
Standard Deviation	49.90372	61.68152	68.37804	38.87804	50.82608	50.80625	20.2703	26.91742
Sample Variance	2490.381	3804.61	4675.557	1511.502	2583.29	2581.275	410.8853	724.5473
Kurtosis	0.22583	0.442883	0.804249	-0.44478	1.167307	1.305956	0.550153	0.489977
Skewness	0.490542	0.856325	0.961292	0.298997	1.109078	1.073292	0.864974	0.019342
Range	205.2379	246.8805	279.6385	145.699	203.514	201.2365	77.83166	113.5549
Minimum	-60.9092	-62.5265	-63.7094	-52.7772	-58.3437	-60.1508	-8.10608	-53.6727
Maximum	144.3287	184.354	215.9291	92.92171	145.1703	141.0857	69.72558	59.88217
Sum	635.0671	832.4692	1000.456	348.5666	420.3379	355.6183	443.3004	185.3807

Table 2 shows the correlation among the market risk premium, Small Minus Big (SMB) factor and the High Minus Low (HML) factor. The correlation coefficient (Pearson) between SMB and HML is 0.381, between SMB & Rm-Rf is 0.666, between HML and Rm-Rf is 0.498.

**Table 2: Correlation Matrix between the market risk premium, size effect and value effect.**

	Rm-Rf	SMB	HML
Rm-Rf	1		
SMB	0.665784	1	
HML	0.497932	0.381185	1

Table 3 displays the first pass time series regression for Capital Asset Pricing Model (CAPM) while Table 4 summarizes the first pass regression for Fama French Three Factor Model (FF3). It is clear from these tables that a statistically significant relation exists between the excess portfolio returns and the market beta.

**Table 3: First Pass Time Series Regression Results for CAPM.**

	Low	Medium	High	Low	Medium	High
	Alpha			p-value Alpha		
Small	1.663048	4.129197	8.55335	0.608389	0.289933	0.098743
Big	-4.77027	-8.72865	-9.83047	0.166604	0.009169	0.082238
	Beta			p-value Beta		
Small	0.915573	1.134563	1.242654	2.24E-13	1.03E-13	2.53E-12
Big	0.693797	0.936819	0.874893	7.44E-11	5.23E-14	5.42E-09
	Adj R2					
Small	0.932348	0.937399	0.913857			
Big	0.879398	0.94148	0.815407			

**Table 4: First Pass Time Series Regression Results for Fama French Three Factor Model.**

	Low	Medium	High	Low	Medium	High
	Alpha			p-value Alpha		
Small	-4.40153	-5.89379	-0.23154	0.198326	0.060003	0.933834
Big	-1.20609	-4.5968	-5.29185	0.528206	0.195473	0.094403

	Beta			p-value Beta		
Small	0.821677	0.920414	0.922472	1.68E-10	3.73E-12	1.18E-12
Big	0.877691	0.98454	0.778147	3.73E-15	1.55E-11	8.63E-11
	HML Beta			p-value HML Beta		
Small	-0.12631	0.040656	0.596017	0.227627	0.657228	1.38E-06
Big	-0.47018	0.154797	0.800967	1.81E-07	0.157329	7.15E-08
	SMB Beta			p-value SMB Beta		
Small	0.492247	0.796189	0.658853	0.00549	1.99E-05	8.18E-05
Big	-0.25142	-0.34015	-0.41754	0.011069	0.050002	0.00872
	Adj R2					
Small	0.953292	0.975725	0.982675			
Big	0.975085	0.95154	0.962731			

Table 5 describes the results of second pass cross sectional regression for CAPM.

**Table 5: Second Pass Cross Sectional Regression Results for CAPM.**

Year	gamma0	gamma1	Dummy
1998	39.53961	-23.9762	0
1999	25.64407	45.69365	0
2000	-84.9831	57.23496	
2001	-52.3833	31.87557	
2002	-77.4464	116.1796	
2003	-4.56402	139.5478	
2004	-34.5045	79.36502	
2005	-33.7906	104.8695	
2006	0.477995	22.23407	
2007	28.77412	-4.75887	
2008	-42.472	-17.8647	
2009	-57.4151	216.1822	
2010	-49.9732	65.21074	
2011	-22.8441	9.736062	
2012	-9.1091	31.21531	
2013	-9.08813	2.249271	
2014	-96.8656	199.2778	
2015	-56.417	52.82186	
2016	-54.7483	81.44702	
2017	-70.627	121.912	
2018	-7.89585	-17.1203	
2019	32.42243	-33.2796	

The t-tests for evaluating the significance of Gamma0 and Gamma1 for CAPM are given in Table 6 and Table 7.

**Table 6: t-test Results for CAPM (H0: gamma0 = 0).**

t-Test: Two-Sample Assuming Unequal Variances		
	gamma0	Dummy
Mean	-29.0122	0
Variance	1561.852	0

Observations	22	2
Hypothesized Mean Difference	0	
Df	21	
t Stat	-3.44328	
P(T<=t) one-tail	0.001219	
t Critical one-tail	1.720743	
P(T<=t) two-tail	0.002437	
t Critical two-tail	2.079614	

**Table 7: t-test Results for CAPM (H0: gamma1 = 0).**

t-Test: Two-Sample Assuming Unequal Variances		
	gamma1	Dummy
Mean	58.18421	0
Variance	4811.411	0
Observations	22	2
Hypothesized Mean Difference	0	
Df	21	
t Stat	3.934416	
P(T<=t) one-tail	0.00038	
t Critical one-tail	1.720743	
P(T<=t) two-tail	0.00076	
t Critical two-tail	2.079614	

In Table 8, the results of second pass regression for Fama French Three Factor Model are displayed.

**Table 8: Second Pass Cross Sectional Regression Results for Fama French Three Factor Model.**

gamma0	gamma1	gamma2	gamma3	Dummy
19.40888	3.549109	19.82028	-55.8863	0
-42.938	125.6258	14.85218	-3.9496	0
-43.8785	9.006618	10.78239	27.45356	
17.81732	-48.5228	13.67989	8.229897	
85.25777	-71.296	35.53476	42.4743	

-65.4755	206.9793	16.58873	61.28075	
87.26677	-58.2844	41.04875	0.23977	
-50.2592	126.1643	40.54427	-0.45689	
26.10467	-7.02086	8.288377	4.647857	
71.99876	-55.8586	-7.65249	16.63238	
-56.3582	-1.87068	-5.10623	-5.57621	
25.84261	120.4948	59.8208	58.84132	
-45.17	59.89133	18.18915	14.56657	
-20.3794	7.291953	5.018588	-1.7342	
31.30035	-13.9456	18.05964	-4.44136	
1.594851	-8.00749	13.6025	-21.4251	
-75.1928	177.2618	69.99811	19.48057	
-67.7837	67.58214	23.36256	-5.98473	
10.4618	5.691465	19.3685	32.76229	
-36.2718	83.29199	38.38041	22.97779	
-52.9749	34.93284	-5.30499	-9.17097	
3.748486	0.980193	-2.02237	-24.3224	

Table 9, Table 10, Table 11 and Table 12 evaluate the significance of Gamma0, Gamma1, Gamma2, and Gamma3 for the Three Factor Model using t-test.

**Table 9: t-test Results for Fama French Three Factor Model (H0: gamma0 = 0).**

t-Test: Two-Sample Assuming Unequal Variances		
	gamma0	Dummy
Mean	-7.99453	0
Variance	2495.039	0
Observations	22	2
Hypothesized Mean Difference	0	
df	21	
t Stat	-0.7507	
P(T<=t) one-tail	0.230582	
t Critical one-tail	1.720743	
P(T<=t) two-tail	0.461164	
t Critical two-tail	2.079614	

**Table 10: t-test Results for Fama French Three Factor Model (H0: gamma1 = 0).**

t-Test: Two-Sample Assuming Unequal Variances		
	gamma1	Dummy
Mean	34.72441	0
Variance	5938.657	0
Observations	22	2
Hypothesized Mean Difference	0	
Df	21	
t Stat	2.113499	
P(T<=t) one-tail	0.023348	
t Critical one-tail	1.720743	

P(T<=t) two-tail	0.046697	
t Critical two-tail	2.079614	

Table 11: t-test Results for Fama French Three Factor Model (H0: gamma2 = 0)

t-Test: Two-Sample Assuming Unequal Variances		
	gamma2	Dummy
Mean	20.31154	0
Variance	411.0632	0
Observations	22	2
Hypothesized Mean Difference	0	
Df	21	
t Stat	4.698939	
P(T<=t) one-tail	6.12E-05	
t Critical one-tail	1.720743	
P(T<=t) two-tail	0.000122	
t Critical two-tail	2.079614	

It can be clearly seen from the tables that the gamma0 and gamma1 coefficients for CAPM are significant. This suggests that CAPM fails to completely capture the excess portfolio returns (presence of abnormal returns). On the other hand, gamma0 is insignificant for the Fama French Model implying that the model successfully captures the variation in excess stock returns (absence of abnormal returns). The R2 also improves compared to the CAPM. The coefficients for market risk premium and the SML factor are statistically significant while the coefficient for the HML factor is insignificant. This indicates that the size effect prevails whereas the value effect is less prominent in the Indian equity market.

#### IV. Conclusions

The study found that Fama French Three Factor Model (FF3) explains variation in excess stock returns better than Capital Asset Pricing Model (CAPM). The market risk premium was unable to capture the excess equity returns completely. A linear relation was found between the excess portfolio returns & the market beta. R2 also improved while using Fama French Three Factor Model. In the time series regression, results of CAPM were inferior to Fama French Three Factor Model since the alpha intercepts were significant in the case of CAPM and insignificant for the Three Factor Model. The beta coefficients were significant for SML factor (proxy for size effect) but it was insignificant for HML factor (proxy for value effect). This implied that the Size Effect was significantly present in the Indian equity market while the Value Effect was statistically insignificant. Thus, an investor can attain higher returns by investing in smaller sized companies. The abnormal returns were absent because gamma0 coefficient was insignificant (through the regression analysis) for the Fama French Three

Factor Model suggesting that the model successfully captures variation in excess returns. On the other hand, the significant presence of abnormal returns due to significant gamma0 coefficient (through the regression analysis) for CAPM suggests that other factors also influence the portfolio returns. This also implied that the Indian stock market has still not achieved semi-strong form of market efficiency and indicated that the investors behave irrationally. It is clearly evident that academicians prefer to apply the Fama French Three Factor Model because of its accuracy in estimating the expected return on portfolio; while practitioners prefer Capital Asset Pricing Model due to its simplicity.

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# M&AS OF INDIAN COMMERCIAL BANKS: A NON-PARAMETRIC APPROACH TO EFFICIENCY ANALYSIS

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**Purpose:** The present study seeks to investigate the effects of Mergers & Acquisitions (M&As) on the efficiency level of the merging units in the Indian banking sector. It intends to address the following research questions: Does the efficiency level of banks change after the merger event? What are the changes in efficiency scores of banks when the assumption of constant returns to scale is rejected? Do input prices contribute towards efficiency scores of merging banks? What do these variations in efficiency measures signify?

**Design/methodology/approach:** The study employs an input-oriented Data Envelopment Analysis (DEA) model with window approach to investigate the technical, pure technical, scale, allocative, and cost efficiencies of the Indian Scheduled Commercial Banks (SCBs) that merged during the period 2000-2018.

**Findings:** Although an overall conclusion of efficiency increase/decrease cannot be claimed, the results indicate a higher potential of merger-induced synergy in cases with low pre-merger efficiency levels.

**Originality/value:** The study provides a comprehensive and exhaustive efficiency analysis of M&As. An ordinal transformation of DEA efficiency scores enabled the derivation of several additional findings with respect to M&As in the Indian banking scenario. While the DEA efficiency scores provide an intensive reflection of the impact of past M&As in the Indian banking industry, the technique of ordinal transformation can be employed just as effectively in future studies, irrespective of the choice of industry or country.

**Keywords:** Data Envelopment Analysis; Efficiency Measurement; Mergers and Acquisitions; India; Scheduled Commercial Banks.

**JEL Classification:** D61, G21, G34, L25

Efficiency is an essential concept in financial economics. It means using a few inputs to produce more outputs, or achieving effectiveness while minimizing wastage (Coelli, Rao and O'Donnell, 2005). Management looks at the indicators of a firm's efficiency to review its performance and to ensure the realisation of management strategies and objectives of the firm (Ebben and Johnson, 2005).

Similarly, the performance of any economy hinges on the efficiency of its financial system (Levine, 1999) in general, and the banking system (Berger, Hasan and Klapper, 2004) in particular. Banks, as financial intermediaries, have conventionally been a significant component of Indian economy. The Scheduled Commercial Banks (SCBs) hold more than 75 per cent of the financial assets and essentially control as well as influence the whole banking industry. Mergers and Acquisitions (M&As) among the SCBs are driven by government reforms and economic policies that altered the competitive landscape of the Indian banking sector (Sharma, 2008). Such deals create significant variations in the assets, earnings, expenditures, workforce, and shareholder value of the banks involved (Focarelli, Panetta and Salleo, 2002). Consequentially, the efficiency and earning capacity of not just

the banks involved in the M&A deal changes, but the entire banking industry also changes. Although numerous studies have been conducted so far, yet there is a shortage of studies that could provide useful information on the complexities of M&As in general, and its relation to the Indian banking industry in particular. Most of the research is based on the developed economies like UK, USA, and Europe (Bliss and Rosen, 2001; Figueiria, Nellis, and Parker, 2009; Ismail, Davidson, and Frank, 2009; Webb, 2003), which is unable to generate reliable financial information that could be applied to the specific requirements of the banking sector of India or any other developing economy. Taking into consideration the specific requirement of Indian banking industry in context of market driven M&As and its impact on the efficiency of banks involved in general and banking

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industry in particular are the sources of motivation to conduct research in this area. The present study attempts to make a contribution towards the existing literature by focusing on the crucial role that efficiency of Indian banking industry plays in determining the growth of Indian economy. This paper employs an input-oriented Data Envelopment Analysis (DEA) model to analyse technical, pure technical, scale, allocative, and cost efficiencies of Indian SCBs that merged during the period 2000-2018. The study seeks to investigate the effect of M&As on the efficiency level of the merging units in the Indian banking sector. It intends to address the following research questions: Does the efficiency level of banks change after the merger event? What are the changes in efficiency scores of banks when the assumption of constant returns to scale is rejected? Do input prices contribute towards efficiency scores of merging banks? What do these variations in efficiency measures signify? An attempt in answering these questions would not only help in detecting the effects of M&As on banks' efficiency but also try to identify the possible sources of these effects. The remainder of the paper is structured as follows. Section 2 discusses the related literature on bank's M&As and efficiency of the banks, as well as papers employing DEA as a tool of efficiency analysis. Section 3 explains the methodology of the study, and Section 4 presents the empirical results. Finally, findings and discussion have been provided in Section 5, while the conclusion of the study is given in Section 6.

## I. Review of Literature

Extensive research has been conducted in the field of M&As, which builds the foundation for the development of the present study. Firstly, M&As among banks has been a popular interest area for a long time, and its importance continues to grow because of the heterogeneity between countries, economies, and culture. Anand and Singh (2008) attempted to analyse the returns to shareholders as a result of the mergers' announcements of Indian private sector banks. Such analyses of market returns were previously carried out by Elfakhani, Ghantous, and Baalbaaki (2003) in the US banking industry, Campa and Hernando (2006) in Europe, and Vergos and Christopoulos (2008) in Greece. Hernando, Nieto and Wall (2009) analysed the determinants of bank acquisitions in the EU-25 region. Another study concentrated on the strategic similarities and dissimilarities of merged banks in the Indian banking sector (Kuriakose and Kumar, 2010). However, performance analysis was and remains the most popular focus area in M&As research. Ismail, Davidson, and Frank (2009) employed cross-sectional regression to investigate the post-merger operating performance of thirty-five publically listed European bank mergers. Later, Akinbuli and Kelilume (2013) used ratio analysis to analyse the effects of M&As on the Nigerian banking industry. In recent years, multivariate regression using financial ratios (Dunn, Intintoli and McNutt,

2017; Onoh and Sarah, 2017; Arif and Rahmawati, 2018) and the CAMEL (Das, 2015) model also became very popular. Among the various parameters of banks' performance, fewer studies have focused exclusively and intensively on efficiency analysis. The present study extends the work done by its peers and predecessors in the field, using linear programming method: Data Envelopment Analysis (DEA). Drake and Hall (2003) used DEA to compute scale and technical efficiency of Japanese banks. Sharma, Sharma and Barua (2012) went a step further and employed Tobit regression on DEA results to predict the relationship between firm-specific factors and efficiency of Indian banking industry. Halkos and Tzeremes (2013) implemented a DEA-bootstrapped procedure to investigate the operating efficiency of possible mergers of 45 Greek banks. DEA was applied by several researchers to measure cost, revenue or profit efficiency (Staub, Souza and Tabak, 2010; Kočiřová, 2014; Raghoobar, 2017). Webb (2003), Řepková (2014), and Rahman, Lambkin and Hussain (2016) employed the DEA window analysis approach for banks' efficiency assessment of Czech Republic, UK, and the USA.

Another popular linear programming technique for performance assessment is the parametric Stochastic Frontier Analysis (SFA). A Spanish study analysed the technical efficiency of merged savings banks using a stochastic distance function approach (Cuesta and Orea, 2002). Rezitis (2008) employed Stochastic Frontier Analysis (SFA) to analyse the effect of acquisition activity on the efficiency and total factor productivity of Greek banks. Ravichandran, Mat-Nor and Mohd-Said (2010) analysed the efficiency and performance of market-driven bank mergers in the Indian banking industry. Behr and Heid (2011) assessed the success of German bank mergers using a matching strategy. SFA was also employed in a study of the Pakistani banking sector Du and Sim (2016) investigated how M&As effect the efficiency of target banks and acquiring banks differently. From the above review of literature, it is evident that the application of DEA technique is quite prevalent for analysis of bank mergers around the world. This popularity justifies its validity for efficiency analysis in the in the field of M&As. The banking sector in India is currently going through a merger wave, aimed to remodel the entire financial sector. The studies providing a comprehensive analysis of all the past and recent M&As in the Indian banking sector can thus prove to be of paramount utility to all the stakeholders of the industry. Therefore, the present study makes a sincere attempt to contribute reliable information towards this demand in literature.

## II. Research Design and Methods

The assessment of banks' performance has been the traditional domain of ratio analysis and regression modelling, which suffer

from some severe limitations (Rahman Lambkin and Hussain, 2016). Through the ideas of Farrell (1957), the parametric technique of Stochastic Frontier Analysis (SFA) and the non-parametric technique of Data Envelopment Analysis (DEA) evolved as alternatives to the traditional tools. The present study has chosen the application of non-parametric approach, i.e. DEA, due to the several benefits it offers over and above other techniques like: (a.) DEA incorporates the identification of an efficient frontier and the distance of inefficient observations from that frontier. (b.) It also provides a robust framework to accommodate multiple inputs and outputs. (c.) The Decision Making Units (DMUs) in a DEA model can refer to a sample of any entities that convert inputs into outputs.

The present study utilises the input-oriented intermediation approach of DEA to analyse the changes in banks' efficiency level before and after a merger event. Under the intermediation approach, the primary function of a bank is to act as an

intermediary or facilitator of funds transfer between savers and investors. Numerous past studies (Řepková, 2014; Rahman Lambkin and Hussain, 2016) support the superiority of the input-oriented approach over the output-oriented approach of DEA while analysing efficiency scores of banks, as it is realistically more feasible to manipulate inputs as compared to outputs. In case of the M&A scenario, the results would help capture the synergies from a structural combination by the increase in improvement potential (efficiency), as we move towards the consideration of the joint unit instead of two independent units (Boetoft and Otto, 2010).

The selection of inputs and outputs is a vital component of DEA. The utility of subsequent results is directly dependent on the validity and accuracy of inputs and outputs chosen to calculate the efficiency scores. The definitions of the variables selected for empirical analysis have been given in Table I.

Table 1: Definitions of input and output variables.

Measure	Variable	Definition
Input 1	Deposits	Deposits comprise of demand deposits, savings bank deposits, and term deposits from banks as well as other investors. They include deposits of branches in India as well as outside India.
Input 2	Capital	Capital consists of premises and physical assets under construction, along with all other fixed assets that a bank holds.
Operationalization of Cost of Input 1	Total Interest Expenses	Total interest expenses include interest on deposits, RBI/ Inter-bank borrowing, and any other kinds of interest expenses.
Operationalization of Cost of Input 2	Other Operating Expenses	Other operating expenses comprise of all operating expenses except personnel expenses.
Output 1	Loans	Loans include bills purchased and discounted; cash credits, overdrafts and loans; and term loans (both secured and unsecured).
Output 2	Net-interest Income	Net-interest Income is arrived at by deducting total interest expenses from total interest income.

The current study evaluates the efficiency scores of banks under both the versions of DEA: Constant Returns to Scale and Variable Returns to Scale. An ordinal transformation of DEA scores is then employed for secondary evaluation and testing the significance of computed results.

#### Sample and Data Characteristics

The inputs and outputs data for the current study have been collected from the 'Statistical Tables Relating to Commercial Banks in India', an annual publication of Reserve Bank of India, and double-checked against annual reports of the specified banks, and other research articles. The study applied the following criteria for sample selection:

- In order to maintain homogeneity among the DMUs, the sample includes only completed bank-to-bank mergers of

Indian SCBs (excluding foreign banks, regional rural banks, local area banks, and cooperative banks), that took place during the period of January 1, 2000 to December 31, 2018

- Financial data is collected for each M&A deal during the sample period. The data pertains to two-years before (T-1; T-2) and two-years after (T+1; T+2) the year of the merger in each case. The data for the year of merger (T) has not been used for analysis.

The population size for this study was 17 M&A deals involving 39 banks. On application of the above mentioned selection criteria and data requirements, the sample reduced to 16 deals involving 32 banks. The details of the sample have been provided in Table II.

Table 2: Details of merger deals in the sample of the study

Serial No.	Acquiring Bank	Target Bank	Year of Merger
N1	Kotak Mahindra Bank	ING Vyasa Bank	2015
N2	ICICI Bank	Bank of Rajasthan	2010
N3	State Bank of India	State Bank of Indore	2010
N4	State Bank of India	State Bank of Saurashtra	2008
N5	HDFC Bank	Centurian Bank of Punjab	2008
N6	Centurian Bank of Punjab	Lord Krishna Bank	2007
N7	Indian Overseas Bank	Bharat Overseas Bank	2007
N8	ICICI Bank	Sangli Bank	2007
N9	Federal Bank	Ganesh Bank of Kuranwad	2006
N10	IDBI Bank	United Western Bank	2006
N11	Bank of Punjab	Centurian Bank	2005
N12	Oriental Bank of Commerce	Global Trust Bank	2004
N13	Punjab National Bank	Nedungadi Bank	2003
N14	Bank of Baroda	Benaras State Bank	2002
N15	ICICI Bank	Bank of Madura	2001
N16	HDFC Bank	Times Bank	2000

The employment of DEA Window technique effectively led to the specification of a total of 64 DMUs (16 SCBs x 4 years). However, the final dataset pertains to 63 DMUs, as data for one merger deal was only available for (t+1) post-merger. This sample size did not cause any bias in the DEA results as there is a general rule of thumb supported by Boetoft and Otto (2010), and many other DEA experts which states that the number of sample units should be at least  $2m \times s$ , where  $m \times s$  is the product of the number of inputs and outputs, a criterion that this study satisfies.

#### DEA Window Analysis

Most studies using DEA have analysed cross-sectional data wherein each DMU was observed only once. However, data on DMUs can be used for longitudinal analysis by considering each DMU in each time period as if it were a distinct DMU. This technique is known as Window Analysis. In this study, a (T-2, T+2) event window has been created, where the efficiency for each bank engaged in a merger deal is computed for the summation of acquiring and target banks during the two years before the merger, and for the merged bank during the two years after the merger.

#### Constant Returns to Scale (CCR version) Vs. Variable Returns to Scale (BCC version)

Two major variations of the DEA Model are generally utilised in efficiency studies: the Constant Returns to Scale version given by Charnes, Cooper, and Rhodes (CCR) in 1978, and the Variable Returns to Scale version proposed by Banker, Charnes, and Cooper (BCC) in 1984. The feature that differentiates CCR version from the BCC version is the

acknowledgment of the existence of scale inefficiency. The CCR version assumes that all DMUs are scale efficient (Bowlín, 1998). The technique provides technical efficiency scores of the analysed DMUs. *Technical efficiency* indicates the ability of a bank (or any DMU) to maximize the outputs from a given set of inputs. It suggests control of wastage in using inputs to produce a standardised level of outputs. When we eliminate the assumption that all DMUs are scale efficient, we get separate results for scale and pure technical efficiency. *Scale efficiency* acknowledges that as the scale of operation changes, the efficiency of the inputs varies. Once a DMU achieves scale efficiency, any increase or decrease in its inputs would force it into inefficiency. The BCC version thus facilitates a deeper understanding of the sources responsible for the inefficiencies. The present study employs both the versions, to get a better insight into the performance of the merging banks. Additionally, the BCC version can be utilised to compute two other measures of efficiency: (a.) *Allocative efficiency* refers to the capacity of a technically efficient DMU to utilise inputs in proportions that minimize production costs given the input prices. (b.) *Cost efficiency* entails minimization of costs, given the input prices and outputs. A DMU (in this case, bank) indicates cost efficiency when it qualifies to be both allocatively as well as technically efficient.

### III. Results & Discussion

In the present study, DEA window analysis has been employed with four different windows of one year each; two before the merger (T-2, T-1) and two after the merger (T+1, T+2). The

year of M&A deal has been excluded from the sample period. This section has been divided into three parts: (1) CCR version, (2) BCC version, and (3) Testing for significance of results.  
*CCR Version (Constant Returns to Scale)*

Four-year window DEA scores of technical efficiency according to the CCR version of constant returns to scale have been provided in Table III. Among all the deals during the selected sample period, the mean scores ranged between 0.163 and 0.980 for the pre-merger period, while the post-merger scores fell in the range of 0.245 to 1.000.

Table 3: Technical efficiency scores (CCR version).

Merger Deal	T-2	T-1	T+1	T+2	Mean	
					Pre	Post
N1	1.000	0.906	0.821	0.882	0.953	0.851
N2	0.652	0.687	0.632	0.715	0.669	0.673
N3	0.887	0.901	1.000	1.000	0.894	1.000
N4	0.778	0.863	0.890	0.933	0.820	0.911
N5	0.529	0.623	0.688	0.704	0.576	0.696
N6	0.863	0.423	0.559	1.000	0.643	0.779
N7	0.607	0.725	0.803		0.666	0.803
N8	0.387	0.534	0.692	0.735	0.460	0.713
N9	0.496	0.524	0.706	0.734	0.510	0.720
N10	0.865	0.876	0.425	0.500	0.870	0.462
N11	0.403	0.405	0.366	0.481	0.404	0.423
N12	0.517	0.470	0.584	0.714	0.493	0.649
N13	0.479	0.380	0.574	0.623	0.429	0.598
N14	0.960	1.000	0.527	0.494	0.980	0.510
N15	0.340	0.336	0.231	0.259	0.338	0.245
N16	0.175	0.151	0.378	0.335	0.163	0.356

Note. Source: Authors' calculations

- \*T-2= Two years before merger
- T-1= One year before merger
- T+1= One year after merger
- T+2= Two years after merger

The mean scores indicate that in most cases, the technical efficiency of banks increased as a result of the M&A deal. In particular, a major enhancement of efficiency can be seen in merger cases of Indian Overseas Bank with Bharat Overseas Bank, ICICI bank with Sangli Bank, Federal Bank with Ganesh Bank of Kuranwad, Oriental Bank of Commerce with Global Trust Bank, and HDFC Bank with Times Bank. SBI and State Bank of Indore, which were already on an upward trend before the merger deal, attained full efficiency after the merger and continued it for the next two years. However, the deal that benefitted the most was the merger of Centurian Bank of Punjab with Lord Krishna Bank. These banks were on a sharp downward trajectory before the merger, but the merged unit

bounced back heroically to become fully efficient two years after the merger. 5 out of the 16 deals show a decrease in mean technical efficiency, with the worst merger cases being that of IDBI Bank with United Western Bank, and Bank of Baroda with Benaras State Bank. The latter was fully efficient before the merger, but its efficiency fell below 50% after two years of the merger.

*BCC Version (Variable Returns to Scale)*

PURE TECHNICAL EFFICIENCY AND SCALE EFFICIENCY

Four-year window DEA scores of pure technical efficiency and scale efficiency according to the BCC version of variable returns to scale have been provided in Tables IV and VI respectively. Among all the deals during the selected sample period, the mean scores of pure technical efficiency ranged between 0.385 and 1.000 for the pre-merger period, while the post-merger scores fell in the range of 0.255 to 1.000.

Table 4: Pure technical efficiency scores (BCC version).

Merger Deal	T-2	T-1	T+1	T+2	Mean	
					Pre	Post
N1	1.000	1.000	0.828	0.888	1.000	0.858
N2	0.809	0.856	0.829	0.924	0.832	0.876
N3	0.890	0.907	1.000	1.000	0.898	1.000
N4	0.811	0.867	0.898	0.934	0.839	0.916
N5	0.549	0.634	0.690	0.705	0.591	0.697
N6	1.000	0.592	0.721	1.000	0.796	0.860
N7	0.695	0.793	0.874		0.744	0.874
N8	0.390	0.574	0.815	0.868	0.482	0.841
N9	0.928	0.893	1.000	0.960	0.910	0.980
N10	1.000	0.923	0.437	0.508	0.961	0.472
N11	0.453	0.469	0.595	0.676	0.461	0.635
N12	0.636	0.661	0.727	0.833	0.648	0.780
N13	0.522	0.478	0.600	0.645	0.500	0.622
N14	0.981	1.000	0.573	0.530	0.990	0.551
N15	0.449	0.455	0.242	0.269	0.452	0.255
N16	0.449	0.324	0.607	0.507	0.386	0.557

Note. Source: Authors' calculations

- \*T-2= Two years before merger
- T-1= One year before merger
- T+1= One year after merger
- T+2= Two years after merger

The mean scores indicate that in most cases, the pure technical efficiency of banks increased as a result of the M&A deal. In particular, a major enhancement in post-merger efficiency can be seen in merger cases of ICICI Bank with Sangli Bank, Bank of Punjab with Centurian Bank, and HDFC Bank with Times

Bank. These banks were on a sharp downward trajectory before the merger, but the merged unit bounced back heroically to become fully efficient two years after the merger. Four out of the 16 deals show a decrease in mean pure technical efficiency. Two mergers in particular, IDBI bank with United Western Bank and Bank of Baroda with Benaras State Bank, suffered tremendously as their near-efficient performance fell to almost 50 per cent after the merger deal.

Table 5: Scale efficiency scores.

Merger Deal	T-2	T-1	T+1	T+2	Mean	
					Pre	Post
N1					0.953	0.992
N2	1.000	0.906	0.991	0.993	0.804	0.768
N3	0.806	0.803	0.762	0.774	0.995	1.000
N4	0.997	0.993	1.000	1.000	0.977	0.995
N5	0.959	0.996	0.992	0.999	0.972	0.998
N6	0.963	0.982	0.996	1.000	0.789	0.887
N7	0.863	0.716	0.775	1.000	0.894	0.919
N8	0.874	0.914	0.919		0.961	0.847
N9	0.991	0.932	0.849	0.846	0.561	0.735
N10	0.535	0.587	0.706	0.764	0.907	0.978
N11	0.865	0.950	0.973	0.984	0.877	0.663
N12	0.890	0.864	0.615	0.712	0.762	0.830
N13	0.813	0.711	0.802	0.858	0.856	0.960
N14	0.918	0.795	0.955	0.966	0.989	0.925
N15	0.979	1.000	0.920	0.931	0.772	0.960
N16	0.758	0.787	0.956	0.964	0.427	0.641
N15	0.390	0.465	0.622	0.661		

Note. Source: Authors' calculations  
 \*T-2= Two years before merger  
 T-1= One year before merger  
 T+1= One year after merger  
 T+2= Two years after merger

As can be seen from Table V depicting the scores of scale efficiency of selected banks during the sample period, the mean scores ranged between 0.427 and 0.995 for the pre-merger period, while the post-merger scores fell in the range of 0.641 to 1.000. This indicates that in most cases, the scale efficiency of banks increased as a result of the M&A deal. In particular, a major enhancement of efficiency can be seen in cases of Federal Bank merger with Ganesh Bank of Kuranwad, ICICI Bank with Bank of Madurai, and HDFC Bank with Times Bank. State Bank of India, State Bank of Indore, HDFC Bank and Centurion Bank of Punjab, which were already on an upward trend before the merger deals, attained full efficiency after the merger. Four out of the 16 DMUs show a decrease in mean scale efficiency, with the worst case being the merger of Bank of Punjab Centurion Bank.

#### Allocative Efficiency and Cost Efficiency

Four-year window DEA scores of allocative efficiency and cost efficiency according to the BCC version of variable returns to scale have been provided in Tables VI and VII respectively. Among all the deals during the selected sample period, the mean scores of allocative efficiency ranged between 0.291 and 1.000 for the pre-merger period, while the post-merger scores fell in the range of 0.252 to 0.986.

Table 6: Allocative efficiency scores.

Merger Deal	T-2	T-1	T+1	T+2	Mean	
					Pre	Post
N1	1.000	1.000	0.886	0.930	1.000	0.908
N2	0.930	0.938	0.928	0.904	0.934	0.916
N3	0.969	0.947	0.972	1.000	0.958	0.986
N4	0.998	0.955	0.951	0.987	0.976	0.969
N5	0.970	0.955	0.962	1.000	0.962	0.981
N6	1.000	0.796	0.598	1.000	0.898	0.799
N7	0.530	0.526	0.287		0.528	0.287
N8	0.745	0.969	0.943	0.950	0.857	0.946
N9	0.323	0.378	0.342	0.648	0.350	0.495
N10	0.607	0.204	0.151	0.354	0.405	0.252
N11	0.853	0.891	0.784	0.714	0.872	0.749
N12	0.459	0.220	0.543	0.480	0.339	0.511
N13	0.360	0.223	0.666	0.659	0.291	0.662
N14	0.982	1.000	0.387	0.496	0.991	0.441
N15	0.630	0.515	0.392	0.275	0.572	0.333
N16	0.982	0.874	0.559	0.562	0.928	0.560

Note. Source: Authors' calculations  
 \*T-2= Two years before merger  
 T-1= One year before merger  
 T+1= One year after merger  
 T+2= Two years after merger

The mean scores fail to indicate a definitive majority, as only in nine out of the 16 cases, the technical efficiency of banks increased as a result of the M&A deal. A particularly major enhancement of efficiency can be observed in cases of Oriental Bank of Commerce with Global Trust Bank, and Punjab National Bank and Nedungadi Bank. The cases of Centurian Bank of Punjab with Lord Krishna Bank, and Federal bank with Ganesh bank of Kuranwad also reveal prominent effect of merger event on the post-merger trajectory of efficiency. All other cases of increased mean efficiency show very small degree of improvements. On the other hand, among the seven cases of decrease in mean efficiency, four show tremendous negative effects of the merger event. While IDBI Bank and ICICI Bank failed to decelerate their falling efficiency after mergers with United Western Bank and Bank of Madura respectively, two cases of the earliest M&As seem to have fared the worst. In both the merger cases, Bank of Baroda with

Benaras State bank and HDFC Bank with Times Bank, the near-efficient scores before the merger, fell to nearly 50 per cent in the post-merger period.

Table 7: Cost efficiency scores.

Merger Deal	T-2	T-1	T+1	T+2	Mean	
					Pre	Post
N1	1.000	1.000	0.734	0.826	1.000	0.780
N2	0.753	0.803	0.769	0.835	0.778	0.802
N3	0.862	0.859	0.972	1.000	0.860	0.986
N4	0.810	0.828	0.853	0.922	0.819	0.887
N5	0.533	0.606	0.664	0.704	0.569	0.684
N6	1.000	0.471	0.431	1.000	0.735	0.715
N7	0.368	0.471	0.251		0.419	0.251
N8	0.291	0.556	0.769	0.825	0.423	0.797
N9	0.300	0.338	0.342	0.622	0.319	0.482
N10	0.607	0.188	0.066	0.180	0.397	0.123
N11	0.386	0.418	0.467	0.483	0.402	0.475
N12	0.292	0.145	0.395	0.400	0.218	0.397
N13	0.188	0.107	0.400	0.426	0.147	0.413
N14	0.963	1.000	0.222	0.263	0.981	0.242
N15	0.283	0.234	0.095	0.074	0.258	0.084
N16	0.392	0.283	0.339	0.285	0.337	0.312

Note. Source: Authors' calculations

- \*T-2= Two years before merger
- T-1= One year before merger
- T+1= One year after merger
- T+2= Two years after merger

As can be seen from Table VII depicting the scores of Cost efficiency of selected banks during the sample period, the mean scores ranged between 0.218 and 1.000 for the pre-merger period, while the post-merger scores fell in the range of 0.123 to 0.986. It can be observed that in relatively more cases (10 out of 16), the cost efficiency of banks decreased as a result of the M&A deal. The worst case being that of Bank of Baroda merger with Benaras State bank (0.981 to 0.242), followed by IDBI Bank with United Western Bank (0.397 to 0.123) and ICICI Bank with Bank of Madura (0.258 to 0.084). Among the six cases that indicated increased mean efficiency, only two show major improvements in post-merger trajectory of efficiency: ICICI Bank merger with Sangli Bank and Punjab National Bank merger with Nedungadi Bank.

*Testing for significance of results*

The present study comprises of a sample of 16 M&A deals involving 32 banks. Four-years DEA scores have been

computed for each deal (for each measure of efficiency) in the sample. As can be observed from the previous section, almost all measures of efficiency show a majority of cases with positive/negative change in mean efficiency after the merger. However, the study intends to identify if the change was significant or not. Direct application of parametric or non-parametric tests on the pre and post mean efficiencies is inadvisable as the DEA technique provides efficiency scores which are not absolute measure of a firm's efficiency. Each score indicates the level of efficiency in relation to all the other DMUs in the sample. Therefore, for a better understanding of the impact of M&As on banks' efficiency, and to make a more appropriate comparison among the five measures of efficiency, the present study proposes a preliminary transformation of the DEA scores using an ordinal scale. The characteristics of the scale are as follows:

- The scale is ordinal in nature.
- It captures all possible values of efficiency scores calculated through the DEA technique, i.e., from 0 to 1.
- The scale is divided into 10 parts or grades, to detect even the minor changes in DEA scores.
- Each grade is represented by cardinal numerals: 1, 2, 3,....., 10.
- The range of values captured by the different grades are as under—

- 1: 0.000-0.100
- 2: 0.100-0.200
- 3: 0.200-0.300
- 4: 0.300-0.400
- .
- .
- .
- .
- 10: 0.900-1.000

Based on the above-mentioned ranges of efficiency scores, a grade each is allotted to the pre-merger and post-merger periods of every individual M&A deal. Table VIII shows the combined results of DEA technique, converted into ordinal values using the above-mentioned scale. To ensure robustness of results, both parametric and non-parametric tests of significance have been utilised. Table X depicts the p-values of various tests of significance of the impact of M&As on efficiency of banks in India, while Table IX shows the correlation matrix of the five measures of efficiency.

Table 8: Scores of efficiency: Converted as per Ordinal Scale.

Merge Deal	Technical Efficiency Score			Pure Technical Efficiency Score			Scale Efficiency Score			Allocative Efficiency Score			Cost Efficiency Score		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
N1	10	9	Negative	10	9	Negative	10	10	Nil	10	8	Negative	10	10	Nil
N2	7	7	Nil	9	9	Nil	9	8	Negative	8	9	Positive	10	10	Nil
N3	9	10	Positive	9	10	Positive	10	10	Nil	9	10	Positive	10	10	Nil
N4	9	10	Positive	9	10	Positive	10	10	Nil	9	9	Nil	10	10	Nil
N5	6	7	Positive	6	7	Positive	10	10	Nil	6	7	Positive	10	10	Nil
N6	7	8	Positive	8	9	Positive	8	9	Positive	8	8	Nil	9	8	Negative
N7	7	9	Positive	8	9	Positive	9	10	Positive	5	3	Negative	6	3	Negative
N8	5	8	Positive	5	9	Positive	10	9	Negative	5	8	Positive	9	10	Positive
N9	6	8	Positive	10	10	Nil	6	8	Positive	4	5	Positive	4	5	Positive
N10	9	5	Negative	10	5	Negative	10	10	Nil	4	2	Negative	5	3	Negative
N11	5	5	Nil	5	7	Positive	9	7	Negative	5	5	Nil	9	8	Negative
N12	5	7	Positive	7	8	Positive	8	9	Positive	3	4	Positive	4	6	Positive
N13	5	6	Positive	5	7	Positive	9	10	Positive	2	5	Positive	3	7	Positive
N14	10	6	Negative	10	6	Negative	10	10	Nil	10	3	Negative	10	5	Negative
N15	4	3	Negative	5	3	Negative	8	10	Positive	3	1	Negative	6	4	Negative
N16	2	4	Positive	4	6	Positive	5	7	Positive	4	4	Nil	10	6	Negative

Note. Source: Authors' calculations

\*Pre = Pre-merger

Post = Post-merger

Table 9: Correlation matrix of different measures of efficiency.

	Technical	Pure Technical	Scale	Allocative	Cost
Technical	1				
Pure Technical	.915**	1			
Scale	.243	.049	1		
Allocative	.702**	.617*	-.146	1	
Cost	.463	.282	-.026	.756**	1

Note.

\*\*Significant at 1% level

\*Significant at 5% level

Tables VIII and IX help in making a few very interesting observations:

- A general inference of efficiency increase/decrease cannot be drawn from the results. Only two cases show total consistency, and five show almost-consistent efficiency-change (at least four similar results) across the five measures. Among the almost-consistent cases, scale efficiency seems to be the source of divergence.
- Across all the measures of efficiency, a greater incidence of positive post-merger change is observed in cases where the respective pre-merger efficiency was less than 50 per cent. The frequency of this observation is highest with respect to measure of cost efficiency (74.91 %), followed

by scale efficiency (60 %), pure technical efficiency (25.46 %), technical efficiency (6 %), and Allocative efficiency (1.57 %). While considering cases with pre-merger efficiency below 80 per cent, this phenomenon becomes even more prominent.

- It is observed that in all the cases where scale efficiency decreased after the merger event, the pre-merger efficiency was higher than 90 per cent. Also, increased post-merger efficiency can be seen in all the cases with pre-merger efficiency below 90 per cent.
- Highest correlation can be observed between the changes in technical and pure technical efficiency, followed by Allocative and cost efficiency, technical and Allocative efficiency, and pure technical and Allocative efficiency. Again, scale efficiency changes depict the lowest correlation with the other efficiency measures (least with cost, followed by pure technical).
- Dividing the efficiency measures into three categories on the basis of co-movement: (1) Technical-Pure technical, (2) Allocative-Cost, and (3) Technical-Allocative; certain anomalies emerge. These anomalies within the categories overlap in a few merger cases.
- The merger of Bank of Punjab with Centurian Bank shows anomaly across Technical-Pure technical, as well as Allocative-Cost categories.
- Mergers of ICICI Bank with Bank of Rajasthan, Centurian Bank of Punjab with Lord Krishna Bank, and HDFC Bank with Times Bank show anomalies across Technical-Allocative, as well as Allocative-Cost categories.
- Among the four overlapping anomalies, decrease in post-merger efficiency (across all measures) is observed only in those cases where the respective pre-merger efficiency was higher than 80 per cent.

Table 10: Summary of parametric and non-parametric tests.

Test implemented	p-value				
	Techn ical Effici ency	Pure Techni cal Effici ency	Scale Effici ency	Alloc ative Effici ency	Cost Effici ency
Wilcoxon signed ranks test (non-parametric)	.207	.425	.264	.812	.263
Sign test (non-parametric)	.344	.180	.180	.714	.549
Paired samples t-test (parametric)	.211	.669	.471	.684	.283

Note.

\*\*Significant at 1% level

\*Significant at 5% level

On the other hand, Table X shows that none of the tests found any significant difference between the pre and post-merger efficiency scores of merged banks. The change is insignificant across all the five measures of efficiency. However, in light of the small sample size and evident heterogeneity among the sample units, the study acknowledges the superiority of the inferences drawn from Tables VIII and IX.

### Findings and Discussion

In Section 1, we put forward a few questions that were anticipated to be answered through the results of the present study. Table X provides the summary statistics of the p-values of various tests applied to examine the significance of difference between the pre and post-merger efficiency scores. Major contribution of the present study comes from the ordinal transformation of DEA scores as shown in Table VIII, which led to some very interesting insights into the M&A activity in the Indian banking industry.

*Does the efficiency level of banks change after the merger event?* As can be observed from the empirical results, the mean efficiencies of most merging banks changed after the merger deal took place. However, an overall conclusion of efficiency increase/decrease cannot be claimed. On the other hand, the study found that the lower the pre-merger efficiency, more are the incidences of post-merger positive change in efficiency. This indicates that while M&As have been mostly successful in unlocking the efficiency potential of the highly inefficient banks, their impact on already near-efficient banks is insignificant.

*What are the changes in efficiency scores of banks when the assumption of constant returns to scale is rejected?* The assumption of constant returns to scale is adopted in BCC version of DEA which gives scores of technical efficiency. Rejection of this assumption leads to the CCR version of DEA which is based on variable returns to scale. This version disintegrates scores of technical efficiency into pure technical efficiency and scale efficiency. The observations made in the previous section indicate that scale efficiency may improve/decline irrespective of a significant enhancement in productivity of inputs. A merger deal might increase (or decrease) the technical efficiency of the bank, even if the scale of operations does not improve (or decline). Scale efficiency is also found to be the source of anomaly in otherwise consistent results across all the measures of efficiency. This indicates that while merger-induced synergy contributes well to the productivity of inputs, achieving a higher scale of operations is a more complex feat.

*Do input prices contribute towards efficiency scores of merging banks?* All the measures of banks' efficiency can be divided into two groups on basis of the impact M&A had on

their pre-merger scores. The first group (technical efficiency, pure technical efficiency, and scale efficiency) suggests that efficiency of banks either improved or remained stable in the post-merger period. The other group (cost efficiency and allocative efficiency) reflects comparatively more cases of decline in efficiency scores. The study utilised the same inputs and outputs, corresponding to the same selected sample and time period for each of these measures. The one difference in data is that the second category employs Input Costs or Input Prices. While cost efficiency intends to minimise costs of inputs for a given level of output, allocative efficiency looks for optimal allocation of resources on basis of their prices. The inference can be drawn that that M&As have not been able to bring about an overall improvement in bank efficiency because of their inability to accommodate for high input prices. Also, even though cost efficiency is the product of Allocative and technical efficiency, it is found to be highly uncorrelated with the latter parameter. This observation further supports the importance of input prices as an extraneous variable to any M&A strategy.

*What do these variations in efficiency measures signify?* The variations in efficiency measures enable the identification of anomalies, which further helps in understanding the causes of these variations. In the present study, the cases which reflect the most significant anomalies are the mergers of Bank of Punjab with Centurian Bank, ICICI Bank with Bank of Rajasthan, Centurian Bank of Punjab with Lord Krishna Bank, and HDFC Bank with Times Bank. These cases reflect the strong influence of cost of inputs and the scale of operations on the technical and Allocative efficiency of the banks.

#### IV. Conclusion

The present study employs an input-oriented DEA model to measure technical, pure technical, scale, Allocative, and cost efficiencies of the Indian SCBs that merged during the period 2000-2018. The study seeks to investigate the changes in level of efficiency of the merging units in the Indian banking sector. Although an overall conclusion of efficiency increase/decrease cannot be claimed, the results indicate a higher potential of merger-induced synergy in cases with low pre-merger efficiency levels. The insignificant changes in the efficiency scores can also be attributed to the deal-specific circumstances that are prominent in the small sample of the present study, spread over a time period of 19 years.

An ordinal transformation of DEA efficiency scores enabled the derivation of several important findings with respect to M&As in the Indian banking scenario. The study found that while M&As contribute well to the productivity of inputs, achieving a higher scale of operations is a more complex feat. Also, the empirical evidence supports the inability of M&As in

accommodating for high input prices, leading to insignificant improvements and even decline in the levels of Allocative and cost efficiencies. The study found cost of inputs and achievement of a more efficient scale of operations as the most powerful factors that could make or break the outcome of a M&A activity.

#### Implications of the Study

The results of the present study offer several theoretical as well as practical implications in the field of M&As. The problem of efficiency analysis gets trickier when it comes to financial institutions, as the scope of such research is ever-enlarging and dynamic. While the DEA efficiency scores provide an intensive reflection of the impact of past M&As in the Indian banking industry, the technique of ordinal transformation can be employed just as effectively in future studies, irrespective of the choice of industry or country. The specific results of the present study might also greatly aid the development and growth objectives of the banks' management, regulators of the banking industry, policymakers of the financial system, and academicians in the field of financial economics and efficiency management.

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# AN EVALUATION OF INDIAN STRESSED BANKS: A DUPONT ANALYSIS

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**Purpose:** The main arena of this work is to use DuPont analysis to study common causes and determine the personal motivation behind the merger of 10 Indian public sector banks into four major banks.

**Design/methodology/approach:** The banks under analysis are Punjab National Bank (PNB), Oriental Bank of OBC), as well as United Bank, United Bank of India, Andhra Bank, Corporate Bank, Canara Bank, Syndicate Bank, Bank of India and Allahabad Bank. To this end, we used the annual data as of March 31, 2015 and the year ended March 31, 2019. The DuPont model divides ROE into three parts: net profit margin, total asset turnover rate and equity multiplier. The application of the DuPont model gives further bits of knowledge into the efficiency and financial performance of banks.

**Findings:** It turns out that there was no single common component of the DuPont model responsible for the merger of Indian Public Sector Banks. In this study, it was found that the reasons behind each bank's merger had no common ground.

**Originality/value:** The analysis presented in the current paper contributes to existing literature by steering a DuPont Analysis and determining whether a common factor is ultimately responsible for the merger of all ten public sector banks considered in the study. The findings provide useful insights to the policymakers and analysts into the study of Indian Stressed Banks.

**Keywords:** DuPont Analysis, ROE, RETURN ON ASSETS, Merger, Indian Public Sector Banks.

**JEL Classification:** G21, G34.

A well-functioning banking sector is a mainstay for any virtuous economy. Banks can be characterized as financial institutions that mobilize funds, manage credit, and other financial transactions. Following are the types of banks that exist in India:

- Commercial Banks- They are banking organizations that acknowledge stores and award transient credits and advances to their clients. Notwithstanding giving momentary advances, they additionally give a medium-term and long haul advance to business ventures.
- Cooperative Banks- Individuals who meet up to together serve their basic intrigue frequently structure a co-operative society under the Cooperative Societies Act.
- Specialized Banks- There are a few banking institutions, which oblige the necessities and offer generally help for setting up business in explicit territories of action. EXIM Bank, SIDBI and NABARD are instances of such banks.
- Central Bank- An institution which is depended with the elements of directing and managing the financial arrangement of a nation. It acts basically as Government's broker, keep up store records of every other bank and advances cash to different banks when required.

The existence of Indian banking can be traced back to the Hindustan Bank established in 1770 and the First Bank of India established in 1786. The pre-independence era was dominated by private banks been structured as joint-stock companies.

Table 1: Pre-Independence era banks.

Name of the bank	Year of establishment
Bank of Hindustan	1770
General Bank of India	1786
Oudh Commercial Bank	1881
Bank of Bengal	1809
Bank of Bombay	1840
Bank of Madras	1843
Allahabad Bank	1865
Punjab National Bank	1894
Bank of India	1906
Canara Bank	1906
Bank of Baroda	1908
Central Bank of India	1911

The implementation of the Reserve Bank of India Act in 1934 paved the way for the establishment of the Reserve Bank of India. So far, India's banking industry is under the jurisdiction

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of the Reserve Bank. From 1967 to 1991, major developments took place, namely the social control of banks in 1967, the nationalization of 14 banks in 1969, and the nationalization of 6 more in 1980. (Reserve Bank of India, 2008).

Table 2: List of nationalised banks.

Allahabad Bank	Bank of India
Bank of Baroda	Bank of Maharashtra
Central Bank of India	Canara Bank
Dena Bank	Indian Overseas Bank
Indian Bank	Punjab National Bank
Syndicate Bank	Union Bank of India
United Bank	UCO Bank
Andhra Bank	Corporation Bank
New Bank of India	Oriental Bank of Commerce
Punjab and Sind Bank	Vijaya Bank

Furthermore, to ensure the Indian economy's rapid development, the government left on a strategy of Liberalization during the 1990s. Liberalized banks came to be called a new generation of technology-savvy banks. As part of this plan, the Global Trust Bank was also established, which is the first of a new generation of banks. GTB participated in the 2001 market scam run by Ketan Parekh and lent heavily to individuals who speculated on the stock market. When the market collapsed, the bank suffered huge losses. As a result, merger negotiations with UTI Bank failed. Later, Oriental Bank of Commerce professed synergy between the two banks and access to India's southern parts, where it has a weak presence. On August 14, 2004, the Oriental Bank of Commerce acquired the Global Trust Bank.

The Indian Banking Industry has undergone several mergers and acquisitions over the decades. The first one dating back to the pre-independence era, the year 1921 witnessed the merger of Bank of Bombay, Bank of Madras, and Bank of Bengal (presently known as the State Bank of India) to form the Imperial Bank of India, which in the event of India's Independence came to be known as the State Bank of India. With effect from April 01, 2017, SBI merged its associated banks, namely Bikaner and Jaipur National Bank (SBBJ), Hyderabad National Bank (SBH), Mysore National Bank (SBM), Travancore National Bank (SBT) and Bhartiya Mahila Bank Ltd., and realized The expected growth market share increased from 17% to 23%, making it India's largest bank. As perceived by The Hindu, 2017; the bank's total number of customers will reach 370 crores with approximately 24,000 branches and a branch network of nearly 59,000 ATMs across the country. Post 1999 it had been observed that banks considered the option of merger as they perceived effective synergies on the business and commercial front.

Table 3: Indian Banks amalgamated since nationalisation.

Name of Acquirer Bank	Name of Acquired Bank
Bank of Bihar Ltd.	State Bank of India
National Bank of Lahore Ltd.	State Bank of India
Miraj State Bank Ltd.	Union Bank of India
Lakshmi Commercial Bank Ltd.	Canara Bank
Bank of Cochin Ltd.	State Bank of India
Hindustan Commercial Bank Ltd.	Punjab National Bank
Traders Bank Ltd.	Bank of Baroda
United Industrial Bank Ltd.	Allahabad Bank
Bank of Tamil Nadu Ltd.	Indian Overseas Bank
Bank of Thanjavur Ltd.	Indian Bank
Parur Central Bank Ltd.	Bank of India
Purbanchal Bank Ltd.	Central Bank of India
New Bank of India	Punjab National Bank
Kashi Nath Seth Bank Ltd.	State Bank of India
Bari Doab Bank Ltd.	Oriental Bank of Commerce
Punjab Co-operative Bank Ltd.	Oriental Bank of Commerce
Bareilly Corporation Bank Ltd.	Bank of Baroda
Sikkim Bank Ltd.	Union Bank of India
Times Bank Ltd.	HDFC Bank Ltd.
Bank of Madura Ltd.	ICICI Bank Ltd.
ICICI Ltd.	ICICI Bank Ltd
Benaras State Bank Ltd.	Bank of Baroda
Nedugadi Bank Ltd.	Punjab National Bank
South Gujarat Local Area Bank Ltd.	Bank of Baroda
Global Trust Bank Ltd.	Oriental Bank of Commerce
IDBI Bank Ltd.	IDBI Ltd.
Bank of Punjab Ltd.	Centurion Bank
Ganesh Bank of Kurundwad Ltd.	Federal Bank Ltd.
United Western Bank Ltd.	IDBI Ltd.
Bharat Overseas Bank Ltd.	Indian Overseas Bank
Sangli Bank Ltd.	ICICI Bank Ltd
Lord Krishna Bank Ltd.	Centurion Bank of Punjab Ltd.
Centurion Bank of Punjab Ltd.	HDFC Bank Ltd.

Source: Report on trend and progress of banking in India

The paper has been presented as follows:

Section 1: Introduction

Section 2: Review of existing literature

Section 3: Objective and hypothesis of the study

Section 4: Research methodology employed  
Section 5: Presentation and analysis of data  
Section 6: Conclusion and Recommendation

## I. Review of Literature

A substantial amount of literature exists on banks' performance and profitability pre and post-merger across the globe. An ample amount of resources can be found where DuPont Analysis has been used to study ROE's co-variants across various industries like pharmaceuticals, furniture, financial services, etc. These studies have aimed at analysing the growth of the banking sector and the covariates that influence profitability. The existing writings highlight whether a sole factor affects the mergers of Indian Public Sector Banks. An in-depth review of the available literature is done to avoid duplication of all sorts.

One of the earliest works of DuPont Analysis in the field of financials was Solimon (2008) that analysed the importance of DuPont components to market participants like equity analysts and stock market investors. In addition, Soliman (2004) proposed that industry-specific DuPont multiplication components provide more useful evaluation and improve effectiveness. DuPont was suggested as a handy tool by Liezs (2002) that should be used by all business managers and consultants to evaluate a firm's financial performance; he made use of the modified five steps DuPont model, i.e.  $(EBIT/SALES) \times (SALES/INVESTED\ CAPITAL) \times (EBT/EBIT) \times (INVESTED\ CAPITAL/ EQUITY) \times (EAT/EBT)$ . Ly Kirikal et al. (2004) analysed the Estonian Banking sector's performance for four years from 1999 to 2003, making use of the Malmquist Indexes in addition to DuPont Financial Ratio Analysis. Georgios (2011) were among others who carried out different researches using the Du Pont Model. They concluded that the new bank had to substantially increase its profitability to sustain the financial crisis that started in the year 2007. The impact of the world financial crisis on the efficiency and profitability of the world systematic banks by positioning DuPont analysis was prepared by Georgios et al. (2013).

Almazari (2012) reviewed the Jordanian Arab Commercial Bank's financial performance during the period 2000-2009 using the DuPont system of economic analysis. The study determined an adverse effect of the global financial crisis on the profitability of one of the largest banks in Jordan, as otherwise stable ROE declined in 2009. Padake & Soni (2015) researched the efficiency of the top 12 banks in India that form the BSE Bankex using the DuPont Method. The study ranged over the span of 6 years from 2007 to 2013 and ranked the banks based on four performance indicators- Net Profit, ROS, ROA, and ROE. Kusi et al. (2015) employed 5 step DuPont model

Pearson Correlation matrix, and OLS regression measure and rank the performance of banks in Ghana during and post profit decline. In Ghana's particular case, ROE was influenced by operating profit margin, asset turnover, and leverage. Haider (2016) sorts out comparative research to study the influence of operational efficiency and financial leverage efficiency on the overall financial efficiency, i.e., return on equity of Bank of Baroda and HDFC Bank for the period 2010 to 2015.

The paper showed that HDFC Bank handles its financial resources more efficiently than the Bank of Baroda, indicated by asset utilization and Net Margin. The chi-square test to test the null hypothesis, analyse data, and other statistical tools were used by Anthony (2017) to do a comparative analysis of the financial performance pre, and post-merger of commercial banks merged between 1999 and 2005 in Kenya. Network Data Envelopment Analysis (DEA) was used to analyse the South African banking sector's efficiency after mergers by Wanke, Maredza, Gupta. (2017). They said mergers and acquisitions were considered beneficial if they occurred in the same year for both target and bidder companies. The effect of mergers on banks of Turkey and Lebanon was premeditated by Küçükkocaoğlu et al. (2018) and Hiyam & Sujud et al. (2018) respectively. Considering the bank mergers in Turkey, it was found that mergers had not met the expected success. On the contrary, in Lebanese banks, a positive relation was found between profit and bank innovation, because this has a positive effect on the bank's return on assets. Underlying bank merger strategies adopted by banks across Europe and the USA were investigated by Hagendorff & Keasey (2009). Ishwarya J (2019) suggested that the Indian banking sector trend has been to or restructure the weak and financially distressed banks. Reasons behind mergers, implications, and challenges after the merger of Indian public sector banks were descriptively analysed by Kamar (2019). Banks' share price post-merger period showed a positive response as indicated by a study conducted by Chaitra, Manjunath, and Rehaman (2019). Financial considerations like Net Margin, operating profit margin, return on capital employed, return on equity, and capital adequacy ratio, amongst others, were analysed in the post-merger circumstance of Indian commercial banks by Singh & Das (2018). The merger, acquisition, and amalgamation of ICICI Bank with nine financial institutions were considered by Goyal & Joshi (2012). They analysed the impact on the growth and profitability of the bank pre and post-merger. Paul (2013) directed an in-depth analysis of the merger of ICICI Bank and Bank of Madura. The merger took place on December 8, 2020.

The use of DuPont analysis can be seen across a spectrum of industries apart from banking. Herciu et al. (2011) claimed that companies with high profits don't necessarily have high profitability ratios. ROS, ROE, and ROA by conducting

DuPont Analysis on the top 20 companies in the world. Christina Sheela & Karthikeyan (2012) measured the financial performance of the top 3 pharmaceutical giants in India and ranked them using the DuPont model. Phillip L. Little et al. (2013) tested the results of financial success by adopting other business strategies in the retail industry. The inspection was done using the DuPont method and the ANOVA model. Burja & Marginean et al. (2014) studied the factors affecting the DuPont analysis of five large furniture companies in 13 years. In addition, they calculated the Pearson coefficient to understand the correlation between turnover and ROE indicators and other model indicators. Bhaskar et al. (2012) generalized the use of strategic human resources integration and Return on assets on active communication to improve mergers and acquisition deals of enterprises of all kinds.

After a successive review of existing literature, we can suggest that a serious study on the analysis of distressed and merged Indian banks has not been conducted yet. Through this work, we aim to fulfil this objective.

Objective and hypothesis of the study:

This study's driving impetus is to widen the existing literature on the mergers and acquisitions of stressed Indian Banks by drawing out shreds of evidence of whether a common factor is ultimately responsible for the merger of all ten public sector banks considered in the study. A circumstance where two establishments pool their advantages and liabilities to become one establishment is called a merger.

The study's objective is to decompose the elements of Return on Equity, i.e., Net Margin, Asset Turnover Ratio, and Equity Multiplier. The research intends to find the potential influence of the above-mentioned constituents on the merger of stressed Indian Banks in the Year 2020. To attain the objective, as mentioned above, the present study attempts to test the following hypothesis:

H1: Net Margin, Return on assets, and Equity Multiplier are the solitary impactful reason behind the merger of all 10 Public Sector Banks in the Year 2020.

H2: Net Margin, Return on assets, and Equity Multiplier are not the solitary impactful reason behind the merger of all 10 Public Sector Banks in the Year 2020.

## II. Research Design & Methods

To effectively analyse the pillars behind the mergers of 10 public sector banks, we'll be plying Du Pont Analysis. DuPont Analysis entails the division of Return on Equity into three variants:

- \* Net Margin
- \* Return on assets
- \* Equity Multiplier

Profitability is measured by net profit margin, asset efficiency is measured by asset turnover rate, and financial leverage is measured by equity multiplier.

ROE= NET MARGIN x RETURN ON ASSETS x EQUITY MULTIPLIER

NET MARGIN = NET PROFIT/ SALES  
 RETURN ON ASSETS = SALES/ASSETS  
 EQUITY MULTIPLIER = ASSETS/EQUITY

DuPont Treasury Staff F. Donaldson Brown (Donaldson Brown) developed the DuPont return on equity model. In 1918, he assisted in arranging for DuPont to purchase a large share of General Motors from the former chairman of the board William C. Durant. DuPont analysis gives a beginning stage to deciding the organization's qualities and shortcomings. The model is based on three components, covering the areas of profitability, operational efficiency and leverage (liquidity). In addition, he introduced standard financial ratios (return on investment and return on equity) and flexible budgets that enable companies to effectively manage their dispersed empire.

The prime motivation behind deploying DuPont Analysis is the fact that DuPont Analysis provides us with a detailed view of the components of Return on Equity (ROE). Therefore, help us understand the contribution of these components to the overall financial performance of the stressed Indian public sector banks. The data included if from the year ended March, 2015 to year ended March, 2019.

On August 30, 2019, Ms. Nirmala Sitharman, the well-known Minister of Finance of India, announced the merger of 10 public sector banks into 4. As a result of this merger, the number of public sector banks in the country has been reduced from 27 major banks to 12.

Table 4: List of merged banks in the year 2020.

ACQUIRING BANKS	ACQUIRED BANKS
- Punjab National Bank	- Oriental Bank of Commerce and United Bank
- Canara Bank	- Syndicate Bank
- Union Bank	- Andhra Bank and Corporation Bank
- Indian Bank	- Allahabad Bank

After the merger of Punjab National Bank, Oriental Bank of Commerce and and United Bank, PNB became the second

largest bank in India. The national turnover reaches Rs. 18 lakh cr. And it has the second largest branch network.

Alongside the announcement of the merger, Rs. 55,250 crore was announced as upfront capital for credit growth and compliance the splitting up is as follows:

Table 5: Division of funds among banks, 2019.

BANKS	DIVISION OF FUNDS
- Punjab National Bank	Rs. 160 Billion
- Canara Bank	Rs. 65 Billion
- Bank of Baroda	Rs. 70 Billion
- Union Bank	Rs. 117 Billion
- Central Bank of India	Rs. 33 Billion
- UCO Bank	Rs. 21 Billion

- Indian Bank	Rs. 25 Billion
- Indian Overseas Bank	Rs. 38 Billion

This paper aims to highlight what could be the possible factor common to all banks responsible for their merger using DuPont Analysis. Sheela and Dr. Karthikeyan (2012) stated DuPont analysis (ROE AND ROI) as an important tool for judging operational financial performance.

There can be seen significant increment in the post-merger measurements of the consolidated establishments. The adjustments in the two prime zones of significance: Deposits and number of representatives are exhibited beneath [Figure 1 and Figure 2].

Figure 1: Deposits of the merged banks.

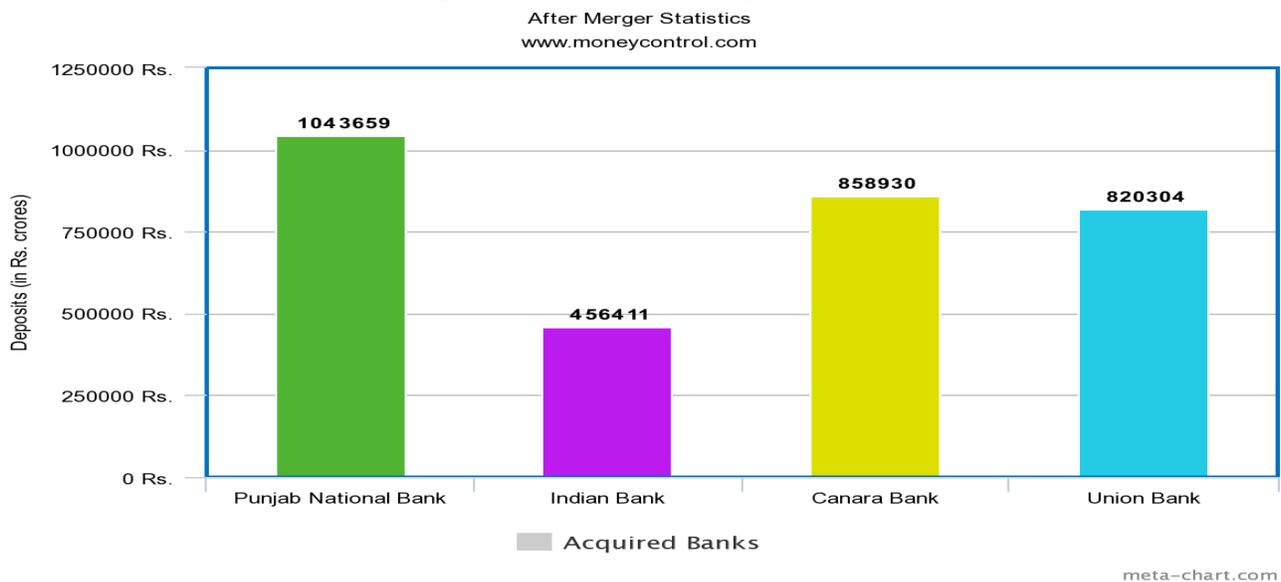
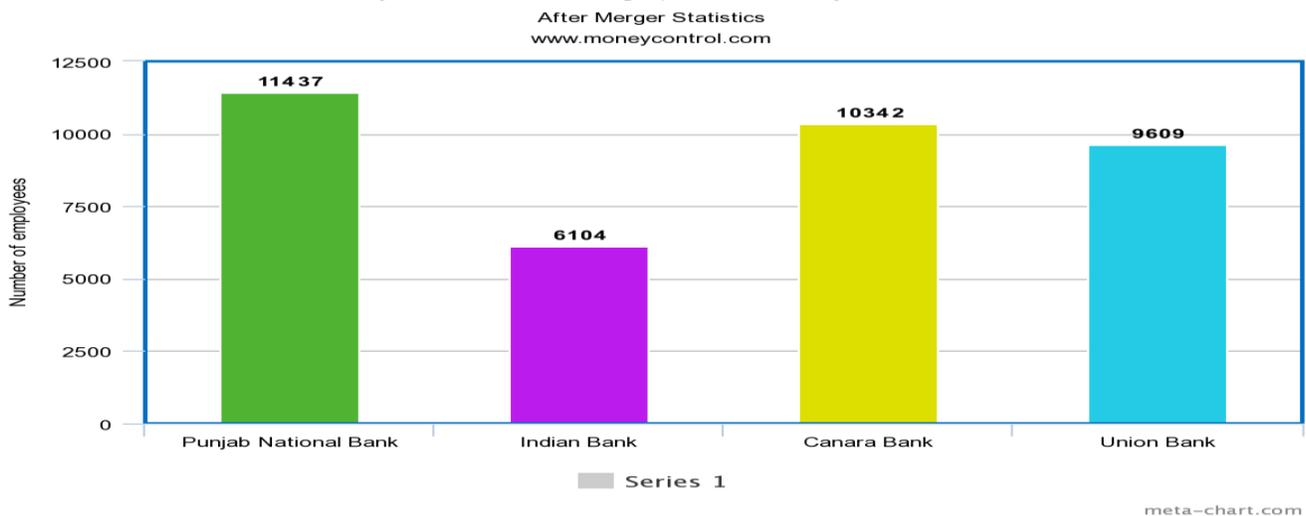


Figure 2: Number of employees of the merged banks.



### III. Results & Discussion

Following is the DuPont analysis conducted to study the variants of the merged 10 public sector banks from Year ended March 31, 2015 to the Year ended March 31, 2019.

Table 6: DuPont Analysis of merged banks: Canara and Syndicate Bank.

	Canara Bank	Syndicate Bank
YEAR ENDED ON March 31, 2015		
Net Margin	6.5	7.1
Asset Turnover Ratio	0.076923077	0.070422535
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.5	0.5
Equity Multiplier	17.6	21.4
ROE= RETURN ON ASSETS x Equity multiplier	8.8	10.7
As of March 31, 2016		
Net Margin	-5.9	-7.1
Asset Turnover Ratio	0.084745763	0.070422535
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-0.5	-0.5
Equity Multiplier	16	24
ROE= RETURN ON ASSETS x Equity multiplier	-8	-12
As of March 31, 2017		
Net Margin	3.3	1.6
Asset Turnover Ratio	0.060606061	0.0625
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.2	0.1
Equity Multiplier	19.5	23
ROE= RETURN ON ASSETS x Equity multiplier	3.9	2.3
As of March 31, 2018		
Net Margin	-9.6	-14.8
Asset Turnover Ratio	0.0625	0.067567568
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-0.6	-1
Equity Multiplier	-17.83333333	19.4
ROE= RETURN ON ASSETS x Equity multiplier	10.7	-19.4
YEAR ON ENDED March 31, 2019		
Net Margin	1.3	-11.9
Asset Turnover Ratio	0.076923077	0.067226891
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.1	-0.8
Equity Multiplier	16	17.75
ROE= RETURN ON ASSETS x Equity multiplier	1.6	-14.2

Table 7: DuPont Analysis of merged banks; Union Bank of India, Andhra and Corporation Bank.

	Union Bank of India	Andhra Bank	Corporation Bank
YEAR ENDED ON March 31, 2015			
Net Margin	5.5	3.9	2.9
Asset Turnover Ratio	0.090909091	0.076923077	0.103448276
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.5	0.3	0.3
Equity Multiplier	17.6	21	18

ROE= RETURN ON ASSETS x Equity multiplier	8.8	6.3	5.4
YEAR ENDED ON March 31, 2016			
Net Margin	4.2	3.1	-2.6
Asset Turnover Ratio	0.071428571	0.096774194	0.076923077
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.3	0.3	-0.2
Equity Multiplier	19.66666667	17	22
ROE= RETURN ON ASSETS x Equity multiplier	5.9	5.1	-4.4
FOR THE YEAR ENDED March 31, 2017			
Net Margin	1.7	1.1	2.9
Asset Turnover Ratio	0.058823529	0.090909091	0.068965517
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.1	0.1	0.2
Equity Multiplier	24	18	22
ROE= RETURN ON ASSETS x Equity multiplier	2.4	1.8	4.4
YEAR ENDED ON March 31, 2018			
Net Margin	-15.8	-18.5	-23
Asset Turnover Ratio	0.069620253	0.075675676	0.07826087
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-1.1	-1.4	-1.8
Equity Multiplier	18.72727273	22	20.66666667
ROE= RETURN ON ASSETS x Equity multiplier	-20.6	-30.8	-37.2
As of March 31, 2019			
Net Margin	-8.5	-14.3	-40.5
Asset Turnover Ratio	0.070588235	-0.104895105	0.074074074
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-0.6	1.5	-3
Equity Multiplier	18.16666667	-13.4	12.7
ROE= RETURN ON ASSETS x Equity multiplier	-10.9	-20.1	-38.1

Table 8: DuPont Analysis of merged banks; Punjab National Bank, Oriental Bank of Commerce and United Bank of India.

	Punjab National Bank	Oriental Bank of Commerce	United Bank of India
As of March 31, 2015			
Net Margin	6.7	2.5	2.5
Asset Turnover Ratio	0.074626866	0.08	0.08
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.5	0.2	0.2
Equity Multiplier	15.4	18	22
ROE= RETURN ON ASSETS x Equity multiplier	7.7	3.6	4.4
FOR THE YEAR ENDED March 31, 2016			
Net Margin	-7.6	1	-2.8
Asset Turnover Ratio	0.065789474	0.1	0.071428571
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-0.5	0.1	-0.2
Equity Multiplier	18.4	13	-15
ROE= RETURN ON ASSETS x Equity multiplier	-9.2	1.3	3
As of March 31, 2017			
Net Margin	1.8	-5.9	2.3
Asset Turnover Ratio	0.055555556	0.06779661	0.086956522

RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.1	-0.4	0.2
Equity Multiplier	20	19.25	15
ROE= RETURN ON ASSETS x Equity multiplier	2	-7.7	3
As of March 31, 2018			
Net Margin	-25.9	-33.8	-17.4
Asset Turnover Ratio	0.061776062	0.073964497	0.057471264
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-1.6	-2.5	-1
Equity Multiplier	18.5625	19.92	16.8
ROE= RETURN ON ASSETS x Equity multiplier	-29.7	-49.8	-16.8
As of March 31, 2019			
Net Margin	-19.2	-32.6	-27.1
Asset Turnover Ratio	0.067708333	0.064417178	-0.055350554
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	-1.3	-2.1	1.5
Equity Multiplier	16.92307692	14.66666667	-13.4
ROE= RETURN ON ASSETS x Equity multiplier	-22	-30.8	-20.1

Table 9: DuPont Analysis of merged banks; Indian and Allahabad Bank.

	Indian Bank	Allahabad Bank
YEAR ENDED ON March 31, 2015		
Net Margin	6.6	3.3
Asset Turnover Ratio	0.075757576	0.090909091
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.5	0.3
Equity Multiplier	14	16.66666667
ROE= RETURN ON ASSETS x Equity multiplier	7	5
As of March 31, 2016		
Net Margin	4.6	-3.8
Asset Turnover Ratio	0.086956522	0.078947368
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.4	-0.3
Equity Multiplier	11.5	16.66666667
ROE= RETURN ON ASSETS x Equity multiplier	4.6	-5
As of March 31, 2017		
Net Margin	9.1	-1.6
Asset Turnover Ratio	0.076923077	0.0625
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.7	-0.1
Equity Multiplier	11.85714286	19
ROE= RETURN ON ASSETS x Equity multiplier	8.3	-1.9
As of March 31, 2018		
Net Margin	7.7	-27.9
Asset Turnover Ratio	0.064935065	0.064516129
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.5	-1.8
Equity Multiplier	14	23.83333333

ROE= RETURN ON ASSETS x Equity multiplier	7	-42.9
As of March 31, 2019		
Net Margin	2	-50
Asset Turnover Ratio	0.05	0.068
RETURN ON ASSETS= Net Margin x Asset Turnover Ratio	0.1	-3.4
Equity Multiplier	19	26.47058824
ROE= RETURN ON ASSETS x Equity multiplier	1.9	-90

Herciu et al. al (2011) interprets ROE as a basic test of how a company's management effectively utilizes investor funds – ROE shows whether management has increased the company's value at an acceptable rate. In addition, it can also measure the company's return on equity. A three-step DuPont analysis was completed to highlight the advantages and clarify the shortcomings of the merged bank.

The Net Margin is a profitability metric that measures a company's efficiency in transforming their revenues into profit. In a select few cases, the acquirer banks' Net Margin: Canara Bank, Punjab National Bank, Indian Bank, and Union Bank are higher than most of the banks to be merged through Year ended March 31, 2015, till Year ended March 2019. Demonstrating the acquirer Indian Bank and acquired Allahabad Bank, we observe that the former's Net Margin has exceeded that of the latter unswervingly through the years taken into consideration. Punjab National Bank's Net Margin was at 6.7% and -19.2% for the Year ended March 31, 2015, and March 31, 2019, respectively, unfaithfully pasting that of the acquired banks: Oriental Bank of Commerce and United Bank of India.

According to Soliman, previous studies have found that changes in asset turnover are directly proportional to future returns. The Economic Times gave the crux of asset turnover ratio as the ratio between the value of a company's sales or incomes and its assets. It is an indicator of the efficiency with which a company allocates assets to generate revenue. Therefore, the higher the asset turnover ratio, the better the bank is performing. Canara Bank consistently moved past Syndicate Bank. If we observed the same for acquirer Union Bank and merged banks Andhra Bank and Corporation Bank; the ratio of the Union Bank's revenue and the value of its assets slowly overshadowed Andhra Bank's with 0.090909091% as compared to 0.076923077% for the Year ended March 31, 2015, to 0.070588235% in comparison to -0.104895105% for the Year ended March 31, 2019.

Ly Kirikal et al. (2004) observed that changes in the rate of return on assets are usually the cause of the most important changes in bank performance and require more detailed analysis. Return on Assets is a profitability ratio that represents the net profit generated by total assets (Reserve Bank of India).

Return on assets can be a significant factor that would have been considered while deliberating regarding the banks' merger. -1.3%, 0.1%, 0.1% and -0.6% of Punjab National Bank, Canara Bank, Indian Bank, and Union Bank of India was the return on assets respectively for the Year ended March 31, 2019. As mentioned earlier, while comparing the Indian Bank and Allahabad Bank, the difference between the two banks' RETURN ON ASSETS is noticeable. While Indian Bank projects 0.1%, the RETURN ON ASSETS of Allahabad Bank is -3.4% for the Year ended March 31, 2019.

The equity multiplier is a financial leverage ratio that clearly shows how the company's assets are funded by shareholder's equity. The equity multiplier is defined as  $(1 + \text{debt}/\text{equity})$  as a company's ability to raise funds- a measure of the ability of large mature companies to provide collateral after have assets and goodwill, they may increase their borrowing capacity as stated by Abraham et al.(2017). An equity multiplier in the case of the banks described above has been interpreted in the following way; Allahabad Bank had the equity multiplier 26.47058824 % a year before the merger, i.e., Year ended March 31, 2019, which implies higher debt servicing costs. Corporation Bank had an equity multiplier at 12.7%, which, on the other hand, indicates the bank's inability to entice lenders to lend money.

Return on equity (ROE) is the ratio that relates net profit to shareholder's equity (RBI). The Financial Times quoted Morgan Stanley as saying that there is a 92% correlation between the difference between a bank's return on equity and its cost of equity (that is, the return investors get from the company's stock) and book value. Therefore, it is a key performance metric used by most of the analysts. In March-end 2019, the Indian Banking Industry's ROE was -0.09 %, as published by the Reserve Bank of India.

An ROE is considered to be useful when it is above and beyond the average ROE. Canara Bank and Indian Bank have been able to reasonably maintain their ROE well above the average of other banks at 8.8% and 7% respectively at the start of the period of study, i.e., year ended on March 31, 2015, to 1.6% and 1.9% for the year ended on March 31, 2019. There may be a by and a massive decline in the ROE of the overhead banks,

but they have performed pointedly well in contrast to the other banks.

The DuPont Analysis of the acquirer and merged banks has made it indistinct that there is no one particular component of the ROE that played a crucial role in the banks' merger. Still, different constituents of distinct years and bank part component return on assets is the most widely used profitability metric but as the DuPont Analysis advocates, it might decision-making on making force in case of some banks; in case of Punjab National Bank and United Bank of India, the return on assets is -1.3% and 1.5% respectively for the Year ended March 31, 2019. In contrast, the acquirer bank is Punjab National Bank. After the merger, the Punjab National Bank became the second largest bank in India. Furthermore, scrutinizing Union Bank and d Andhra Bank, we can interpret the same results. While Union Bank's return on assets is at -0.6%,' Andhra Bank is at a whopping 1.5% for the Year Ended March 31, 2019.

#### IV. Conclusion

The former years of the aera ended with tremendous changes in the banking industry in terms of mergers and acquisitions. The purpose of this study was to find out whether a single variant of the decomposition of Return on Equity was responsible for the merger of 10 Indian public sector banks. To critic this, we used three steps DuPont Analysis and took into account the period of study from Year ended March 31, 2015, to Year ended March 31, 2019.

With the above analysis, we can suggest rejecting H1: Net Margin, Return on assets, and Equity Multiplier are the only impactful reason behind the merger of all 10 Public Sector Banks in the Year 2020. Furthermore, we accept H2: Net Margin, return on assets, and Equity Multiplier are not the only impactful reason behind the merger of all 10 Public Sector Banks in the Year 2020.Thus, we can conclude that different Return on Equity components held responsibility in each merger of the 10 Indian Public Sector Banks.

Poor corporate governance (indicated by poor board supervision and excessive government intervention) is a basic credit weakness for public sector banks in India. The quality of the top managers of these banks is affected by the opaque appointment process, relatively short tenure and lack of accountability. With the weakening of the Indian economy, the impact of this weak governance has become apparent. Public sector banks have lagged behind private sector banks in terms of asset quality and profitability. The government has already injected capital into the bank, but management, infrastructure issues, and the transfer of senior managers have caused certain unforeseen issues or are still in progress. Effective governance of the newly merged PSBs is a strong sanction.

Table 10: Banks and significant factors affecting their financial performance.

BANKS	SIGNIFICANT FACTOR
1. Indian and Allahabad Bank 2. Punjab National Bank, Oriental Bank of Commerce and United Bank of India	Net Margin
1. Canara Bank and Syndicate Bank 2. Union Bank of India, Andhra Bank and Corporation Bank	Asset Turnover Ratio
1. Union Bank of India and Andhra Bank 2. Punjab National Bank, Oriental Bank of Commerce and United Bank of India	Equity Multiplier

After the merger of some banks, the Reserve Bank of India excluded six public sector banks from the Second Schedule of the Reserve Bank of India Act. The six banks are:

- Syndicate Bank
- Eastern Commercial Bank
- United Bank of India
- Andhra Bank
- Allahabad Bank
- Corporate Bank

A bank that is mentioned in the second schedule of the RBI Act comes to be known as a scheduled commercial bank. Since, the statistic of Net Margin, asset turnover ratio and equity multiplier were dominating factors in the financials of these select few merged banks, we would recommend a proper observation of their forthcoming routine. This would help us to review whether mergers of these distressed Indian banks were profitable in the long run. A performance management framework based on profitability will decipher organizational strategies into fitting functional level objectives that can be pursued and monitored at the appropriate level and frequency to achieve. It can provide foreseeable improvement of pointers such as ROA to evaluate the value. Upgraded spending on framework, expedient execution of ventures and continuation of changes are required to give further catalyst to development in the financial area. Every one of these elements recommend that India's financial area is ready for a vigorous development as quickly developing organizations will go to banks for their credit needs.

Indian banks generally have a higher expense card, partly because many banks have large networks on the ground to serve rural customers in inaccessible areas. To combat this complication, we suggest mergers and acquisitions between banks to enhance profitability and increase returns. DuPont's analysis lacks the background on why individual ratios are high

or low, and the reason behind why are they high or low. There is a need for further studies to be conducted to understand the context behind the results of the DuPont model.

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# IMPACT OF ENVIRONMENTAL ACCOUNTING PRACTICES ON FIRM PERFORMANCE AND ENVIRONMENTAL EFFICIENCY- AN EMPIRICAL STUDY WITH REFERENCE TO THE INDIAN SUGARCANE INDUSTRY

**Gunjan Gupta\***

**Purpose:** This study has investigated the impact of the adaption of environmental accounting practices on the firm performance and environmental efficiency respectively through an empirical approach.

**Methodology:** In this research the environmental accounting practice has been defined and measured using three constructs namely positive environmental strategy, financial condition and government enforcement. Environmental efficiency has been measured using the scale developed by Doorasamy, (2014) and firm performance has been measured using the scale developed by Ismail and King, (2005). Quantitative primary data has been collected from 323 respondents working in the finance department of select sugar manufacturing companies in the northern part of India through stratified disproportionate random sampling technique. Analysis of the data has been done using MLR through SPSS software

**Findings:** The application of Multiple Linear Regression on the data collected reveals that the variable financial performance is found to explain 56% of the variable environmental accounting practices and the variable environmental efficiency explains 83.1% of the variable environmental accounting practices revealing a good model fit

**Originality/Value:** There are very few numbers of studies so far done with respect to Indian sugar cane industries' environmental accounting practices. This study has addressed the gap. Original conceptual model has been developed and tested through empirical approach.

**Keywords:** Green Accounting, Environmental Accounting, Environmental Efficiency, Firm Performance, Positive Environmental Strategy, Financial Condition, Sugarcane Industry India

**JEL Classification Code:** Q56

As sugarcane companies are main driving forces of contaminating the environment, it becomes essential that the sugar firm perceive not only all the systems and regulations allotted by pollution control boards but as well implements ecological friendly practices and systems. Accordingly, Nirjar, et al (2014) emphasized that if the sugarcane companies take essential activities to implement environmental accounting activities in their policy structure to look after social, financial and other requirements of farmers, hence assuring a continuous supply of sugarcane and an encouraging growth in production and functioning of business. The awareness and contribution in social responsibility in India could be noticed as both intentional and by the enacted law from government and pressure from society (Gautam and Singh 2010).

As pointed out by Nirjar, et al (2014) the Constitution of India (Article 51A) implies natural environment as one of basic duties of every constituent to protect and enhance the environment; and so this statement implies environmental liability of corporate people as well. The concern relating to

environmental responsibility along with the sustainable industrial development has paved the way for new branch of accounting, that is, environmental accounting which meant to make sure that all stakeholders, financial organizations and general public have access to standard and fundamental environment information similar to corporate fiscal reporting. Environmental accounting as a concept integrates assessment of environmental expenses, its actual persistence, and identification of environmental liabilities and also revelation of all environmental responsibilities in a particular section of the yearly reports of an organization. Relating physical resources accounts to green financial accounts, environmental cost and benefit evaluation, and dealing with tangible wealth accountability are some of the important objectives of environmental accounting. Mittal, (2018) pointed out some benefits of green accounting, which include that it will contribute to enhance environmental performance, to manage

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costs and to encourage sustainable development and also it would contribute to greener practices and product development. In general, the environmental accounting is the management of numerous environmental concerns of the business within the financial accounts. Bhatt, (2005) examined the environmental reporting structure of Indian organizations and compared it with various established firms around the world which are international benchmarks in environmental accounting and the results emphasized that Indian organizations stood weakly in this field. Sen (2011) reported that environmental accountability by corporate people demands change in perspective of people within the managerial staff and front-line people. Prakash (2016) specified that a successful company is one that incorporates environmental accounting into the organization and also reported that Indian organizations have become ecologically conscious and attempts are being made to moderate the unfavorable impact on the environment. Every business has a supreme accountability to make the extreme possible usage of its resources - human and as well material. The developing nations particularly India is experiencing twofold problems of looking after the environment and endorsing financial development. A trade-off among ecological protection and growth is required. Environmental Accounting was primarily introduced in Norway during early 1970s and in India, it is in practice only in sectors like cement, petroleum, steel, engineering and textile businesses, and so on. Segment environmental accounting, eco-balance environmental accounting and corporate environmental accounting are some of the important forms of environmental accounting. Ramesh, (2013) expressed that the advantages of taking on an environmental accounting measure integrate the recognition and increased awareness of environment based costs giving the opportunity to identify means to lessen or avoid these expenditures, while as well enhancing environmental function. Environmental accounting is considered to mean the recognition and reporting of environment based cost for example liability cost and costs linked with wastage disposal. It is representing any costs and benefits which result from change to an organization's products and systems wherein the change as well entails a change in ecological impact. Muninarayanappa and Augustin (2014) expressed that environmental accounting should act as a tool to assess the financial efficiency of ecological conservation actions and the environmental effectiveness of the commercial activities of an organization as a whole. Environmental accounting is to assess and record and reveal the effects of commercial environmental activities on its economic status by means of a set of accounting systems. Environmental accounting is a quantitative evaluation of the cost and efficiency of businesses in environmental protection activities. It is essential for businesses to have organized records and information and is directed to keep up a positive relationship

with green environment to execute valuable and effective environmental activities. The ultimate aim is to achieve sustainable growth. Business as commercial citizens has a principled duty to have their part in contributing to lessen the impairment they do to the atmosphere. Environmental accounting generally deals with three significant factors, which include people, profitability and planet. Kumar, et al (2017) emphasized that in terms of India, green accounting is still in its developing stage and it is one of the best methods to be followed for sustainable development. Corporate reporting is one of significant medium for the business bodies to connect with external world. With the growths of the complications of the corporate world the responsibility of information has been progressively intensifying for making financial decision. It is as well acknowledged fact that as a result of increase in level of ecological awareness of shareholders green reporting now turns out to be a part of financial reporting. But study by Manglani (2016) concluded that, though green reporting has been established in corporate reporting in India, It is still figured out to be lack of comparability and verifiability, the fundamental features of accounting information.

#### **Rationale of the research**

Environmental accounts present a method to assess total wealth and examine changes as potential indicator of sustainability. Consequently, greening the accounts or establishing the ecologically adjusted GDP could create an indicator which could direct the countries to consume without weakening itself. In India, Malik and Mittal (2015) has emphasized that only a few business organizations have sufficient information regarding environmental issues. The industrial green account will certainly be an effective economic tool since it has the prospective to give an insight into the effect of industrial measures on the environment and their consequent outcome on human welfare. As expressed by Syamroy, (2017) this might play an important role in main decisions which should be taken to monitor environmental degradation and restructure resource use in suitable manner and, consequently, contribute to deal with sustainable development. Therefore this particular research intends to study about the factors that drive towards the implementation of green accounting practices and the impact of environmental accounting practices on the firm performance and environmental efficiency with specific reference to Indian sugarcane companies.

### **I. Review of Literature**

#### **Existing Studies**

Ezeagba et al (2017) studied about the association between disclosures of environmental accounting and financial performance with specific reference to food and beverage

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companies with respect to Nigeria. From the outcomes of the analysis, it was indicated that firms with better disclosures of environmental accounting had higher return on equity and earnings per share. It was found that selected firms had put more effort towards protection of environment. It was recommended that there must standard for accounting to measure, treat and disclosure of environmental practices in firms. This would improve appropriate reporting for environmental accounting. Firms have to adopt uniform disclosure standards and reporting of environmental practices for intention of measurement and control of performance. Small firms must be motivated for disclosing their practices in environmental accounting in annual reports for enhancing their competitiveness which would result in high corporate performance. Disclosures in environment must be made compulsory on companies so as to provide a fair and true view of corporate financial position and performance. On the other hand, Adeniran and Alade (2013) identified negative link between practices of environmental accounting and earnings per share and return on capital employed (Yang et al, 2011).

Sengottuvel (2018) stated that procedures of accounting permit a firm to determine the environmental conservation cost during the normal business course, determine advantage obtained from such activities, give best probable ways of quantitative measurement (in physical units or monetary value) and support interaction of its outcomes. Eze et al (2016) determined issues of environmental accounting and impacts of such factors on Nigerians. It was found that environmentally friendly companies which reveal their activities related to environment benefit from high competitiveness level. It was suggested that firms must uniform and acceptable standards for need of measurement and control of performance and must develop products that create less emission or waste in life cycle. Magara et al (2015) examined about effect of environmental accounting towards financial performance. It was determined that recognized financial performance was good in the organization. Analysis of individual parameters of recognized financial performance indicated that generation of revenue was enhancing, flows of cash are found to be in good state as well as increase probability. According to the research by Rahahleh (2011) studied about deployment of environmental accounting from perspectives of Jordan people. It was found that giving duties exemptions and tax incentives would motivate firms for committing with environmental accounting application. There is necessity for qualified accounting personnel and staff and efficient systems for accounting. Accessibility of related legislations with respect to activities of environment for firms for applying those legislations attaching to be adopted with

requirement of identifying sanctions provisions for non-application. There is necessity for framework awareness and general ideas of environmental accounting and systems and methods of accounting. It was suggested that for raising awareness of financial directors, accountants and firms departments on notion of environmental accounting and its framework for achieving the needed advantages of its application. It is important to urge the stakeholders for developing and solving required legislations for environmental accounting application which take the obligatory nature as probable.

Mogaka and Jagongo (2013) carried out a research for determining whether a link exists between firms' profitability and environmental accounting. From the findings of the research, it was found that negative link between environmental accounting and earnings per share. There was positive link between environmental accounting and dividend per share and net profit margin. A research was conducted by Dion and Rui (2014) identifying variables which affect the index of environmental reporting. It was found that size of firm and type of industry had a main optimistic link with index of environmental reporting. Probability of firm had negative impact on index of environmental reporting. Rakiv et al (2016) studied about the link between reporting disclosure of environmental accounting and firm probability with specific reference to manufacturing firms. Content analysis was adopted for obtaining the disclosure index as well as statistical tools like Bivariate regression model, ANOVA, standard deviation, frequency and mean was adopted for analyzing the data. It was found that a main optimistic link exists between reporting disclosure of environmental accounting and firm profitability.

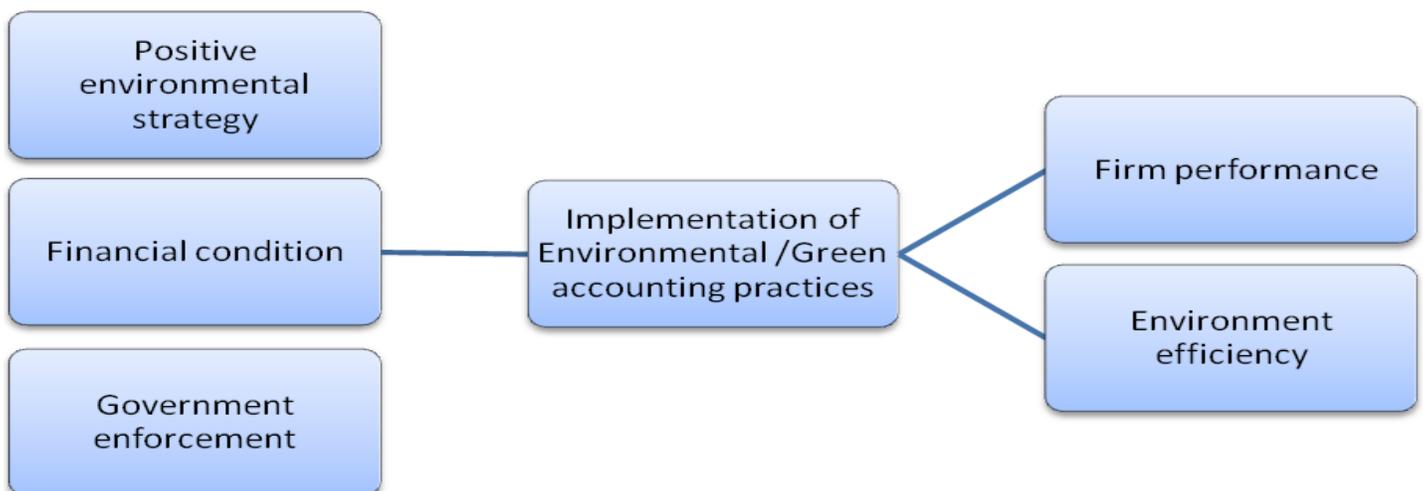
Ingumba (2017) conducted a research to examine the link between environmental reporting and accounting practices and profitability with respect to manufacturing firms. It was revealed that environmental reporting and accounting practices had an optimistic link with profitability of the firms. Selected manufacturing firms have to control their effect on environment and connect in impacts of public disclosure and environmental activities. It was also noticed that companies must adopt practices of environmental accounting and reporting as part of approach used for profitability. In addition to that, other factors which influence profitability must be adopted together with practices of environmental reporting and accounting for enhancing profitability. Thus it could be concluded that practice of environmental reporting and accounting expect high levels of profitability. Leverage and liquidity have an optimistic link with profitability.

S.No	Author and Year	Relationship between constructs	Findings
1	Ezeagba et al (2017)	Association between disclosures of environmental accounting and financial performance	Disclosures in environment must be made compulsory on companies so as to provide a fair and true view of corporate financial position and performance
2	Adeniran and Alade (2013) and Yang et al, 2011	Practices of environmental accounting	Negative link between practices of environmental accounting and earnings per share and return on capital employed
3	Eze et al (2016)	Environmental accounting	It was suggested that firms must uniform and acceptable standards for need of measurement and control of performance
4	Magara et al (2015)	Environmental accounting and financial performance	Financial performance indicated that generation of revenue was enhancing, flows of cash are found to be in good state as well as increase probability.
5	Rahahleh (2011)	Deployment of environmental accounting from perspectives of Jordan people.	It is important to urge the stakeholders for developing and solving required legislations for environmental accounting application which take the obligatory nature as probable.
6	Mogaka and Jagongo (2013)	Firm profitability and environmental accounting	There was positive link between environmental accounting and dividend per share and net profit margin.
7	Rakiv et al (2016)	Link between reporting disclosure of environmental accounting and firm probability with specific reference to manufacturing firms	Main optimistic link exists between reporting disclosure of environmental accounting and firm profitability.
8	Ingumba (2017)	Link between environmental reporting and accounting practices and profitability with respect to manufacturing firms	Practice of environmental reporting and accounting expect high levels of profitability. Leverage and liquidity have an optimistic link with profitability

### Conceptual Framework

Figure 1 illustrates implementation of environmental accounting practices on firm performance and environmental efficiency with specific reference to Indian sugar companies.

**Figure 1: Conceptual Framework.**



Source: Author

Following are the hypotheses of the research:

1. H1: Positive environmental strategy is a significant factor in determining the environmental accounting practices of sugar manufacturing companies in India
2. H2: Financial condition is a significant factor in determining the environmental accounting practices of sugar manufacturing companies in India
3. H3: Government enforcement is a significant factor in determining the environmental accounting practices of sugar manufacturing companies in India
4. H4: The environmental efficiency is dependent on the implementation of environmental accounting practices at the organization.
5. H5: The firm performance of sugar manufacturing companies in India is dependent on the implementation of environmental accounting practices at the organization.

## II. Research Design & Methods

Methodology of the study is a systematic examination which assists investigator to collect new and existing knowledge for determining the answer for proposed issue. It assists in developing and validating facts, solving issues, supporting theories and developing novel theories. Investigation carried by the investigators involves structured and formal processes associated with methods and tools for collection of data and analysis. This research adopted positivism paradigm for investigating the implementation of environmental accounting practices on firm performance and environmental efficiency with specific reference to Indian sugar companies. In order to verify the hypotheses of the research quantitative method are adopted. Design of the research is descriptive research since it adopts numerical results. Sample size of the research is 320 respondents. Respondents are selected randomly from large group of inhabitants and thus simple random sampling is adopted. Data plays a major part in conducting the examination. This study will make use of both primary data and secondary data. Primary data are collected through survey from financial managers and accountants. Closed-end questionnaires are given to the respondents. Secondary data are collected from prior sources like books, journals, research publications and more. Variables selected for testing the hypothesis are environmental accounting, firm performance, environmental efficiency, positive environmental strategy, financial condition and government enforcement. Environmental accounting practices are measured by scale developed by Rahahleh, 2011. Environmental efficiency is measured by scale developed by Doorasamy, 2014. Firm performance is measured by scale developed by Ismail and King, 2005. Positive environmental strategy is measured by scale developed by Kumpulainen, 2005. Financial condition is measured by scale developed by Burritt, 2004. Government

enforcement is measured by scale developed by Qian and Burritt, 2008. After collecting the data, it is analyzed using statistical tools namely ANOVA test, correlation test and SPSS. The process of analyzing the data assists the investigator for identifying out the solution for issue of the research. Interpretation of data is done by examiner towards acquiring results of developed objectives or aims. This research strictly followed ethical regulations and rules for conducting the examination. Data collected for this specific investigation is used only for academic uses. Respondents are not forced to participate in this survey for collecting information from them.

## III. Results and Discussion

### Frequencies

Table 1 depicts frequencies of variables. It explains mean, median, mode and standard deviation of all variables selected for analysis namely positive environmental strategy, environmental efficiency, firm performance, environmental accounting, government enforcement and financial condition.

**Table 1: Frequencies of Variables.**

	Mean	Median	Mode	Std. Deviation
PE1	2.6749	2	2	0.98256
PE2	3.2724	4	4	0.95232
PE3	2.5573	2	2	1.00262
PE4	2.72	2	2	1.027
FC1	4.0433	4	4	0.70357
FC2	4.0093	4	4	0.69821
FC3	4	4	4	0.7093
GE1	3.4644	4	4	0.92639
GE2	3.4892	4	4	0.93036
GE3	3.5418	4	4	0.90235
GE4	3.7337	4	4	0.81732
GE5	3.3932	3	4	0.94748
IEP1	2.7523	3	2	0.8455
IEP2	2.8731	3	2	0.90512
IEP3	2.7276	3	2	0.89169
IEP4	3.0836	3	4	0.91696
IEP5	3.0124	3	4	0.94236
IEP6	3.0464	3	4	0.94294
IEP7	2.9133	3	3	0.9013
IEP8	2.6718	2	2	0.97994
IEP9	3.257	3	4	0.94519
IEP10	2.5542	2	2	0.99969
IEP11	3.6656	4	4	0.83385
IEP12	3.7276	4	4	0.8452
FP1	2.7245	3	2	0.90629

FP2	3.1115	3	4	0.92915
FP3	3.0155	3	4	0.94725
FP4	3.0495	3	4	0.95424
FP5	2.9164	3	3	0.89641
EE1	2.7523	3	2	0.84181
EE2	2.87	3	2	0.90296
EE3	2.7245	3	2	0.88899

It is clear from Table 1 that there are four items in positive environmental strategy variable. There are five items in variable of firm performance. Environmental accounting practices variable has 12 items. Government enforcement variable has 5 items. Financial condition variable has 3 items. There are three items in environmental efficiency variable. The standard deviation values of all the items is above 0.69.

### Reliability Analysis

George and Mallery (2007) suggested a measure namely Cronbach's alpha in order to test the reliability of a research instrument and according to them the value of Cronbach's alpha obtained for a research instrument must be greater than 0.7. The test has been adapted in this research as well. The Table 2 gives the reliability results of the instrument employed in this research.

**Table 2: Reliability Test results of the research instrument.**

S.No	Construct	Item	Alpha
1	Positive environmental	4	.816

	strategy		
2	Financial condition	3	.904
3	Government enforcement	5	.913
4	Implementation of environmental accounting practices	12	.886
5	Firm performance	5	.882
6	Environmental efficiency	3	.836

It is clear from Table 2 that the instrument adapted in this research is a reliable one and is an efficient measure of the variables proposed in the model

### Factors impacting the implementation of environmental accounting practices by Indian sugar manufacturing companies

The hypothesis on the relationship between the dependent variable environmental accounting practices and the three independent variables positive environmental strategy, financial condition and government enforcement respectively have been tested in the following sections.

### Positive environmental strategy– Test of Hypothesis H1

The Tables 3,4 and 5 give the model summary table, ANOVA table and co-efficients table obtained on performing a linear regression analysis with positive environment strategy as the independent variable and the implementation of environmental practices as the dependant variable.

**Table 3: Model Summary Table – Positive environment strategy and Environmental Accounting practices.**

Model Summary <sup>b</sup>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.633 <sup>a</sup>	.401	.394	.47168	.401	53.234	4	318	.000
a. Predictors: (Constant), PE4, PE1, PE3, PE2									
b. Dependent Variable: IEPMEAN									

**Table 4: ANOVA Table – Positive environment strategy and Environmental Accounting practices.**

The Anova table is found to be significant.

ANOVA <sup>a</sup>						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47.374	4	11.843	53.234	.000 <sup>b</sup>
	Residual	70.748	318	.222		
	Total	118.122	322			
a. Dependent Variable: IEPMEAN						
b. Predictors: (Constant), PE4, PE1, PE3, PE2						

**Table 5: Co-efficient Table – Positive environment strategy and Environmental Accounting practices.**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.665	.100		16.687	.000
	PE1	.105	.035	.171	3.002	.003
	PE2	.153	.037	.241	4.131	.000
	PE3	.136	.034	.225	4.010	.000
	PE4	.087	.033	.148	2.676	.008

a. Dependent Variable: IEPMEAN

It can be understood from Table 3 that the R Value is .633, R<sup>2</sup> Value is found to be .401 and adjusted R<sup>2</sup> Value is found to be .394. The independent variable explains **40.1%** of the dependent variable. The ANOVA table is presented in Table 4. It explains about regression and residual for positive environmental strategy. Table 4 makes it clear that the Independent variable positive environmental strategy statistically and significantly predicts the dependant variable implementation of environmental accounting practices. The F value is 53.23 and  $p < .0005$  and it indicates data is good fit from regression model and significant from ANOVA. If p value is 0.000 then data is determined to be good fit using regression model. Therefore the hypothesis “*H1: Positive environmental strategy is a significant factor in determining the environmental accounting practices of sugar*

*manufacturing companies in India*“ can be accepted. The Table 5 gives the co-efficient table. The regression equation from the co-efficient table can be written as follows.

$$IEP = 1.665 + (.105 * PE1) + (.153 * PE2) + (.136 * PE3) + (.087 * PE4)$$

#### Financial conditions - Test of Hypothesis H1

The Tables 6, 7 and 8 give the model summary table, ANOVA table and co-efficients table obtained on performing a linear regression analysis with financial conditions as the independent variable and the implementation of environmental practices as the dependant variable.

**Table 6: Model Summary Table – Financial conditions and Environmental Accounting practices**

Model Summary <sup>b</sup>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.395 <sup>a</sup>	.156	.148	.55902	.156	19.663	3	319	.000

a. Predictors: (Constant), FC3, FC1, FC2

b. Dependent Variable: IEPMEAN

**Table 7: ANOVA Table – Financial conditions and Environmental Accounting practices.**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.434	3	6.145	19.663	.000 <sup>b</sup>
	Residual	99.687	319	.312		
	Total	118.122	322			

a. Dependent Variable: IEPMEAN

b. Predictors: (Constant), FC3, FC1, FC2

**Table 8: Co-efficient Table – Financial conditions and Environmental Accounting practices.**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.675	.197		8.508	.000
	FC1	-.071	.073	-.082	-.972	.332
	FC2	.323	.085	.373	3.787	.000
	FC3	.087	.073	.102	1.185	.237

a. Dependent Variable: IEPMEAN

It can be understood from Table 6 that the R Value is .395, R<sup>2</sup> Value is found to be .156 and adjusted R<sup>2</sup> Value is found to be .148. The independent variable explains just **1.56%** of the dependent variable. The ANOVA table is presented in Table 7. It explains about regression and residual for financial conditions. Table 7 makes it clear that the Independent variable financial conditions statistically and significantly predicts the dependant variable implementation of environmental accounting practices. The F value is 19.66 and  $p < .0005$  and it indicates data is good fit from regression model and significant from ANOVA. If p value is 0.000 then data is determined to be good fit using regression model. Therefore the hypothesis “H2: Financial condition is a significant factor in determining the environmental accounting practices of sugar manufacturing companies in

India “ can be accepted. The Table 8 gives the co-efficient table. The regression equation from the co-efficient table can be written as follows.

$$IEP = 1.675 - (.071 * FC1) + (.323 * FC2) + (.087 * FC3)$$

### Government enforcement- Test of Hypothesis H3

The Tables 9, 10 and 11 give the model summary table, ANOVA table and co-efficients table obtained on performing a linear regression analysis with government enforcement as the independent variable and the implementation of environmental practices as the dependant variable.

**Table 9: Model Summary Table – Government enforcement and Environmental Accounting practices.**

Model Summary <sup>b</sup>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.620 <sup>a</sup>	.384	.375	.47892	.384	39.600	5	317	.000

a. Predictors: (Constant), GE5, GE1, GE3, GE4, GE2

b. Dependent Variable: IEPMEAN

**Table 10: ANOVA Table – Government enforcement and Environmental Accounting practices.**

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	45.414	5	9.083	39.600	.000 <sup>b</sup>
	Residual	72.708	317	.229		
	Total	118.122	322			

a. Dependent Variable: IEPMEAN

b. Predictors: (Constant), GE5, GE1, GE3, GE4, GE2

**Table 11: Co-efficient Table – Government enforcement and Environmental Accounting practices.**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.344	.129		10.438	.000
	GE1	.072	.042	.110	1.707	.089
	GE2	.046	.052	.071	.899	.369
	GE3	.061	.049	.090	1.233	.219
	GE4	.127	.058	.172	2.179	.030
	GE5	.173	.043	.271	4.042	.000

a. Dependent Variable: IEPMEAN

It can be understood from Table 9 that the R Value is .620, R<sup>2</sup> Value is found to be .384 and adjusted R<sup>2</sup> Value is found to be .148. The independent variable explains **38.46%** of the dependent variable. The ANOVA table is presented in Table 10. It is clear that the independent variable government enforcement statistically and significantly predicts the dependant variable implementation of environmental accounting practices. The F value is 39.6 and  $p < .0005$  and it indicates data is good fit from regression model and significant from ANOVA. If p value is 0.000 then data is determined to be good fit using regression model. Therefore the hypothesis “*H3: Government Enforcement is a significant factor in determining the environmental accounting practices of sugar manufacturing companies in India*” can be accepted.

The Table 11 gives the co-efficient table. The regression equation from the co-efficient table can be written as follows.

$$IEP = 1.344 + (.072 * GE1) + (.046 * GE2) + (.061 * GE3) + (.127 * GE4) + (.173 * GE5)$$

**Relationship between implementation of environmental accounting practices and environment efficiency**

A multiple linear regression analysis has been done taking into consideration implementation of environmental practices as the independent variable and environment efficiency as the dependant variable. The results of the analysis are presented in Tables 12 and 13 respectively.

**Table 12: Model Summary Table –Environmental Accounting practices and Environment Efficiency.**

Model Summary <sup>b</sup>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.912 <sup>a</sup>	.831	.825	.31859	.831	127.480	12	310	.000

a. Predictors: (Constant), IEP12, IEP10, IEP1, IEP5, IEP8, IEP7, IEP9, IEP3, IEP4, IEP2, IEP11, IEP6  
b. Dependent Variable: EEMEAN

**Table 13: ANOVA Table –Environmental Accounting practices and Environment Efficiency.**

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	155.270	12	12.939	127.480	.000 <sup>b</sup>
	Residual	31.465	310	.101		
	Total	186.735	322			

a. Dependent Variable: EEMEAN  
b. Predictors: (Constant), IEP12, IEP10, IEP1, IEP5, IEP8, IEP7, IEP9, IEP3, IEP4, IEP2, IEP11, IEP6

It can be understood from Table 12 that the R Value is .912, R<sup>2</sup> Value is found to be .831 and adjusted R<sup>2</sup> Value is found to be .825. The independent variable explains **83.1%** of the dependent variable. The ANOVA table is presented in Table 13. It is clear that the independent variable implementation of environmental accounting practices statistically and

significantly predicts the dependant variable environment efficiency. The F value is 127.48 and  $p < .0005$  and it indicates data is good fit from regression model and significant from ANOVA. If p value is 0.000 then data is determined to be good fit using regression model. Therefore the hypothesis “*H4: The environmental efficiency is*

dependent on the implementation of environmental accounting practices at the organization“ can be accepted.

**Relationship between implementation of environmental accounting practices and firm performance**

Likewise, a multiple linear regression analysis has been done taking into consideration implementation of environmental practices as the independent variable and firm performance as the next dependant variable. The results of the analysis are presented in Tables 14 and 15 respectively.

**Table 14: Model Summary Table –Environmental Accounting practices and Firm performance.**

Model Summary <sup>b</sup>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.638 <sup>a</sup>	.560	.420	.75613	.056	1.547	12	310	.000
a. Predictors: (Constant), IEP12, IEP10, IEP1, IEP5, IEP8, IEP7, IEP9, IEP3, IEP4, IEP2, IEP11, IEP6									
b. Dependent Variable: FPMEAN									

**Table 15: ANOVA Table –Environmental Accounting practices and Firm performance.**

ANOVA <sup>a</sup>						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.613	12	.884	1.547	.000 <sup>b</sup>
	Residual	177.235	310	.572		
	Total	187.849	322			
a. Dependent Variable: FPMEAN						
b. Predictors: (Constant), IEP12, IEP10, IEP1, IEP5, IEP8, IEP7, IEP9, IEP3, IEP4, IEP2, IEP11, IEP6						

It can be understood from Table 14 that the R Value is .638, R<sup>2</sup> Value is found to be .560 and adjusted R<sup>2</sup> Value is found to be .420. The independent variable explains **56%** of the dependent variable. The ANOVA table is presented in Table 15. It is clear that the independent variable implementation of environmental accounting practices statistically and significantly predicts the dependant variable firm performance. The F value is 1.547 and  $p < .0005$  and it indicates data is good fit from regression model and significant from ANOVA. If p value is 0.000 then data is determined to be good fit using regression model. Therefore the hypothesis “H5: The firm performance is dependent on the implementation of environmental accounting practices at the organization “ can be accepted.

**IV. Conclusion**

Environmental accounting integrates environment as capital source and costs spend for environment is included in economic and computational processes. It gives information for evaluating the performance, monitoring, decision making & reporting to supervisors to assist. Practices of environmental accounting are associated with information of environment and eco-auditing systems. It acts a main tool for understanding the role that functioned by natural circumstance in financial system as well as assists in decision making

process. It helps the companies to utilize and plan the best technology and add as a role in review and contribute element of controlling the quality externally to administrative system as pointed out by Ezeagba et al, (2017). When deploying the practices of environmental accounting in companies it would enhance the performance of firm and efficiency of environment. Companies adopt practices of environmental accounting for some reasons are as follows. It assists supervisors make decisions which would eliminate or minimize their costs related to environment and develop positive strategy in the environment. It tracks the costs associated with environment that are unclear in prior overhead accounts that is financial condition would be enhanced. It supports the operation and growth of overall system in environment. It also enhances the process of appraisal and analysis of investment for encompassing potential impacts in environment as mentioned by Eze et al, 2016. Overall, it was obvious from the outcomes of the research that, deploying the practices of environmental accounting would helps in enhancing positive environmental strategy, financial condition, firm performance, government enforcement and environmental efficiency. Environmental accounting is a main tool to recognize the role played by organizations in economy towards welfare and safety in environment. Main aim of the research is to examine the implementation of environmental accounting practices on firm performance and environmental

efficiency with specific reference to Indian sugar companies. Variables tested for identifying the significance of implementing the environmental accounting practices with respect to Indian sugar companies. From the findings of analysis, it is obvious that implementing the environmental accounting practices would enhance the firm performance and environmental efficiency. It was evident from the analysis that positive environmental strategy is acquired when practices of environmental accounting is deployed in companies. Financial conditions are improved through deployment of practices of environmental accounting in sugarcane companies. Government enforcement controls the rules and regulations of environmental practices and at the same time maximize the growth in the companies. It was recommended that practices of implementing environmental accounting could reach sustainability when companies could able to reach its objectives without any threat. Social, economic and environmental responsibilities must be clear in the company for achieving sustainable growth and development with the help of practices namely environmental accounting. If the practices are properly followed then environmental accounting acts a tool for sustainability. At the same time, it was noted that when environmental accounting is properly incorporated in companies which would aid sustainable, effective and sound practices. This research would be eye-opener for accounting professionals, management, practitioners, and academicians for understanding the significance of implementing the practices of environmental accounting in companies. Even though there are numerous advantages associated in carrying out the research and it is not free from restrictions. This study focused only on environmental accounting practices in Indian companies. Company selected for this research is sugarcane companies with respect to India. Data collected for this research cannot be generalized for other sectors. In future, work could be extended into identifying issues faced when deploying environmental accounting practices by companies from different sectors like manufacturing sector, hospitality sector, oil and gas companies and financial institutions and so on. Data could be collected from respondents from different sectors.

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# THE SCENARIO OF KNOWLEDGE MANAGEMENT, ALONG WITH THE MODEL OF E-GOVERNANCE FOR ENHANCEMENT OF PROFESSIONAL EDUCATION IN HIGHER EDUCATIONAL INSTITUTIONS

Gaurav Jindal\*

**Purpose:** Purpose of the research paper includes the study and application of Knowledge Management Principles in the field of education and study of E-governance model as one of crucial factor for enhancing quality of education in universities and Institutions. In recent times, higher education is not having a favourable time period. Various challenges and pressures are associated with it.

**Approaches:** Various approaches and improvements are described in this paper in order to cope with latest trends of technology and growing demands of students in universities. To avoid students going to different private coaching centers, there is crying need to use Knowledge Management Principles. Apart from KM approaches, E-governance is one of crucial factor for enhancing quality of education in universities. To apply e-governance in education system, we must create technical and management skills that can replace the traditional skills and practices.

**Findings:** There are various KM tools like video conferencing, chat servers, blogs, social networking sites that helps in improving extent of communication and learning among students. If knowledge is managed in efficient way, then it becomes easier for student and teachers to access facts, information and solutions. Knowledge is managed by using Knowledge Management Systems (KMS) that can be Document based, Ontology based or Artificial Intelligence based. The courses like 'E-Transformation and Management' must be introduced in various institutions to create awareness about e-governance. E-governance model has been shown in paper with its phases and their application to support institutional transformation.

**Value:** The paper tries to contribute a sustainable approach of teaching and learning so that the very purpose of professional education might be achieved by each and every institution irrespective of being private or public. Every institution may help their students to achieve the goals by providing better education using KMS & E-governance model.

**Keywords:** Knowledge, Knowledge Management (KM), Information and Communication Technologies (ICT), E-Learning, E-Governance.

**JEL Classification:** 123.

With advent of time and era of Internet, students prefer receiving information quickly. They wish to perform multiple tasks at one time, low tolerance of lectures and depends on ICT [2]. So, universities need to expand themselves in terms of skills and knowledge. The way of managing information by any institution is also one of crucial factor in estimating the ranking of a given institution. It is directly connected to KM as KM is effective allocation of resources like staff, lecture details, courses, student's information etc.

The faculty members in various colleges must not adhere themselves to conventional education techniques. They must provide flexible teaching to students with the help of modern computational methods and analysis tools. There are various issues that need to be notices like:

- Various approaches in KM area
- Pros and cons of these approaches during implementation.
- Reasons to use KM principles.

There are two factors that can make any university to limit sky in terms of knowledge and skills are: Availability of technology and Knowledge Management (KM). Some universities have benefitted themselves by investing in knowledge resources while some of them are facing challenges. Fruitful plans and recommendations should be made in all universities to improve knowledge sharing and reform decision making.

The following sections of paper are as follows: Section 2 gives brief description of KM and its importance in higher education. In Section 3, various approaches of KM are presented. It lists improvements that should be carried out within institution itself as well as by government. Section 4 deals with e-governance model and its application in increasing growth of education in universities. Section 5 concludes about following paper.

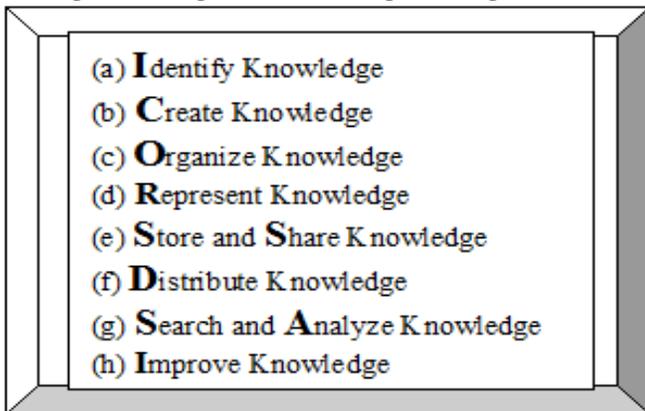
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## I. Review of Literature

It seems that golden period when educational institutions are treated as temples of education has gone from our lives. With increasing conditions of marketplace and latest technology trends, educational institutions have become shops serving educational business. There are several studies and efforts led on KM principles and techniques towards learning education. But, concept of Knowledge Sharing has not been defined. Knowledge Management (KM) is sea of concepts and practices used in universities to perform following strategies. Figure 1.

**Fig 1: Strategies of Knowledge Management (KM).**



All strategies employ methods and Software tools for promoting KM in higher education systems. Various universities have failed to cross first step of KM (i.e. identification) due to lack of technology, infrastructure facilities, lack of communication and business techniques. Various views by different professionalists are given as:

- In most organizations, the key professionals involved in knowledge management activities are human resource managers, process & product developers, and information technologists (Taylor, 2001)
- Kautz (2002) investigated the use of an IT-supported knowledge management system (KMS) that is embedded in knowledge management framework in a large, global IT consulting company.

The implementation of an appropriate knowledge management program in universities has potential of improving student's actual knowledge, improving managerial skills and contributes to global position in marketplace (Heisig & Vorbeck, 2001).

## II. Research Design and Methods

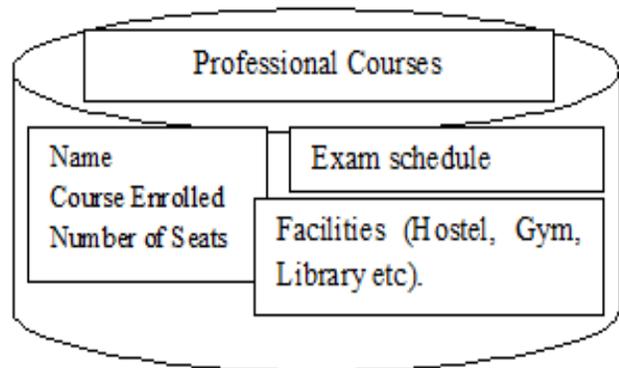
The word Knowledge Management (KM) is derived from two words- Knowledge and Management. Knowledge in turn is derived from Data and Information. **Data** is raw information

related to any topic. **Information** is linked data set made from raw data. Do not mix terms information and knowledge. Information is not Knowledge. **Knowledge** is defined as selecting suitable information and applying it to given problem. Knowledge management (KM) is a collection of processes that govern the creation, dissemination, and utilization of knowledge in an organization (Newman, 1991). Knowledge is defined as perception/understanding that is gained through some experience or performing some studies and analysis. Management means how to manage knowledge in an efficient manner i.e. how given knowledge is to be **developed, shared and analysed (DSA)** to enhance the quality of education. KM is an alarming topic in management area.

### Issues that hinders growth of professional education in Institutions

Following are issues that hinder the growth of any institution in implementing KM programs [3].

**Fig 2: Sample of Professional Knowledge Repository.**



- Failure to maintain collaboration with institutions objective and KM tools:** - It means that institution authority spends time and money on those things that have minimal impact on student's performance instead of spending time and money in developing and using KM tools.
- Development of Online Software without knowing the methodology and design of KM practices.**
- Dependent on Online Training Programs:** - Many institutions focus more in organizing online training programs for student's education. Although It is one of KM tool but significant learning and knowledge is achieved only when student interact with teachers to solve problems. Institution must try to make students more responsive towards teachers.

### Benefits of KM in professional education

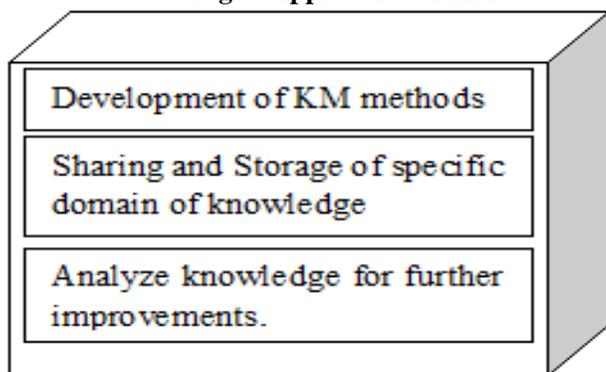
- KM helps university to gain appropriate information as well as knowledge and applying those using Knowledge Management System (KMS).

- It helps teachers and students to search basic documentation knowledge in less time.
- It makes efficient use of ICT methods to create new innovation theories related to education.
- KM plays vital role in main tasks of any university – Teaching and Research. In context of teaching, it uses various KM tools to facilitate e-learning portal and online transformations at university level. In context of research, seminars, survey are organized and information is distributed to all phases of university.
- It creates modern picture of institution accomplishing latest technology trends for KM.
- It makes knowledge learning interactive and easier among students.

### Approaches of KM in Higher Education

There are mainly three approaches of Knowledge Management (KM).

**Fig 3: Approaches of KM.**



(a) Development of Knowledge Management Methods: - It is done with the help of technical experts to develop some e-learning portals for teaching students. Here, we have described about e-learning teaching application that is used in some universities like IPU, JNU etc. It is web based application that distributes entities of knowledge into different independent modules. E.g. Separate modules for Student Corner, University Corner etc.

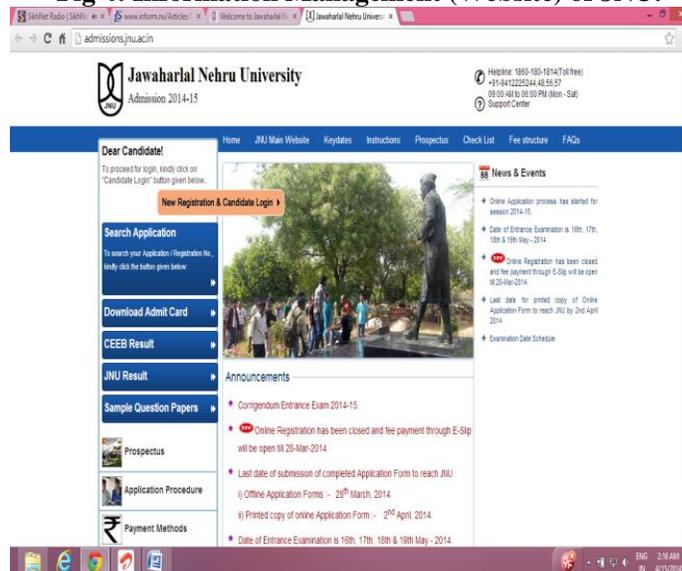
(b) Sharing of Knowledge: - This approach uses KM tools like email, video conferencing, blogs, chat servers to facilitate the interaction and involvement between faculty and students. This method of visualization increases ability of students to learn from their teachers in existing environmental conditions. It is one of vital factor for improving management of higher education in various Delhi universities.

### It is two-way process.

Shared Knowledge is stored in form of repositories.

(c) Analysing Knowledge: - We have developed e-learning teaching portal but after analyzing knowledge obtained through

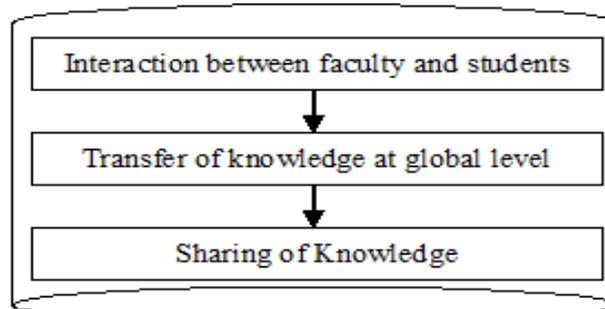
**Fig 4: Information Management (Website) of JNU.**



application, we have noticed some of its bottlenecks. They are as follows:

- No face to face interaction between faculty and students.
- Lack of confidence among students to present their knowledge in front of teachers.
- Students become independent of teachers because they can access assignments, lectures, and study material from online portal thus reducing teacher-student relationship.
- It may be possible that online portal is developed only in English language which makes difficult to understand by all students.

**Fig 5: Backbone of Educational Institutions.**



### Focus areas to enhance professional education development

- Determine degree of involvement of teachers, information professionals in KM activities within institutions.
- Lists various roles performed by professionals.
- Encourage students to learn from the skills and activities of professional teachers.
- Factors inhibiting the participation of professionals in KM activities.

### Improving KM in Professional Education

#### (a) Improvement within institutions

- There should be some features like decision making, rewards, prizes based on student's assignment and presentation to their teachers.
- It will increase enthusiasm and interest of students regarding their studies.
- Poster competitions, writing research papers and organizing research funded projects by institution may help to improve higher education and increases thinking ability of students.
- There must be high quality, interactive application modules over Internet for students in institutions.
- Virtual learning tools (editors, converters) should be used in universities to provide educational content, online information etc.

#### (b) Improvement by Government

- Every institution must be approved by governing agencies like AICTE, UGC.
- Government must eliminate the gaps among different levels of colleges in India like some colleges are owned by trust and some are running without any affiliation from govt. departments. Various professional courses must be introducing in colleges.
- All institutions should be equally funded by govt. thus providing all essential KM facilities to students.
- Govt. should select students from various institutions based on their academic performance and technical activities.
- Students must be given opportunities to show their talent in government aided research projects like DST, MHRD etc.
- Govt. must introduce fee waiving system for reserved categories students/ financially weak who wants to study in their lives.

### III. Results and Discussion

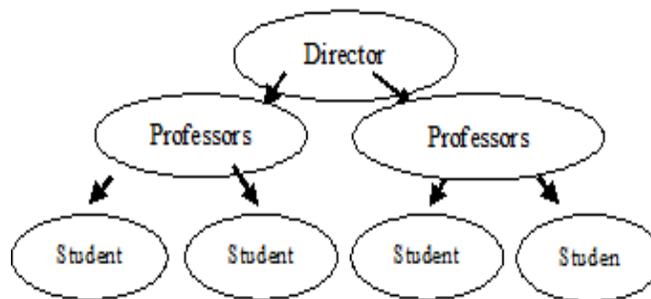
#### Concept of E-Governance

Applying effective and electronic methods of ICT for strengthening the performance of educational institutions is termed as E-Governance [4]. Performance of educational institutions covers aspects like management, administration, responsiveness towards students and curriculum activities. Due to ample amount of colleges/universities in recent years, e-governance has lost its scope. So, it is duty of government to keep record of colleges and prescribe certain measures to improve student's academic performance. Indian education system must be eco-governing.

#### Why there is need of e-governance?

For last decades, education is growing like a business tree. Root Node of tree is Director of respective institution and its child nodes are Professors who are guiding students in non-contiguous manner. They are only concerned about their salaries instead of learning capabilities of students.

**Fig 6: Education Tree.**



After this one question arises: **Is Computerization and E-Governance are same?**

The answer is NO. Computerization means use of computers only. It replaces existing methods/norms by introducing facility of online methods. It does not take into account about needs of students and institutions. E- Governance modifies as well as creates new system by using services of ICT according to student's and college requirements. It reduces manual management as well as increases operational efficiency.

#### E-governance Model

Basic e- governance model is based on applying electronic methods on three groups' viz internal operations of Government (G2G), External methods between Government to Consumers (G2C) and Government to Business (G2B). Consumers mean students, professors and other information seekers in field of education.

**Table 1: Internal vs. External Methods.**

Internal Methods	External Methods
This mode of interaction reduces cost of sharing views among different governments. They can internally resolve matters.	This mode can be treated as creating awareness among various institutions regarding the management, admin, staff etc of respective colleges. It can be done in form of seminars, workshops (Faculty Development programme) organized by various colleges.

For better functioning and increasing involvement of government, there are some govt. based models like Gartner Model, Howard Model etc. which uses ICT methods to implement e-governance in higher education system.

The model has following phases:

**(a) Information (Lowest Complexity):** It is based on external operations (G2C, G2B). G2B means government will consider various aspects for giving quality education to students like Course Details, Results, Facilities (Library, Gym, and Hostel), Research Facilities (Seminars, Publications, Thesis). It is termed as Information Management that emphasis on storing and delivering of information related to following aspects:

- Information about govt. central schemes for career advancement.
- Student Fellowships programme and scholarships.

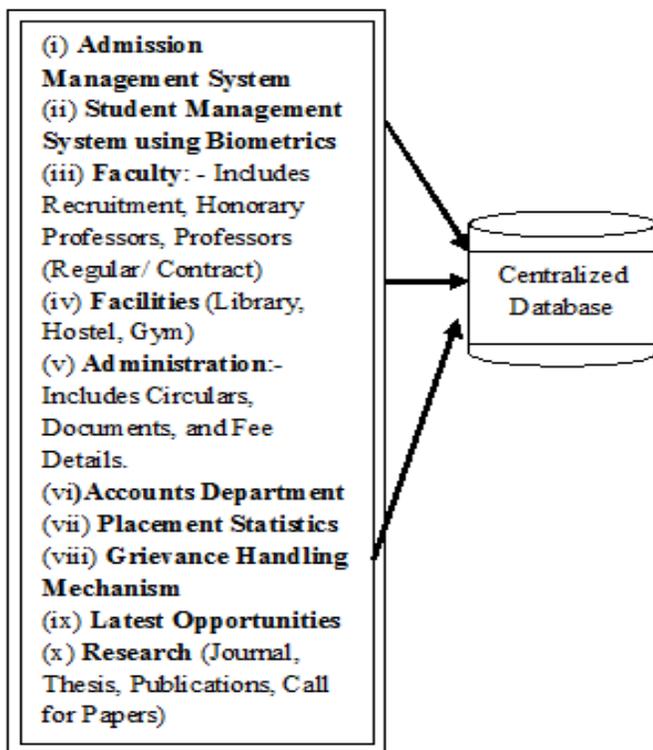
Government agencies like AICTE, UGC must provide affiliation to various colleges and prepares Management Information Systems (MIS) of above given aspects.

**(b) Interaction:** - It interacts with regulating govt. bodies as well as provides two way communications between students and teachers. Affiliated institutes are made to send monthly reports, their demands, and approval to UGC, AICTE.

**(c) Transaction:** - The model introduces e-filling of application forms and depositing fees. There is no need to go bank to deposit fees. Students can upload their photo and signature while filling application forms.

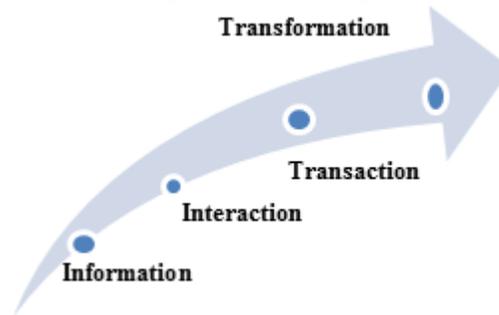
**(d) Transformation (Highest Complexity):** - It includes development of online MIS for various colleges that is divided into following modules.

**Fig 7: Sample of MIS in various Universities.**



Our aim is that data stored in MIS is centralized / integrated so that regulating bodies and students can access particular information at one place. This MIS must be updated weekly like Student's Placement Statistics, Fund allocation etc.

**Fig 8: Phases of E-governance Model.**



#### Role of E-governance Model in Professional Education

- This model is developed by government in collaboration with participating industries and other funded organizations. So, this model is suitable to meet all the requirements of institutions according to present scenario of ICT.
- The model has centralized database that makes retrieval of educational aspects easier.
- Centralized database consisting of MIS of various colleges will keep the updated credentials related to student's management.
- Provides services covering all aspects of quality education like job opportunities, physical as well as mental fitness, personally development training to students. For giving latest job opportunities, institutions must have collaboration with companies.

#### IV. Conclusion

The paper makes readers aware of Knowledge Management Principles in field of education. Various approaches and improvements are described in paper in order to cope with latest trends of technology and growing demands of students in universities. To avoid students going to different private coaching centers, there is crying need to use Knowledge Management Principles. There are various KM tools like video conferencing, chat servers, blogs, social networking sites that helps in improving extent of communication and learning among students. If knowledge is managed in efficient way, then it becomes easier for student and teachers to access facts, information and solutions. Knowledge is managed by using Knowledge Management Systems (KMS) that can be Document based, Ontology based or Artificial Intelligence based. Apart from KM approaches, E-governance is one of crucial factor for enhancing quality of education in universities.

To apply e-governance in education system, we must create technical and management skills that can replace the traditional skills and practices. The courses like 'E-Transformation and Management' must be introduced in various institutions to create awareness about e-governance. E-governance model has been shown in paper with its phases and their application to support institutional transformation. Being citizen of India, let's take pledge to make India- KNOWLEDGE POWER NATION in upcoming years.

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# DEVELOPING A FRAMEWORK FOR DESIGNING A CAPITAL STRUCTURE AND ITS IMPACT ON VALUE OF FIRM – A CONCEPTUAL DISCUSSION

**Madhu Ruhil\* Vikas Madhukar\*\***

**Purpose:** The present study is focused on developing a framework to study the capital structure and its impact on value of firm of automobile industry within the Indian perspective specifically after the financial crisis of 2008-09. This paper aims at identifying the various measures and determinants of capital structure, and develop a framework for a comprehensive analysis of capital structure of Indian Automobile Industry over the period of 2009-10 to 2018-19.

**Methodology:** The paper is a descriptive and exploratory research based on secondary data received from various journals, thesis and PROWESS Database maintained by the Centre for Monitoring Indian Economy (CMIE).

**Findings:** The paper identified eleven determinants of capital structure and fourteen leverage ratios, and developed a framework along with two panel data regression models for the extensive analysis of capital structure of Indian Automobile Industry over the period of 2009-10 to 2018-19.

**Originality:** This paper is a work of originality that tries to identify measures and determinants of capital structure, and develop a framework for a meticulous analysis of Automobile Industry from Indian perspective especially after the financial crisis of 2008-09.

**Keywords:** Automobile Industry, Capital Structure Framework, Determinants of Capital Structure.

**JEL Classification:** G32, L62

Whenever a firm is required to take an investment decision, it is also required to take its financing decision which eventually builds the capital structure of that firm. Capital Structure is an imperative managerial decision about the composition of internal and external funds that a firm should use to finance its investments. It is believed by many researchers [Chowdhury & Chowdhury (2010), Antwi & Mills (2012), Rajhans & Kaur, (2013), Hossain, & Hossain, (2014), Akhtar, Khan, Shahid, & Ahmad (2016), Neha Poddar (2017)] that a well analysed capital structure decision of any firm eventually benefits its shareholders' wealth.

## I. Review of Literature

Automobile Industry, being a capital-intensive industry, requires heavy investment for its expansion and thus needs to be circumspect in handling its financial decisions. For this reason, it attracts many researchers to do an in-depth study of the capital structure of this industry especially after the financial crisis of 2008-09. The global recession 2008-09 had a devastated effect on the world's automobile industry and had distressed the Indian automobile industry too. Therefore, it is interesting to see the changes, if any, in the nature of the Indian automobile companies' capital structures, post the financial crises of 2008 (Nelson Vergas, et.al., 2015). For the detailed study of capital structure of automobile industry from Indian perspective, a proper framework and research model should be

developed. Therefore, this paper aims at identifying the various indicators and determinants of capital structure, and developing a framework which would lead to a meticulous study of capital structure of automobile industry in India over the period of 2009-10 to 2018-19.

## Objectives of the Study

- To identify the various indicators of capital structure of the Automobile Industry in India.
- To identify the various determinants of capital structure of the Automobile Industry in India.
- To develop a framework for the empirical analysis of Capital structure of Automobile Industry in India post the financial crises 2008-09.
- To develop a regression model for the empirical analysis of Capital structure of Automobile Industry in India post the financial crises 2008-09.

## II. Research Design and Methods

- Research Design:** The paper is a descriptive and exploratory research.

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- b) **Collection of Data:** The secondary data received from various journals, thesis and PROWESS Database maintained by the Centre for Monitoring Indian Economy (CMIE).
- c) **Statistical Research Technique:** Intensive review of literature has been done to identify the various indicators and determinant of capital structure, and to develop the capital structure framework.

### Capital Structure Indicators of Automobile Industry in India

Bevan & Danbolt (2000) found significant differences in the determinants of short-term and long-term forms of debt, and argued that analysis of capital structure is incomplete without a detailed examination of debt. Therefore, this study will undertake the detailed analysis of debt source and employ a variety of debt components to analyze the capital structure of Indian automobile industry.

**Total Current Liabilities/Total Assets (TCL/TA):** In this measure, total current liabilities (TCL) include all the current liabilities and provisions. This ratio shows the proportion of total assets that is financed by the total current liabilities.

**Short Term Borrowings/Total Assets (STB/TA):** As stated in Ambadkar (2010), Bhat (1980) had argued that short-term borrowings account for a larger proportion of companies' liabilities and are continually being repaid and renewed. Also, companies using short-term borrowings and long-term borrowings have considerable substitutability for each other. Therefore, short-term borrowings should be studied separately to have a narrow picture of company's financing pattern. Following Pandey (2001), Bhaduri (2002) and Ambadkar (2010) this measure is selected to highlight the proportion of company's total assets that is financed by short term borrowed funds.

**Bank Borrowings Repayable in Current Year/Total Assets (BRCY/TA):** Bank Borrowings Repayable in Current Year represents the total amount of borrowing whether long-term or short-term that must be paid in the current year. Following the Bevan & Danbolt (2000) and Ambadkar (2010), this ratio is employed to get an idea of immediate payments that a company has to make apart from the current liabilities.

**Total Current Liabilities/Net Worth (TCL/NW):** Since the short-term debts like borrowing from banks and creditors have prior and equal claim to long-term debt lenders at the time of liquidation, their relationship with the owner is important (Ambadkar, 2010). Hence, TCL/NW presents the percentage of creditors fund that a company uses against their self-generated funds.

**Short Term Borrowings/Net Worth (STB/NW):** The STB/NW excludes Other Current Liabilities and Provisions, and will show the proportion of Short-Term Borrowings against net worth of the shareholders.

**Long-Term Debt/Total Asset (LTD/TA):** This measure represents that how much assets of the company are being financed by the long-term debt. It has been followed by Bevan & Danbolt (2000), Pandey (2001), Bhaduri (2002), Buferna et.al. (2005), De Jong et.al (2008) and Ambadkar (2010).

**Long-Term Bank Borrowings/Total Assets (LTBB/TA):** According to Bevan & Danbolt (2000) and Ambadkar (2010), this measure is important to find the role of long-term bank borrowings in financing the assets of the companies in India.

**Long-Term Debt/Net Worth (LTD/NW):** This is the most accepted measure to express the relationship between debt funds and equity funds that construct the capital structure of a company. This measure has been followed by Titman & Wessels (1988), Mittal & Singla (1992), Kantawala (1997), Kakani (1999), Garg & Shekhar (2002) and Ambadkar (2010) as an analytical tool for Capital Structure.

**Long-Term Debt/Capital Employed (LTD/CE):** This measure is used by Huang & Song (2002) and Ambadkar (2010) which analyses the proportion of long-term debt verses capital employed. Capital employed is another important indicator of any company's investment. It is the total amount of funds used for running the business with the intent to earn profits.

**Long-Term Debt/Total Current Liabilities (LTD/TCL):** This ratio shows the proportion of long-term and short-term debt used by the companies. Following the Ambadkar (2010) this measure will help to represent the change in the composition of debt of the Indian automobile companies over the years.

**Total Debt / Total Assets (TD/TA):** Following Rajan & Zingales (1995), Bevan & Danbolt (2000), Bhaduri (2002), Drobetz & Fix (2005), Bhole & Mahakud (2004) and Ambadkar (2010) this measure has been selected which shows the extent to which the company's total assets are financed by total debts.

**Total Borrowing/Total Assets (TB/TA):** Here, the total borrowings include long-term and short-term borrowings. Rajan & Zingales (1995), Drobetz & Fix (2005), Buferna et. Al (2005) and Ambadkar (2010) has selected this ratio as one of the measures of total debt to know the extent to which the company's assets are financed through borrowed funds.

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**Total Debt/Net Worth (TD/NW):** It is also important to analyse the proportion of total debt that a company raised against the shareholders' fund. This measure will give an enhanced picture of how much total external funds has been employed by a company against its internal funds.

**Total Borrowing/Net Worth (TB/NW):** This measure shows the proportion of long-term and short-term borrowings (excluding other current liabilities and provisions) versus shareholders' fund.

### **Determinants of Capital Structure of Automobile Industry**

The study, after the intensive review of literature, selected eleven determinants of capital structure to be studied in respect of Indian automobile industry post the financial crises of 2008-09.

**Size:** The effect of size on leverage is ambiguous. Some of the empirical studies show that size has a positive relation with leverage and support the trade-off theory which predicts an inverse relationship between size and probability of bankruptcy and hence a positive relationship between size and leverage [Remmers et. Al (1974), Rajan & Zingales (1995), Huang & Song (2002), Buferna et. Al (2005), Song (2005), Ambadkar (2010), R. Deepa (2011), Mukherjee & Mahakud (2012)]. Whereas other studies show a negative relation supporting pecking order theory which predicts that larger firms exhibiting increasing preference for internal funds relative to debt [Titman & Wessel's (1988), Chen (2003), Purohit and Khanna (2012), Alipour et al (2015), Sharma and Chadha (2015), Tripathi Vibha Deepakkumar (2018)].

**Profitability:** The Static trade off theory shows an inverse relationship between profitability and cost of distress, and therefore exhibits a positive relationship with leverage. Long and Matliz (1985), Peterson and Rajan (1994), Singh (1995), Pandey (2004), Buferna et al. (2005) and R Deepa (2011) supported static trade off theory by confirming a positive relationship between them. Whereas, Titman and Wessels (1988), Rajan and Zingales (1995), Kakani (1999), Booth et al. (2001), Bahudri (2002), Chen (2003), Bevan and Denbolt (2004), Carmelita (2004), Chakraborty (2010), Ambadkar (2010) and Tripathi Vibha Deepakkumar (2018) confirmed the predictions of pecking order theory which suggests that firm prefers to first use retained earnings, followed by debt and then equity to finance its projects, and therefore show existence of negative relation between leverage with profitability.

**Tangibility:** Creditors demand high interest rates and put strict terms & conditions for firms having less assets to use as collateral. To avoid these strict conditions, firm may opt for equity financing rather debt financing (Ambadkar, 2010). The Trade-off Theory also suggests that a high ratio of tangible assets reduces the cost of debt and increases the debt capacity

of a firm. Rajan & Zingales (1995) and Tripathi Vibha Deepakkumar (2018) also supported this theory. Kakani (1999) and Song (2005) found that tangibility has positive relation with total debt and long-term debts but former found insignificant and later negative relation with short-term debt. The pecking order theory suggests that due to the presence of agency cost, a firm with less tangibility may opt for higher level of debt as it serves to curb managers tendency to spend the organizational cash on their personal perquisites by reducing the availability of free cash for wasteful expenses. De Angelo and Masulis (1980), Kunt & Maksimovic (1994), Carmelita (2004), R. Deepa (2011) also supported the pecking order theory. Whereas, there are some empirical results which showed insignificant association between the two [Titman & Wessel (1988) and Bhaduri (2002)].

**Volatility:** According to trade-off and pecking order theories, firms having variable earnings use lower debt to avoid the risk of bankruptcy and suggest an inverse association between volatility and leverage. The pecking order theory also stated that a firm with high volatility in earnings accumulates its cash during good years to avoid under-investment problems in the future (Myers, 1977). Many authors found the same results and supported these theories [Mittal & Singla (1992), Bhat (1980), Kakani (1999), Pandey (2001), Gonenc (2005)]. Whereas, Huang & Song (2002) and Ambadkar (2010) discovered positive relation between the debt and volatility indicating that firms having volatile earnings tend to borrow more debts. Some studies like Ferri & Jones (1979), Titman & Wessel (1988), Baral (2004), R. Deepa (2011) highlighted insignificant relationship between the firm's leverage and variations in its income.

**Growth:** According to Trade off theory, growth has negative relationship with leverage because growth opportunities possess high risk and return relationship which leads to higher bankruptcy cost and therefore avoid raising funds via debt financing. Whereas, Pecking Order Theory suggests a positive relationship by reasoning that higher growth means greater need of funds and hence requires to raise funds from debt source as well. Pandey (2001), Bevan & Danbolt (2000), Kakani (1999), Baral (2004), Deepa R. (2011) supported the pecking order theory and found significant positive relationship with all the debt ratios. Whereas, Titman & Wessel (1988) stated a negative relation between growth and leverage with the reasoning that growth opportunities cannot be collateralized to raise funds and do not generate instant income. Ambadkar (2010) stated that to avoid agency costs, a growing firm may issue short-term debt rather than long-term debt. Bhat (1980), Song (2005), Tripathi Vibha Deepakkumar (2018) found that growth rate has no significant relationship with leverage.

**Non-Debt Tax Shield (NDTS):** DeAngelo and Masulis (1980) argued that since the tax shield is available on both debt and

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NDTS, firms can go for lower level of debt in their capital structure to avoid the additional cost of debt capital and probability of bankruptcy from an additional unit of debt. With the same argument, the Trade-off theory also suggests a negative relationship between leverage and NDTS. Tripathi Vibha Deepakkumar (2018) also supported the theory and found an inverse relationship between them. Kakani (1999), Huang & Song (2002), Song (2005) found that NDTS has positive effect on short-term debt and negative on long-term debt ratios. Whereas, Ambadkar (2010) found that NDTS is negatively related with short-term debt and positively with long-term & total debt. But Titman & Wessel's (1988), Carmelita (2004) and R. Deepa (2011) found insignificant relation between the two.

**Debt Service Capacity (DSC):** The DSC is used to determine the capacity of a firm to pay its fixed payments on its outstanding debt. It gives information to its lenders whether the firm is in a state to bear the interest expenses even if its profits suffer significant fall in any upcoming year. Higher the DSC ratio, more debt a firm can have in its capital structure. Therefore, a positive relationship between DSC and leverage is suggested by Bhat (1980), Mittal & Singla (1992) and Tripathi Vibha Deepakkumar (2018). Whereas, Carmelita (2004) found a negative relationship between them, stating that firms might like to avoid financial distress involved in debt financing. Baral (2004) and Ambadkar (2010) found a statistically insignificant relationship of DSC with the leverage.

**Age:** Age is the proxy to capture the creditworthiness and reputation of a firm. Ambadkar (2010) stated that lenders may doubt the credibility of young companies, therefore young age firms face difficulty in raising funds from debt source and rely more on equity funds. Whereas a mature firm who has established its reputation in the market has easy access to debt funds. This suggests a positive relation between firm's age and leverage. R. Deepa (2011) also found that the age of the industry has highly significant positive correlation with short-term debt and total debt. But Guha & Kar (2006) found that age has negative effect on debt. Bhaduri (2002) stated that young firms have large probability of asymmetric information problem and therefore use more leverage.

**Uniqueness:** Bhaduri (2002) indicated that firm with unique products find it difficult to borrow because of their specific use of capital and less tangible assets, and found a negative relation between the uniqueness and leverage. Titman and Wessel's (1988) gave a model that links a firm's liquidation decision to

its bankruptcy status. They argued that customers, workers, and suppliers of firms that produce unique or specialized products probably suffer relatively high costs at the time of liquidation because their workers and suppliers have job specific skills and their customers may find it difficult to find alternative product for their relatively unique products, and therefore uniqueness is expected to be negatively related to debt ratios. The trade-off theory also predicts negative relation between the uniqueness and leverage. Ambadkar (2010) and Tripathi Vibha Deepakkumar (2018) found a positive relationship between the two. Kakani (1999) also found a positive relationship between uniqueness and short-term and total debt of the firms. Carmelita (2004) indicated a weak positive relation of uniqueness with leverage.

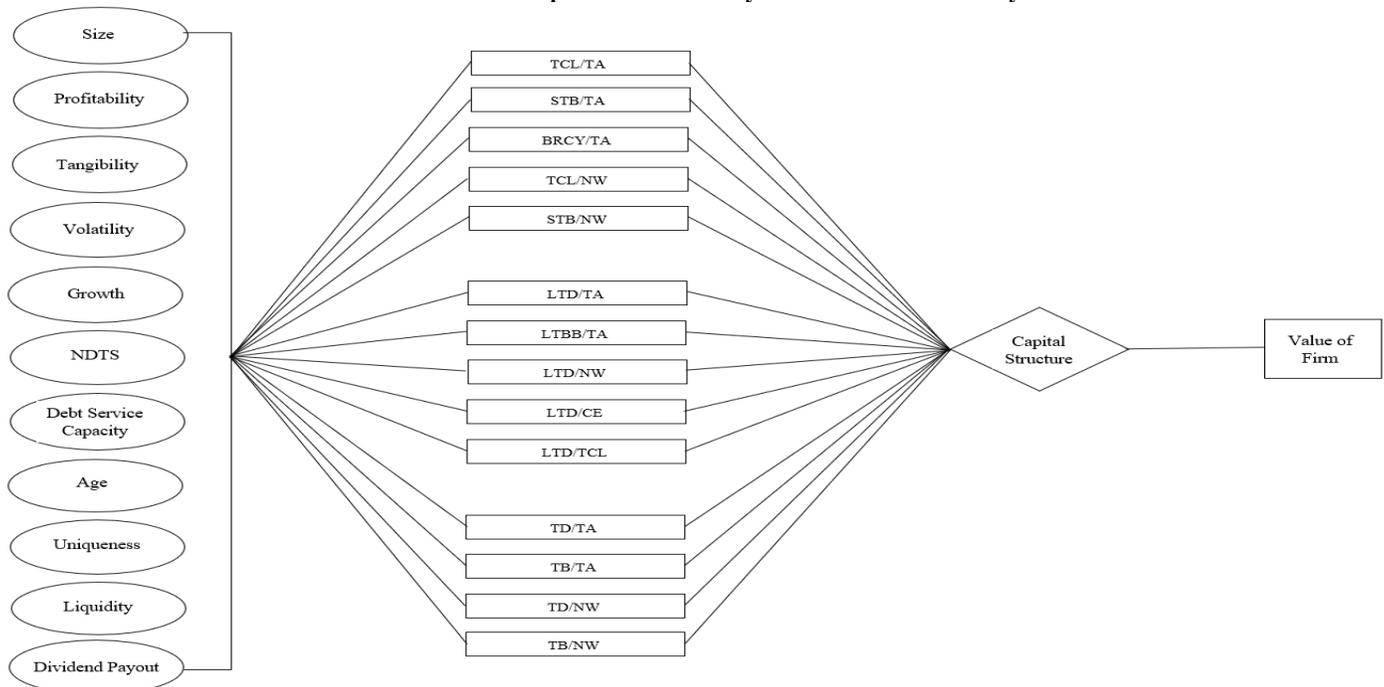
**Liquidity:** Liquidity is the amount that is readily available for investment and spending. The pecking order theory postulates that firms with greater liquid assets can use them as another internal source of funds instead of debt, leading to lower levels of debt and thus suggested a negative relationship between liquidity and leverage. Whereas, the trade-off theory shows a positive relationship, as firms with higher liquidity shows the ability of the firms to satisfy the short-term liabilities and thus, increases the debt issuing capacity of that firm. Carmelita (2004) and Ambadkar (2010) supported the pecking order theory and posited a negative relation between the two. Zuhair A. Bazaz (2015) found puzzling relationship and confirmed applicability of both trade-off and pecking order theories due to the positive relationship of liquidity with total debt and negative with long-term debt and short-term debt.

**Dividend:** Dividend is the part of earnings that is paid to the shareholders. The larger is the amount of the dividend, the lesser will be left as retained earnings to finance the future investments, in which case, firms will go for debt issue to arrange funds for their future investments. This has also been suggested by the pecking order theory and indicated the positive relationship between dividends and debt. Whereas, the trade-off theory suggested a negative relation between them, reasoning that the dividend pay-out can be higher only when the firm adopts lower level of leverage in its capital structure, subsequently has to pay lower cost of debt and saves larger part of earnings to be distributed as dividend. Ambadkar (2010) and Zuhair A. Bazaz (2015) also found that dividend pay-outs possess a statistically significant inverse relationship with different leverage ratios. But Tong & Green (2005) supported the pecking order theory and found a positive association between dividend and debt.

**Table 1: Representing the Summary of Variables.**

S. No.	Dependent Variables	Independent Variables			
		Determinant of Capital Structure	Acronyms	Measurement	Researchers Followed the Measurement
1	TCL/TA, STB/TA, BRCY/TA, TCL/NW, STB/NW, LTD/TA, LTBB/TA, LTD/NW, LTD/CE, LTD/TCL, TD/TA, TB/TA, TD/NW and TB/NW	Size	SIZE	Natural Logarithm of Sales	Bhat (1980), Titman & Wessel's (1988), Bevan & Danbolt (2000), Booth et.al (2001), Manos & Green (2001), Pandey I.M (2001), Huang & Song (2002), Drobetz & Fix (2005), Baral (2004), Carmelita (2004), Song (2005), Guha & Kar (2006), Rupali S. Ambadkar (2010), R. Deepa (2011), Tripathi Vibha Deepakkumar (2018)
2		Profitability	PROF	PBITDA / TA	Tripathi Vibha Deepakkumar (2018)
3		Tangibility	TANG	Net Fixed Assets / Net Total Assets	Bevan & Danbolt (2000), Pandey I.M (2001), Huang & Song (2002), Drobetz & Fix (2005), Gupta (2004), Carmelita (2004), Song (2005), Bufermaet.al (2005), Rupali S. Ambadkar (2010), Tripathi Vibha Deepakkumar (2018)
4		Volatility	VOL	S.D of PBITDA / TA	R. Deepa (2011)
5		Growth	GROW	Year on Year Growth in Sales	Carmelita (2004), Tripathi Vibha Deepakkumar (2018)
6		Non-debt Tax Shield	NDTS	Dep & Amort / TA	Carmelita (2004), Chakraborty (2010) and R. Deepa (2011)
7		Debt Service Capacity	DSC	PBITDA / Interest Expense	-
8		Age	AGE	Total Number of Years from the Date of Incorporation	Akhtar & Oliver (2005), Hall et al. (2004), Ahmed, Ahmed, & Ahmed, (2010), R. Deepa (2011)
9		Uniqueness	UNIQ	Research & Development Expenditure / Net Sales	Titman & Wessel's (1988), Bhaduri (2002), Song (2005), Ruplai S. Ambadkar (2010)
10		Liquidity	LIQ	CA / CL	Carmelita (2004), Rupali. S Ambadkar (2010), Rasoolpur (2012), and Zuhaib A. Bazaz (2015)
11		Dividend	DIV	Equity Dividends / Profit after tax	Bhat (1980), Baral (2004) and Rupali S. Ambadkar

**Framework for capital structure analysis of automobile industry.**



The above framework is built on eleven independent variables and fourteen dependent variables which are selected from the intensive review of literature. According to this framework, the capital structure analysis starts with the analysis of the relationship of all the independent variables (SIZE, PROF, TANG, VOL, GROW, NDTs, DSC, AGE, UNIQ, LIQ and DIV) with each dependent variable (TCL/TA, STB/TA, BRCY/TA, TCL/NW, STB/NW, LTD/TA, LTBB/TA, LTD/NW, LTD/CE, LTD/TCL, TD/TA, TB/TA, TD/NW and TB/NW) to identify the significance of selected capital structure determinants on each leverage ratio. Then, at the second stage analysis, the fourteen leverage ratios are to be treated as independent variables, indicating the capital structure of automobile industry, and value of firm as the dependent variable to identify the impact of capital structure on value of firm of Indian Automobile Industry.

### Research Model of Panel Data

The general regression models of panel data are developed to ascertain the impact of selected determinants on various leverage measures and eventually the impact of capital structure on the value of firm. These models will provide information on individual behaviour, both across individuals and over time, and lead to a comprehensive study of capital structure of Indian Automobile Industry post the financial crisis of 2008-09.

### Model to Study the Determinants of Capital Structure

The first model is developed to test the relationship of selected determinants with each debt ratios individually and find out how much influence these determinants have on the capital structure of Indian Automobile Industry.

$$LEV_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 PROF_{i,t} + \beta_3 TANG_{i,t} + \beta_4 VOL_{i,t} + \beta_5 GROW_{i,t} + \beta_6 NDTs_{i,t} + \beta_7 DSC_{i,t} + \beta_8 AGE_{i,t} + \beta_9 UNIQ_{i,t} + \beta_{10} LIQ_{i,t} + \beta_{11} DIV_{i,t} + e_{i,t}$$

Here,

- LEV = Leverage ratios i.e., TCL/TA, STB/TA, BRCY/TA, TCL/NW, STB/NW, LTD/TA, LTBB/TA, LTD/NW, LTD/CE, LTD/TCL, TD/TA, TB/TA, TD/NW and TB/NW
- $B_0$  = Constant term of the model
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_n$  are the coefficients of the independent variables.
- SIZE, PROF, TANG, VOL, GROW, NDTs, DSC, AGE, UNIQ, LIQ and DIV are the independent variables.
- $e = e$  is the error term.

### Model to Study the Capital Structure and Firm's Value

The second model will unveil the relationship between independent variables i.e., the capital structure of the industry, and the dependent variable i.e., VOF. This will analyse whether the capital structure of Indian Automobile Industry has any

significant impact on its value of firm, especially after the financial crisis of 2008-09.

$$VOF_{i,t} = \beta_0 + \beta_1 TCL/TA_{i,t} + \beta_2 STB/TA_{i,t} + \beta_3 BRCY/TA_{i,t} + \beta_4 TCL/NW_{i,t} + \beta_5 STB/NW_{i,t} + \beta_6 LTD/TA_{i,t} + \beta_7 LTBB/TA_{i,t} + \beta_8 LTD/NW_{i,t} + \beta_9 LTD/CE_{i,t} + \beta_{10} LTD/TCL_{i,t} + \beta_{11} TD/TA_{i,t} + \beta_{12} TB/TA_{i,t} + \beta_{13} TD/NW_{i,t} + \beta_{14} TB/NW_{i,t} + e_{i,t}$$

Here,

- VOF = Dependent variable i.e., Value of Firm
- $B_0$  = Constant term of the model.
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_n$  are the coefficients of the independent variables.
- TCL/TA, STB/TA, BRCY/TA, TCL/NW, STB/NW, LTD/TA, LTBB/TA, LTD/NW, LTD/CE, LTD/TCL, TD/TA, TB/TA, TD/NW and TB/NW are the independent variables.
- $e = e$  is the error term.

### IV. Conclusion

Automobile Industry, being a capital-intensive sector, require heavy investment for their expansion and therefore needs to be circumspect about its capital structure decisions. Hence, it is necessary to do a scrupulous study of the capital structure of this industry especially after the financial crisis of 2008-09. For the achievement of set objectives, the study went through an intense review of literatures and identified eleven determinants of capital structure i.e., SIZE, PROF, TANG, VOL, GROW, NDTs, DSC, AGE, UNIQ, LIQ and DIV, and fourteen leverage ratios i.e., TCL/TA, STB/TA, BRCY/TA, TCL/NW, STB/NW, LTD/TA, LTBB/TA, LTD/NW, LTD/CE, LTD/TCL, TD/TA, TB/TA, TD/NW and TB/NW. To analyse these variables, the paper constructed a framework that will direct the analysis process and lead to an in-depth study of capital structure of Indian Automobile Industry. Further, the paper also developed two panel data regression models to study the association of the identified variables. The first model will help to unveil the relationship between the capital structure and its determinants, and the eventual model will help to identify the impact of capital structure on the value of firm of Automobile industry after the 2008-09 financial crisis.

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# THE RISE AND FALL OF BHUSHAN STEEL LIMITED: A CASE STUDY

**Amit Kumar Arora\***

*Bhushan Steel Limited (BSL) was incorporated in 1983 and in a very less time company become one of the major players in the steel industry by capturing a large market share. The objective of the study is to do a critical analysis of the failure of the BSL. What were the factors behind the failure? Does for the banks it was possible to avoid the NPA's by not giving loans to the company after analyzing the Altman's Z score to measure the financial stability of the organization. The study used secondary data from sources like CMIE Prowess IQ and EMIS Database and Annual Reports of the company. The study discussed the reasons behind the failure of the company. The study recommends to the banks for assessing the creditworthiness of a company to use Altman's Z score so that the banks can avoid NPA's.*

**Key Words:** Altman's Z score, Steel Industry, TBSL, Insolvency

**JEL Classification Code:** G32, G34, M41.

Steel Industry plays a major role in the economy of the country. This industry has the advantage that its raw material is available in the domestic location and the availability of cheap manufacturing labour. Bhushan Steel Limited (BSL) was incorporated in 1983 as Jawahar Metal Industries Pvt. Ltd. BSL was manufacturing cold-rolled steel sheets, CRCA, hard density sheets, galvanized sheets, strips etc. BSL was one of the major players in the steel industry capturing a large market share. BSL was providing the product for most of the automotive industry. Everything was going good the company was growing very fast and expanding. To complete the dream of expansion, the company started taking loan more and more without bothering the increasing burden of payment of interest. Everything was going good up to the year 2008 but due to a decrease in the demand for steel in the international market and due to decrease in the price of steel and due to the overburden of the debt company's performance start declining. Against the company, few cases were filled such as a case that had been filed before the National Green Tribunal (NGT) against the BSL that the company is contaminated the groundwater during the processes of the company. The case has been filed against the company that company is using groundwater without the permission of CGWA. During the investigation, NGT has passed the order for the closure of the plant for four weeks. So to run the plant processes company has to take permission from the Central Groundwater Authority (CGWA). Another Case is that SBI was among the one of the banker of the BSL in 2008 the lawyer of SBI state that BSL is not in a financial condition to pay the thousands of Crore loan and debt. Serious Fraud Investigation Office (SFIO) took the charge to investigate the case. The promoters of the company asked for the same, the promoters' blame that it is due to the global Recession and poor regulation. In

reality, there was fraud in the company, the financial statement was showing the overvaluation of the assets, and on behalf of that, they are getting a loan from various sources. As the assets which they used as collateral were overvalued and interest on which are increasing and increased up to a level at which company fails to pay it. This creates a negative impact on the company, and cause a financial crisis for the company.

The company took more loan on the assets that were not in existence, and due to more loan, interest on the loan was increasing and the condition comes when the company was unable to pay the loan. There was a bankruptcy Fraud that occurred in the company and whenever there is a banking fraud or bankruptcy in a company NCLT took over the charge of the company. NCLT investigate the case, NCLT appoints Insolvency Professional (IP). When NCLT appoints IP the boards of directors are suspended and IP took the charge and supervise the company. All the business, Assets, liability, management, corporate relations are handled by the IP. IP investigate whether the company should be liquidated or performance can be improved to pay for the loan. IP investigate that a change is required in the management and the process of the company so that the company finances can be improved and the company can be going further for growth. On July 26, 2017, Corporate Insolvency Resolution Process (CIRP) initiated and on 18 May 2018 Tata Steel announced the completion of its acquisition of Bhushan Steel Limited and become Tata Steel BSL Limited (TBSL). The objective of the study is to a critical analysis of the failure of

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the BSL. What were the factors behind the failure? Does for the banks it was possible to avoid the NPA's by not giving loans to the company after analyzing the Altman Z score to measure the financial stability of the organization.

**Company's Journey:**

The following diagram is showing the journey of the BSL from its starting year i.e. 1983 to its growth and its acquisition by Tata steel.

Diagram 1: Company's Journey.



Source: Author's Compilation

**Research Methodology**

The study examines past annual reports and financial statements of BSL. The study used secondary data from sources like CMIE Prowess IQ and EMIS Database and Annual Reports of the company. The methodology involves the study of ratio analysis, earning per share, capital structure and calculation of Altman's Z score.

**Analysis of data**

**Ratio Analysis**

The study considered three main private sector steel companies and one Government owned steel industry in addition to the BSL. The summary of various ratios and expenses as a ratio of sales are given in table-1.

**Table-1: Various Ratio of major competitor companies in Steel Sector.**

Current Ratio												
Company/Year	2018-03-31	2017-03-31	2016-03-31	2015-03-31	2014-03-31	2013-03-31	2012-03-31	2011-03-31	2010-03-31	2009-03-31	2008-03-31	Average
BSL Ltd.	0.13	0.26	0.26	1.04	0.82	1.08	0.91	0.65	1.76	1.47	1.02	<b>0.85</b>
JSW	1.07	0.83	0.67	1.18	0.94	1.09	0.91	0.98	0.72	0.53	0.69	0.87
SAIL	0.65	0.54	0.60	0.84	0.92	1.10	1.31	1.34	1.90	1.89	1.98	1.19
Vedanta	0.45	0.38	0.31	0.55	0.71	0.40	0.47	2.20	3.87	2.88	2.27	1.32
TATA Steel Ltd.	0.77	0.66	0.57	0.69	0.62	0.94	0.97	1.63	1.36	1.06	5.36	1.33
<b>Average</b>	<b>0.74</b>	<b>0.60</b>	<b>0.54</b>	<b>0.82</b>	<b>0.80</b>	<b>0.88</b>	<b>0.92</b>	<b>1.54</b>	<b>1.96</b>	<b>1.59</b>	<b>2.58</b>	<b>1.18</b>
Quick Ratio												
BSL Ltd.	0.07	0.15	0.16	0.46	0.39	0.58	0.55	0.24	0.85	0.81	0.54	<b>0.44</b>
JSW	0.68	0.49	0.37	0.76	0.65	0.79	0.61	0.58	0.39	0.29	0.34	0.54
SAIL	0.3	0.23	0.27	0.39	0.46	0.53	0.72	0.95	1.46	1.35	1.47	0.74
Vedanta	0.29	0.30	0.25	0.31	0.52	0.22	0.26	1.80	3.49	2.46	1.49	1.04
TATA Steel Ltd.	0.41	0.31	0.28	0.30	0.35	0.66	0.72	1.38	1.02	0.76	4.98	1.02
<b>Average</b>	<b>0.42</b>	<b>0.33</b>	<b>0.29</b>	<b>0.44</b>	<b>0.50</b>	<b>0.55</b>	<b>0.58</b>	<b>1.18</b>	<b>1.59</b>	<b>1.22</b>	<b>2.07</b>	<b>0.83</b>
Debt to Equity Ratio (%)												
BSL Ltd.	-55.72	3.00	967.09	488.92	347.85	297.27	267.92	261.91	285.70	396.53	351.82	<b>328.39</b>
JSW	113.67	137.91	150.01	100.14	102.84	82.98	66.51	71.58	119.36	141.63	98.30	107.72
SAIL	117.66	108.03	84.37	64.87	56.88	52.41	40.43	51.41	49.56	26.94	13.20	60.52
Vedanta	36.59	45.83	38.68	102.43	100.27	34.56	27.87	8.38	26.71	0.04	0.00	38.31
TATA Steel Ltd.	44.73	60.83	43.98	39.32	42.73	46.93	45.03	55.91	68.28	89.30	66.01	54.82
<b>Average</b>	<b>78.16</b>	<b>88.15</b>	<b>79.26</b>	<b>76.69</b>	<b>75.68</b>	<b>54.22</b>	<b>44.96</b>	<b>46.82</b>	<b>65.98</b>	<b>64.48</b>	<b>44.38</b>	<b>65.34</b>
Interest Coverage Ratio												
BSL Ltd.	0.07	0.23	0.07	0.50	1.04	1.93	2.28	3.93	3.72	1.32	0.58	<b>1.42</b>
JSW	2.98	2.34	1.09	2.09	2.21	2.51	1.08	1.74	2.13	0.95	3.25	2.03
SAIL	0.55	-1.05	-2.30	1.98	2.28	4.30	6.61	12.54	20.23	30.28	41.93	10.67
Vedanta	0.99	0.94	0.42	0.99	0.23	0.41	6.00	45.93	29.11	663.71	1197.26	176.91
TATA Steel Ltd.	4.29	3.10	3.61	4.05	5.98	5.05	5.39	5.96	4.04	7.12	10.54	5.38
<b>Average</b>	<b>2.20</b>	<b>1.33</b>	<b>0.71</b>	<b>2.28</b>	<b>2.68</b>	<b>3.07</b>	<b>4.77</b>	<b>16.54</b>	<b>13.88</b>	<b>175.52</b>	<b>313.25</b>	<b>48.75</b>
Net Profit Margin (%)												
BSL Ltd.	-142.57	-23.30	-25.37	-10.68	0.58	7.70	10.30	14.36	15.07	8.52	10.14	<b>-12.30</b>
JSW	6.98	6.29	-8.64	4.30	2.71	4.63	5.06	8.68	11.11	3.27	15.13	5.41
SAIL	-0.82	-5.69	-9.17	4.09	5.00	4.34	7.21	10.30	15.33	12.52	16.32	5.40
Vedanta	15.78	28.72	-33.05	5.62	3.58	5.28	25.48	45.43	46.10	40.92	46.02	20.90
TATA Steel Ltd.	6.89	6.47	11.48	13.82	13.85	11.96	18.10	21.52	20.17	19.38	23.80	15.22
<b>Average</b>	<b>7.21</b>	<b>8.95</b>	<b>-9.85</b>	<b>6.96</b>	<b>6.29</b>	<b>6.55</b>	<b>13.96</b>	<b>21.48</b>	<b>23.18</b>	<b>19.02</b>	<b>25.32</b>	<b>11.73</b>
Return on Capital Employed (%)												
BSL Ltd.	-1.65	3.76	0.86	3.07	4.79	7.75	9.79	9.98	5.74	3.76	1.53	<b>4.49</b>
JSW	17.95	15.84	6.97	11.23	12.82	11.17	3.89	5.74	11.81	6.42	11.92	10.52
SAIL	2.37	-4.80	-9.35	4.81	3.77	5.71	8.44	12.51	16.08	20.43	35.00	8.63
Vedanta	4.09	3.59	1.47	6.48	1.49	1.36	17.87	31.35	19.29	55.85	72.18	19.55
TATA Steel Ltd.	12.74	10.07	5.37	8.42	12.20	11.44	13.45	13.99	11.02	16.73	23.04	12.59
<b>Average</b>	<b>9.29</b>	<b>6.18</b>	<b>1.12</b>	<b>7.74</b>	<b>7.57</b>	<b>7.42</b>	<b>10.91</b>	<b>15.90</b>	<b>14.55</b>	<b>24.86</b>	<b>35.54</b>	<b>12.82</b>
Salaries and Employee Benefits to Net sales (%)												
BSL Ltd.	3.41	3.26	3.32	2.19	1.78	1.47	1.45	1.76	2.51	2.04	1.77	2.27
JSW	1.90	2.05	2.33	1.88	1.62	1.73	1.95	2.31	2.01	2.06	2.40	2.02
SAIL	15.01	17.98	22.14	19.04	18.29	17.28	15.54	16.01	12.29	17.23	17.15	17.09
Vedanta	1.74	2.03	1.96	1.89	1.86	8.07	2.90	1.97	2.58	1.78	1.73	2.59
TATA Steel Ltd.	7.98	8.65	10.13	9.88	7.93	8.53	8.23	8.89	9.44	8.59	-	8.83
<b>Average</b>	<b>6.66</b>	<b>7.68</b>	<b>9.14</b>	<b>8.17</b>	<b>7.43</b>	<b>8.90</b>	<b>7.16</b>	<b>7.30</b>	<b>6.58</b>	<b>7.42</b>	<b>7.09</b>	<b>7.59</b>
Administrative Expenses to Net Sales (%)												

BSL Ltd.	14.22	11.62	10.69	5.64	3.48	2.71	4.29	5.12	2.03	3.20	1.81	5.89
JSW	7.70	9.07	10.23	9.01	6.92	6.50	4.36	4.75	5.06	7.03	7.14	7.07
SAIL	13.67	13.43	15.69	12.02	10.98	10.40	8.74	8.66	4.25	1.10	1.40	9.12
Vedanta	8.88	9.99	6.23	6.04	7.81	35.80	36.91	28.09	38.25	33.05	21.79	21.17
TATA Steel ltd.	24.30	25.97	24.68	22.57	21.51	21.12	20.71	18.34	5.34	4.46	-0.18	17.17
<b>Average</b>	<b>13.64</b>	<b>14.62</b>	<b>14.21</b>	<b>12.41</b>	<b>11.81</b>	<b>18.46</b>	<b>17.68</b>	<b>14.96</b>	<b>13.23</b>	<b>11.41</b>	<b>7.54</b>	<b>13.63</b>
<b>Depreciation and Amortization to Net sales (%)</b>												
BSL Ltd.	10.26	11.22	13.18	8.00	9.09	7.04	6.24	3.97	3.73	4.74	5.06	7.50
JSW	4.61	5.32	6.97	5.53	5.53	5.08	5.32	5.95	6.17	5.91	6.02	5.67
SAIL	5.20	5.38	5.48	3.47	3.28	2.81	3.07	3.12	3.04	2.61	2.68	3.65
Vedanta	6.18	7.75	11.90	2.95	5.00	6.46	1.27	1.10	1.25	0.93	1.31	4.19
TATA Steel ltd.	6.16	6.65	4.53	4.29	4.16	3.88	3.11	3.59	4.33	3.63	4.24	4.42
<b>Average</b>	<b>5.54</b>	<b>6.28</b>	<b>7.22</b>	<b>4.06</b>	<b>4.49</b>	<b>4.56</b>	<b>3.19</b>	<b>3.44</b>	<b>3.70</b>	<b>3.27</b>	<b>3.56</b>	<b>4.48</b>
<b>Interest paid to Net sales (%)</b>												
BSL Ltd.	36.23	36.11	35.06	21.25	15.69	10.91	10.52	6.38	3.74	5.10	3.28	<b>16.75</b>
JSW	5.42	6.40	7.88	5.77	5.56	4.44	3.69	3.00	4.74	5.69	3.86	5.13
SAIL	4.79	5.08	5.24	2.84	1.85	1.50	1.33	1.00	0.88	0.50	0.51	2.32
Vedanta	8.48	10.11	9.99	10.65	11.85	20.50	6.37	1.14	1.17	0.07	0.05	7.31
TATA Steel ltd.	4.64	5.05	3.42	4.24	3.93	4.44	5.20	5.44	6.03	4.29	4.46	4.65
<b>Average</b>	<b>5.83</b>	<b>6.66</b>	<b>6.63</b>	<b>5.88</b>	<b>5.80</b>	<b>7.72</b>	<b>4.15</b>	<b>2.65</b>	<b>3.21</b>	<b>2.64</b>	<b>2.22</b>	<b>4.85</b>

Source: EMIS

In the above table, we have computed the yearly average of all company from 2008-2018 and an aggregate average of each company excluding Bhushan steel limited.

**The current ratio and liquid ratio** shows the short term solvency position of the organization. From the above table, we can interpret that almost in all the years the current ratio and liquidity ratio of BSL Ltd. is less than the average of the industry. For the years 2016-2018, the ratio is too less which shows the incapability of the organization to pay the short term debts. This is a very critical condition of the organization and it is not a good indicator of the short term solvency of the organization.

**The debt Equity ratio** shows the long term solvency problem of the organization. From the above table, we can interpret that the company is having too high debt as compared to the other companies except the years 2017 & 2018. This is an indicator of high-interest obligation on the organization. As the debt is too high as compare to the other organizations the risk level for the investment in BSL Ltd. is also high.

**Interest Coverage Ratio** shows the capability of the organization to pay the interest expenses payable capabilities of the organization. A high ratio is the indicator of the capability of the organization to pay the interest amount. We can interpret from the above table that the ratio is too less in all the years. This is not a good indicator of the financial health of the organization.

**Net Profit Margin** shows the profitability of the organization. The higher the ratio better for the organization. From the

above table, we can interpret the average net profit margin of BSL Ltd. is too low as compared to the other organizations. From 2010 onwards the ratio is decreasing year by year and from 2015 onward it is negative. It is not a good indicator for the organization as without profits no organization can survive for the long period.

**Return on Capital Employed** shows the company's profitability and capital efficiency. The higher the ratio indicates strong profitability. From the above table, we can interpret that the ratio of the company is low as compared to other companies almost in all the years. This is again not a good indicator for the organization.

**Salaries and Employee Benefits to Net sales** shows the amount spent on the salaries and employee benefits as a ratio to net sales. The expense on salaries and employee benefits by BSL Ltd. is more or less similar to the other private organization except for TATA Steel Ltd.

**Administrative Expenses to Net Sales** shows the amount of expenditure on administrative expenses as a ratio to net sales. From the above table, we can interpret that the average expenditure of BSL Ltd. is comparatively low from other organization.

**Depreciation and Amortization to Net sales** show the amount of depreciation and amortization as a ratio to net sales. From the above table, we can interpret that the average amount of expenditure on depreciation and amortization is high as compared to the other organization. The amount is

almost double the average which is not a good sign for the organization.

**Interest paid to Net sales** shows the amount of expenditure on payment of the interest on borrowing by the organization as a ratio to net sales. From the above table, we can interpret that the amount of burden of interest payment to sales is very high for BSL Ltd. during all the years. The ratio is increasing year after year except in 2010. During the last three years, we

can see the interest paid by the organization is more than 35 of the sales. This is not a positive sign for the organization as the majority of the sales revenue is utilized for the payment of interest burden.

**Comparative analysis of Earning per Share (EPS)**

Earnings per share indicates how much money a company makes for one share. Higher EPS indicates a good amount of profit in an organization.

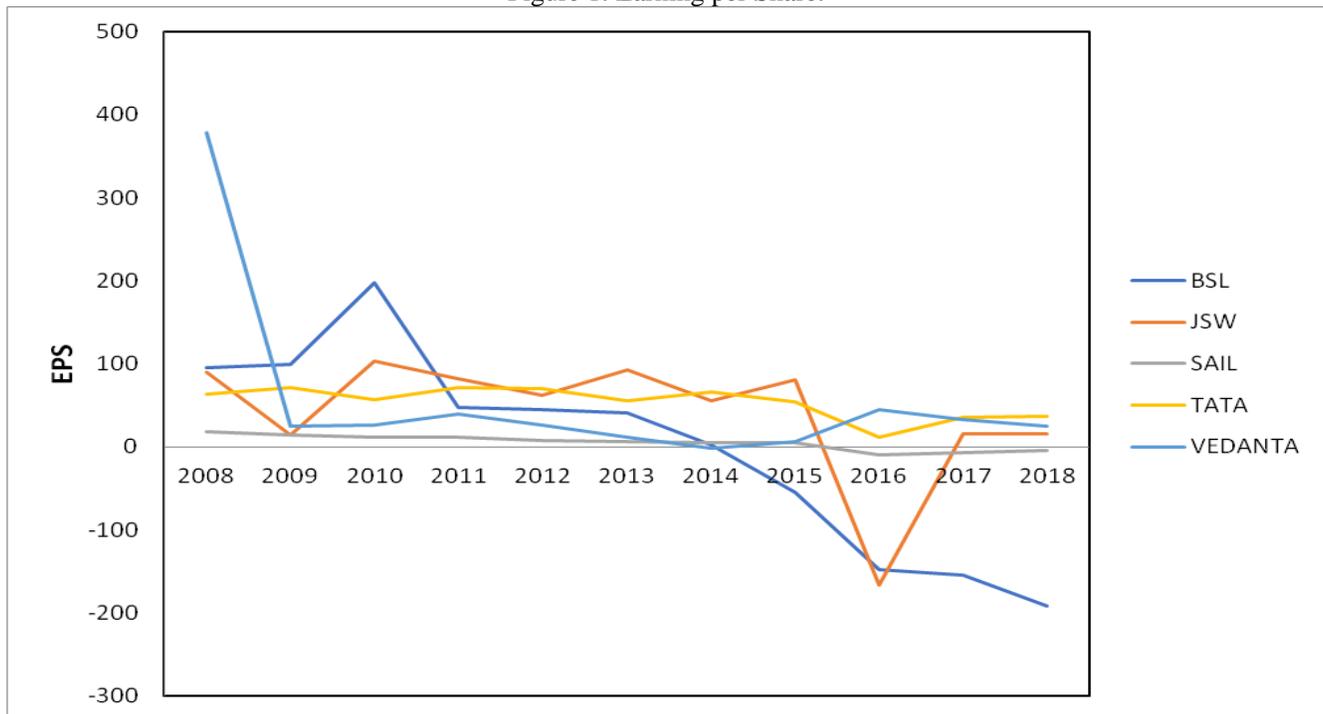
**Table 2: Earning per Share (EPS).**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average
BSL	94.74	99.04	197.78	47.22	44.79	41.33	2.78	-55.59	-147.39	-154.32	-191.27	-1.90
JSW	90.12	14.14	103.04	82.26	62.29	92.98	55.12	81.16	-166.79	15.26	15.47	40.46
SAIL	17.97	14.37	12.03	11.22	7.82	6.37	5.20	4.80	-9.71	-6.94	-4.86	5.30
TATA	63.77	71.29	56.62	71.79	70.68	55.28	66.36	53.61	11.26	36.01	37.22	53.99
VEDANTA	378.73	24.66	25.49	39.49	25.73	10.91	-1.33	6.44	45.18	32.60	24.80	55.70
Average	137.65	31.12	49.30	51.19	41.63	41.39	31.34	36.50	-30.02	19.23	18.16	38.86

Source: Prowess IQ

From the above table-2, we can analyse that the average EPS of BSL is negative for the period 2008 to 2018. Initially, the EPS of BSL was good as compare to other companies but from the year 2011 onwards it starts decreasing and from 2015 onwards it is negative.

**Figure 1: Earning per Share.**



Source: Prowess IQ

From the above figure, we can see that in the year 2009 and 2010 the EPS of BSL was highest and then it start continuous decreasing and become negative.

**Capital structure**

As we know the capital structure has a significant impact on the profitability of the organisation. We can see a very high debt-equity ratio as compared to the other companies in the

industry. Due to high debt, the interest expenses increased too much which create problems for the survival of the company. The higher cost of debt increases the weighted average cost of capital higher and higher.

**Altman’s Z score model**

In the year 1968, Altman suggested the Z score to measure the financial stability of the organization. In the year 2000 he suggested an alternative way of calculating Z score, which was used by a large majority, is stated under:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

Where:

- X1 = working capital/total assets
- X2 = retained earnings/total assets
- X3 = EBIT/total assets
- X4 = market value of equity/book value of total liability assets
- X5 = sales/total assets

**Table 3: Altman’s Z score of Bhushan Steel Ltd.**

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
X1	-1.25	-0.29	-0.25	-0.01	-0.05	0.01	-0.06	-0.11	0.05	0.03	0.05
X2	-0.55	-0.05	-0.05	-0.02	0.00	0.02	0.03	0.04	0.05	0.03	0.05
X3	-0.49	0.02	0.01	0.02	0.03	0.06	0.08	0.07	0.08	0.07	0.08
X4	0.01	0.02	0.02	0.03	0.31	0.41	0.26	0.37	0.41	0.14	0.32
X5	0.39	0.22	0.21	0.22	0.21	0.27	0.32	0.30	0.35	0.45	0.53
TOTAL	-1.88	-0.08	-0.07	0.25	0.50	0.77	0.63	0.67	0.94	0.72	1.02
Altman’s Z score	-3.48	-0.12	-0.13	0.28	0.45	0.75	0.69	0.69	0.98	0.85	1.11

Now after the Z score of Bhushan steel, it is compared to the Z-score indicator to determine the current financial status of the organisation. If the Z-score is less than 1.81 the company is likely to go bankrupt. If the Z-score is between 1.81 to 2.99 the company should be cautious and if the Z-score is above 2.99 we can interpret that the company is financially stable.

From the above, we can interpret that Altman's Z score of BSL is always below 1.81 which shows that the company was not financially stable and was in the danger zone. From the year 2016 onward the score is negative which make the situation worst. It was surprising why the banks kept on sanctioning the loan to this company which was not financially viable.

**Conclusions and Recommendations**

From the above ratios, we can conclude that the company was having a turbulent financial condition. The finance cost and other costs very too high as compared to the other companies in the industry. Despite heavy losses company raised more and more loan for expansion. A decrease in the steel price was also a cause of bad performance. EPS was negative, liquidity position was not good. The interest coverage ratio was too low to survive. The net profit margin was negative. All the above facts were very clear without any analysis anyone can tell by seeing the financial statement but it is surprising why the banks keep on giving the loan to a firm that was not financially sound. Study recommends to the banks for

assessing the creditworthiness of a company to use Altman's Z score so that the banks can avoid NPA's. Study also recommend to the organizations to keep close eye on the amount of debt as with the increased amount of debt there is increase in the interest payment burden also. So it is advised not to relay too much on debt as the reason behind most of the companies failed is excessive debt.

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## A Book Review On “No Rules Rules: Netflix and the Culture of Reinvention”

**Author:** Erin Meyer and Reed Hastings

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Rs. 1826/- for Hardcover

**Vivek Singh Tomar \***

Academic theories and practice of classroom concepts in businesses, the best of both worlds have been brought together in this book jointly authored by Erin Meyer, a business management professor at INSEAD and Reed Hastings co-founder, chairman and co- CEO of Netflix. This book has a unique narrative that includes the scientific explanation of the management concepts coupled with their application to solving the modern world problems for the diffusion of products/business ideas based on inventions and reinventions. Based on numerous interviews with current and past Netflix employees from around the globe and untold stories of hit and trials from Hastings's career, No Rules Rules is the captivating and enriching account of the philosophy behind one of the world's most innovative, imaginative, and successful global company Netflix. Reed Hastings in the introduction of the book compared Netflix with the Dallas based Blockbuster in the backdrop of the year 2000 when Netflix was little more than 2 years old. with losses of \$57 million in the year 2000. Both Reed Hastings and Marc Randolph the partners in Netflix tried to convince John Antioco to buy Netflix at \$50 million, an offer which was refused on their face. That year Blockbuster a \$6 Billion company, dominated the home entertainment business globally with over nine thousand stores and sixty thousand employees. Netflix along with around a hundred employees with meagre three hundred thousand subscribers of Netflix DVD rentals at home through the website was nothing as compared to Blockbuster. By the year 2002 Netflix went public and the world starts changing for them with steady business growth, but still Blockbuster was a giant, almost a hundred times bigger than Netflix. The things turnaround and by the year 2010 Blockbuster, a multibillion company owned by Viacom was declared bankrupt and Netflix emerged as a rising star in the home entertainment business, and then there was no looking back. Hasting attributed the success of Netflix against the giant Blockbuster to the adaptability with changing environment, which Blockbuster could not despite better

brand, power, vision, and resources. The adaptability supported by a culture that valued people over processes; stressed innovation over efficiency; and most importantly, having very few controls in the system. A culture focused on top performance driven by talent density where people are driven by context over controls. This philosophy in the words of Hastings enabled Netflix to evolve, grow and adapt to changing environment, which eventually morphed the employee's need around Netflix. The book also presents an equally fascinating commentary by Erin Meyer with her infamous opening remark, “Netflix culture is weird”. She emphasized her point by comparing Netflix with big and mighty companies that work hard on slick posters and slogans on annual reports, which appears big but sounds empty. Why? Because the people of those mighty companies may use best-articulated words to define their values, but the words rarely match the way people of those companies behave. On the contrary, Netflix culture is famous or infamous for telling the external world exactly what they mean. This book is divided into four power-packed sections and 10 chapters, each emphasizing the major elements of the book viz. first step to a culture of freedom and responsibility (building talent density, increasing candour and removing controls); second step to a culture of freedom and responsibility (fortifying talent density, pumping up candour and releasing more controls); techniques to reinforce a culture of freedom and responsibility (max up talent density, max up control and eliminate most controls); and finally going global and bringing up or replicating the culture globally. Readers like business management students, academicians and practising professionals would find this book fascinating and enriching. My favourite takeaways from the book are the power of feedbacks, understanding of the culture map and the differentiation between symphony and jazz in the corporate environment and cultural transformation.

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