Journal of Positive School Psychology
2022, Vol. 6, No. 4, 11733 – 11746 http://journalppw.com

Performance Of Selected Companies of Iron and Steel Industry in India: In Special Reference to Profitability And Liquidity

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ABSTRACT

The iron and steel sector of India is the sector on which all the other sectors and industries in the nation depend upon. It procures the raw material for almost all the domestic construction and development projects and hence is a cog in the economy of the country. The industry also endorses a major share in the export of the country and contributes to the 6% of global steel production along with the US (Deloitte report on Analysis of Iron and Steel Industry). The iron and steel industry of India contributes around 2% of Indian GDP which is further anticipated to increase with the increase in the status of development in India. The industry is also recognised as a profitable investment avenue by global investors and has attracted FDI flows of USD 14.74 Billion during the FY 2020-21. The importance of the industry exemplifies it necessary to analyse its profitability and liquidity. Although various researches have been done on this industry, dedicated research to analyse the factual profitability and liquidity of this industry rested in the research gap. This research is an attempt to statistically analyse the profitability and Liquidity of the Indian iron and steel industry based on a sample of 5 iron and steel giants (namely: Tata Steel, JSW, SAIL, VISA and Jindal Steel). The research will have many folds usefulness, it will be useful for the government for making policies, for the companies to assess the performance of their policies, for the investors to understand the major drivers of profitability of iron and last but not the least, the research will be the contribution of a value to the literature on the subject matter.

Keywords: Profitability, NPR, EPS, OPR, ROCE, ROE, Iron and Steel industry of India

1. Introduction

The iron and steel industry of India is amongst the most important industries of the country. As per the World ranking dated August'21, the 'Iron and Steel industry' of India indexes IInd in the world in terms of production of crude-steel having an output of 99 MT which is further anticipated to increase by approximately 18% in (120 MT) in the financial year 2022. Easy availability of raw material and low-cost labour. The demand of the Iron and steel sector can be fetched by the fact that it is the ancillary industry to most of the other industries operating in India. The ongoing infrastructure and development along with the upcoming construction projects throughout the country such as smart city projects, metro projects in various states guarantee the ongoing incremental growth in the demand of the Indian iron and steel sector. This industry is intermingled with the Mining & metallurgical sectors of the country and has witnessed heavy development and domestic as well as foreign investment in the recent past. On top of demand and supply, various schemes of government such as PLI (production linked incentive scheme) for speciality steel, 'Atmanirbhar Bharat', a drive for making Indian eastern states as a hub for metallurgical and MOU with the government of Japan and introduction of recycling policy for iron and steel evident greater marginal hike in the forthcoming future for this major heavy industry of India. The CAGR of the Indian steel and iron sector has grown at the rate of 4.43% from 2008 to 2019.

Identification of the demand, need and production of Indian steel and iron in the domes-

tic and global market is well comprehended. The steel and iron industry are the foundation stones upon which the pillars of development of other industries rest upon. This marks the importance to analyse the profitability as well as the liquidity of the Indian iron and steel industry. Since iron and industry comprises many plants, factories and companies a sample of 5 giant iron and steel companies were taken to study the profitability and liquidity of this sector. Since the object of the research is to analyse the profitability and liquidity of the iron and steel industry of India, secondary data was considered to justify such an objective. Also, since this the industry has global standing and is exposed to both the micro as well as macro determinants, a period of 10 years (starting from 2011 to 2020) was considered to wrinkle out the positive and negative windfall effect on the financial position and to derive reliable results. The study will pave the way to further in-depth research on the subject matter and will be useful for the industry as well as stakeholders in identifying the major drivers of profitability of the power sector of India.

2. Data Description

Popat, et.al. (2011) in their study titled "A comparative study of profitability analysis of selected steel industries", comparatively analysed the selected Indian steel industries by using financial ratios and an ANOVA table. It was found that the profitability of Tata steel is best amongst the companies analyzed in the study followed by Jindal Steel, JSW and SAIL.

Varadarajan et.al. (2013) in their paper titled "Development of performance steel products in sail through R&D initiatives" evaluated the impact of R&D over the increase in the performance of SAIL and found a highly significant impact of R&D on the profitability of SAIL.

Gogia, N. (2016). In their study titled "Effect of capital structure determinants on profitability: With special reference to iron and steel sector units of India" analysed the effect of various determinants of capital structure over the profitability of the iron and steel sector of India using a regression model and ANOVA table. They found that the operating-profit ratio, debt-equity ratio & interest-coverage ratio has a significant relationship with the profitability of the selected companies of the study.

Li, S. (2016) in their paper titled "Analysis on the profitability of iron and steel industry under new economic normal state" analysed the profitability of the Indian iron & steel industry of Wuhan district over the term of 5 years (2011-2015). The study found a sharp decline in the profitability of the iron and steel industries of India as against their past performance and such industries need to explore new opportunities to regain their profitability levels.

Singh, (2017). In their research titled "Working capital management and profitability: Evidence from selected steel manufacturing companies in India" analysed the data of 40 steel companies of India throughout 2004-2016 and found that effective management of working capital has a significant positive impact on the profitability of the steel companies of India.

Paul et.al. (2018). In their study titled "Analysis of the effect of working capital management on profitability of the firm: Evidence from Indian steel industry" explored the impact of working capital on the profitability of the Indian steel industry for17 years (2000-2016). It was found that working capital has a significant impact on the profitability of the steel industry of India.

Bali et.al. (2019) in their research titled "Sustainable performance-oriented production practices in the Indian iron and steel industry: An empirical investigation" empirically studied the performance of the Indian iron and steel industry and found that performance-oriented production practices not only increase the production of iron and steel but also ensure sustainability and environment protection.

Shekhar, et.al (2020) in their study titled "The Impact of Liquidity Management on Profitability of Steel Authority of India Limited (SAIL): An Empirical Assessment" analysed the performance of SAIL for15 years

(2005-2020). The study found a positive correlation of CR, QR and inventory turnover ratio with the profitability of SAIL. They suggested equity financial seeding to overcome liquidity crunch rather than the use of leverage.

Modal (2020) in their research titled "Firm-specific determinants of profitability: A study on Indian Iron and Steel Industry", evaluated the determinants of profitability of the Indian iron and steel industry for 13 years. They found that amongst all liquidity, efficiency, growth, size and solvency are the most significant determinants of profitability of Indian iron & steel industries.

3 Materials and Method

3.1 Research Gap and Problem Statement

Various researches have been accomplished for analysing the profitability of the iron and steel sector of India but dedicated research for analysing the liquidity along with the profitability of such industry is still evacuated in the research gap.

3.2 Objectives of the Study

Specific Objectives of this study are as follows:

1. To analyse the profitability of the selected iron and steel industry of India
2. To analyse the liquidity of the selected iron and steel industry of India
3. To explore the statistical relationship amongst the determinants of profitability and liquidity with the profit of the iron and steel industry of India.

3.3 Hypotheses of the Study

H01: No significant difference exists amongst the indicators of profitability and the profit of the selected power sector industries of India.

H02: No significant difference exists amongst the indicators of liquidity and the liquid position of the selected power sector industries of India.

4. Results & Discussion

4.1 Statistical Analysis of the Profitability of Steel Industry of India

Table 1: Descriptive Analysis, Mean and Standard Deviation

	N	Mean	Std. Deviation
	Statistic	Statistic	Statistic
Company	45	3.0000	1.43019
NPR	45	4.3487	7.53417
EPS	45	17.9671	38.41837
OPR	45	18.0040	10.43488
ROCE	45	6.5900	6.16082
ROE	45	5.6411	6.95971
Valid N (listwise)	45		

Inferences:

For descriptive statistics of the data collected for analysing the profitability of the Steel Industry of India; Mean and standard deviation are used to analyse the most common value and scatteredness of the other data values near it. The results of the model reveal that

- NPR, EPS and ROE are not volatile because the standard deviation of all these variables is below the present data distribution of OPR and ROCE are volatile. After all, the standard deviation of all these variables is above the mean.

Table 2: Descriptive Analysis, Skewness & Kurtosis tests

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Company	.000	.354	-1.311	.695
NPR	-.348	.354	-.219	.695
EPS	-1.255	.354	6.639	.695
OPR	-.431	.354	-.538	.695
ROCE	-.062	.354	.868	.695
ROE	-.584	.354	.338	.695
Valid N (list wise)				

Inferences:

The Skewness and Kurtosis model was used for measuring the symmetry or lack of symmetry in the data collected for this study. The results of the model reveal that

- NPR is left negative skewed/tailed and is light right-tailed as kurtosis is -.219 which is less than 0.
- EPS is highly negative left-skewed /tailed as the skewness statistic is -1.255. Further, the distribution is heavy-tailed as the kurtosis statistics of the EPS data is 6.639.
- OPR is negative left-skewed/tailed but such skewness is approximately symmetrical as the skewness statistic is -.431 which is near to the critical value -.5. Further, the distribution is light-tailed as the kurtosis statistics of the OPR data is -.538 which is less than 0.
- ROCE is highly left tailed/skewed and has a heavier left tail as the skewness statistics of ROCE is -.062 which is below1 and kurtosis is -.868 which signifies the heaviness of the tail of data as the kurtosis statistics are close to -1.
- ROE is approximately symmetrical as the skewness statistic of ROE is -.584 which lies between -0.5 to 0.5. Also, the data distribution is normal as compared to the other variables analysed in the above table as the kurtosis statistic of ROE is .338 which is the least among the variables analysed therein.
- The equal standard deviation of .354 in all the variants indicates that all the variants equally represent the population with equal accuracy since the standard deviation is low it can be assumed that the data points tend close to the mean of the data set.

Table 3: Normality Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
NPR	.137	45	.034	.962	45	.144
EPS	.183	45	.001	.826	45	.000
OPR	.114	45	.177	.958	45	.103
ROCE	.146	45	.018	.959	45	.107
ROE	.169	45	.003	.942	45	.027

Inferences:

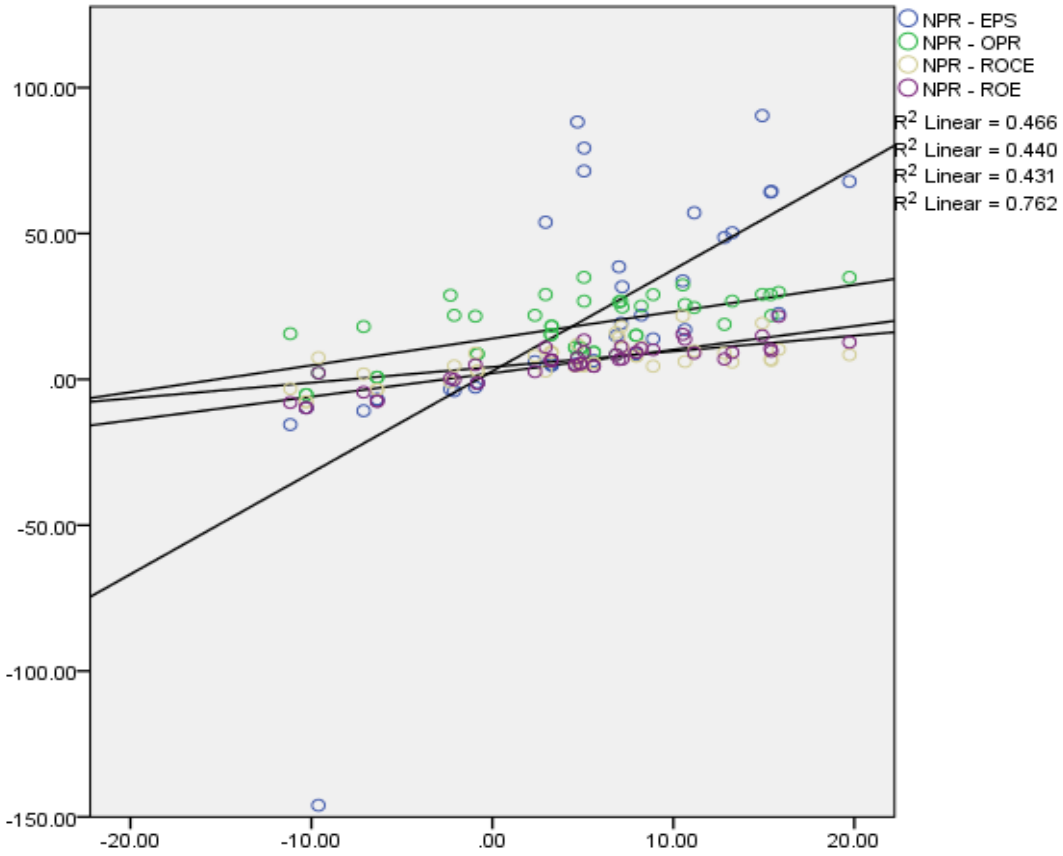
The above table depicts the results of the test of normality of distribution of the data collected for this study, more particularly the Kolmogorov-Smirnov and Shapiro-Wilk tests. The test authenticates the data collected by analysing the data scattered near and far from the mean value.

The Sig value of Kolmogorov-Smirnov and Shapiro-Wilk is more than 0.05 for OPR. Therefore, the OPR data collected for the study are not different from the normal distribution and the majority of the data points are relatively similar. The sig value of data of EPS and ROE is less than the critical value of .05 in both the Shapiro Wilk and Kolmogorov-Smirnov test which means that data is not normally distributed. Further, the Significance value of NPR and ROCE as per the Shapiro Wilk test is more than the critical value of .05 (.144 and .107 respectively) which signifies the normal distribution of data while as per Kolmogorov-Smirnov the significance value of both NPR and ROCE is less than .05 which means that data is not normally distributed. Since the Shapiro Wilk test is considered more accurate than the Kolmogorov-Smirnov test, we conclude that the data of NPR and ROCE taken for this study are normally distributed.

Table 4: Correlation Analysis

Correlations					
		EPS	OPR	ROCE	ROE
NPR	Pearson Correlation	.683**	.664**	.657**	.873**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	45	45	45	45

Figure 1: Scatterplot



Inferences:

The above table exhibits the correlation Matrix between the Independent Variables of the Study. The dependent variable is NPR while the independent variable is EPS, OPR, ROCE, and ROE.

The analysis depicts that:

Correlation among EPS and NPR:

- Pearson's value i.e., r= .683 signifies a moderate positive relationship among the two variables.
- There exists a significant relationship among 'EPS and NPR' (p=0) as p value for the relationship <0.05.

Interpretation: EPS and NPR are positively related and such a relationship is statistically significant to induce the quantum of NPR on grounds of movement in EPS value.

Correlation among OPR and NPR:

- Pearson's value i.e., r= .664 signifies a moderate positive relationship among the two variables.
- There exists a significant relationship among 'OPR and NPR' (p=0) as p value for the relationship <0.05.

Interpretation: OPR and NPR are positively related and such a relationship is significant enough to influence the quantum of NPR on grounds of movement in OPR value. These statistical results are also backed up by the accounting concept that NPR is worked on after adjusting the indirect expenses and income to the OPR and hence they have a direct correlation and the magnitude of NPR lies on the OPR of the company or industry as operating profits are the basic profits or revenues earned by the companies from their business operations. Furthermore, the moderate nature of the relationship as interpreted above is also backed up by the accounting concept that OPR provides the base for working the NPR of a company or industry and

hence has a significant influence thereon and in cases where the indirect revenues and expenses of the company become more this effect reduced but cannot be nullified and hence rests at the moderate level.

Correlation among ROCE and NPR:

- Pearson's value i.e., r= .657 signifies a moderate positive relationship among the two variables.
- There exists a significant relationship among 'ROCE and NPR' (p=0) as p value for the relationship <0.05.

Interpretation: ROCE and NPR are positively related and such a relationship is significant enough to influence the quantum of NPR on grounds of movement in ROCE value. This statistical relationship can also be supported by the concept that return on capital employed is basically the operating return of the company over the capital employed therein an increase in which is an obvious increase in the NPR of the company.

Correlation among ROE and NPR:

- Pearson's value i.e., r= .873 signifies a strong positive relationship among the two variables.
- There exists a significant relationship among 'ROE and NPR' (p=0) as p value for the relationship <0.05.

Interpretation: ROE and NPR are positively related and this relationship is strongly significant to influence the quantum of NPR on grounds of movement in ROE.

Regression Analysis

Table 5: Model Summary

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.912[a]	.832	.815	3.24088	.653

Inferences:

The above table shows the model summary of regression analysis of NPR based onROE, ROCE, OPR and EPS; ***R Square*** is ***.832*** which means that **financial factors (i.e.,** ROE, ROCE, OPR and EPS) show ***83.2%*** of the variability with a significant effect on **NPR**.

The above table shows multiple linear regression model summary and overall fit statistics. It indicates that the **R** value of our model is .912 with the $\mathbf{R^2}$ = .832. Linear regression shows 83.2% of the variance in the data. The Durbin-Watson d = .653, which does not fall between the two critical values 1.5 < d < 2.5. Therefore, we can presuppose that there exists first-order linear auto-correlation in our multiple linear regression data.

Table 6: ANOVA (Goodness of fit)

ANOVA[s]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2077.471	4	519.368	49.448	.000[b]

	Residual	420.133	40	10.503		
	Total	2497.604	44			

Inferences:

In the ANOVA table, the F-ratio tests whether the regression model is a good fit for the data. The above table shows that different identified financial factors (independent variables) statistically significantly anticipate the NPR (dependent variable). The F sig. value is .0 which is less than 0.05, thus the regression model is a good fit of the data. The F-test is highly significant; thus, we can assume that the model explains a significant amount of the variance in NPR of the company.

Table 7: Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.394	1.130		-.348	.729
	EPS	.064	.016	.327	4.056	.000
	OPR	-.064	.073	-.088	-.867	.391
	ROCE	.025	.123	.020	.202	.841
	ROE	.811	.141	.749	5.735	.000

Inference

The above table presents the coefficients of variation in NPR based onEPS, OPR, ROCE and ROE. The data reveals that ROCE and OPR is the significant predictor of NPR as its ***sig. value*** **of** regression with NPR is less than **0.05** which indicates that the null hypothesis is rejected. Further, it can also be seen that **OPR has a negative (Beta= -.088) impact on NPR**. This is also proved by the accounting considerations that ROCE is calculated based on EBIT and NPR are calculated based on net profit which is derived after deducting interest and depreciation expenses and hence explains the statistical result derived from the above analysis that ROCE carries the negative impact on NPR of the company.

The data reveals that EPS and ROE are not the significant predictors of NPR as its ***sig. value*** **of** regression with NPR is more than **0.05** which indicates that the null hypothesis is accepted.

4.2 Statistical Analysis of the Liquidity of Steel Industry of India

A quantitative analysis of the financial variables taken for the analysis of liquidity of the Steel sector of India is presented hereunder:

Table 8: Descriptive Analysis, Skewness & Kurtosis tests

Descriptive Statistics							
	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
WCTR	45	-8.8380	28.77151	-4.041	.354	16.658	.695
DTR	45	27.5084	19.39121	.949	.354	-.363	.695
CR	45	.6931	.27456	.515	.354	1.516	.695
ITR	45	5.8884	3.09058	2.578	.354	9.907	.695
Valid N (list-wise)	45						

Inferences:

For descriptive statistics of the data collected for analysing the profitability of the Indian Steel Industry Mean and standard deviation are used to analyse the most common value and scatteredness of the other data values near it. The skewness and Kurtosis model was used for measuring the symmetry or lack of symmetry in the data collected for this study. The results of the model reveal that

- CTR is volatile because the standard deviation is above the meanwhileDTR, CR and ITR are not volatile because standard deviation of all the variables is below the mean.
- CTR is extremely negatively skewed (skewness -8.8380) which is more than 3 and is heavy left-tailed as kurtosis is 16.658 which is more than 0. The WCTR data set has a negative skew and means that overall performance is negative.
- DTR and ITR are right positively skewed as the skewness statistic is .949 and .515. Further the distribution of DTR is light tailed as the kurtosis statistics of the DTR data set is -.363 while the distribution of ITR is heavy tailed as the kurtosis statistics of the ITR data set is 1.516.
- CR is highly skewed and has a heavier right tail as the skewness statistics of CR is 2.578 which are above 1 and kurtosis is 9.907 which signifies the heaviness of the tail of data.
- The equal standard deviation of .354 in skewness and 695 in the kurtosis test in all the variants indicates that all the variants equally represent the population with equal accuracy also since the standard deviation is low it can be assumed that the data points tend close to the mean of the data set.

Table 9: Normality Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.

WCTR	.355	45	.000	.460	45	.000
DTR	.217	45	.000	.837	45	.000
CR	.118	45	.131	.938	45	.018
ITR	.211	45	.000	.764	45	.000

Inferences:

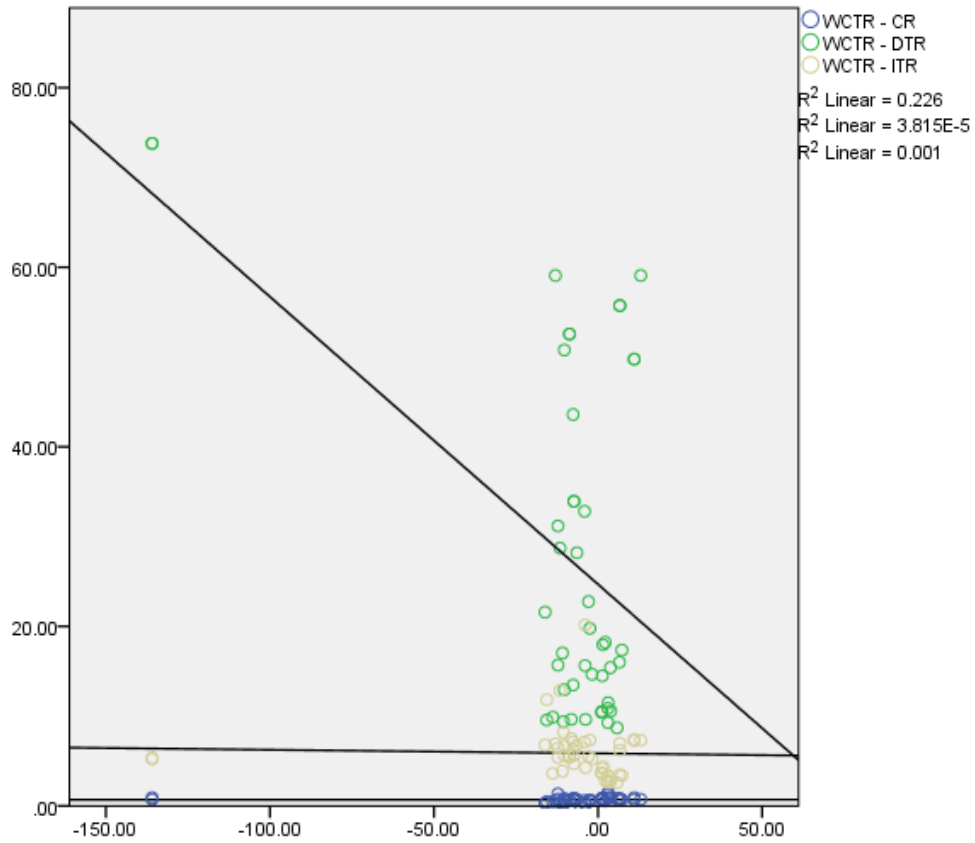
The above table depicts the results of the test of normality of distribution of the data collected for this study, more particularly the Kolmogorov-Smirnov and Shapiro-Wilk tests. The test authenticates the data collected by analysing the data scattered near and far from the mean value.

The Sig value of Kolmogorov-Smirnov and Shapiro-Wilk of WCTR, DTR and ITR are less than 0.05 which signifies that their data sets are different from the normal distribution and the majority of the data points are not relatively similar while the Sig value of Kolmogorov-Smirnov and Shapiro-Wilk of CR is more than 0.05 which signifies that their data sets are not different from the normal distribution and the majority of the data points are similar.

Table 10: Correlation Analysis

Correlations		
		WCTR
DTR	Pearson Correlation	-.475**
	Sig. (2-tailed)	.001
	N	45
CR	Pearson Correlation	.006
	Sig. (2-tailed)	.968
	N	45
ITR	Pearson Correlation	-.037
	Sig. (2-tailed)	.810
	N	45

Figure 2: Scatterplot



Inferences:

The above table shows the correlation Matrix between the Independent Variables of the Study. The dependent variable is WCTR while the independent variable is DTR, CR, and ITR.

The analysis depicts that:

Correlation among DTR and WCTR:

- Pearson's value i.e., r= -.640 signifies a strong negative relationship among the two variables.
- There exists no significant relationship among 'DTR and WCTR' (p=0.063) as p value for the relationship >0.05.

Interpretation and WCTR are negatively related but such a relationship is statistically insignificant to influence the quantum of WCTR on grounds of movement in DTR. The statistical finding is also backed by the fact that the increase in the debtor turnover ratio decreases the working capital and hence its turnover.

Correlation among CR and WCTR:

- Pearson's value i.e., r= .071 signifies a weak positive relationship among the two variables.
- There exists no significant relationship among 'CR and WCTR' (p=0.856) as p value for the relationship >0.05.

Interpretation and WCTR are positively related but such relationships are not significant to influence the quantum of WCTR on grounds of movement in CR value.

Correlation among ITR and WCTR:

- Pearson's value i.e., r= .420 signifies a weak positive relationship among the two variables.
- There exists no significant relationship among 'ITR and WCTR' (p=0.261) as p value for the relationship >0.05.

Interpretation and WCTR are positively related but such a relationship is not significant enough to influence the quantum of **Regression Analysis** WCTR on grounds of movement in ITR value.

Table 11: Model Summary

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.482[a]	.232	.176	26.11912	2.171

Inferences:

The above table shows the model summary of regression analysis of WCTR on the basis of ITR, DTR and CR; ***R Square*** is ***.232*** which means that **Liquidity ratios (i.e.,** ITR, DTR and CR) shows ***23.2%*** of the variability with a significant effect on **WCTR**.

The above table shows multiple linear regression model summary and overall fit statistics. It indicates that the **R** value of our model is .482 with the $\mathbf{R^2}$ = .232. The Durbin-Watson d = 2.171, which is below 2.5. Therefore, we can presuppose that there exists no first order linear auto-correlation in our multiple linear regression data.

Table 12: ANOVA (Goodness of fit)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8452.660	3	2817.553	4.130	.012[b]
	Residual	27970.537	41	682.208		
	Total	36423.197	44			

Inferences:

In ANOVA table the F-ratio tests whether the regression model is a good fit for the data. The above table shows that different identified financial factors (independent variables) statistically significantly predict the WCTR (dependent variable). The F sig. value is 4.130 which is more than 0.05, thus the regression model is not a good fit of the data. The statistical results are also supported by the fact that WCTR usually depends on the operational cycle and the fund requirement of the company and hence cannot be predicted on the basis of statistical samples.

Table 13: Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.999	16.834		.119	.906
	DTR	-.729	.208	-.491	-3.509	.001
	CR	8.910	16.043	.085	.555	.582
	ITR	.517	1.426	.056	.363	.719

Inferences:

The above table presents the coefficients of variation in WCTR on the basis of DTR, CR and ITR. The data reveals that DTR is a significant predictor of WCTR as their ***sig. value*** **of** regression with WCTR is less than **0.05** (.001) which indicates that the null hypothesis is rejected. Further, it can also be seen that **DTR has a negative (Beta = -.491) impact on WCTR**.

The data also reveals that CR and ITR is not the significant predictor of WCTR as its ***sig. value*** **of** regression with WCTR is more than **0.05** which indicates that the null hypothesis is accepted.

5 Conclusions and Recommendation

Quantitative analysis of the determinants of profitability of the iron and steel industry of India revealed that EPS, ROE, ROCE and OPR have a significant positive relationship with NPR of the selected iron and steel industries of India and, ROCE and OPR are the significant predictors of NPR. On the other hand, the liquidity analysis of the selected iron and steel industry of India reveals that DTR, CR, ITR have no significant relationship with WCTR and amongst all the variants analysed, DTR is the most significant predictor of WCTR.

The conclusion of the study highlights the importance and direct impact of operating profit on the net profit of the iron and steel companies of India and the importance of a good debtor turnover period i.e., the collection period of debtors to maintain the liquidity of the company. The study provides useful insights of the iron and steel industry of India which would help government and investors for making informed decisions, this will also help the company to formulate and reframe their corporate and functional policies and lastly will also be a useful addition to the treasure of literature on the subject matter.

References:

- Ashoke Mondal (2020). Firm specific determinants of profitability: A study on Indian Iron and Steel Industry. (2020). *Adalya*, *9*(10). https://doi.org/10.37896/aj9.10/053
- Bali, N., Panta, M. P., & Antelo, M. (2019). Sustainable performance-oriented production practices in the Indian iron and steel industry: An empirical investigation. *Journal of Cleaner Production*, *226*, 379–391.

- Gogia, N. (2016). Effect of capital structure determinants on profitability: With special reference to iron and steel sector units of India. *Adhyayan A Journal of Management Sciences*, *6*(2). https://doi.org/10.21567/adhyayan.v6i2.7046
- Li, S. (2016). Analysis on the profitability of the iron and steel industry under the new economic normal state. *Proceedings of the 2016 6th International Conference on Mechatronics, Computer and Education Informationization (MCEI 2016)*.
- Paul, P., & Mitra, P. (2018). Analysis of the effect of working capital management on profitability of the firm: Evidence from Indian steel industry. *Asia-Pacific Journal of Management Research and Innovation*, *14*(1–2), 32–38.
- Popat, P. K. H., & Visiting Lecturer in J.H.Bhalodia women's college,Kalawad Road, Rajkot. (2011). A comparative study of profitability analysis of selected steel industries. *Indian Journal of Applied Research*, *1*(12), 35–37.
- Shekhar, S., & Jena, N. (2020). The Impact of Liquidity Management on Profitability of Steel Authority of India Limited (SAIL): An Empirical Assessment. *Solid State Technology*, *63*(6), 23118-23133.
- Simranjeet Singh, (2017). Working capital management and profitability: Evidence from selected steel manufacturing companies in India. *Indian Journal of Commerce & Management Studies*, *VIII*(2), 73–79.
- Varadarajan, S., Saxena, A., Deva, A., & Jha, B. K. (2013). Development of high performance steel products in sail through R&D initiatives. *Transactions of the Indian Institute of Metals*, *66*(5–6), 689–695.