Firm size and solvency in Indian pharmaceutical sector: A relational co-movement analysis

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C H R O N I C L E	A B S T R A C T
	The financial size of the firm can be defined based on sales, working capital (WC), and total assets of the business organization. Two terms i.e. liquidity and solvency are to be used to measure the paying ability of the business. The liquidity is a short-term approach while solvency is the long-term approach of redemption of long-term debts (LTDs). The study investigates the relationship between size determinants and solvency of the Indian pharmaceutical business organization as few studies available that explain the relationship between the size of the firm and solvency in the pharmaceutical industry. The study considers the data of the selected pharmaceutical companies in India for the period 2013-2018. Two approaches are to be used to analyze the solvency i.e. solvency against ownership and solvency against the total assets (TA). Ratio analysis is the basis of the study and Spearman's rank correlation is calculated to get the relative relationship between size and solvency of the Indian pharmaceutical companies. The result of the relative study shows the positive and moderate correlation between the size determinants and solvency of the Indian pharmaceutical companies.

1. Introduction

There are two terms liquidity and solvency used to measure the paying ability of the business organizations. Liquidity refers to the short-term paying ability while solvency is associated with the redemption of long-term debts or liabilities of the business organization. In other words, the short-term paying ability refers to the operational payment while solvency reveals the payment of non-operational items, contractual capital, or any other extraordinary liabilities payable after an accounting period. The paying ability of the business organization depends on many factors i.e. factors responsible for the short-term paying ability and long-term paying ability. The short-term paying ability factors are closely related to the velocity of the cash conversion cycle or cash conversion period that starts from the introduction of the cash for operational activities and ends with the cash sales or collection form accounts receivables. The liquidity of the business organization to payout short-term liabilities will be enough, if the cash cycle period of operational activities is smaller, collection from the accounts receivables is faster and payment to the creditors are comparatively slow. This process makes available more current assets (CA) and especially cash or cash equivalent for making payment of the current liabilities (CL). So, the short-term paying ability is necessary for the smooth operation of business activities. The long-term paying ability of the business depends on the capital structure or the capital composition of the business and total debt to total assets ratio. The capital composition refers to the ratio between the total debt and owners' equity while the total debt (TD) to total assets (TA) ratio refers to the ratio between long term debt (LTD) and total assets (TA) or resources

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of the business. A lower capital structure or debt-equity ratio, and total debt (TD) to total assets (TA) ratio is an indication of the sound solvency of the business organization. But, the higher the solvency ratio is the worse the status of working on equity. So, there should be an optimum balance between total debt (TD) and owners' equity to maintain the solvency and return for owners' point of view. Also, the lower debt to assets ratio indicates that the total resources are arranged from the owners' fund, not from LTD, and reflect the sound financial position. The financial size of the firms is determined by the three variables i.e. sales, totals assets (TA), and working capital (WC) (Ali, A., 2020a). Sales of the goods and services of the business organization refer to the level of operational activities while the WC and TA indicate the resources available to run the operational activities. The sales amounts reflect the involvement of the employees and resources needed to procure the factors of production to fulfill the demand of the product on the market. To study the relationship between the firms' size and solvency, the analysis of sales, WC, TA, LTD, and owners' equity of the business organization is necessary. Fig. 1 explains the absolute amount and trend of the size determinants, LTD, and owners' equity of the selected leading pharmaceutical companies of India.
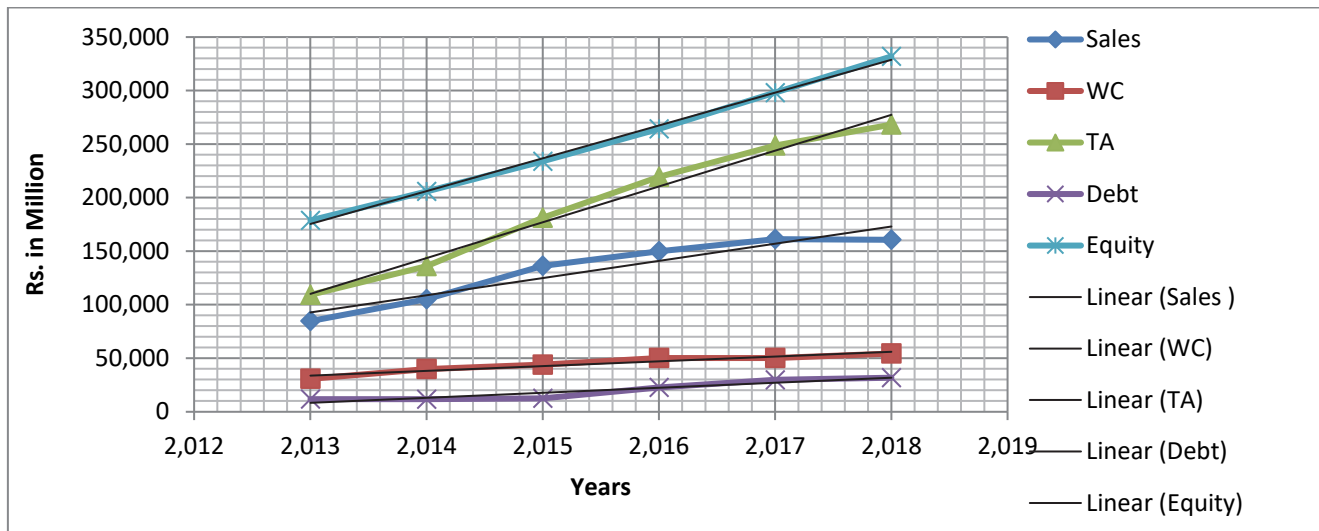

Fig. 1. Trend of average absolute amounts of size determinants (sales, WC, and TA), LTD & Equity of Indian pharmaceutical companies

From the above figure, it can be explained that there is a very low ratio between the debt and equity, and debt and total assets. There is a huge difference between the internal capital (owners' equity) and external capital (debt), and TA and debt. This reveals the sound financial position or the solvency of the selected leading Indian pharmaceutical companies. The increasing trend of the equity, total assets indicates the sound financial position of the Indian pharmaceutical sector. The size determinants (sales, WC, and TA), and solvency proxies (TA, TD, and owners' equity) are increasing but the increasing trend on the size determinants are not perfectly support solvency proxies. There are no studies available that explain the relationship between the firms' size and solvency of Indian pharmaceutical companies. So, there is a requirement to find and establish an average relationship between size determinants and solvency proxies of the Indian pharmaceutical companies.

2. Literature review

Dang et al. (2018) suggested that the firm size variable is the robust variable to measure and basis for all aspects of corporate finance. Nair (2013) found that gross earnings govern the solvency of the firm. Mutiara et al. (2018) revealed that the size of the form has a relatively negative impact on the financial performance of the firm. Saragih (2019) found the effect of the firm size on audit delay while solvability has a significant effect on audit delay. But he did not study the firm size and solvency. Marjohan et al. (2019) observed in their study that firm size and solvency positively influence profitability. The size of the firm and financial performance has a negative impact on financial soundness (Lopez-Valeiras et al., 2016). The total assets are not the only means of measuring the size of the firm while the number of employees and the market value of the firm is also considerable factors (Huff et al., 1999). Muhindi and Ngaba (2018) found in their study that the size of the firm has a positive impact on the financial performance of banks in Kenya. The large banks financially perform better than small or medium banks. Ayuba et al. (2019) recommended that the firm should increase its total assets to increase its size by issuing the debts. Ultimately, it will reduce the ratio of owners' capital in the firm. González and González (2011) suggested that both theory i.e. TOT (trade-off theory) and POT (pecking order theory) are suitable to enhance the size of the firm but a negative relationship with the profitability especially in smaller and medium firms. The Fixed Assets to Total Assets and firms' size affect the profitability on

total assets, insignificantly (Bui et al., 2020). Ramin et al. (2017) considered total assets and paid-up capital as a proxy of the size of the firms for the study and applied current and debt-equity ratio to measure the liquidity and solvency of the firm. They found that the correlation between solvency and total assets is positive and significant while solvency measured based on paid-up capital is less significant and positive. Xu et al. (2019) revealed that the large firm's sales promotional activities positively govern the financial performance of the business. Shinde et al. (2013) found that the components of the capital structure in the Indian pharmaceutical sector vary from firm to firm. Ali (2020a) explored that the smaller Indian pharmaceutical firms are enjoying profitability more than the bigger firms with lower solvency. There is a between profitability and solvency. Ali (2020b) found that the firms' size determinants increase the absolute profits of the material sector companies of Saudi Arabia but not the profitability, proportionately. Ramya et al. (2014) advocated that the paying ability is also a measure of the financial performances of the business organizations. Some other studies reveal that financial performance and the paying ability of the firm is governed by some other factors. The R& D (research and development) activities, patent level, and size of the firm define the level of export of the Indian pharmaceutical companies (Tyagi, & Nauriyal, 2017). Viswanathan et al. (2016) and Palanisamy et al. (2015) explored that excess investment in current assets i.e. receivables and current stock is the cause of lower return while there is a positive and strong relationship between WC management and the strong financial position of the pharmaceutical companies in India. WC management is vital for the profitability of the pharmaceutical companies and it is also advantageous for owners' of the business (Chowdhury et al., 2018). Structural and physical capital affects the financial performances of Indian pharmaceutical companies' performances positively (Narwal, & Ramandeep, 2014). There is a negative relationship between liquidity and profitability and the need to maintain the equilibrium between liquidity and profitability to enhance the paying ability goodwill of the business organization (Priya et al., 2013; Pushparaj Kulkarni et al., 2019). Panigrahi et al. (2018) also found a negative relationship between paying ability and profitability in Indian pharmaceutical companies and explored that all the liquid businesses need not suffering from low profitability. In further studies related to profitability and liquidity, Panigrahi et al. (2019) observed that profitability and liquidity relation are not similar in all companies of the same industry. There is a different opinion of Bhunia et al. (2015) that the profit earning capacity, WC management, and paying ability are not correlated mutually and revealed a weaker correlation among profitability, WC management, and payability. But, Srivastva (2017) found the profitability of Indian pharmaceutical industries is satisfactory.

3. Materials and methods

The study of the relationship between firm size determinants and solvency is based on the secondary data taken from the websites of the Indian pharmaceutical companies. The variables were taken from the financial statements of Sun Pharmaceutical Industries Limited (Su), Cipla Limited (Ci), Cadila Healthcare Limited (Ca), Aurobindo Pharma Limited (Ar), Dr. Reddy's Laboratories (Dr), and Lupin limited (Lu), Glenmark Pharma Limited (Gl) pharmaceutical companies to study the relationship of firm's size determinants and solvency or financial soundness. The average absolute amounts form the financial statements are to be used to determine the size of the Indian pharmaceutical companies, relatively. The average ranks of three proxies i.e. Total Assets (TA), Working Capital (WC), and sales revenue are used to determine the size of the selected Indian pharmaceutical companies. The working capital is the excess of Current Assets (CA) over current liabilities (CL) in the business organization (Ali, 2020c).

Table 1
Size & Rankings of the leading selected Indian pharmaceutical companies

Size Determinants	Indian pharmaceutical companies					(Rs. in Million)	
	Su	Lu	Dr	Ci	Ar	Ca	Gl
TA	464474	179864	187476	176201	137885	112850	97422
R1	1	3	2	4	5	6	7
WC	130960	55724	37184	41462	21521	7593	19358
R2	1	2	4	3	5	7	6
Sales	241128	137190	142354	126912	120157	90097	72660
R3	1	3	2	4	5	6	7
Av. of Ranks	1	2.67	2.67	3.67	5	6.33	6.67
Composite Rank	1	2.5	2.5	4	5	6	7

Source: Average absolute amounts of TA, WC, and sales are taken from the financial statements of the concerned companies for the period 2013-18.

Table 1 explains the size of the Indian pharmaceutical companies as per the size determinants i.e. TA, WC, and sales. Two different approaches are used to analyze the solvency of the selected Indian pharmaceutical companies.

Debt-Equity ratio = $\frac{LTD}{Equity}$;

Debt to Total Assets Ratio = $\frac{LTD}{TA}$;

where, LTD = Long-Term Debts

Debt-Equity ratio explains the solvency in respect to the ownership interest or against the capital of the owners of the business organization while the Debt to total assets ratio is the assurance of the redemption of the debts against the total resources of the business. The debt to total assets ratio is more favorable while the business is managing the funds from the internal sources and the debt-equity ratio is in case of management of funds from internal capital. In both cases, the solvency results would be stronger if the company were working on equity (Ali & Haque, 2014). Spearman's rank correlation is calculated to get the relative correlation between the debt-equity ratios, debt to assets ratio, and size determinants of the firms.

Spearman's Rank Correlation (r_s) = 1- $\frac{6*\sum(D*D)}{n(n*n-1)}$

4. Analysis and results

The analysis of the relationship of the firm size and solvency of Indian pharmaceutical business organizations can be bifurcated into two i.e. industry analysis and firm analysis.

4.1 Industry Analysis

The industry analysis of the relationship of firm size and solvency status of Indian pharmaceutical reveal the co-movement or cohesiveness of the size determinants (sales, WC, and TA) and solvency agent proxies (LTD & equity).

4.1.1 Variability of Size determinants and solvency proxies

The movement of an average of absolute size determinants and solvency proxies explain the cohesiveness and movement mutually. The similarity of the variances of variables of size determinants and solvency proxies will indicate the relationship and reflect the solvency status of the Indian pharmaceutical industry.

Table 2
Variability of absolute average amounts of size determinants (Sales, WC, and TA), and LTD & Equity (Rs. in Million) of Indian pharmaceutical companies

Years	Sales	WC	TA	LTD	Equity
2,013	84,662	30,656	109,228	11,734	178,696
2,014	105,068	39,773	135,885	11,666	205,730
2,015	136,207	43,919	181,115	12,475	233,904
2,016	149,810	50,150	219,349	22,594	264,137
2,017	161,245	50,135	248,602	29,684	298,051
2,018	160,577	54,341	268,256	31,763	331,889
Average	132,928	44,829	193,739	19,986	252,068
σ	31,521	8,651	63,035	8,498	52,428
CV (%)	24	19	33	43	21

Source: Yearly average absolute amounts of TA, WC, sales, LTD, and equity of all selected companies are taken from the financial statements for the period 2013-18.

Table 2 reveals that the variations of all variables are similar and indicates the cohesiveness except LTD. The movement in the average amounts of LTD abnormal and indicating the increasing trend since 2016. Overall, the variations of all variables (size determinants & solvency proxies) are not statistically significant as the percentage of the co-efficient of the variation (CV) is below 100.

4.1.2 The relationship among size determinants solvency proxies

Relationship of the size determinants and solvency proxies explain the average relationship and co-movement of the firm size and solvency variables. The stronger correlation among size determinants and solvency variables explain the symmetry and movement trend.

Table 3 explains that all size determinants and solvency proxies move together positively and strongly. It reveals that all the size determinants effects or govern positively. The variability and co-movement of the size determinants and solvency proxies reveal the normality of movement and expected relationship. The firm analysis will explain and divide the inferences based on the size and solvency of the Indian pharmaceutical companies.

Table 3

Multiple correlation of average absolute size determinants (Sales, WC, and TA), and LTD & Equity

	Sales	WC	TA	LTD	Equity
Sales	1				
WC	0.971	1			
TA	0.975	0.967	1		
LTD	0.851	0.852	0.937	1	
Equity	0.937	0.949	0.988	0.952	1

Source: Multiple correlation calculation is based upon the values given in the table 2.

4.2 Firm analysis

The firm analysis considers the analysis of the business firms and extracts inferences relatively. The firm analysis of the Indian pharmaceutical companies analyzes the relationship of size determinants and solvency proxies generalize the inference of the study. Based on the solvency approach, the analysis can be divided into solvency based on ownership or owners' equity (debt-equity ratio) and total resources (debt to total assets ratio).

4.2.1 Solvency based on ownership or owners' equity

Solvency based on ownership measures the relationship between the LTD and equity of the business organization. The lowest ratio of debt-equity is to be considered as the strongest indication of the solvency. The relative and qualitative correlation between the ranks of debt-equity ratio and size determinants explain the average relationship of solvency and size of the firm.

Table 4

Debt-Equity Ratio and rankings of Indian pharmaceutical companies (Rs. in Million)

	Dr			Lu			Su			Ci		
Years	Debt	Equity	Ratio	Debt	Equity	Ratio	Debt	Equity	Ratio	Debt	Equity	Ratio
2013	12,659	63,691	0.199	11,645	52,042	0.224	1,153	149,897	0.008	N.A.	901,868	0.000
2014	20,755	78,652	0.264	6,537	69,316	0.094	487	185,250	0.003	3,179	1,005,035	0.032
2015	14,315	98,531	0.145	5,371	91,732	0.059	13,684	256,232	0.053	3,093	1,078,924	0.029
2016	10,690	117,009	0.091	71,775	111,634	0.643	31,167	314,042	0.099	2,219	1,151,622	0.019
2017	5,449	122,621	0.044	79,661	134,976	0.590	14,361	366,397	0.039	36,454	1,252,542	0.291
2018	25,089	125,716	0.200	71,428	135,771	0.526	17,721	381,006	0.047	36,621	1,422,919	0.257
Av.			0.157			0.356			0.041			0.105
Ranks			3			6			1			2

Source: Amounts of debt and equity are taken from the financial statements of the concerned companies

Table 4

Debt-Equity Ratio and rankings of Indian pharmaceutical companies (Rs. in Million) (Continued)

	Ar			Ca			Gl		
Years	Debt	Equity	Ratio	Debt	Equity	Ratio	Debt	Equity	Ratio
2013	11,483	26,058	0.441	14,260	29,445	0.484	19,203	27,874	0.689
2014	12,794	37,502	0.341	13,622	34,390	0.396	24,287	29,966	0.810
2015	13,615	51,559	0.264	11,504	42,516	0.271	25,744	17,835	1.443
2016	8,472	70,567	0.120	8,964	53,519	0.167	24,873	30,564	0.814
2017	1,814	93,740	0.019	24,684	71,161	0.347	45,363	44,921	1.010
2018	4,512	116,822	0.039	25,551	89,355	0.286	41,418	51,631	0.802
Av.			0.204			0.325			0.928
Ranks			4			5			7

Table 4 explains that the owners' equity point of view the solvency of the Su, Ci, Dr, and Ar is satisfactory while Gl, Ca, and Lu are weaker, relatively. The relative correlation of the debt-equity and firm size determinants (sales, TA, and WC) ranks will explain the relationship of debt-equity ratio with each size determinants, individually.

Table 5

Qualitative relationship between Total assets and Debt- Equity relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies						
	Su	Lu	Dr	Ci	Ar	Ca	Gl
Total Assets (R1)	1	3	2	4	5	6	7
Debt-Equity (R2)	1	6	3	2	4	5	7
D(R1-R2)	0	-3	-1	2	1	1	0
D^2	0	9	1	4	1	1	0	$\sum D^2 = 16$

Originating Source: R1 and R2 from table 1 and 4.

Spearman's Rank Correlation $(r_s) = 1 - \dfrac{6*\sum(D*D)}{n(n*n-1)};\quad = 1 - \dfrac{6*16}{7(7*7-1)};\quad = 0.71$

Table 5 explains that the qualitative relationship between debt-equity and total assets is positive and moderate (0.71). The level of total resources moderately correlated with the debt-equity ratio or the TA of the Indian pharmaceutical companies positively and moderately governs the solvency owners' point of view.

Table 6
Qualitative relationship between WC and Debt- Equity relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies							
	Su	Lu	Dr	Ci	Ar	Ca	Gl	
WC (R1)	1	2	4	3	5	7	6	
Debt-Equity (R2)	1	6	3	2	4	5	7	
D(R1-R2)	0	-4	1	1	1	2	-1	
D²	0	16	1	1	1	4	1	$\sum D^2 = 24$

Originating Source: R1 and R2 from Table 1 and Table 4.

Spearman's Rank Correlation $(r_s) = 1 - \dfrac{6*\sum(D*D)}{n(n*n-1)} = 1 - \dfrac{6*24}{7(7*7-1)} = 0.57$

From Table 6, it can be explained that the qualitative relationship between debt-equity and WC is positive and moderate (0.57). The amount of WC moderately correlated with the debt-equity ratio or the WC of the Indian pharmaceutical companies positively and moderately governs the solvency owners' point of view.

Table 7
Qualitative relationship between Sales and Debt- Equity relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies							
	Su	Lu	Dr	Ci	Ar	Ca	Gl	
Sales (R1)	1	3	2	4	5	6	7	
Debt-Equity (R2)	1	6	3	2	4	5	7	
D(R1-R2)	0	-3	-1	2	1	1	0	
D²	0	9	1	4	1	1	0	$\sum D^2 = 16$

Originating Source: R1 and R2 from table 1 and 4.

Spearman's Rank Correlation $(r_s) = 1 - \dfrac{6*\sum(D*D)}{n(n*n-1)} = 1 - \dfrac{6*16}{7(7*7-1)} = 0.71$

From Table 7, it can be explained that the qualitative relationship between debt-equity and sales is positive and moderate (0.71). The amount of sales moderately correlated with the debt-equity ratio or the sales amount of the Indian pharmaceutical companies positively and moderately governs the solvency owners' point of view.

Table 8
Rank correlation between averages of size determinants ranks and Debt- equity ratio

Ranks	Indian pharmaceutical companies							
	Su	Lu	Dr	Ci	Ar	Ca	Gl	
Size det. (R1)	1	2.5	2.5	4	5	6	7	
Debt-Equity (R2)	1	6	3	2	4	5	7	
D(R1-R2)	0	-3.5	-0.5	2	1	1	0	
D²	0	12.3	0.3	4	1	1	0	$\sum D^2 = 18.50$

Originating Source: R1 and R2 from Table 1 and Table 4.

Spearman's Rank Correlation $(r_s) = 1 - \dfrac{6*\sum(D*D)}{n(n*n-1)} = 1 - \dfrac{6*18.50}{7(7*7-1)} = 0.67$

Table 8 concludes that the qualitative relationship between debt-equity and size determinants is positive and moderate (0.67). The amount of size determinants moderately correlated with the debt-equity ratio or the size determinants of the Indian pharmaceutical companies positively and moderately governs the solvency owners' point of view. The relationship of WC (0.57) with the debt-equity ratio is positive but weaker than the TA (0.71) and sales (0.71) of the Indian pharmaceutical companies.

4.2.2 Solvency based on total assets (TA) or total resources

Solvency based on ownership measures the relationship between the LTD and TA of the business organization. The lowest ratio of debt-TA is to be considered as the strongest indication of the solvency. The relative qualitative correlation between the ranks of debt- TA ratio and size determinants explain the average relationship of solvency and size of the firm.

Table 9
Debt-TA Ratio and rankings of Indian pharmaceutical companies   (Rs. in Million)

Years	Dr			Lu			Su			Ci		
	Debt	TA	Ratio	Debt	TA	Ratio	Debt	TA	Ratio	Debt	TA	Ratio
2013	12,659	134,872	0.094	11,645	89,139	0.131	1,153	205,827	0.006		11,658	0
2014	20,755	160,296	0.129	6,537	102,060	0.064	487	293,708	0.002	318	13,403	0.024
2015	14,315	185,978	0.077	5,371	132,610	0.041	13,684	487,985	0.028	309	15,718	0.02
2016	10,690	200,104	0.053	71,775	226,249	0.317	31,167	542,196	0.057	222	21,128	0.011
2017	5,449	218,165	0.025	79,661	266,073	0.299	14,361	614,102	0.023	3,645	20,953	0.174
2018	25,089	225,443	0.111	71,428	263,054	0.272	17,721	643,028	0.028	3,662	22,861	0.16
Av.			0.082			0.187			0.024			0.065
Ranks			4			6			1			2

Source: Amounts of debt and equity are taken from the financial statements of the concerned companies.

Table 9
Debt-TA Ratio and rankings of Indian pharmaceutical companies   (Rs. in Million) (Continued)

Years	Ar			Ca			Gl		
	Debt	TA	Ratio	Debt	TA	Ratio	Debt	TA	Ratio
2013	11,483	72,729	0.158	14,260	73,742	0.193	19,203	71,710	0.268
2014	12,794	94,898	0.135	13,622	79,865	0.171	24,287	86,336	0.281
2015	13,615	129,145	0.105	11,504	90,471	0.127	25,744	84,439	0.305
2016	8,472	156,994	0.054	8,964	100,163	0.089	24,873	98,454	0.253
2017	1,814	162,494	0.011	24,684	152,207	0.162	45,363	117,639	0.386
2018	4,512	211,052	0.021	25,551	180,653	0.141	41,418	125,954	0.329
Av.			0.081			0.147			0.304
Ranks			3			5			7

Table 9 explains that the total assets point of view the solvency of the Su, Ci, Dr, and Ar are satisfactory while Gl, Ca, and Lu is weaker, relatively. The relative correlation of the debt- TA ranks and firm size determinants (sales, TA, and WC) will explain the relationship of debt-equity ratio with each size determinants, individually.

Table 10
Qualitative relationship between Total assets and Debt- TA relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies						
	Su	Lu	Dr	Ci	Ar	Ca	Gl
Total Assets (R1)	1	3	2	4	5	6	7
Debt-TA (R2)	1	6	4	2	3	5	7
D(R1-R2)	0	-3	-2	2	2	1	0
D^2 ($\sum D^2 =22$)	0	9	4	4	4	1	0

Originating Source: R1 and R2 from Table 1 and Table 9.

Spearman's Rank Correlation (r_s) = 1- $\frac{6*\sum(D*D)}{n(n*n-1)}$=1- $\frac{6*22}{7(7*7-1)}$ = 0.61

From Table 10, it can be explained that the qualitative relationship between debt-TA ratio and TA is positive and moderate (0.61). The level of total resources moderately correlated with the debt-TA ratio or the TA of the Indian pharmaceutical companies positively and moderately governs the solvency against total assets.

Table 11
Qualitative relationship between WC and Debt- TA relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies						
	Su	Lu	Dr	Ci	Ar	Ca	Gl
WC (R1)	1	2	4	3	5	7	6
Debt-TA (R2)	1	6	4	2	3	5	7
D(R1-R2)	0	-4	0	1	2	2	-1
D^2 ($\sum D^2 =26$)	0	16	0	1	4	4	1

Originating Source: R1 and R2 from Table 1 and Table 9.

Spearman's Rank Correlation (r_s) = 1- $\frac{6*\sum(D*D)}{n(n*n-1)}$ =1- $\frac{6*26}{7(7*7-1)}$ = 0.54

From Table 11, it can be explained that the qualitative relationship between debt-TA ratio and WC is positive and moderate (0.54). The amount of WC moderately correlated with the debt-TA ratio or the WC of the Indian pharmaceutical companies positively and moderately governs the solvency against total assets.

Table 12
Qualitative relationship between Sales and TA relationship of Indian Pharmaceutical firms

Ranks	Indian pharmaceutical companies						
	Su	Lu	Dr	Ci	Ar	Ca	Gl
Sales (R1)	1	3	2	4	5	6	7
Debt-TA (R2)	1	6	4	2	3	5	7
D(R1-R2)	0	-3	-2	2	2	1	0
D² ($\sum$D² =22)	0	9	4	4	4	1	0

Originating Source: R1 and R2 from Table 1 and Table 9.

Spearman's Rank Correlation (r_s) = 1- $\frac{6*\sum(D*D)}{n(n*n-1)}$ = 1- $\frac{6*22}{7(7*7-1)}$ = 0.61

From Table 12, it can be explained that the qualitative relationship between debt-TA ratio and sales is positive and moderate (0.61). The amount of sales moderately correlated with the debt-TA ratio or the sales amount of the Indian pharmaceutical companies positively and moderately governs the solvency against total assets.

Table 13
Rank correlation between averages of size determinants ranks and Debt- TA ratio

Ranks	Indian pharmaceutical companies						
	Su	Lu	Dr	Ci	Ar	Ca	Gl
Size det. (R1)	1	2.5	2.5	4	5	6	7
Debt-TA (R2)	1	6	4	2	3	5	7
D(R1-R2)	0	-3.5	-1.5	2	2	1	0
D² ($\sum$D² =23.50)	0	12.25	2.25	4	4	1	0

Originating Source: R1 and R2 from Table 1 and Table 9.

Spearman's Rank Correlation (r_s) = 1- $\frac{6*\sum(D*D)}{n(n*n-1)}$ = 1- $\frac{6*23.50}{7(7*7-1)}$ = 0. 58

Table 13 concludes that the qualitative relationship between debt-TA and size determinants is positive and moderate (0.58). The amount of size determinants moderately correlated with the debt-TA ratio or the size determinants of the Indian pharmaceutical companies positively and moderately governs the solvency against the total assets. The relationship of WC with debt-equity ratio (0.54) is positive but weaker than the TA (0.61) and sales (0.61) of the Indian pharmaceutical companies.

4.2.3   Debt-equity ratio, debt-TA, and size determinants of Indian pharmaceutical companies

Consolidated study of the debt-equity ratio, debt-TA, and size determinants explain the average relation of size determinants and solvency of Indian pharmaceutical companies.

Table 14
Summary of qualitative correlation between size determinants and solvency

Ratio	Correlation of ranks of size determinants and debt-equity, debt-TA ratio			
	TA	WC	Sales	Size det. & sol. proxies
Debt-equity	0.71	0.57	0.71	0.67
Debt-TA	0.61	0.58	0.61	0.58

Originating source: Rank Correlation co-efficient from the table 4 and 9.

From the concluding Table 14, it is obvious that the average relationship between size determinants and solvency proxies are positive and moderate. The solvency against ownership (0.67) is comparatively more strongly governed by the solvency against the total resources (0.58). There is similarity in solvency against the size determinants TA (0.71) and sales (0.61) for ownership and total point of view. The solvency difference of the WC size determinants against the ownership and total resources is against is insignificant (0.57 and 0.58).

5. Discussion

There are few studies available explaining the relationship of size determinants and the solvency proxies. Mutiara et al. (2018) and Lopez-Valeiras et al. (2016) observed in their studies that the firm's size has negatively governed the financial performance and financial soundness. But, the relative study of Indian pharmaceutical companies explains that there is a positive qualitative relationship between the size determinants and solvency proxies. The relation of firm size and solvency proxies is stronger as per solvency against the ownership comparatively solvency against total resources. This implies that companies have to issue more equity capital to make financially sound. But, excess of equity capital will diminish the expected return on existing owners' capital, and companies will not be able to enjoy the benefits of working on equity (González & González, 2011). The WC size determinant (0.57, 0.58) governs the solvency but not so strongly as TA (0.71, 0.61) and sales (0.71, 0.61) of the Indian pharmaceutical companies for owners' capital and total assets point of view. There is similarity seen in the relationship of TA, sales, and solvency of the Indian pharmaceutical companies.

6. Conclusion

Based on the above all industry and firm analysis, it can be concluded that the size determinants of the Indian pharmaceutical companies positively and moderately govern the solvency or financial soundness to redeem its long-term debts (LTDs). In the relative study, the size determinants govern positively and strongly the ownership solvency (debt-equity) comparatively solvency total resources or total assets point of view. To enhance the solvency of the Indian pharmaceutical companies, there is a need to issue the equity capital to arrange the TA of the business organization. But the equity capital cannot be issued up to a certain limit to provide the progressive return on existing equity capital. The solvency situation in the bigger pharmaceutical organization is better than the smaller business organization in India. Probably, the bigger organizations manage the total resources from their internal funds or owners' equity. In a smaller pharmaceutical organization in India manage the maximum of their total resources from the external funds and enjoy the benefits of the working on equity. WC of the Indian pharmaceutical companies govern and has a lower impact on solvency indirectly. So, there is a need to enhance the owners' equity in the smaller pharmaceutical organization of India to make them financially sound to payout their LTDs. Inversely, the bigger Indian pharmaceutical companies may enhance their LTD to enjoy the benefits of working on equity as their solvency to pay out their LTD. Overall, the solvency of all Indian pharmaceutical companies either satisfactory in smaller Indian pharmaceutical companies or robust in the bigger Indian pharmaceutical organization. The study only considers only the absolute amount of the equity, TA, and LTD of the Indian pharmaceutical organization while there is a need to consider the salability or maturity of the ingredients of TA according to the redemption tenure of the LTDs. There is scope for further researches to analyze in-depth the relationship of size and solvency of the Indian pharmaceutical companies after considering the scheduled payment of the LTDs and availability of the resources of TA to payout the scheduled redemptions.

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