

## THE IMPACT OF THE HOCKEY-STICK PHENOMENON ON THE RETAIL INDUSTRY IN INDIA: PRE AND DURING COVID-19

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### ABSTRACT

*The hockey-stick sales phenomenon has been less examined in the earlier studies and doesn't receive much attention due to the cumbersome process involved in the change of sales policies in the companies and the overall restructuring of the supply chain management. The process is costly and mostly the hockey-stick sales phenomenon has an adverse impact on the profitability of companies. However, this was not observed in the case of the companies belonging to the retail industry in India. Our study shows that hockey-stick sales have a positive impact on the profitability of the companies measured by Profit After Tax (PAT) while on the other hand during the COVID-19 period, the hockey-stick sales phenomenon appears to negatively impact the profitability of the companies specifically. The results could not be generalized as the results are industry specific, but the methodology could be applied to a different industrial sector in order to study the relationship between hockey-stick sales and profitability and its impact on the performance of the companies.*

### KEYWORDS

Hockey-stick phenomenon, Bullwhip Effect, Sales, Profitability, India, COVID-19.

## 1. INTRODUCTION

Bullwhip effect or Whiplash Effect refers to the phenomenon where orders to suppliers tend to have larger variances than sales to buyers (i.e., demand distortion) and it propagates upstream in an amplified form (i.e., variance amplification) ([Lee et. al., 2004](#)). Distortion of demand information arises when a retailer issues orders based on an updated demand forecast and the distortion amplifies as the number of intermediaries in the channel increases. There are mainly four sources of the bullwhip effect which are demand signal processing, rationing game, order batching and price variations. As a result of the escalated bullwhip effect, it leads to a rise in sales at the end of the quarter giving birth to the hockey-stick phenomenon. The reason for the arrival of hockey-stick sales may be many such as demand distortion, discount applied at the end of the quarter sales, salesforce incompetence, etc. but it hampers the overall productivity of the firm and creates an imbalance and thus instability in the growth of the firm. The main objective principle of sales contracts should be to optimize the worst-case outcomes than to optimize the expected profit ([Jerath and Long, 2019](#)) but this is not generally the case happening in companies.

According to a study in Brazil, hockey stick sales negatively impacted the manufacturer's financial performance in the long term and required measures should be adopted to remediate the phenomenon ([Sanchez and Lima, 2014](#)). Similarly, the bullwhip effect was coined by Procter and Gamble executives to describe the problems they were facing in the diapers market ([Sanchez and Lima, 2014](#); [Lee et. al., 1997](#)). In the case of American manufacturing firms, the largest decline is found for work-in-process inventory days which declined about 6% per year, raw materials declined about 3% per year while finished goods inventories did not decline and in some cases, these actually increased notably in tobacco, leather goods and medical instruments industries ([Chen et. al., 2005](#)). Overall, the hockey-stick phenomenon has generally declined the profits of companies over a period and for the industry even, the long-term result was a fall in profits for a company caused by increased costs ([Sanchez and Lima, 2011](#)).

Hence, the need and motivation for the study were mainly due to the problem that hockey-stick sales have received little academic study and the theoretical models which have been employed are based on agency theory, non-cooperative game theory and dynamic stochastic models and dynamic stochastic models ([Sanchez and Lima, 2011](#)). This study contributes to the literature and could be of interest to managers and practitioners in many ways. Firstly, in this study, we examine the 629 companies in the retail industry in India listed on the National Stock Exchange (NSE) and no previous study has been observed in this context. Secondly, the regression analysis was performed on the data

observed from the Prowess IQ database from March 2010 to February 2021 annually and quarter-wise during the COVID-19 period. Ordinary Least Square (OLS) and Fixed Effects Model (FEM) regression analysis techniques were carried out in response to the panel data created for the period. Thirdly, from the results, it has been shown that the hockey-stick sales phenomenon overall has a positive significant impact on the profitability of the companies but appears to have a negative impact on the profitability during the COVID-19 period as there is a decline in the profitability of the companies in this period. The rest of the section in the study, includes the literature review, hypothesis development, data and research methodology, and empirical results followed by the conclusion.

## 2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The bullwhip effect is more prevailing in emerging markets because of gaps in management competencies ([Lorentz et. al., 2007](#); [Sanches and Lima, 2014](#)). A case study of the emerging markets of Central and Eastern Europe (CEE) states that the distribution structures are overlapping and complex and there exists a need for a more direct approach. This improves supply chain performance by eliminating echelons and thus promoting information sharing ([Lorentz et. al., 2007](#)). Many of the significant causes of the bullwhip effect are demand forecasting updating, echelon levels and price variations ([Sanches and Lima, 2014](#); [Paik and Bagchi, 2007](#)). However, the hockey stick phenomenon is attributed to order batching and includes pricing, transportation, periodic review of the ordering process and transaction costs through electronic data interchange (EDI), less-than-truckload (LTL) and coordination of delivery schedules ([Lee et. al., 1997](#); [Sanches and Lima, 2014](#)). They also demonstrated that when rational behaviour agents must follow the high-low prices policies the bullwhip effect is generated. Majority of assembly plants operating on a monthly production planning cycle issue orders almost at the same time resulting in the hockey stick phenomenon to manufacturers ([Lee et. al., 2004](#)). A study conducted in Brazil showed that hockey stick sales are not an exogenous phenomenon rather policies are able to improve financial performance ([Sanches and Lima, 2014](#)).

Obviously, some questions arise regarding the nature of the bullwhip effect constituting the hockey-stick sales as to why they have been problematic and how? The answers to these questions have been looked at in the literature and it was found that hockey-stick syndrome causes changes in stock levels and could be checked through the redesign of a sales force and dealer bonuses ([Hines et. al., 2000](#); [Sanches and Lima, 2014](#)). A Lean Processing Program was designed to extend and improve Lean Thinking for a particular group of firms and their customer base. Three-year period study reveals a better understanding of the customer requirements and cultures, faster reaction time and improved

productivity ([Hines et. al., 2000](#)). Moreover, another study states that hockey-stick sales' high demand skew negatively impacts customer service ([Sanchez and Lima, 2014](#)). Firms with abnormally high inventories have abnormally poor stock returns while firms with abnormally low inventories have ordinary stock returns. Firms with slightly lower than average inventories perform best over time, and they also outperform average firms by about 4.5% per year on average ([Chen et. al., 2005](#)) but still some questions arise further as to what are the causes of the bullwhip effect and the hockey-stick sales phenomenon? To our surprise, it was observed that lead time of information and material are classified as the primary reasons for the bullwhip effect. Demand forecast on the succeeding orders, batch ordering, price fluctuations and exaggerated order quantity in case of bottlenecks are the secondary reasons for the bullwhip effect ([Nienhaus et. al., 2006](#)). Moreover, results of the beer distribution online game show that safe harbour and panic have a negative impact on the performance of supply chains.

However, the hockey stick phenomenon is caused by an endogenous variable rather than an exogenous variable. The companies should change their price discount policies, incentive schemes and sell-out activities. ([Sanchez and Lima, 2014](#)). The hockey stick sales phenomenon was due to the sales pushed towards the end of the month in a way to reach monthly sales targets and this is not only confined to salespersons but to the entire company ([Zotteri, 2013](#); [Sanchez and Lima, 2014](#)). In a study, the results of the model show that the hockey stick sales phenomenon is caused by a mix of three factors: unrealistic profit targets, as well as manufacturer and retailer incentive systems ([Sanchez and Lima, 2014](#)). To measure the bullwhip effect considering the FMCG (Fast Moving Consumer Goods) sector, it happens that demand upstream, and demand downstream have up and down variations. Sometimes the demand upstream (sell-in) is twice as variable as the demand downstream (sell-out). However, in other cases, it can be negligible and sometimes the demand upstream is slightly less than the demand downstream ([Zotteri, 2013](#)). The study also shows that the flatter the consumer demands the more options are there for the retailers to take advantage of the deals offered by the manufacturer's sales force. However, another study also proposes the policy to eliminate the hockey stick phenomenon through a better agreement between the value of the sales quota and market demand and indicates reallocating sales efforts to point-of-sale activities. Due to these and certain other causes, the bullwhip effect and certainly hockey-stick sales pump up and decline the profitability of the companies ([Sanchez and Lima, 2014](#)).

Now, eventually, one of the most important questions is how this can be treated or what are the remedial measures to consider the bullwhip effect leading to the hockey-stick phenomenon? From the prior literature, it has been observed that in bullwhip effect the non-stationary demand is not only passed on rather it is also amplified or dampened by changes to inventory levels in anticipation of

changes in demand ([Neale and Willems, 2009](#)). The variability of demand experienced by the supplier is higher than that experienced by the retailers ([Lee et. al., 2004](#)). Further, using non-cooperative game theory, the retailers use knowledge of future demand and stocks to force suppliers to give discounts for achieving sales targets and this is the main cause of the end-of-month sales spike ([Sanchez and Lima, 2014](#)). In a scenario where outcomes are measured every quarter and the salesperson is paid a bonus if the sales quota is reached in six months (i.e., two quarters), the agent may shirk work in the first quarter and exert greater effort in the second quarter based on the outcome of the first quarter ([Jerath and Long, 2019](#)). The bonuses especially at the end of the year motivate salespeople to perform well through higher effort motivation despite gaming effects being present but there has to be a balance between the two countervailing forces i.e., the demand effect (how much demand is expected from the sales contract and the firm wants this to be high) and the incentive effect (how much a firm will have to pay per unit of expected demand while the firm wants this to be low) ([Jerath and Long, 2019](#)).

Hockey stick sales in the case of cancer drugs create three types of scenarios as the costs are high enough and create a radical shift of risk concerning the cost of drugs firstly. Secondly, control drug use in a draconian fashion and thirdly an attempt to directly control drug prices ([Polite et. al., 2020](#)). When the product demand is not related to the seasons of the year, many companies still experience hockey stick patterns because of sales-force incentives and customer buying behaviour. For example, Dell experiences a demand spike in July because of school and government buying behaviour ([Neale and Willems, 2009](#)). It has been also found in several studies that salespeople pull in orders from future periods if they fall in sales quota in one period and also push out orders to the future periods if quotas are unachievable or have already been achieved ([Jerath and Long, 2019](#)). Many companies separate the problem of managing inventory into strategic and tactical components. Strategic as if where to locate inventories in the supply chain, what levels of service to provide and whether these choices should change over time. Tactical as if how to calculate targets that change with demand from week to week, month to month or season to season ([Neale and Willems, 2009](#)). Although the nonstationary demand increases the computational complexity of the algorithms, a typical supply chain of approximately 100 stages with a dozen time phases can be calculated in less than a minute and optimized in less than 10 minutes on a standard Microsoft-based server. Some companies, for instance, Seagate reserve the supplier's capacity or intermediary goods well ahead of time so that the buyer and the supplier share risk and demand information ([Lee et. al., 2004](#)). Some other studies also strongly reject the idea that firms with the lowest levels of inventory perform best, and similarly low but not too low levels of inventory seem to have done particularly well. However, firms with bloated inventory levels perform poorly ([Chen et. al., 2005](#)).

Hence, due to the problems caused by the hockey-stick sales phenomenon, we arise on two questions whether the hockey-stick sales have an adverse impact on the profitability of Indian companies and what the impact of the hockey-stick sales during the COVID-19 period is, since the results in the market are alarmingly high. Therefore, this leads to the development of our following two hypotheses:

**H01:** Hockey-stick sales do not have an impact on the profitability of Indian Companies.

**H02:** Hockey-stick sales do not have an impact on the profitability of Indian Companies during the COVID-19 period.

The first hypothesis is for the overall study period taken into consideration while the second hypothesis is specifically for the COVID-19 period taken quarterly. According to previous studies, the analysis for two different manufacturing companies shows that a strategy based on minimizing unit cost and maximizing equipment utilization is likely to produce suboptimal financial results ([Bradley and Arntzen, 1999](#)). In another study, the electronics company had attempted over a long period to remove the hockey-stick demand pattern, which seemed to be caused by the business practices the company has followed and by customers who had been conditioned to anticipate end-of-quarter deals. However, in the mean course of time by revising business practices and realigning incentives, inventory and production planning improvements were used to mitigate the cost of the hockey-stick demand pattern ([Bradley and Arntzen, 1999](#)). A firm-level analysis may yield insights into the true causes of changes in the inventory ratios, and this is valuable in exploring the linkages between inventory performance and financial performance using firm-level data ([Chen et. al., 2005](#)). The sales spike cannot be eliminated just with operational changes in one specific direction, but it requires tactical and even strategic changes in various areas of the firm. This is a risky process whose results only appear in the long term, and this also explains why so very few companies are able to adopt it ([Sanchez and Lima, 2011](#)). As long-time horizon contracts will be weakly dominant over short-time horizon contracts, some studies also show that under certain conditions long time horizon contracting will be strictly better than short-time horizon contracting while under other conditions both will achieve the same result ([Jerath and Long, 2019](#)). The next section describes the data and methodology adopted for the study and the results obtained from them.

### 3. DATA AND METHODOLOGY

The data chosen for the study represents the companies from the Retail Industry of India listed on the National Stock Exchange (NSE), Delhi and comprises all the 629 companies obtained from the



software database Prowess IQ provided by the Center for Monitoring Indian Economy (CMIE), India. The retail industry is chosen for the study as the hockey stick phenomenon is mostly observed in these types of industries i.e., the non-financial sector. The period chosen for the study is from March 2010 to February 2021 and covers a wide range to study on the hockey stick sales phenomenon. The variables also have been obtained from the Prowess IQ database. The independent variables include Sales ([Hoberg et. al., 2017](#); [Goldense, 2015](#); [Jerath and Long, 2019](#)), Closing Price ([Sanches and Lima, 2011, 2014](#)), Cost of goods sold ([Hoberg et. al., 2017](#)), Cost of production: Work in Process (WIP) ([Hoberg et. al., 2017](#)), Closing stock of finished goods ([Sanches and Lima, 2011, 2014](#); [Jerath and Long, 2019](#)) and Closing stock of WIP and semi-finished goods ([Hoberg et. al., 2017](#); [Sanches and Lima, 2011, 2014](#); [Jerath and Long, 2019](#)). Raw materials relate to the interactions of firms with the suppliers, work in process informs about the efficiency of the firm’s own operations and finished goods describe the firm’s interactions with the customers ([Chen et. al., 2005](#)). The controlling variables include Earnings per share ([Sanches and Lima, 2011, 2014](#)) and Debt ([Chen et al., 2005](#)). Profit after tax ([Sanches and Lima, 2011, 2014](#)) is taken as the dependent variable for the study measuring the impact of hockey stick sales pattern on the company’s performance. The data taken for the above variables have been organized monthly in the panel data form from March 2010 to February 2021. The data for the above variables have been winsorized at 1% and 99% respectively and a log of sales has been taken to make the data more symmetric.

**Table 1<sup>1</sup>:** Descriptive Statistics.

Variables (INR Million)	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	No. of Observations
Sales	5962.97	764.80	583370.20	1.60	25014.77	10.55	154.53	50288
Closing Price	204.19	26.95	15743.70	0.13	824.08	10.99	146.90	5539
Closing stock of finished goods	966.33	106.90	12174.70	0.00	4792.23	13.85	258.90	44212
Closing stock of WIP and semi-finished goods	144.60	31.20	6569.50	0.00	481.24	8.89	103.67	4016
Cost of goods sold	4786.61	342.34	1186360	0.00	31428.65	23.29	736.42	59895
Cost of production WIP	753.41	34.76	66563.74	0.00	3337.79	10.84	160.82	59895
Earnings Per Share	1.81	0.24	435.64	-168.42	27.86	6.98	109.05	5513
Debt	1658.74	143.70	158758.80	0.00	7640.56	9.72	120.71	48324
Profit after tax	23.99	1.00	55397.90	-31895.20	1280.37	23.23	1016.68	58094

Table 1 represents the descriptive statistics for the different variables under the study. Table 1 clearly shows the mean, median, maximum, and minimum values of the different variables and all the

<sup>1</sup> Table 1 represents the descriptive statistics of the different variables used in the study.

figures are in INR million. The number of observations is less for the Closing price, closing stock of WIP and semi-finished goods and Earnings per share as the data was unavailable for the study. There is a large standard deviation among the range of sales of about 25015 indicating the steep rise and downfall of sales during the period. Moreover, the standard deviation is also large for Closing stock of finished goods, Cost of goods sold and Cost of production WIP. For all the variables, the data is positively skewed with a strong measure of kurtosis.

**Table 2<sup>2</sup>:** Correlation Matrix (T-Statistics) (Probability).

Variable	Closing price	Closing stock of finished goods	Closing stock of WIP and semi-finished goods	Cost of goods sold	Cost of production WIP	Sales	Earnings per share	Debt	Profit after tax
<b>Closing Price</b>	1.00 -- --								
<b>Closing Stock of finished goods</b>	0.139 (4.395) (0.000) ***	1.00 -- --							
<b>Closing stock of WIP and semi-finished goods</b>	-0.074 (-2.320) (0.021) **	0.136 (4.296) (0.000) ***	1.00 -- --						
<b>Cost of goods sold</b>	0.126 (3.959) (0.000) ***	0.952 (96.952) (0.000) ***	0.108 (3.405) (0.000) ***	1.00 -- --					
<b>Cost of production WIP</b>	0.175 (5.532) (0.000) ***	0.694 (30.097) (0.000) ***	0.138 (4.336) (0.000) ***	0.788 (40.010) (0.000) ***	1.00 -- --				
<b>Sales</b>	0.145 (4.584) (0.000) ***	0.959 (105.909) (0.000) ***	0.068 (2.116) (0.035) **	0.991 (234.915) (0.000) ***	0.772 (37.886) (0.000) ***	1.00 -- --			
<b>Earnings per share</b>	0.235 (7.530) (0.000) ***	0.150 (4.727) (0.000) ***	0.049 (1.542) (0.124)	0.166 (5.252) (0.000) ***	0.176 (5.567) (0.000) ***	0.175 (5.542) (0.000) ***	1.00 -- --		
<b>Debt</b>	0.059 (1.852) (0.064) *	0.895 (62.634) (0.000) ***	0.146 (4.594) (0.000) ***	0.909 (68.243) (0.000) ***	0.752 (35.579) (0.000) ***	0.896 (62.844) (0.000) ***	0.085 (2.666) (0.008) ***	1.00 -- --	
<b>Profit after tax</b>	0.260 (8.411) (0.000) ***	0.304 (9.947) (0.000) ***	0.014 (0.429) (0.668)	0.372 (12.523) (0.000) ***	0.265 (8.588) (0.000) ***	0.389 (13.194) (0.000) ***	0.473 (16.760) (0.000) ***	0.098 (3.078) (0.002) ***	1.00 -- --

<sup>2</sup> Table 2 shows the correlation matrix for the different variables under the study. (\*), (\*\*) and (\*\*\*) shows the significance level at 10%, 5% and 1% respectively.



Table 2 shows the correlation matrix with degrees of correlation, t-statistics, and probability for the different variables under the study. Closing price shows a low degree of correlation with the Cost of goods sold, Cost of production WIP and Sales. Similarly, the Cost of goods sold shows a high degree of correlation with the Cost of production WIP and Sales. This is mainly due to the fact that these costs are incorporated in the Closing Price of the stock and Sales and hence will show a high degree of correlation. Debt is also showing a high degree of correlation with Closing stock of finished goods, Cost of goods sold, Cost of production WIP and Sales. This is mainly due to the liabilities that a company owes to achieve its sales targets. We have taken these variables as the independent variables in order to determine their independent impact on the profits generated by the company from their sales quota targets.

#### 4. EMPIRICAL RESULTS AND DISCUSSION

An Ordinary Least Square (OLS) regression equation of the following form is estimated:

$$\text{Profit after tax}_{it} = \alpha + \beta_1 * \text{Sales}_{it} + \beta_2 * \text{Earnings per share}_{it} + \beta_3 * \text{Debt}_{it} + \varepsilon \text{ (Error term)} \text{-----(1)}$$

In Table 3, Equation (1) shows the impact of sales on the profitability of the companies measured by profit after tax in the presence of the controlling variables earnings per share and debt.  $\alpha$  and  $\beta$  are the intercepts and the coefficients of the variables respectively.  $\varepsilon$  denotes the error term in the regression process. The results of equation 1 show that the sales have a positive impact on the profitability of the firm in the presence of the controlling variables earnings per share being positively significant and debt being negatively significant.

An OLS regression consisting of the independent variables and the controlling variables is estimated and is shown below where notations have their usual meaning:

$$\text{Profit after tax}_{it} = \alpha + \beta_1 * \text{Sales}_{it} + \beta_2 * \text{Closing Price}_{it} + \beta_3 * \text{Cost of goods sold}_{it} + \beta_4 * \text{Cost of production WIP}_{it} + \beta_5 * \text{Closing stock of finished goods}_{it} + \beta_6 * \text{Closing stock of WIP and semi-finished goods}_{it} + \beta_7 * \text{Earnings per share}_{it} + \beta_8 * \text{Debt}_{it} + \varepsilon \text{ (Error term)} \text{-----(2)}$$

OLS (2) shows the impact of sales on the profitability of the companies in the presence of the independent and control variables. It was observed that the sales have a negative impact on the profitability of the companies which is in opposition due to the earlier result in OLS (1). The other independent variables closing price, cost of goods sold, closing stock of WIP and semi-finished goods have a positive impact on the profitability whereas the closing stock of finished goods had a negative

impact on the profitability. Similarly, in the controlling variables earning per share has a positive impact on profitability whereas debt has a negative impact on profitability. The opposition to the earlier results may be due to the endogeneity present in the panel data. The panel data OLS regression was further examined through Hausman Specification Test for endogeneity and the p-value came out to be significant (0.000) indicating the application of the Fixed Effects Model (FEM).

**Table 3<sup>3</sup>:** OLS and FEM Regression Estimates (Coefficient (T-Statistics) (Probability) showing the impact of sales and supporting variables on the profitability of the companies.

Variables	OLS (1)	OLS (2)	FEM (Annual)	FEM (Quarter-Wise)
Log (Sales)	329.290 (11.481) (0.000)***	-86.365 (-2.134) (0.033)**	220.221 (2.784) (0.006)***	254.325 (3.223) (0.002)***
Closing Price		0.787 (4.572) (0.000)***	0.463 (1.946) (0.052)*	0.687 (3.020) (0.003)***
Cost of goods sold		0.065 (18.922) (0.000)***	0.059 (13.971) (0.000)***	0.056 (13.545) (0.000)***
Cost of production WIP		-0.005 (-0.953) (0.341)	0.033 (5.053) (0.000)***	0.034 (5.316) (0.000)***
Closing stock of finished goods		-0.020 (-1.931) (0.054)*	-0.008 (-0.632) (0.527)	-0.002 (-0.152) (0.879)
Closing stock of WIP and semi-finished goods		0.250 (1.903) (0.057)*	0.520 (2.615) (0.009)***	0.341 (1.780) (0.076)*
Earnings per share	17.886 (12.453) (0.000)***	33.680 (15.002) (0.000)***	30.586 (6.942) (0.000)***	20.354 (4.655) (0.000)***
Debt	-0.103 (-36.359) (0.000)***	-0.074 (-22.094) (0.000)***	-0.092 (-17.634) (0.000)***	-0.087 (-16.611) (0.000)***
Intercept	-1723.854 (-8.070) (0.000)***	602.823 (1.852) (0.064)*	-2119.527 (-3.094) (0.002)***	-2426.572 (-3.550) (0.000)***
@year=2019 and @quarter=1				616.496 (2.699) (0.007)***
@year=2019 and @quarter=2				684.561 (3.409) (0.000)***
@year=2019 and @quarter=3				409.538 (2.070) (0.039)**
@year=2019 and @quarter=4				-123.398 (-0.631) (0.528)
@year=2020 and @quarter=1				-77.220 (-0.389) (0.697)
@year=2020 and @quarter=2				1.127 (0.005) (0.996)
@year=2020 and @quarter=3				-553.948 (-2.645) (0.008)***
@year=2020 and @quarter=4				-1838.397 (-8.793) (0.000)***
R Squared(%)	53.753	59.332	66.371	69.981

<sup>3</sup> Table 3 shows the Ordinary Least Square (OLS) regression and Fixed Effect Model (FEM) estimates of the different independent variables with the dependent variable Profit After Tax. (\*), (\*\*) and (\*\*\*) shows the significance level at 10%, 5% and 1% respectively.

The regression equation for the FEM is similar to equation (2) representing OLS with a slight difference in the application of the FEM. FEM specification again shows similarity to the results obtained in the first step. The sales have a positive significant impact on the profitability of the companies in the presence of the independent and the controlling variables. Closing price, cost of goods sold, cost of production WIP and closing stock of WIP and semi-finished goods have a positive impact on the profitability of the companies. Earnings per share again have a positive impact on profitability whereas debt also negatively impacts profitability. The sales however positively impact the profitability of the companies but still, the impact of sales spikes and quarter-end performances of sales must be measured in order to determine the hockey-stick phenomenon prevalent in the Indian retail industry. For this, we estimated equation (2) with additional quarter-end sales impact on the profitability. We determined the impact of sales spike for the four quarters present in the year 2019 and 2020 (COVID-19 period). The regression equation for determining the impact of sales spikes is shown below:

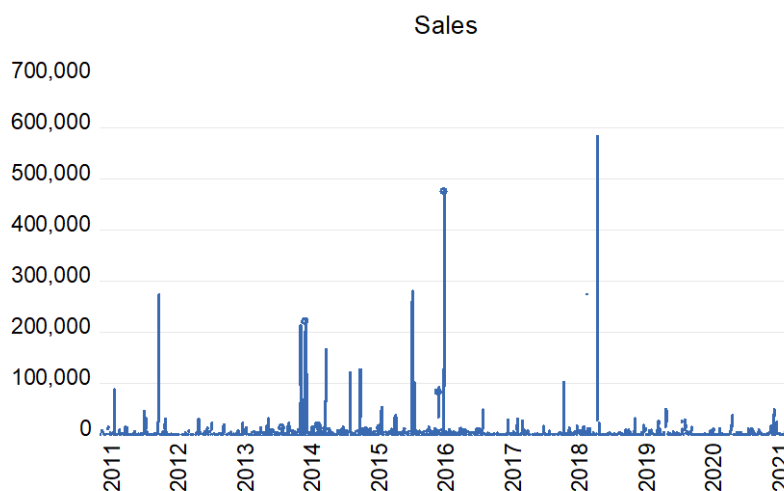
$$\begin{aligned} \text{Profit after taxit} = & \alpha + \beta_1 * \text{Salesit} + \beta_2 * \text{Closing Priceit} + \beta_3 * \text{Cost of goods soldit} + \beta_4 * \\ & \text{Cost of production WIPit} + \beta_5 * \text{Closing stock of finished goodsit} + \beta_6 * \text{Closing stock of WIP and} \\ & \text{semi-finished goodsit} + \beta_7 * \text{Earnings per shareit} + \beta_8 * \text{Debitit} + \beta_9 * (\text{@year=2019 and @quarter=1}) \\ & + \beta_{10} * (\text{@year=2019 and @quarter=2}) + \beta_{11} * (\text{@year=2019 and @quarter=3}) + \beta_{12} * (\text{@year=2019} \\ & \text{and @quarter=4}) + \beta_{13} * (\text{@year=2020 and @quarter=1}) + \beta_{14} * (\text{@year=2020 and @quarter=2}) + \\ & \beta_{15} * (\text{@year=2020 and @quarter=3}) + \beta_{16} * (\text{@year=2020 and @quarter=4}) + \varepsilon \text{ (Error term)} \end{aligned}$$

(3)

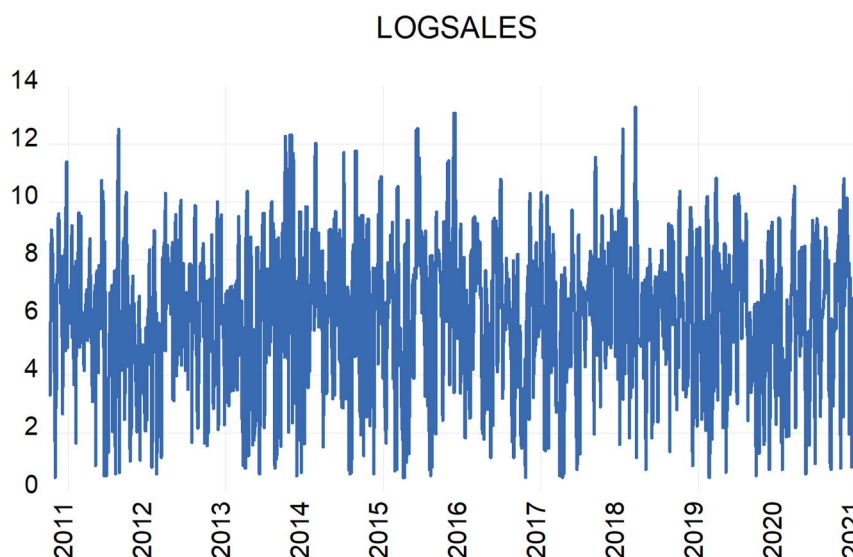
Equation (3) shows the impact of sales spikes on the profitability of the companies in the presence of the independent and the controlling variables. The results show that sales again have a positive impact on the profitability of the companies. Closing price, cost of goods sold, cost of production WIP and closing stock of WIP and semi-finished goods have a positive impact on the profitability of the companies. Earnings per share enhance the profitability whereas debt weakens the profitability of the companies. The sales spike impact on the profitability of the companies has been examined for the period 2019 and 2020 (COVID-19 period). The first three quarters of the year 2019 show a significant positive impact of sales spikes on the profitability of the companies whereas the last quarter shows the relationship is insignificant. However, during the COVID period 2020, the first two quarters show that there is no significant impact of the sales spikes on the profitability whereas the last two quarters show a significant negative sales spike on the profitability of the companies indicating the reduced sales targets achieved during the COVID-19 period. The sales graph is shown in figure-1 and the log of sales graph is shown in figure-2 clearly indicating the sales spike at the end of quarters.

The sales spikes have also been reduced to a lower level during the end of 2019 due to the beginning of COVID-period.

**Figure 1<sup>4</sup>:** Hockey-stick pattern of sales:



**Figure 2<sup>5</sup>:** Hockey-stick pattern of sales expressed in the form of log (sales):



<sup>4</sup> Figure 1 shows the relationship between the sales of the companies during the period March 2010 to Feb 2021. The X-axis represents the year, and the Y-axis represents the sales.

<sup>5</sup> Figure 2 represents the relationship between log of sales and the period chosen for the study. The X-axis represents the year and Y-axis represents the log (sales).

## 5. CONCLUSION

The present study deals with the hockey-stick sales phenomenon and its impact on the profitability of the retail industry in India during the period from March 2010 to February 2021. Different ordering patterns generate the same expected number of orders with different variances. The results show that overall, the hockey-stick sales phenomenon has a significant positive impact on the profitability of companies in the retail industry in India. Therefore, our first hypothesis is rejected. However, during the COVID-19 period, the hockey-stick sales phenomenon has a significant negative impact on the firm performance proving to have a detrimental effect on the profitability of the companies. The sales in the months end and delivery volume fluctuations have a number of impacts on the manufacturer's logistics area including costs of shipping, stocking, warehousing, handling and extra hours directly affecting the hockey stick sales phenomenon ([Sanchez and Lima, 2011](#)) while in India this doesn't seem to be the case overall but could be said for the COVID-19 period.

In fact, the results could not be generalized as are specific to the retail industry only but still, this methodology could be adopted for different industries with more profound data and methodology. For instance, the manufacturing industry, wholesale industry, etc. have been under the influence of the hockey-stick sales phenomenon and if the hockey-stick phenomenon appears to be a problem then buyer and manufacturer could sign a purchase contract, according to which a buyer agrees to buy a large number of goods at a discount, but the goods are delivered in multiple future time points separated evenly ([Lee et. al., 2004](#)). The best business hockey stick sales have no blade but only a handle, the blade of the hockey stick represents a graph of the flat sales period while the handle represents a rise ([Goldense, 2015](#)). There could be various solutions to a particular problem but initially, it is important to identify the impact of the hockey-stick sales phenomenon on the different industrial sectors in India in order to have a complete understanding of the phenomenon in the Indian context.

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