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THE IMPACT OF MACROECONOMIC CONDITIONS ON INDIAN AUTOMAKERS INCLUDED IN THE S&P BSE MANUFACTURING INDEX LIST

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ABSTRACT
The Indian automobile industry plays a pivotal role in the nation's economic development and is significantly influenced by changing macroeconomic conditions. This research examines the impact of key macroeconomic variables—Inflation, Gross Domestic Product (GDP), Crude Oil Prices, and Per Capita Income—on the production and sales performance of Indian automobile companies listed under the S&P BSE Manufacturing Index. Despite the sector's importance, limited studies have investigated how these macroeconomic indicators affect its growth trajectory. Utilizing secondary data sources such as annual reports, financial statements, and databases like SIAM, IBEF, and Statista, this study spans the period from 2014 onwards. A multiple regression analysis is employed to evaluate the relationship between the identified macroeconomic variables and the performance of automakers in terms of vehicle production and sales. The findings aim to offer valuable insights for industry stakeholders, helping them make informed strategic decisions in response to changing economic trends.
Keywords : Macroeconomic Variables, Indian Automobile Industry, S&P BSE Manufacturing Index, GDP, Inflation, Crude Oil Prices, Per Capita Income, Production, Sales, Multiple Regression Analysis, Secondary Data Analysis

1. Introduction:

Economics is considered as the fundamental social science that studies the choices of the entire society's stakeholders, including individuals, businesses and governments, with respect to allocating scare resources. Macroeconomics is the branch of economics that studies the behavior of an overall economy i.e. The market, Businesses, Consumers and Government. Macroeconomics studies factors related to economy such as Inflation, price levels, rate of economic growth, household income, national income, Gross Domestic Product (GDP), Exchange rate, Rate of interest etc.

Automotive sector consists of Automobile sector and allied sector. Automobile industry includes two wheelers, three wheelers, Passenger car and Multi Utility Vehicles (MUVs), Light and Heavy Commercial Vehicles (LCVs, HCVs) while Allied industry is made up of mostly the auto components sectors.

The Automobile industry contributes significantly to global trade. Along with the developed

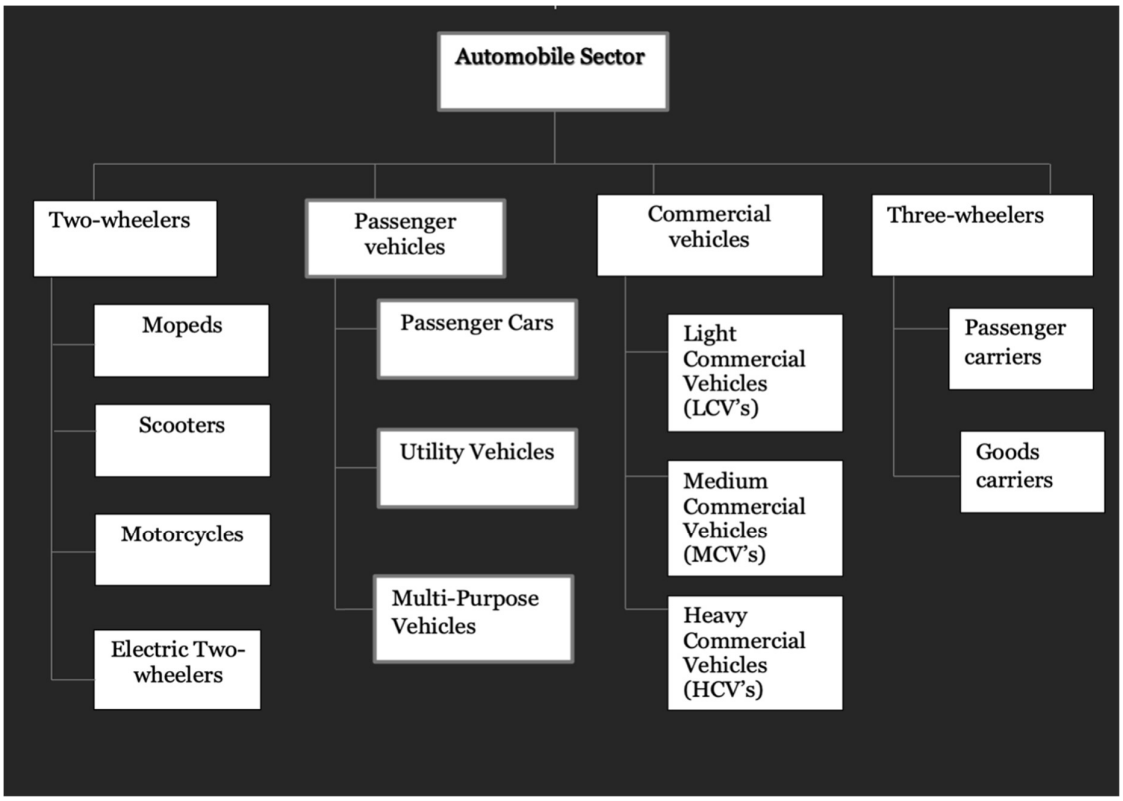
economies like China, South Korea, The United States, Japan etc. India has also emerged as a significant role in the global automobile industry. After India gained independence, the government of India partnered with Suzuki to create Maruti Udyog in 1981 to supply the nation with small passenger vehicles that could operate in Indian conditions.

One of the primary industries is automobile industry which has grown rapidly over the period and accounts a sizable and growing portion of industrial output, production, exports, and employment. It is notable that this industry has made a good presence in the global market. Therefore, we can say that one of the key sectors of Indian Economy is the automobile industry. Currently this sector is also developing its one of the main parts which is electronic vehicle which may lead to economic growth in Indian Economy. This study is done to investigate the effect of macro-economic variables in this industry as the well as in electronic vehicle market of Automobile Industry in India and the effect of macro-economic variables with the Indian Automobile manufacturing company's stock price.

The Indian automobile market is unique in that it is an oligopoly market, with the biggest market share held by very few companies in the sector. As a result, it is very much challenging for new manufacturers to enter the market because such dominant corporations are not very innovative when it comes to their automobiles because of their strong position and the difficulty of competing with the reputation they have built over the years.

The below-mentioned categories form the automobile sector which serves as a solid foundation for the movement of the people, products, and other assets too. For the transportation of goods from the production Centre to the consuming Centre, suitable transportation is required which is provided by the automobile sector.

- **Classification of Automobile Sector into Various Segments:**



SOURCE: SIAM

- **Trend in Production Volumes of Automobile Industry:**

Category	Passenger Vehicles	Commercial vehicles	Three wheelers	Two wheelers	Grand Total
2017-18	4,020,267	895,448	1,022,181	23,154,838	29,092,734
2018-19	4,028,471	1,112,405	1,268,833	24,499,777	30,909,486
2019-20	3,424,564	756,725	1,132,982	21,032,927	26,347,198
2020-21	3,062,280	624,939	614,613	18,349,941	22,651,773
2021-22	3,650,698	805,527	758,669	17,821,111	23,036,005
2022-23	4,578,639	1,035,626	855,696	19,459,009	25,928,970
Grand Total	22,764,919	5,230,670	5,652,974	124,317,603	157,966,166

SOURCE: SIAM

2. Literature Review:

- (Hussain, Nguyen, Nguyen, Nguyen, & Nguyen, 2021), In this article the goal

is to investigate how much working capital flows and macroeconomic indicators interact to affect financial performance in a developing economy. It has been proved that there is some link between the working capital element and the gross profit and cash conversion time utilizing panel analysis static and vibrant approach. Secondly, even though interest rates have negative impacts when used as a variable that engage with the average payment days, a rise in interest rates would be bad for business. The typical time frame for payment increases it has positive correlation with the company performance rather than largely regressing. Cash conversion cycle has a negative association, but it turns around when interest rate interaction is used. Financial performance will improve because of higher exchange rates and longer cash conversion times. Both currency exchange rates and interest rates have a substantial effect in improving a firm's performance.

- (Wang & Miao, 2021), In this research the effect of U.S. Corporate Average Fuel Economy (CAFÉ) rules for advancements in automotive fuel economy is empirically examined. Strict fuel efficiency regulations have been shown to boost the development of new cars and this effect is primarily due to the reaction of American automakers, using precise vehicle attributes data from 1978 through 2018. There is no proof that CAFÉ requirements have a similar impact on light duty truck technology advancement. The findings from the study also show that increased petrol costs have a considerable and advantageous impact on the advancement of technology that save gasoline in both light trucks and passenger cars. According to the empirical projections, the latest repeal of the Obama era CAFÉ standards would prevent cars from experiencing a roughly 2% boost in fuel efficiency between 2021 and 2025.

- (Joshi H. S., 2020) In this Research he has explained that in any economy, the corporate sector is essential to accelerating growth and transforming the economy from a developing to a developed one. Given that India is developing, it is critical that the corporate sector does well, propels the economy, and allows India to compete in the global market. Given that India is a developing nation, a significant portion of its GDP comes from the corporate sector. The automotive industry is essential to the growth of any economy. The automobile industry's commercial vehicle segment is essential to the supply chain management of other economic sectors. The main goal of the current research is to comprehend the profitability status of the businesses involved in India's commercial vehicle manufacturing sector. Ten years' worth of sample companies' financial data were examined for the aim. The financial data of the sample companies was compared both inside and between companies. The thesis's later section compared the companies' financial data to the industry norms for India's commercial vehicle manufacturing sector to shed light on how well the companies performed in comparison to other businesses in the same sector and identify areas where they could become more competitive.

Improving the business's financial performance will also aid in the sector's growth.

- (Sotnyk, et al., 2020), In this article, research is carried out by having mathematical modeling methods to study the main trends and macroeconomic indicators of the electric car market development for taking years from 2011 to 2018 and taking US as base country. The above research study concludes the dependence of the US electric vehicle market on certain macroeconomic indicators i.e., GDP, household income of the citizens, usage of energy such as electricity, and other non-monetary factors such as environmental factors.

- (Patra & Rao, 2019), In the study it has been stated that the Indian automotive industry has grown significantly due to country's increasing openness, rising per capita income, introduction of new and existing models, accessibility to credit at a low interest rate, and price reductions provided by dealers and manufacturers. Although there are many factors that influence automotive demand, the study aims to investigate how changes in gasoline prices, loan rates, GDP and per capita in India's automobile sector interact with country's automobile sales. To examine potential casual relationships between the variables indicated above, this study employed the correlation and VECM. The findings show that there is evidence of long term, positive correlation between GDP and automotive sales, while the remaining factors show an unfavorable correlation with automobile demand. The sale of both commercial vehicles and passenger vehicles, however, is negatively correlated with borrowing rates and fuel prices. This study may indicate that the government can assist by requiring greater fuel efficiency for vehicles, providing resources for increasing easily available credit, and lowering reliance on outside nation oil, which may increase turnover demand in the Indian auto industry.

- (Misra, 2018), In this research, the researcher has carried out an investigation to examine that any connection is there between Bombay Stock Exchange Sensex and macro-economic factors such as Index of IIP, price rise, interest rate, gold price, exchange rate and so forth taking data for year from April 1999 to March 2017. This study is also carried to out to check the strength of relationship between independent macro-economic variables as mentioned above and dependent variables i.e., BSE Sensex for short term and long term based on the test of Johansen Cointegration, test of Granger Causality, and VECM. An analysis taken out through VECM model concludes that there is long term causality between the macro-economic variables and BSE Sensex. It also comes to conclusion that Bombay Stock Exchange Sensex is also the main indicator that show changes in the exchange rate and money supply, FII, gold prices and IIP.

- (Kaur & Bhatia, 2016) this study investigated how macroeconomic factors affected the way the Indian stock market operated. The studies objective has been achieved by utilizing 10 macroeconomic factors—Broad Money, Call Money Rate, Crude Oil Price, Exchange Rate, Foreign Exchange Reserve, FII, Gross Fiscal Deficit, IIP, Price Rise, and Trade Balance—as well as one stock market index, the BOMBAY STOCK EXCHANGE 500, have been used to achieve the study's goals. To determine the outcomes, the Granger Causality Test, Multiple Regression, and Augmented Dickey Fuller (ADF) Test were used. Foreign institutional investors were determined to have stabilized at the level of the call money rate, the price of gasoline, the exchange rate, the foreign exchange reserve, the gross fiscal deficit, price rise and the trade balance at the first difference, and IIP and broad money at another difference. Using the multiple regression technique, this stagnant data was used to identify the important macroeconomic factors. The exchange rate and foreign institutional investors were the two macroeconomic variables that were deemed significant. The causal connection between these two important variables and the average closing prices of BSE 500 manufacturing businesses was examined using the Granger causality test. Since there was no correlation between the variables during the study period, the research also states that the stock market was a weak form efficient.

- *(*Muhammad, Yahya, Razak, Ramli, & Gan, 2013), In this study it is examined the long-term causal link between Malaysian passenger vehicle sales and macroeconomic variables. This study makes use of monthly time series data from April 2004 to December 2010. The VAR estimate method is used to accomplish the goals. The findings indicate that there is no long-term balance between passenger vehicle turnover and macroeconomic factors. Only a significant IPI variable has an immediate impact on Malaysia's rise in passenger vehicle sales.

- (Colin & Markus, 2009), The current research examines this problem by conducting an examination using econometrics of the effects of fuel prices as well as circulation tax on automobile market shares in Germany, the biggest auto market auto market in Europe, based on panel data on new car registrations. The analysis considers the segmented structure of the auto market using a hierarchical logit model. The result of research imply that fuel prices and circulation taxes greatly influence car market shares, which runs counter to much of the research gathered too far. As a result, these factors may be useful tools for changing the make-up of the car fleet related CO2 emissions.

- (Ahmed , 2008), Using quarterly data, this investigate examines the type of normal relationships that exist between stock prices and the major macroeconomic variables that represent the financial and real sectors of the

Indian economy from March 1995 to March 2007. These factors include the NSE Nifty and BSE Sensex in India, as well as the indexes of IIP, exports, foreign direct investment, money supply, exchange rate, and interest rate. Long-term relationships have been investigated using Johansen's cointegration technique and the Toda and Yamamoto Granger causality test, while short-term relationships have been investigated using BVAR modeling for variance decomposition and impulse response functions. The study's findings show that, throughout time, there are different causal relationships between stock indexes and aggregate macroeconomic variables. In the medium term, nonetheless, the causal pattern that was discovered is comparable in both markets. Apart from changes in interest rates, the analysis shows that stock prices in India drive economic activity. It appears that interest rates drive stock prices. As per the research, the Indian stock market appears to be influenced by both expected and actual performance. The study shows that changes in stock prices are the result of important macroeconomic variables' actions as well as the factors that influence changes in other macroeconomic dimensions.

- (Tsai & Norsworthy, 1996), This study develops a framework for examining how macroeconomic, global policies and events affect specific industries. A macro-economic industry model connects four-digit models of the industry demand and production structure to the Fair economic model and a modified neoclassical user cost of capital model to account for capital input disequilibrium in the main manufacturing sectors that use machine tools as well as in machine tool production. The metal cutting and metal forming are the two main categories of machine tools that the model is intended to assess the effects of a variety of variables on. The investment tax credits, the federal deficit, interest rates, currency rates and productivity and technological advancements in the domestic and competitive foreign machine-tool industries are among the factors whose quantitative effects are evaluated over the 1977-1986 period.

3. Objectives of Research:

To investigate the relationship between Macro economic variables such as Inflation, GDP, Crude Oil and Per capita income with production and sales of Indian Automobile companies listed under S&P BSE Manufacturing Index.

Very negligible investigation is done to understand the effect of macro-economic variables on the Indian automobile sector. Thus, this study will help to understand how different macro-economic variable will affect the Indian automobile sector. The demand and supply for the product may decline or rise because of macro-economic factors, prompting managers of the company to decide whether to raise or decrease production and sales.

4. Research Methodology:

- This research study is carried out taking Secondary data as base. For analysis, Annual reports, financial statements, and other published data such as any other announcements, press release etc. will be used.

- Data is collected from reliable sources so that to maintain reliability on the research study. Data is collected from certain sources such as registered stock exchange i.e., BSE where the companies are listed and even from another database such as Statista, Society of Indian Automobile Manufacture (SIAM), Road Transport Yearbook and India Brand Equity Foundation (IBEF).

- This research is carried out taking 2014 year as base year and only includes research on Indian Automobile Companies listed under S&P BSE Manufacturing Index. The research includes findings about how the production or sales of the vehicle can be improved with effect of change in macroeconomic variables. The Macroeconomic factors considered for the research are Inflation, GDP, gasoline and Per Capita Income.

- To get the findings on the objective of the research multiple regression method is being carried out. The regression model is as follows:

    - Production = $\alpha + \beta 1 * \text{Inflation} + \beta 2 * \text{GDP Rate} + \beta 3 * \text{Crude Oil Price} + \beta 4 * \text{Per Capita Income} + \varepsilon$
    - Sales = $\alpha + \beta 1 * \text{Inflation} + \beta 2 * \text{GDP Rate} + \beta 3 * \text{Crude Oil Price} + \beta 4 * \text{Per Capita Income} + \varepsilon$

5. Results:

For Dependent Variable Production:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.936[a]	.875	.776	25218.23408

a. Predictors: (Constant), Per_Capita_Income, GDP, Inflation, Crude oil

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-123084.831	66709.703		-1.845	.124
	Inflation	-1317.476	10362.527	-.026	-.127	.904
	GDP	413.164	2619.473	.034	.158	.881
	Crude_oil	346.285	790.479	.115	.438	.680
	Per_Capita_Income	145.964	33.456	.867	4.363	.007

a. Dependent Variable: Production

For Dependent Variable Sales:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922[a]	.849	.729	37426.62409

a. Predictors: (Constant), Per_Capita_Income, GDP, Inflation, Crude oil

b. Dependent Variable: Sales

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-140081.002	99004.513		-1.415	.216
	Inflation	-4838.259	15379.126	-.071	-.315	.766
	GDP	664.242	3887.585	.041	.171	.871
	Crude_oil	312.718	1173.157	.077	.267	.800
	Per_Capita_Income	201.283	49.653	.886	4.054	.010

a. Dependent Variable: Sales

6. Discussion:

- The results state that Inflation rate has a negative relation with Automobile industry sales and production. Muhammad et al. (2013) in their research found that there is no significant relationship between inflation and sales of passenger vehicles in long run. Muhammad et al. (2012) demonstrated a favorable correlation between GDP and automobile sales. They examined four independent variables related to car purchases in

ASEAN nations: GDP, inflation (CPI), UR, and loan rate. According to their findings, the four variables have a long-term impact on car sales but are negligible in the near term. Nawi, et al. (2013) found that their study of passenger automobile sales supports the result. They also investigate the connection between GDP and sales of passenger cars in their study. Their findings also indicated a favorable correlation between GDP and sales of passenger cars. A higher GDP suggests a higher volume of sales of passenger cars.

- **Limitations of the study**: This research only considers some of the macro-economic factors such as Inflation, GDP, Crude Oil and Per capita income. It doesn't consider other as well as micro-economic variables. This study is carried out taking Automobile Companies listed under S&P BSE Manufacturing Index (i.e. Bajaj Auto Ltd, Eicher Motors Ltd, Hero Motocrop Ltd, Mahindra and Mahindra Ltd, Maruti Suzuki India Ltd, Tata Motors Ltd).

- **Scope for Further research:** As this study is carried out considering only 6 companies of Indian Automobile Industry so more in-depth research can be done while taking more companies data. Research can be carried out for other Macroeconomic factors on which research is not carried out (i.e. Exchange rates, Interest Rate etc.)

7. Conclusion:

- India's stock market is renowned for being a sophisticated and stable capital market. Most corporates in India are listed on the BSE. It is the BSE Sensex, or the stock index of the BSE, which is regarded as a commonly followed and recognized stock-market benchmark equity index. It is claimed that the BSE index reflects how well the Indian economy is doing. It is identified that the macro-economic indicators and the Bombay Stock Exchange SENSEX have an overtime relationship. Additionally, it that there is a normal linkage among the oil prices and stock market indices.

- It is observed that India's car sector is ideally there to expand and meet domestic demand. This indicates that the manufacture of cars has been trending upward in terms of both number and value. Lower car sales are a result of higher gasoline prices and lending rates, which have a negative association with demand for automobiles. Sales are positively impacted by increases in income, but demand for automobiles declines when fuel prices rise. The adverse effects of rising gasoline costs also lead to a decline in demand. The rapid expansion of the Indian economy has led to a rise in the production of automobiles. However, there is a negative correlation between the price of petroleum and the manufacturing of automobiles because rising fuel prices result in a drop in both demand and production of automobiles. When considering the demand for automobiles in India, the findings show that fuel prices and lending rates play a significant role in case of Passenger Vehicle's sales in India. Numerous factors impact sales and demand, such as consumer income, commodity prices, crude oil prices, excise

duties, and new product releases. While there are several factors that can impact the demand for cars, GDPP is by far the most important one.

- Long-term drivers of the automotive sector would be improvements in infrastructure and a decline in inflation, both of which can result in lower interest rates. If the government could assist by requiring cars to have greater fuel efficiency and by offering resources for enhancing loan availability and lowering reliance on foreign oil, this would become feasible. There are significant ramifications for energy security and climate change from India's rapid motorization.

8. Limitation:

- This research is carried out only considering passenger vehicles manufactured in India out of the entire automobile sector.

- This research only considers some of the macro-economic variables such as Inflation, GDP, Crude Oil, Per capita income and doesn't consider other as well as micro-economic variables.

- The research is carried out by taking secondary source of data only and no primary source of data is used for collection of data.

- The research is done to investigate relationship between macro-economic variables as mentioned above and only two dependent variables i.e., production and sales and it does not study the effect of macro-economic indicators on Indian automobile sector from the perspective of consumer.

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