MACROECONOMIC VOLATILITY AND ITS IMPACT ON PASSENGER CAR SALE- AN EVIDENCE FROM INDIA

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ABSTRACT

The paper focusses on 5 crucial macroeconomic variables of India and analyzes its effect on the sale of passenger cars in the Indian automobile market. The macroeconomic variables consist of- Interest Rate, Fuel Prices, Taxation, Inflation, and GDP. Correlation and level of impact are being examined in the study with the help of the 'Correlation & Regression' model using data from official and authenticated sources. The study may provide valuable inputs on making policy and driving business strategies to passenger car making companies and the government.The study found the top three macroeconomic variables which have a significant impact on passenger car sale in India in the short run. They are 'Interest Rate, Fuel Price, and Tax on automobile industry'. The study also proposed a regression model which can help to estimate changes in car sale due to change in studied macroeconomic variables.

Key Words: Car Sale, Macroeconomic Variables, Multiple Regression, Inflation, Interest Rate, Fuel Price, GDP

ABBREVIATIONS

GDP: Gross Domestic Production

TOI: Times of India

SIAM: Society of Indian Automobile Manufacturer

IBEF: India Brand Equity Foundation

NPA: Non-performing Assets

1 CONCEPTUAL BACKGROUND

Macroeconomic variables are the real engine of economic as well as the overall growth of the economy (Binh & Dan, 2019). These factors have two-dimensional impact on business operations viz. direct and in-direct. The potential

of these variables reveals the power of an economy and its cycle. Macroeconomic indicators show the market potential of the country and help to estimate the market trend. Government policies have great significance in this regard and decide what would be the scenario of a particular sector in the given economy (Rahman, 2015). India as the second largest populated country in the world represents the potential consumer market for almost every product category (Sharma, et al., 2011).Indian automobile industry holds the fourth rank in global ranking as a manufacturer and consumer market. But, the share of the passenger car is comparatively lower than the developed economies (IBEF, 2019). Macroeconomic factors like inflation, interest rate, fuel prices, Taxation, and GDP play a significant role in driving passenger car demand and sale in the market. It has a direct relationship and has aninfluencing power, in a study conducted by Muhammad et al. (2013) on the relationship between macroeconomic variables and passenger vehicle sales in Malaysia shows that macroeconomic factors particularly GDP plays a vital role in a passenger car sale.Hence, it has created sufficient background of conducting this research and analyze which macroeconomic factor has more, moderate, and lesser impact on passenger car demand in the Indian automobile market. Also, to understand and estimate the level of impact and significance in predicting sales in the future.

1.1 INTRODUCTION

Auto sales have registered significant growth and sustainable performance in the Indian automobile market during the last few years but a significant slowdown has been experienced in the year 2019. According to the 'Society of Indian Automobile Manufacturer (SIAM),' the overall demand for passenger vehicles was observed to be decreasing particularly passenger cars have given big stroke to the demand (SIAM, 2019).The demand for passenger cars for the year 2019 was a registered decrease of 1.2% whereas commercial demand was shrunk by 12.3%. Passenger cars belong to the shopping product category which required essential support of other factors like income, money supply, employment, inflation, etc. Economic factors become prominent to decide the sale of passenger cars in any market. Particularly, to Indian economic slowdown and increasing cost hit badly this sector. The decline in GDP adversely affects industrial operations, policies, and future economic plans (TOI, 2019).Indian automotive market despite having low-interest rates and easy buying options experiencing a big slowdown (Patra & Rao, 2017).

The growth and decline of any industrial sectordepend upon a variety of factors and particularly more upon macroeconomic factors as these have a deep and lasting effect on industrial growth (Sivak, 2013). A significant impact of economic variables on auto sales has been observed by many researchers including Shahabuddin (2009). The author investigated the relationship between economic variables and car sales. The study found a positive relation of economic variables with foreign car sales in India but a weak correlation with Indian car brands' sales. This shows, how important the study of economic variables is for estimating the future growth and trend of industries in the Indian market.

1.2 ROLE AND IMPORTANCE OF SELECTED MACROECONOMIC VARIABLES

The study takes five very crucial macroeconomic variables in the study and examines the level of impact and correlation with passenger car sales in India. The reason for selecting these five variables from many important variables is the closest relationship with the auto sale. Based on literature findings these variables have been identified and selected for the study. Following macroeconomic variables show its importance for the study-

1. Interest Rates: Loan interest rate has a direct relation with loan demand, increasing NPA of commercial banks and money lenders restricted the new inflow of money to the needy. As a result, loans become costly and demand for shopping products like cars went down (Tripathi, 2019). The car loan interest rate is a significant factor that decides what would be the growth of car demand shortly. In India, more than 90 percent of passenger car sales happen through finance, therefore, the rate of interest must be appropriate and lower to attract borrowers. Hence, to empirically examine this variable the study taken it as an important variable.
2. Fuel Prices: Fuel price is an important determinant of future sales figure particularly in developing economies like India. Fuel taxation and fuel economy standards play a vital role in passenger car sales (Clerides&Zachariadis, 2008). The low fuel efficiency of cars and higher fuel prices are the main cause of the slower growth of passenger car sales in struggling economies. Indian automobile market to facing a tough time due to a significant increase in fuel prices. McManus (2007) examined the relationship between Gasoline prices and vehicle sales and found that both have a direct relation. As the fuel prices increase demand for vehicle

goes down or get slower. Hence, this has taken as the second important variable in the current study.

3. Taxation: Tax regime is another important macroeconomic variable that has a significant impact on the demand for goods in all categories. It is pretty much vital to understand the level of impact on different categories of goods. Taxation on vehicle and fuel directly hit the demand and supply of vehicles. Fuel taxation and emission policy negatively affect the diffusion of vehicle demand and significantly affects it (Eugenio, et al., 2018). In developing economies, car manufacturing, and assembling effects by higher import tariffs and hit vehicle demand in the market, therefore, the tax structure is to be minutely observed and studied (Bergstrand, Larch, and Yotov, 2015).
4. Inflation: Low demand for commodities always has a direct or indirect relationship with inflation prevailing in the market. Indian automobile industry to see the era of higher inflation affecting demand for passenger cars. The significant slowdown in auto demand appeared due to various macroeconomic factors viz. higher GST rate, stagnant wage rate, liquidity in the market, farm distress, etc. which hits the rate of inflation in the market (The Economic Times, 2019). Inflation is a major determinant of market demand for commodities of different categories. The entire economy and its growthare significantly affected by inflation as it creates an unwanted increase in prices of the goods in the market which adversely affects the demand in the short as well as long run (Davis, 2019). Hence, inflation is taken as an important variable of the study.
5. GDP: GDPrepresents the changes that occur in the average price of consumer goods which reveal the cost of living in an economy. Higher GDP shows inflation in the economy and reduces the demand for consumer goods. Although GDP affects directly the demand for basic goods and it has a lasting effect on other durable goods also like garments, jewelry, automobiles, etc. The global automotive market gets hit by numerous economic factors and come out of it from extensive efforts of the government (Economic Outlook, 2014). India to look forward to getting the automobile industry back on wheels in the coming months. Hence, GDP is taken to study its role and level of impact on car sales in the Indian market.

2 REVIEW OF LITERATURE

Various researches have been conducted on finding the impact of macroeconomic variables on automobile sales and found a positive relationship among them. A review of literature specifically focuses on the studies which included selected macroeconomic variables which have been taken in the current study. Following researches have been identified which supports the current research and its scope in the current scenario-

Bosworth (2014) examined the relationship between the interest rate and economic growth of the country and found that interest rates including both foreign interest and domestic interest positively affect inflation in the economy. Thus, in the long run, it affects the demand for concerned products.Interest rate incentives to the automobile industry are a great means of giving competitiveness and make the cost of the vehicles effective. Fred (1987) opined to have a favorable interest rate to the industries to boost new automobile sales, on the other hand, consumers' interest rates should also be kept in mind and take it at priority. Supporting this fact, an article published by Copeland, Hall &Maccini (2015) revealed that higher interest rates directly increase the cost of borrowings to households and affect lower-income households' demand for automobiles. Further, consumer affordability is an important determinant of product demand (Litman, 2011). The Indian automobile market loan interest rate plays a prominent role in making the mood of customers buy cars as it is directly connected with the cost of capital borrowed. Interest rates must be consumer favorable irrespective of end-user or manufacturer.

The fuel price has a direct relationship with the demand for automobiles in India as it is a price-sensitive market. The majority of families live below and around medium income and have a car as a second priority after their own house. In such a situation small hike in fuel prices adversely affects the demand for cars (Ray, 2019). The slow growth of the automobile market in India during the previous few months witnessed the impact of a significant hike in fuel prices on the demand for passenger vehicles.Unrau (2018) also observed that fuel price is a competitive driver of the automobile market especially in a growing economy with low per capita income.Developing economies are predominantly based on fuel prices for the demand for various products, therefore, it plays a vital role in estimating the future demand for luxury products. As car belongs to the luxury

segment in India hence, it's buying and operating cost does matter a lot to the buyers.

The tax regime has a direct connection with a cost escalation of industries, GST implementation has added new dimensions in the Indian tax structure. Jha & Singh (2017) found a positive impact of GST on small car sales and other vehicles. The relationship is quite obvious and relative which affects both ways positive and negative. The economy experienced the combined effect of the new tax regime and the automobile sector expects a favorite taxation policy to see sustainable growth. As the fastest growing industry of the country it required back support from the government to become competitive and affordable. Taxation in this way is a prominent parameter that decides the growth and expansion of the sector. It is the influencing driver of demand in the market and carries a positive correlation with auto demand in the country (Sharma, 2018).

The relationship between inflation and automobile sales is found to be positive by many types of research including Retius (2014). The study found both the variables are co-integrated in the long run which shows the perfect correlation among them. Inflation in its nature has sound capacity to directly affect any sector or industry, automobile is not a distinct case. New vehicle sale is largely derived from economic variables in which the cost of buying is prominent. Hence, the level of inflation in the economy predicts the level of demand for goods and services. Price stability is directly dependent upon the rate of inflation prevailing in the economy, however, sudden increase or decrease may not be visible but its results appear in the long run (Niyimbanira, 2013).

Mark& Fiona (1994) supported that GDP is an important parameter of measuring the economic strengthof the country. It is being considered as the most closely linked indicator of a country's potential and helps to predict demand for goods and services.Passenger vehicle demand is highly dependent upon the gross production of automobiles. Large production gives controlled cost of production and offers economies of scale.Financial Express Report (2019) opined that GDP is relative to demand, as public expenditure increases demand increases and its relative effect goes on production. Similarly, if GDP is high in any country economic growth can easily be seen.

3 PURPOSE OF THE STUDY

The current research is the inspiration of previous researches conducted in different sectors, countries, and variables. It concentrates on five macroeconomic variables which are important predictors of market trend especially to the sales and demand of goods and services. To make the study confined specific industry i.e. Automobile, is taken wherein the passenger car segment is selected. The ultimate purpose of the research is to study the impact of selected macroeconomic variables on the sale of passenger cars in India. This would help to understand the level of impact of each variable on car sales. Also, help to estimate the future demand based on results and findings of the study. To have a closer view of the purpose of the study following objectives have been framed:

1. Estimate the correlation between five macroeconomic variables and passenger car sales in India.
2. Measure the level of impact of each macroeconomic variable on passenger car sales.
3. Examine the 'autocorrelation' between the dependent and independent variables.
4. Develop a regression model to predict future demand of any commodity concerning selected macroeconomic variables.

4 RESEARCH METHOD

The study is set to find the correlation (Pearson Correlation) between five important macroeconomic variables viz. interest rate, fuel price, inflation, taxation &GDP, and passenger car sale regarding India. The multiple regression model is used to predict the change in the dependent variable due to the change in independent variables. Variable information is as follows:

Table 1- Description of Variables

***Dependent Variable*:**	***Independent Variable*:**
Passenger Car Sale	**Interest Rate,** **Fuel Price,** **Inflation,** **Tax** **GDP**

The macroeconomic variables were selected based on its relativeness and closeness with passenger care demand in India. Previous studies helped in selecting these variables. 6 years of data statistics from 2013-14 to 2018-19 have been collected for selected independent variables from various authenticated sources like SIAMINDIA, SBI, IOCL, Hindustan Times, etc.

Table 2- Data Description

FY	Passenger Car sale	Interest Rate (%)	FuelPrice (INR)	Inflation (%)	Tax (%)	GDP (%)
2013-14	2503509	10	63.09	6.37	33.5	6.4
2014-15	2601236	9.85	71.51	5.88	32.5	7.4
2015-16	2789208	9.15	66.29	4.97	38.5	8.2
2016-17	3047582	8	63.02	2.49	38.5	7.1
2017-18	3288581	8.15	65.32	4.85	29 (GST)	6.8
2018-19	3377436	8.65	78.43	7.66	29 (GST)	4.5

Source: Author Preparation (Data extracted from official websites of concern variables)

- Passenger car sale data are taken from SIAM INDIA (Society of Indian Automobile Manufacturer),
- The interest varies bank to bank, therefore, State Bank of India interest rate on a car loan is taken for the study,
- Fuel price indices also vary state to state, therefore, to make it rational and comprehensive India's capital (Delhi) fuel price is taken,
- Inflation data is taken from government statistics available on different official websites.
- GDP data is taken from the 'Hindustan Times' official site.

To analyze the long-term relationship between the dependent and independent variables 'Durbin Watson" test has been applied. Durbin Watson test helps to understand and study auto-correlation between variables and suggest whether independent variables are eligible in estimating future values of the dependent variable or not?

5 ANALYSIS

First Objective: *Estimate the correlation between five macroeconomic variables and passenger car sales in India.*

The Pearson correlation test is applied using SPSS 20, the result of the test is displayed as follows:

Table 3- Correlation Result

Correlations

		P. Carsale	Int. Rate	Fuel Price	Inflation	Tax	GDP
Pearson Correlation	P. Carsale	1.000	-.854	.397	-.012	-.442	-.538
	Int. Rate	-.854	1.000	.056	.527	.017	.153
	Fuel Price	.397	.056	1.000	.710	-.560	-.634
	Inflation	-.012	.527	.710	1.000	-.666	-.621
	Tax	-.442	.017	-.560	-.666	1.000	.682
	GDP	-.538	.153	-.634	-.621	.682	1.000

1. ***Passenger Car Sale –Interest Rate:*** Negative correlation is observed between the variables as the value of 'Interest Rate' is found to be -0.854. This result is found accurate as it matches the universal phenomenon of assuming that if the interest rate goes down the sale of goods increases. The testing result supports the same by showing that interest rate is negatively correlated with car sales. It opined that a significant decrease in the rate of interest of car loans boost the car sale in India (Refer table 3).
2. ***Passenger Car Sale –Fuel Price:*** The result shows a positive correlation between the variables as the value of correlation is observed to be .397. The correlation is positive but weak. It means, despite the increase in fuel price, car sale increases. The trend is cyclical, a small hike in fuel price doesn't impact the sale of the car in the short-run but this variable has a significant impact in the long run if fuel price is continuously increasing. After a certain limit, fuel price increment put a negative impact on car sales (Refer table 3).
3. ***Passenger Car Sale – Inflation:*** Correlation of 'Inflation' with passenger car sale is also found negative with a value -.012. It shows that inflation

hasvery little impact on a car sale. The negative correlation indicates that if inflation reduces car sales increases. It is quite an obvious correlation as per economic philosophies. The value of correlation is observed very little, it may be due to data taken of a small period. In the long-run inflation may put a significant impact on car sales in the Indian economy (Refer table 3).

4. ***Passenger Car Sale –Tax:*** The test reveals a negative correlation of 'Tax' on automobiles with car sales. The value of correlation is found to be -.442 that indicate, if Tax on automobile goes down it helps to increase car sale. The test is found as per the general phenomenon and support economics rules. Tax on any commodity affects its demand in the market, also it has a direct relationship with demand and sale. Hence, it is proven that Taxation has a perfectly negative correlation with passenger car sales in India.
5. ***Passenger Car Sale -GDP:*** Negative correlation is found between car sales and GDP of the country. The correlation value is found to be -.538, the result doesn't support the general rule of economics. Here, GDP's negative relationship indicates that, if the GDP goes down car sales would increase. This may not be the case; it may be due to high volatility in GDP growth rate during the past 5-7 years or data taken for the study is of a small-time period. Hence, the test doesn't clarify the relationship between the two (Refer table 3).

Second Objective: *Measure the level of impact of each macroeconomic variable on passenger car sales.*

To measure the predictability power of each macroeconomic variable for a passenger car in India multiple regression is applied and the result is found below:

Table 4- Model Summary

MACROECONOMIC VARIABLE	R SQUARE VALUE	ADJUSTED R SQUARE	% OF IMPACT
INTEREST RATE	.729	.661	66%
FUEL PRICE	.446	.432	43%
INFLATION	.289	.216	22%
TAX	.428	.412	41%

GDP	.417	.401	40%

The model summary in table 4 representing the level of impact of each macroeconomic variable on the increase or decrease of the dependent variable. The predictive power has been analyzed with the help of adjusted R square values extracted from the 'Multiple Regression Model'. According to the result, 'Interest Rate (R= .661)' has the highest power to influence passenger car sales with percent of the impact of 66%. It means car sale is majorly dependent upon the rate of interest charged on car loan or cost of capital borrowed for buying a car in India. Further, the second-highest influential variable is 'Fuel Price (R= .432)' with an impact intensity of 43%. In a highly price-sensitive market 'fuel price' significantly affects consumer buying behavior for automobile products. Hence, 'fuel price' must be in control to generate the desired car demand in the market.The third important predictor is 'Tax (R= .412)' in the automobile industry. The result shows 41% impacting power on a passenger car sale, it is an important determinant of future sale and demand for automobiles in India. The fourth variable with higher influencing power is 'GDP (R= .401)' with a 40% impact on a car sale. However, the correlation value of 'GDP' is found negative, but still, it is a strong predictor in India.The fifth predictor is 'Inflation (R=.216)' in the economy with 22% predicting power. Inflation has got the lowest intensity it may because its impact doesn't appear in the short run for automobile products. Although, inflation is an important determinant of sales in any economy.

Third Objective: *Examine the 'autocorrelation' between the dependent and independent variables.*

The autocorrelation between 'macroeconomic variables and passenger car sales' has been measured through the 'Durbin Watson' test. The value of the Durbin Watson test of autocorrelation is 1.816 that indicates the perfect autocorrelation between the variables. The test helps to measure autocorrelation among time series data on a successive interval. It is also known as 'serial correlation', the test reveals significant autocorrelation between all-time series data used in the study. The test indicates that a change in any of the data series would impact dependent variable performance i.e. passenger car sales up to a certain level. Hence, the study proves that the macroeconomic variables selected in the study have a significant impact on predicting passenger car sales in India.

Fourth Objective: *Develop a regression model to predict the future demand of any commodity concerning selected macroeconomic variables.*

PROPOSED REGRESSION MODEL

Y (Passenger Car Sale) = 6.749 (α) + .446 (Fuel Price) + .606 (Inflation) - .428 (Tax) - .417 (GDP) - .216 (Int. Rate) + 1.7500 (€)

The above-proposed regression model developed to estimate the change may occur in the future value of passenger car sales in the Indian automobile market due to change in above said macroeconomic variables. With the help of this model, variations can be measure in demand for passenger cars. The level of impact of each variable varies due to the duration of time, the economic condition of the nation, and lows & highs in values (statistics).

6 FINDINGS AND LIMITATIONS

6.1 FINDINGS

A perfect correlation between various macroeconomic variables and passenger car sales is observed. The highest influence on car sales is of 'Interest Rate' in the short run. The relation is found perfectly negative which indicate that a decrease in the rate of interest on car loan increases the demand car sale. The second highest influencing variable is 'Fuel Price', in India fuel price put a significant impact on the sale of new passenger cars, hence, fuel price must be taken as an important determinant of car demand in India. The third influencing variable is 'Tax' on the automobile, it directly affects the price of the car, thus significantly influence the car sale. The fourth and fifth important variables are 'GDP & Inflation'. The study also found that the implementation of GST in the automobile industry reduces the various indirect tax burden. The impact of GDP is found weak in car sales as it doesn't affect the demand in the short run. Also, the study found perfect 'Autocorrelation' between macroeconomic variables and passenger car sales in India. The study is carried out on short-period data statistics therefore the level of impact of variables is measured on a short term basis. While concluding the results and findings the study proves a perfect relationship (both positive & negative) among macroeconomic variables and passenger car sales in the Indian economy.

6.2 LIMITATION

Data time frame is the primary limitation of this study as a time series of data is taken for the last 6 years. The result and findings are calculated on data from 2013-14 to 2018-19, hence, probably the result may not be universal. Secondly,

calculations are done on short term data series whose results may not applicable for long term planning. Thirdly, the impact of GDP and Inflation is found to be very low which generally opposes the fundamentals of economics. Fourth, the result may vary when it goes too long-term data series analysis.

7 CONCLUSION

The automobile industry is highly dependent on macroeconomic factors especially in developing economies. Specifically talking on passenger car sales in India depends on various economic variables like cost of capital borrowed to buy a car, volatility in fuel prices, uncertain inflation, and change in GDP, and so on. These factors have a significant impact on the demand and sale of a passenger car in India and a small change in any of the factors significantly affects sales.Consumer behavior also affects change in these variables. Also, the cumulative effect can be seen on car sales in the short as well as long run. Car loan interest rates and fuel prices play an important role in driving demand for passenger cars in India.

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