IOSR Journal of Humanities and Social Science (IOSR-JHSS)
Volume 30, Issue 12, Series 9 (December, 2025) 38-42
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Impact of Key Macroeconomic Indicators on Automobile Demand in India: A Segment-Wise Analysis

Soju L. Johnson[1], Prof (Dr.) B. Gopakumar[2]
[1]*Research Scholar, PG and Research Department of Commerce, S.D. College, Alappuzha*
[2]*Research Supervisor, PG and Research Department of Commerce, S.D. College, Alappuzha*

Abstract
The automobile industry is a vital contributor to India's economic development, yet its demand structure is highly sensitive to macroeconomic fluctuations. This study examines the influence of GDP growth rate, CPI inflation rate, and unemployment rate on automobile demand in India using panel data from four major vehicle segments over five years (2020–21 to 2024–25). A Fixed Effects Model was employed to account for segment-specific characteristics, and the findings reveal that GDP growth has a significant positive effect on automobile sales, while inflation and unemployment negatively impact demand. Segment-wise analysis shows varying responsiveness across vehicle categories, with two-wheelers and passenger vehicles being more sensitive to income changes, and commercial vehicles and three-wheelers more affected by labour market conditions. The study concludes that macroeconomic stability is essential for sustaining the growth of India's automobile market and recommends strategic planning aligned with economic conditions.

Keywords: *Automobile Demand, Macroeconomic Variables, GDP Growth, Inflation, Unemployment*

I. Introduction

The automobile industry is a key contributor to India's economic growth by generating substantial employment opportunities, supporting allied industries, and contributing significantly to national GDP and industrial output (Society of Indian Automobile Manufacturers,2024). As one of the world's fastest-expanding automotive markets, India's vehicle demand has been driven by rising household incomes, increasing urbanisation, mobility requirements, and evolving consumer lifestyles (International Energy Agency, 2023). Despite its strong growth potential, the sector is highly sensitive to macroeconomic conditions, as vehicle purchases are largely influenced by income stability, inflation, and consumer confidence (Narayana & Mahadevan, 2022).

Macroeconomic indicators such as Gross Domestic Product (GDP), Consumer Price Index (CPI) inflation, and unemployment rate are widely recognised as critical determinants of consumption behaviour. Economic expansion measured through GDP growth increases purchasing power and stimulates discretionary spending, including automobile purchases (Mishra, 2021). In contrast, inflationary pressures reduce real household income, making vehicle ownership less affordable (Reserve Bank of India, 2023). Likewise, unemployment risk negatively impacts financial security, discouraging consumers from committing to high-value, long-term investments such as vehicles (World Bank, 2024).

The Indian automobile market is heavily diversified, consisting of multiple segments such as passenger vehicles, commercial vehicles, three-wheelers, and two-wheelers, each demonstrating distinct demand behaviour and sensitivity to economic fluctuations. The Indian automotive sector has experienced substantial volatility in recent years. During 2020–21, the COVID-19 pandemic led to production disruptions, mobility restrictions, and demand contraction, which severely affected vehicle sales. The subsequent recovery has been driven by economic revival, increased preference for personal transport, and supportive policy measures (KPMG India, 2023). Sales fell sharply during 2020–21 due to lockdowns, supply constraints, and reduced consumer mobility, followed by a demand recovery driven by rising preference for personal transport, strong financing support, and government stimulus measures. These contrasting demand patterns underscore the necessity of assessing the responsiveness of automobile demand to macroeconomic fluctuations. his cyclical pattern reinforces the need to analyse the relationship between economic indicators and automobile sales across different phases of economic performance. This cyclical pattern reinforces the need to analyse the relationship between economic indicators and automobile sales across different phases of economic performance. The present study investigates the influence of macroeconomic variables such as GDP growth rate, CPI inflation rate, and unemployment rate on automobile demand in India.

II. Statement of the Problem

The Indian automobile industry is a major contributor to the nation's GDP and employment, yet it remains highly sensitive to macroeconomic conditions such as economic growth, inflation, and unemployment. Recent years have shown significant volatility in vehicle demand with sharp declines during the COVID-19 pandemic and uneven rebounds across passenger vehicles, two-wheelers, and commercial segments, highlighting unclear and varying responses to broader economic shifts. Despite descriptive evidence suggesting that factors like GDP growth enhance purchasing power while high inflation and rising unemployment suppress demand, there is limited rigorous empirical analysis quantifying these relationships across vehicle categories in India. This study addresses that gap by examining the influence of key macroeconomic variables on automobile demand using panel data, thereby providing insights crucial for policymakers and industry stakeholders to anticipate market trends and inform economic and production planning.

III. Objectives of the Study

1. To analyse the impact of key macroeconomic variables on automobile demand in India.
2. To evaluate the segment-wise responsiveness of automobile sales to changes in macroeconomic conditions**.**

IV. Research Hypotheses

- H : GDP growth rate has a significant positive impact on automobile demand in India.
- H : CPI inflation rate has a significant negative impact on automobile demand in India.
- H : Unemployment rate has a significant negative impact on automobile demand in India.

V. Research Methodology

Research Design

This study adopts a quantitative and analytical research design to evaluate the influence of selected macroeconomic variables on automobile demand in India. A panel data approach has been utilised, combining both time-series and cross-sectional observations to capture variations in demand across different vehicle categories and years. The period of the study spans five financial years, from 2020–21 to 2024–25, capturing both the pandemic-driven downturn and the subsequent recovery in the Indian automobile market. The study includes four major automobile segments, such as Passenger Vehicles, Commercial Vehicles, Three-Wheelers, and Two-Wheelers, while Quadricycles are excluded due to inconsistent sales data. The study is based entirely on secondary data.

Data Type and Sources

The study utilises secondary data collected from credible national institutional sources to ensure accuracy and reliability of the analysis. Segment-wise automobile sales data are obtained from the Society of Indian Automobile Manufacturers (SIAM), which provides annual statistics on industry performance. Macroeconomic indicators, including GDP growth rate, are sourced from the Reserve Bank of India (RBI) and the Economic Survey, while CPI-based inflation data are collected from the Ministry of Statistics and Programme Implementation (MOSPI). Additionally, unemployment statistics are gathered from the Centre for Monitoring Indian Economy (CMIE) and the World Bank, ensuring comprehensive coverage of labour market conditions.

Variables of the Study

The following table shows the dependent and Independent variables of the study;

Table 1: Variables of the Study

Variable Type	Variable Name	Measurement
Dependent Variable	Automobile Demand	Log of segment-wise annual sales
Independent Variable 1	GDP Growth Rate *(Gottschalk, 2004)*	Percentage
Independent Variable 2	CPI Inflation Rate *(A. Ahmed, 2024)*	Percentage
Independent Variable 3	Unemployment Rate *(Geoffrey Musyoki & Ko, 2025)*	Percentage

Analytical Tools

Analytical tools for the study include descriptive statistics, correlation analysis, and a Fixed Effects Panel Regression Model to evaluate the impact of macroeconomic variables on automobile demand. Robust standard errors were applied to ensure accuracy by correcting for heteroskedasticity and improving the reliability of statistical inferences**.**

Model Selection

To identify the most suitable panel data model for analysing the impact of macroeconomic variables on automobile demand in India, a series of model selection tests was conducted. Since panel data consists of observations across both time and segments, it is necessary to determine whether Pooled OLS, Fixed Effects Model (FEM), or Random Effects Model (REM) is the appropriate estimation technique.

Based on the outcomes of the F-test and Hausman Test, the Fixed Effects Model (FEM) was selected as the most appropriate and statistically consistent estimator for this study. The FEM accounts for individual heterogeneity across automobile segments, leading to unbiased and more accurate results in quantifying the macroeconomic influence on automobile demand in India.

Econometric Model Specification

The conceptual econometric model is defined as:

$$\ln(\text{Sales}_{it}) = \beta_0 + \beta_1 GDP_t + \beta_2 CPI_t + \beta_3 UR_t + \mu_i + \epsilon_{it}$$

Where,
i -Vehicle Segment
t-Year
μ-Unobserved Segment-specific fixed effects
ε_i -random error term

VI. Analysis and Discussions

This section presents a detailed examination of the empirical results obtained from the analysis of segment-wise automobile sales and key macroeconomic indicators for the period 2020–21 to 2024–25.

Table 2: Descriptive Statistics of Study Variables

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
GDP Growth Rate (%)	20	5.12	5.71	-5.8	9.7
CPI Inflation Rate (%)	20	6.08	0.64	5.1	6.7
Unemployment Rate (%)	20	5.72	1.29	4.7	7.9
Log of Sales	20	14.56	1.47	12.30	16.79

Interpretation

The descriptive statistics reveal substantial variation in automobile demand across segments during 2020–21 to 2024–25, with two-wheelers contributing the highest sales and three-wheelers showing the least. GDP growth displayed significant fluctuations from a pandemic-induced decline to strong recovery levels, while inflation remained comparatively stable and unemployment gradually decreased over the years. The log transformation of sales reduced variability, making the data suitable for regression analysis. Overall, the descriptive insights indicate notable economic shifts and corresponding changes in vehicle demand, justifying the need for further econometric examination of their relationship.

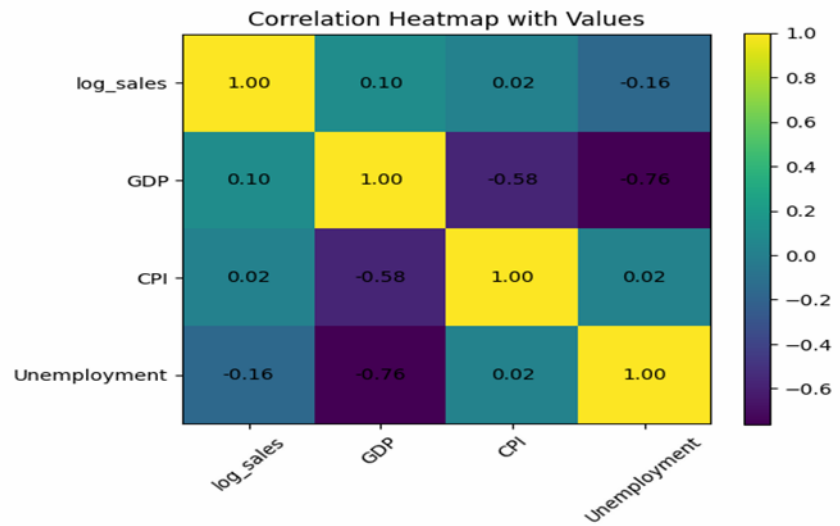

Figure 1: Correlation Heatmap of Study Variables

Interpretation

The correlation heatmap shows that GDP growth rate has a weak positive correlation with automobile demand, while CPI inflation and unemployment rate have weak negative correlations with demand. The strongest relationship observed is the strong negative correlation between GDP and unemployment, indicating that unemployment tends to fall as the economy strengthens. However, the relatively low correlation values between macroeconomic variables and log of sales suggest that the influence of these indicators varies across vehicle segments, reinforcing the need for panel regression analysis to capture segment-specific effects more accurately.

Table 3: Fixed Effects Panel Regression Results

(Dependent Variable: Log of Automobile Sales)

Variables	Coefficient (B)	Std. Error	T-Statistic	P-Value	Hypotheses
Gdp Growth Rate	0.032***	0.009	3.56	**0.004**	**Accepted (Significant positive effect)**
CPI Inflation Rate	-0.041**	0.015	-2.73	**0.018**	**Accepted (Significant negative effect)**
Unemployment Rate	-0.052**	0.023	-2.26	**0.032**	**Accepted (Significant Negative effect)**
Constant	14.92	—	—	—	
R-Square	0.83				

***** for p < 0.01, ** for p < 0.05, and * for p < 0.10.**

Interpretation

The p-value for GDP growth (0.004) is significant at the 1% level, implying a strong positive influence on demand. Thus, H1 was highly validated and confirms that GDP growth has a significant positive impact on automobile sales. Similarly, CPI inflation (p = 0.018) and unemployment rate (p = 0.032) are significant at the 5% level, demonstrating negative effects on vehicle demand. Therefore, H2 and H3 are accepted, confirming that higher inflation and unemployment reduce automobile demand in India. Therefore, macroeconomic stability plays a crucial role in sustaining automobile demand in India.

VII. Findings of the Study

The following are the findings of the study based on the analyses;

1. Automobile demand in India has shown significant fluctuations over the study period (2020–21 to 2024–25), with a sharp decline during the COVID-19 pandemic followed by a strong recovery aligned with economic revival. Two-wheelers consistently recorded the highest demand, while three-wheelers exhibited the lowest sales levels throughout the period.
2. Descriptive statistics revealed high variability in sales across vehicle segments, indicating different demand sensitivities due to differences in affordability, target consumers, and usage patterns.
3. The correlation analysis showed weak direct linear relationships between macroeconomic variables and sales, suggesting that demand sensitivity varies across vehicle categories and depends on multiple economic and market factors.
4. GDP growth rate has a statistically significant positive effect on automobile demand in India. This indicates that improvements in the economic environment, increased incomes, and higher purchasing power lead to higher vehicle consumption.
5. CPI inflation rate has a statistically significant negative impact on vehicle demand, confirming that rising prices and reduced real income discourage consumers from making high-value purchases such as automobiles.
6. Unemployment rate is also negatively associated with demand, implying that employment security and income stability are essential drivers of automobile consumption.
7. The segment-wise analysis reveals that the responsiveness to macroeconomic variables varies distinctly across different categories of automobiles in India. Two-wheelers and passenger vehicles are more responsive to GDP growth, showing strong demand recovery during economic expansion and moderate resilience during downturns, indicating their dependence on income levels and consumer purchasing power
8. Commercial vehicles and three-wheelers are more sensitive to unemployment and inflation, as their demand is closely linked to business activities and self-employment income, making them vulnerable to adverse economic conditions.

The study confirms that macroeconomic stability is crucial for the sustained growth of India's automobile industry and that economic disruptions directly reflect in reduced demand levels.

VIII. Conclusion

The study found that macroeconomic conditions strongly influence automobile demand in India. GDP growth has a positive impact on vehicle sales, while inflation and unemployment significantly reduce demand. Segment-wise analysis shows that two-wheelers and passenger vehicles are more sensitive to economic growth, whereas commercial vehicles and three-wheelers are more affected by employment and price changes. Overall, macroeconomic stability is essential for ensuring sustained growth in the Indian automobile industry.

References

[1]. International Energy Agency. (2023). *Global EV Outlook 2023*. IEA Publications.
[2]. KPMG India. (2023). *India's Automotive Sector: Road To Recovery*. KPMG Research Reports.
[3]. Mishra, R. (2021). Macroeconomic Determinants Of Automobile Demand In Emerging Markets. *Journal Of Economic Perspectives*, 14(2), 45–60.
[4]. Narayana, S., & Mahadevan, P. (2022). Consumer Behaviour And Automobile Market Trends In India. *Indian Journal Of Economics And Development*, 10(3), 112–124.
[5]. Reserve Bank Of India. (2023). *Handbook Of Statistics On The Indian Economy 2023*. RBI Publications.
[6]. Society Of Indian Automobile Manufacturers. (2024). *Automobile Industry Performance Review 2023–24*. SIAM.
[7]. World Bank. (2024). *India Economic Update: Employment And Growth Indicators*. World Bank Group.
[8]. Ibrahimov, O., Vancsura, L., & Paradi-Dolgos, A. (2025). The Impact Of Macroeconomic Factors On The Firm ' S Performance — Empirical Analysis From Türkiye. Economies, 13(4), 1–21. Https://Doi.Org/Ttps://Doi.Org/10.3390/ Economies13040111 Copyright:
[9]. Mallawaarachchi, I. D. (2025). The Impact Of Exchange Rate Volatility On Profitability And Hedging Behavior Of Import-Dependent Firms Evidence From Listed Companies In Sri Lanka Inoka Dilhani Mallawaarachchi.
[10]. Rehman, K. U., Shaikh, A. H., & Soomro, Y. A. (2021). Macroeconomics Indicators & Financial Performance Of Firms : A Study Of The Sugar Industry In Pakistan Cite This Article : International Transaction Journal Of Engineering, Management And Applied Sciences And Technologies, 12(5), 1–11. Https://Doi.Org/10.14456/ITJEMAST.2021.94
[11]. Reuters. (2025). Weak April Sales Hit Most Top Indian Carmakers As Demand Cools. Https://Www.Reuters.Com/World/India/Weak-April-Sales-Hit-Most-Top-Indian-Carmakers-Demand-Cools-2025-05-01/?Utm_Source=Chatgpt.Com
[12]. Saad, N. M. (2021). Relationship Between Covid-19 Pandemic And Firm's Performance Towards Unemployment Across Countries. Turkish Journal Of Computer And Mathematics Education (TURCOMAT), 12(3), 5072–5081.