A STUDY ON GROWTH PERFORMANCE OF AUTOMOBILE INDUSTRY IN INDIA

BY

SWETHA O R

(21PEC011)

A THESIS SUBMITTED TO THE

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN

COIMBATORE - 641 043

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF ECONOMICS

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UNDER THE SUPERVISION OF

Dr. M. SHANTHI

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CERTIFIED AS BONAFIDE RESEARCH WORK

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Introduction

A STUDY ON GROWTH PERFORMANCE OFAUTOMOBILE INDUSTRY IN INDIA

CHAPTER – I

INTRODUCTION

Untimely, peoples are using Animals or carts (Donkeys, horses, camels, bulls, etc.,) for traveling the persons from one place to another place, not only traveling, carrying goods from one place to another place. But now, the peoples are using automobile industries (i.e.) two wheelers, three wheelers to travel or carrying the goods from one place to another. In India, the automobile industry is one of the most important sectors in economic growth and fortunate sectors in country has presence in GVCs (Global Value Chains)

Before 1478, no one can imagine the car. It was first designed by the LEONARDO DA VINCI by ‘’self –propelled car ‘’. Now –a-days, no one can imagine without a machine (i.e.) Automobile industry. The history of automobile is expressed to development and brought into the world. In Indian passengers’ vehicle, Asia is the 7th largest market and 10th largest market in the world.

In 80 years ago, Indian automobile market was nothing because India has no automobile manufacturer. After Independence, the Government has put effort develop the automobile industry. Beginning of automobile industry in India, the progress rate is low. But now, the situation is different. There is a lot of transport option like motor cycles, cars, SUVs etc.., Major automobile companies are BAJAJ, HERO MOTOCORP, MARUTI SUZUKI, MAHINDRA & MAHINDRA HYUNDAI, TATA MOTORS, TVS and CHEVROLET etc.

In the year 1898, the car was firstly touched in Indian streets. Now – a- days, India is the second largest and fastest growing economy after China in the annual production of 3.9 million units. Recently, one of the best things happen in India has export sector has improvement. In 2003 – 04, the history of vehicle in India has more than 1 billion USD in exported in the growth rate of 56%. In 2009, India is the 4th largest exporter in car passengers. In 2010, the production of automotive vehicles has higher than 3.7 million in an increase of 33.9 %, India is the 3rd largest exporter in car passengers. In 2011 – 12, 15.07 %of domestic market shares. So, Auto industry is one

of the largest in the world.

According to data published by department of Industrial policy and promotion (DIPP), Ministry of commerce, the amount of cumulative foreign direct investment (FDI) inflow into the auto sector from April 2000 to November 2001 was worth US$7,518 million. The auto sector accounts for 4 per cent of the total FDI inflows (in terms of US$) In India. (Neelofar Kamal-2014-2017)

According to the recent data released by society of Indian automobiles manufacturers (SIAM) India's scooter and motorcycles manufacturer have registered 4 per cent growth during April-November 2012. The global and India manufacturer are focusing their efforts to develop innovative products, technologies and supply chains. India is one of the key markets for Global Manufacturers for hybrid and electronic vehicles which is the new development in automobile sector. With a turnover of almost $59 million US Dollars, automobile industry provides employment to 13 million people in the India work-class. (Neelofar Kamal-2014- 2017)

TABLE - 1.1 AUTOMOBILE INDUSTRY

Two – wheelers	Mopeds, scooters, motorcycles & electric two wheelers
Passengers vehicle	Passengers cars, utility vehicle and multi – purpose vehicle
Commercial Vehicle	Light and medium – heavy vehicle
Three – wheelers	Passengers carries and goods carries

SOURCE: ABS International Journal of Management (2018)

In the automobile market in India, two wheelers and passengers' cars accounted for 77% and 18% market share respectively during the year 2021-22. Passenger car sales are dominated by small and midsized cars. Export of the total number of automobiles increased from 4,134,047 in 2020-21 to 5,617,246 in 2020-21, registering a positive growth of 35.9%

India aims to double its auto industry size to Rs.15 Lakh corers by end of year 2024. There has been an FDI inflow of $33.7 billion in the industry from April 2000

till September 2022 which is around 5.48% of the total FDI inflows in India during the same period.

The Indian automotive industry has made great strides over the past two decades, capturing the eye-balls at a global level and is considered as a contender for a top-table positions. Over the past ten years, India has emerged as one of the most preferred locations in the world for manufacturing high quality automotive components and vehicles of all kinds, narrowing its gap over several established locations in the process.

Over the next decade, the automotive industry is likely to see some significant transformations at a global level. Principle transformations being the shift of growth in demand for automobiles from developed nations to developing nations (mainly BRICS); a dramatic increase in the share of electronics in automobiles, making them a "computer on wheels and connected to the internet "; a relentless pursuit of economies of scale and scope indesign and engineering of automobiles and components, while also pursuing low-cost manufacturing destinations.

Two wheelers in India are one of the world's fastest growing passenger car markets itis second largest two-wheeler manufacturer and fifth largest commercial vehicle manufacturer. It is also home for the largest motor cycle manufacturer. Moreover, India is fourth, the auto sector in India has achieved a growth rate of 26% in last two years (2010- 12). However, and it has shown a sluggish growth of 12 percent in 2012. The tired is likely to stay with a 10 percent growth outlined for 2013. The main reason are high ownership costs (fuel costs, costs of registration, excise duty, road tax) and slow rural income growth. Overthe next few years solid but cautions growth is expected.

In automobile sector, the Government of India motives the Foreign Direct Investment(FDI) in automatic route.

EVOLUTION AND GROWTH:

The year 1898 saw the first car rolling out, on the streets of Mumbai. Since the Indian auto industry has witnessed a lot of change. A land of premier padminis, Ambassadors, Scooters, tempos, trucks and autos galore, India had not seen much of choice in vehicles. Onlythe affluent could think of owing a personal four-wheeler and

the clichéd image of a car followed by lots of children on a dusty road was actually true.

PROTECTIONISM-EARLY 1980:

This was the pre- 1980 era where the manufacturing of automobiles especially cars was subject to strict licensing, restrictive tariff structure and limited avenues for expansion. The advent of foreign technology collaboration came with the inception of Maruti Udyog in collaboration with Suzuki of Japan in the passenger car segment. Indian roads saw the launch of Maruti 800. It was still not very easy to own a car, first was affordability and next was a long waiting period.

LIBERALIZATION-1990s:

In the early 1990s, with liberalization, some more Japanese manufacturersentered the two-wheelers and the commercial vehicle segment in a collaborative arrangement. These periods characterized joint ventures in India and the market startedopening up. Automobile industry was delicensed in July 1991 with the announcement of the New industrial policy. The passenger car industry was, however, deli censed in 1993.

GLOBALIZATION-2000s:

Early 2000 however saw globalization of Indian auto industry. Several policy changes were introduced with the focus on boosting the auto exports. A core group on automotive research and Development (CAGR) was established in 2003 for encouraging R&D activities. Foreign manufacturers started looking at India for sourcing auto components. The buyers started ruling the market due understand India's challenges and the India consumers. In 2000, the government lifted the requirement that foreign companies establish JVs with the domestic companies. As , its Gross Domestic Product(GDP) grew, India build and sold more vehicles, reaching the 1-million- vehicle mark in the 2004-2005 fiscal year. In 2006, government support forthe industry reached a high point with the creation of the automotive mission plan (AMP). This plan not only documents the importance of the automotive industry to the industry to the Indian economy but also the increased support the government will provide through 2016.

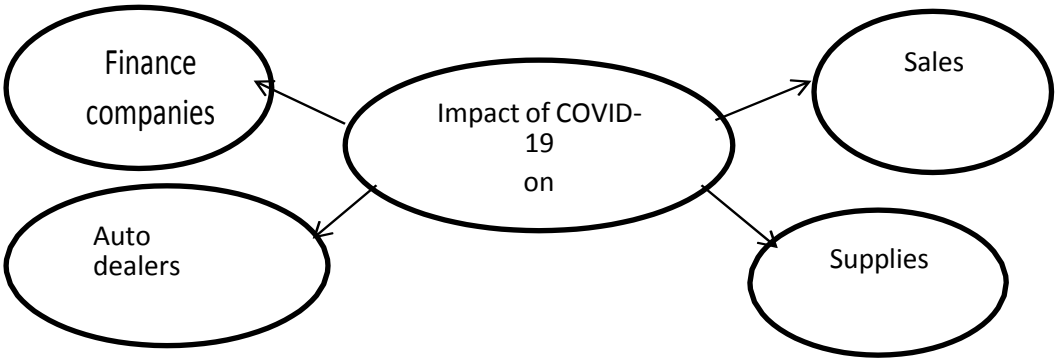
IMPACT OF COVID-19 ON AUTOMOBILE INDUSTRY:

The impact of lockdown in India and particularly about the huge impact it causes to automobile sector in India. Various researchers predict that during the lockdown period, the Indian economy expected to fall about 10-31% of its Gross Domestic Product and production loss is estimated to Rs.2300Cr per day in automobile sector.

The COVID-19 pandemic has wreaked havoc on the world economy and society. The Government of the countries has instituted a countrywide lockdown in anattempt to manage the epidemic. Although the lockdown may have helped to prevent the disease's spread, it has had a devastating the impact in the economy, disrupting whole value chains in the country's most essential businesses. The epidemic is having a significant impact on many aspects of industry, including the car sector, with important manufacturers either closing altogether in response to local government directives or operating with the bare minimum of workers at manufacturing sites to keep their employees safe. The automobile industry had already experienced significant delays due to structural modification openings with the goods and services tax, axle-load reforms, and shift to shared mobility, liquidity crunch, and otherfactor, and has been essentially at a standstill since March 24 due to the COVID- 19's lockdown. The prolonged curtailment of client demand as a result of the lockout is causing major concern among automakers. The majority of businesses are cutting back on R&D (research & development) to preserve key activities and maybe recoup growth in mobility technology and alternative fuels.

FIGURE - 1.1

AREA UNDER AUTOMOBILE INDUSTRY



SOURCE: International Journal of Scientific Research in Engineering and Management (IJSREM) (2022)

AREA UNDER AUTOMOBILE INDUSTRY AND THE COVID-19 IMPACT

AUTO DEALERS:

Auto dealers have had a lot of difficulties. Auto dealers for two-three and four-wheeled vehicles number 15,000 or more in India. During the lockout, they were unable to transfer automobiles. Prior of the shutdown, auto dealers warned customers that finished items would be significantly discounted for 30-45 days. At least 8% to 10% of this dealershipis expected to be closed during the next six month.

AUTO SUPPLIERS:

Due to their dependence on immigrant labor, auto suppliers fear that the extra delay caused by the shutdown would have a cascading across the whole assessment chain. Suppliers are dealing with liquidity issues that might be exacerbated by deteriorating market conditions, resulting in widespread problems for the whole production chain.

FINANCE COMPANIES:

Loan evasions are projected to rise, while new loans are expected to decline, due to the difficulty of determining a customer's credit worth. Used automobiles, mobility solutions,and automotive service providers are projected to be affected by the COVID-19, which is expected to put pressure on their financial support.

SALES:

As a result of COVID-19, new –vehicles sales for automobiles suffered greatly from February 2020. In China, for example, new car sales fell by a whopping 92% in February alone. Overall car sales in Europe fell 7.4% in comparison to previous years. As a result of the lockdown, numerous industries in India, such as TVS and Mahindra, have been impacted,as have many other areas of the economy.

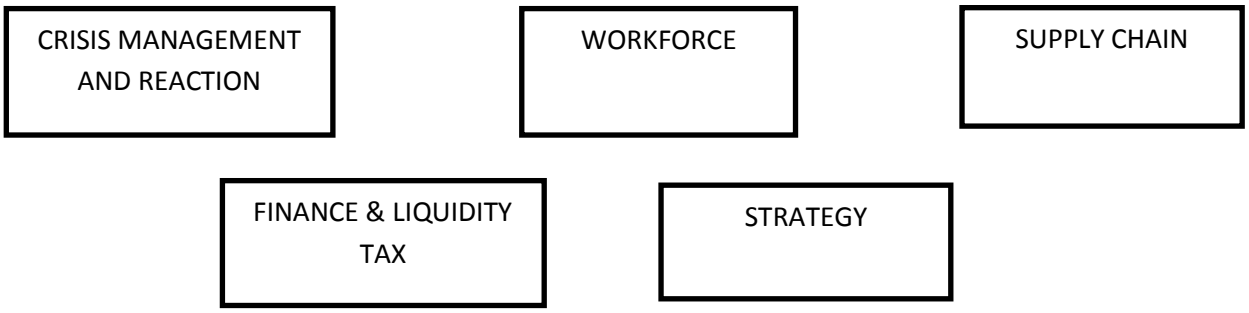
ISSUES FACED BY AUTOMOTIVE SECTOR DUE TO COVID-19

The automobile industry is in a precarious position owing to the epidemic's disruptionof business as usual and the uncertainty it causes in the financial situation. There are a number of significant supply chain sectors that are located in the impacted

regions. Emergencies such as power outages, cyber events, natural catastrophes, and so on necessities unique emergency plans that allowed for operational efficiency. Widespread impacts have sped up the mobbing process.

FIGURE - 1.2

ISSUES FACED BY AUTOMOTIVE SECTOR



SOURCE: International Journal of Scientific Research in Engineering and Management(IJSREM) (2022)

RISIS RESPONSE AND MANAGEMENT:

Preparation for tense situations is essential. Automotive firms must keep up with the times in order to respond to the pandemic, which has moved its epicenter from Asia to North America and Europe. In addition to considering the epidemic's influence on a range of vital areas, businesses should also take the rapidly expanding economic, strategic, and financial market landscape into consideration and financial markets.

WORKFORCE:

More than a million Americans have been employed by automakers and their suppliers, according to the Bureau of Labor statistics. As a business leader, you should focus on the wellbeing of your staff. If the pandemic spreads and a large number of workers become ill, it might have a significant impact on production capacity. Workers need to be informed in a clear, concise, and suitable manner, especially as the quantity of detailed instances increases as a result of increased access to testing.

SUPPLY CHAIN AND OPERATIONS:

COVID-19 might have a significant effect on the automatic supply chain. As a result of the outbreak of this virus, vehicle production in nations likes Japan, China, and South Korea has plummeted. Two-and three –tier dealers are projected to be the most impacted by epidemic-related disruptions by automakers with global supply networks. Enhancing channels of communications and chain visibility are a few of the approaches being considered for early detection of possible issues and development of repair strategies.

LIQUIDITY AND FINANCE:

Early in the first quarter, there was a rapid spread of the COVID-19 outbreak. This has resulted in functional difficulties that have delayed the capacity of enterprises in Spain, Italy, and France to finish financial statements. To make matters worse, a small number of automobile manufacturers are becoming more concerned that the financial effect of thepandemic might lead to recoverability of receivables sparking measures as well as to reform events as well. In the next weeks, the financing team might see a significant increase in the quantity of work they are able to obtain. When it comes to money and liquidity, the majority of suppliers and multi-national corporations should take a careful look at their policies inlight of such epidemic's influence on the worlds and global credit markets.

STRATEGY:

Economic uncertainty and the COVID-19 outbreak might lead to decreased consumerdemand in the near term, which could lead to delayed sales of new vehicles and delaying payments for further maintenance. Employee relaxation and support responsibilities might be compromised if the vehicle supply chain is disrupted. A new strategy may be devised to ease the effect of declining intent cash in the marketplace for an extend period of time because of the causes for its inactivity.

VARIOUS CHALLENGES OF AUTOMOBILE INDUSTRY:

In addition, the table below lists several obstacles (Accenture, 2020) that must beovercome in order to implement the aforementioned solutions.

TABLE - 1.2

CHALLENGES FACED BY AUTOMOBILE INDUSTRY

CHALLENGE	PRESENT SCENARIO	FUTURE SCENARIO
SUPPLY	• China is heavily reliant on the global manufacturer of automobiles. • In Europe and Asia, the car industry isconcerned about a lack of supply. • Almost two-thirds of China's car manufacturing was directly impacted by supplier's disruptions. • Several key ocean transport routes have been cancelled because of a lack of timely supply.	• Many variables,such as labor availability and safety elements and regulatory requirements,contribute to the time it takes for car traders to recover from their losses. • Because the supply chain must be synchronized, the restart will be complex, expensive, and time- consuming. • Production elasticity will be increasedto facilitate the movement of production from one facility from another.
MANUFACTURING	• Automobile manufacturers in China, North America, and Europe have all haltedmanufacturing. • An electric car manufacturer in the United States was forced to shut down in manufacturing • Overtime reduction, short-time labor, and other labor-saving measures have been used by most automakers in certain management departments.	• In the short to intermediate future, the financial effect of production stoppages due to filing demand, supply issues, and staff safety will be the most significant • The loss of 14million jobs in Europe if manufacturing services are halted is expected
WORKING CAPITAL AND LIQUIDITY	• The transaction is now burning cash at a rate less than 2 months • To weather the crisis, several businesses are negotiating higher loan limits with their depositors	• During thecatastrophe, major automakers shouldanticipate to suffer liquidity issues as working cash flowdecreases.
VEHICLE SALES	• There has been a decrease inthe overall sales of automotive light vehicles (LV) • Sales in China, the first nation most hit by the COVID19, fell by more than 80% in February.	• By 2020, sales in China are forecast to decline by more than 10%, while sales in the United States are likely todecline by 15% • In 2020, Western European sales are expected to decline by 14 percent.

SOURCE: International Journal of Scientific Research in Engineering and Management(IJSREM) (2022)

IMPACT ON TRADE:

Reverse migration of employees is one such issue. The potential impact on labor-intensive businesses might come from a drop in industrial production owing to a skill deficit, since many migrant workers with specialized abilities gained over time stayed inactive duringthe crisis and are relocating back to their homes, possibly not returning immediately. With two-fifth of exports and one-third of imports, India's commerce is heavily reliant on severely coronavirus-affected nations (the United States, the European Union and China). The United States and China, in particular, contributed for one-third of India's exports and Imports. It's worth mentioning the India's export and imports to the EU, the US, and China account for two-fifth and one-third of the country's total exposure. When a result, there is less chance of an increase in exports as the rupees falls, as these nations may enter recession and see a major drop in aggregate demand. Furthermore, India has a bigger import exposure than exports to the rest of Asia, particularly ASEAN, thus the predicted gain is lower owing to currency depreciation.

Countries all across the world have been experiencing economic downturn over thepast several years. Countries in a globalized economy so are interconnected and dependent onone another that a downturn in one economy has an influence on the performance of another. Countries were debating how to revitalize their economies and implement fundamental reforms. COVID-19, an unexpected pandemic that was originally found in China, has exacerbated the situation in over 200 nations. Many countries were forced to shut down their economy and declare a state of emergency in order to preserve their inhabitant's lives.

The pandemic wave that hit India in February made the job of Government officials, administrators, and regulatory agencies difficult. In comparison to other countries throughout the world, the Indian economy is varied. It has a population of 130 billion people, with a significant concentration of people living in distant and village regions. During the early days of the pandemic, it had insufficient infrastructure, medical facilities, masks, personal protective equipment, respiratory and life support systems. The government has declared lockdown in order to preserve people's health expense of the economy. These actions broughtthe economy to a halt for more than 45 days, from March 25, 2020 to May 13, 2020, with the unlocking process beginning only

on June 1, 2020.

The decision to shut down the Indian economy and several industries has had a significant impact. Even India has reported negative GDP for two quarters in a row, prompting a lockdown. The effect was visible in the market capitalization of significant industries. (Himanshu Bharti, Dr. Ramarcha Kumar-2022)

RECENT MEASUES AND GOVERNMENT APPROVED SCHEMES FOR AUTOMOBILE AND AUTO COMPONENT INDUSTRY IN INDIA:

- **FOREIGN DIRECT INVESTMENT:**

According to the IMF and OECD definitions, **direct investment** reflects the aim of obtaining a lasting interest by a resident entity of one economy (direct investors) in an enterprise that is resident in another economy (the direct investment enterprise) (**IMF,2003)**. The "lasting interest "implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the latter. This involves both theinitial transaction establishing the relationship between the investors & the enterprise and all subsequent capital transaction between them and among affiliated enterprises, both incorporated and unincorporated. FDI would be preferred by MNC over export only if certain minimum levels of economic development and market institutional conditions exist. These may be in terms of skilled manpower, infrastructure development or protection of intellectual property rights (**Patibandala 2001)**

- **BHARAT STAGE (BS) EMISSION STANDARD:**

Bharat stage emission standards (BSES) are emission standards instituted by the Government of India to regulate the output of air pollutants from compression ignition engines and spark-ignition engines equipment, including motor vehicles. The standards and the timeline for implementation are set by the central pollution controlBoard under the Ministry of Environment, Forest and Climate change.

The standards, based on European regulations were first introduced in 2000. Progressively stringent norms have been rolled out since then. All new vehicles manufactured after the implementation of the norms have to be compliant with the

regulations. Since October 2010, Bharat stage (BS) III norms have been enforced across the country. In 13 major cities, Bharat stage IV emission norms have been in place since April 2010, and it has been enforced for entire country since April 2017.In 2016, the Indian government announced that the country would skip the BS V norms altogether and adopt BS VI norms by 2020. In its recent judgment, the Supreme Court has banned the sale and registration for motor vehicles conforming to the emission standard Bharat stage IV in the entire country from 1 April 2020

On 15 November 2017, the petroleum Ministry of India, in consultation with public oil marketing companies, decided to bring forward the date of BS VI grade auto fuels in NCT of Delhi with effect from 1 April 2018 instead of 1April 2020. In fact, petroleum Ministry OMCs were asked to examine the possibility of introduction of BS VI auto fuels in the whole of NCR area from 1April 2019. This huge step was taken due to the heavy problem of air pollution faced by Delhi which became worse around 2019. The decision was met with disarray by the automobile companies as they had planned the development according to roadmap for 2020.

The phasing out of 2-stroke engine for two wheelers, the cessation of production of the Maruti 800, and the introduction of electronic controls have been due to the regulations related to vehicular emission

While the norms help in bringing down pollution levels, it invariably results in increased vehicle cost due to the improved technology and higher fuel prices. However, this increase in private cost is offset by savings in health costs for the public, as there is a lesser amount of disease- causing particulate matter and pollution in the air. Exposure to air pollution can lead to respiratory and cardiovascular disease, which is estimated to be the cause for 6, 20,000 early deaths in 2010, and the health cost of air pollution in India, has been assessed at 3% of its GDP.

- **PRODUCTION LINKED INCENTIVE (PLI) SCHEME:**

The production linked Incentive (PLI) scheme for automobile and auto component industry in India has been successful in attracting proposed investment of Rs.74,850 crore against the target estimate of investment Rs. 42,500 crore over a

period of five years. The proposed investment of Rs. 45,016 crore is from approved applicants under champion OEM Incentive scheme and Rs 29,834 crore from approved applicants under component incentive scheme.

A total of 115 companies had field their application under the production Linked Incentive (PLI) scheme for automobile and Auto component Industry in India which was notified on 23 September 2021. Out of which, 5(five) Auto OEM companies had applied for both the parts of the schemes. The schemes were open for receiving applications till 23:59:59 hours IST on 9 January 2022. Incentives are applicable under the scheme for Determined sales of Advanced Automotive Technology (AAT) products (vehicles and components) manufactured in India from 1April 2022 onwards for a period of 5 consecutive years.

Reacting to the response Union Heavy Industries Minister Dr. Mahendra Nath Pandey said, "The overwhelming response shows that industry has reposed its faith in India's stellar progress as a world class manufacturing destination which resonates strongly with Hon'ble Prime Minister's clarion call of AtmaNirbharBharat- a self-reliant India. India will surely take a huge leap towards cleaner, sustainable, advanced and more efficient Electric vehicles(EV) based system"

The Government approved the production Linked Incentive (PLI) scheme for automobile and Auto component Industry in India for enhancing India's Manufacturing capabilities for Advanced Automotive products (AAT) with a budgetary outlay of Rs. 25,938 crores. The PLI scheme for Automobile and Auto component industry proposes financial incentives to boost domestic manufacturing of Advanced Automotive Technology (AAT) products and attract investments in the automotive manufacturing value chain. Its prime objectives include overcoming cost disabilities, creating economies of scale and building a robust supply chain in areas of AAT products. It will also generate employment. This scheme will facilitate the Automobile industry to move up the value chain into higher value- added products.

The scheme has two components viz., Champion OEM incentive scheme and Component champion incentive scheme. Total 95 applicants have been approved under this PLI scheme. MHI had earlier approved 20 applicants (along with their 12 subsidiaries) for champion OEM incentives schemes. Subsequently, MHI has

processed the applications received under components champion incentives schemes and 75 applicants (along with their 56 subsidiaries) have been approved under this category of the schemes. Two auto OEM companies have been approved for both the parts of the schemes(pib.gov.in)

TARGET BENEFICIARIES OF PLI SCHEMES:

The PLI scheme seeks to benefit makers of advanced automotive technologies or auto components - whose domestic supply chains are weak, dormant, or non-existent. The PLI scheme was made open to both existing companies and new investors. The schemes exclude conventional petrol, diesel and CNG segments (internal combustion engine) since these have sufficient production capacity in India.

The PLI policy targeting auto parts include the following components schemes

CHAMPION ORIGINAL EQUIPMENT MANUFACTURING (OEM)SCHEME

It is a sales value linked plan, application to battery electric and hydrogen fuel cell vehicle of all segments.

LIST OF APPROVED APPLICATIONS

As a February 11,2022, 20 applications have been approved under this scheme, who has proposed investments worth INR450.16billion.

TABLE - 1.3 APPROVED PLI APPLICANTS

CHAMPION OEM (EXCEPT 2W&3W)

S.NO	COMPANY APPLICATIONS
1	Ashok Leyland Limited
2	Eicher Motors Limited
3	Ford India Private Limited
4	Hyundai Motor India Limited
5	Kia India Private Limited
6	PCA Automobiles India Private Limited
7	Pinnacle Mobility Solutions Private Limited
8	Suzuki Motor Gujarat Private Limited
9	Tata Motors Limited
10	Mahindra and Mahindra Ltd.

SOURCE: India-briefinng.com

TABLE - 1.4

APPROVED PLI APPLICANTS CHAMPION OEM 2W & 3W

S.NO	COMPANY APPLICANTS NAME
1	Bajaj Auto Limited
2	Hero MotoCorp Ltd
3	Piaggio vehicles Private Limited
4	TVS Motor company Limited

SOURCE: India-briefinng.com

In India, the automobile industry is frequently called the barometer of the economy. The automobile industry has given 7 percent GDP in India (nearly 49 percent in manufacturing) and employs (directly and indirectly) in 29 million people.

In 1980s, TATA MOTORS has firstly introduced in India. In the year 1992 and 1997, the automobile industry in India has an immense compound growth rate in the rate of 22% - MINISTRY OF COMMERCE AND INDUSTRY. In 2016, automobile industry, the Government has to achieve the 35 million people in direct and indirect jobs. In India, the automobile industry is one of the profitable industry and largest market in the world for sales. In the year 2017 – 18, the automobile industry has contemplated their sales. In April 1st 2017 – 31st march 2018, the growth rate has indicated double digits. In 2021, the passenger's vehicle market has third's largest market in the world. It is absolutely in GDP (Gross Domestic Product) as 7% annual.

In 2021, the value of Indians automotive market is USD 100 billion and anticipates achieving USD 160 billion in the year 2027.In terms of sales volume and production, the automobile industry in India is one of the largest in the economy. Industry has powerful segment in onwards and reverse relationship in the economy and it manufacturing the one driver income and employment generation and Indian economy, the economic growth has noticeable for sunrise sector.

With this background the present study attempted to analyse the growth performance of automobile industry in India with the following objectives.

OBJECTIVES:

- To analyze the recent trends in automobile production, sales and exports in India
- To examine the sales performance of different types of automobiles from 2011-2021in India

CHAPTER - II

REVIEW OF LITERATURE

Shinde Govind & Dubey Manisha (2011), this study has been directed considering the sections such as passengers' vehicle, commercial vehicle, utility vehicle, two and three-wheeler vehicle of achiever's performance and also the study investigated SWOT analysis andfactor tempting growth of automobile industry.

Mistry Dharmendra (2012), the paper analyzed the effect of various determinants onthe profitability of the selected companies. It concluded the positive and negative effect onthe profitability; it is important determinants of debt equity ratio, inventory ratio, and total assets to be conclude. It propounds to increase solvency as to reduce fixed financial burden on the company profit& give benefit of trading on equity to the shareholders.

Ray sabapriya (2012) focused on the sample of automobile companies to estimatethe concern of industry between indicators specifically sales, production and export trendetc., from the year between 2003-04 to 2009-10. The analysis discovered the automobile industry has been progress through distributive phases by over debt burden, underutilization of assets and liquidity instability. The researcher propounds to better labor productivity, labor flexibility and capital efficiency for success of industry in future.

Zafar SM Taiq & Khalid (2012), the study analyzed that rates are calculated from financial declaration which are arranged as needed policies adopted on depreciation supply assessment by the management. Ratio is simple differentiation of numerator and denominator that will not generate complete and original picture of business. The study results are operated and also did not highlight other factors act on performance of resistant bypromoters.

Ankur Kumar Rastogi & Nitin Gopal Gupta (2013) focused on the changing scenario of automobile industry. It analyzed the importance of vehicle in everyday life. This study concluded that the demand for vehicle depends upon various elements like convenience, cost, vehicle density, market place & earning capacity. The automobile markets develop upon new technology. They also development these markets with the help of new research. The study also suggested that auto company to use the slowdown period

as innovation period, so this leads to increase in the sales of automobile and also helpful for the development of industry.

Dharmaraj & Kathirvel (2013) examine a new industrial policy act 1991, which allows foreign direct investment. The study made an attempt to find the effects of FDI on financial performance of automobile industry. The study concluded that the liquidity ratios give minor changes & profitability gives an increase trend for post FDI when compared to previous FDI. The companies were utilizing the available resources efficiently, which showed by post FDI efficiency ratio.

Dhole Madhavi (2013) explored the impact of price movement of share on performance of selected company. The study made an advice to investor to consider the factors which before choosing the better half portfolio. The study found that the factors play a vital role in price movement which only in short terms but in long run. The annual performance is sole factor which is responsible for price movement.

Hotwani Rakhi (2013) analyzed the profitability position and growth of company? It shows the sales and profitability in TATA Motors in past 10 years. The paper concluded the rations, standard deviations and coefficients of variance and there is no strong difference in sales and profitability of the company.

Murlidhar et al., (2013) assessed the performance of Hyundai motor company to esteem with export, domestic sales, productions and profit after tax. This study shows the bar graph and pie chart to know the company's performance of different years.

Rapheal Nisha (2013) analyzed the financial performance of Indian tyre industry, thepresentation with financial indicators, sales trend, export trend, production trend during the period of 2003-2012.The paper concluded that the better labor productivity, flexibility and capital efficiency to victory the industry.

Azhagaiah & Gounasegaran (2014) the study found that the India's per capita real GDP growth as the one of the key drives to growth of automobile industry of the country. Then, the study examined that the central government as set up various task forces on the issues such as taxation, labour reforms, skill development for automobile industry and land acquisition.

Buvaneshwari & Kanimozhip (2014), they done a study to find the credit worthiness for selected firms of industry in Trichy (India). The study also explored that, the professor Edward Altman of New York University has developed the method Z scores analysis to predict the failure of the company & bankruptcy. This is to measures the fiscal fitness of company which is combined with a set of five financial ratios.

Huda salhe Meften & Manish Roy Tirkey (2014), they studied the financial analysisof Hindustan petroleum Corporation ltd. The study used secondary data. The study found that the company got an excellent profit ratio & trend are raised with appreciable indicating efficiency in production cost. For the years 2011-2021. The net profit was excellent and it is 8 times past years indicating the reduction in operating reduction in operating expenses & Net sales large proportion can be available to the company's shareholders.

Idhayajothi et al., (2014), focused on the financial performance of Ashoka Leyland Itd at Chennai. They concluded that the financial performance is sound and put forward to increase their financial performance for reducing different expenses.

Jothi & kalaivani (2015), analyzed the short-term liquidity position of Honda motors and Toyota motors. In Honda motors the cash ratio is upper hand during this period of 2015 and both the companies the profitability is rising but in Honda motor the potential earning is much higher.

Kumar Rakesh Rasikalalajani & Bhatt Satyaki (2015), this paper concluded to study the trend and pattern of financing the capital structure of Indian companies and analyze the factor of total debt ratios as well as long and short term ratios.

Maheswari (2015), the study analyzed the financial soundness of the Hero Honda motors limited. They have classified into three factors (i.e.) liquidity position, solvency position, profitability position in the period of 2002-2010 with the help of ratio analysis.

Takeh Ata & Navaprabha Jubiliy (2015), focused on the impact of capital structure on the financial performance (i.e.) capital structure and financial performance. In this study capital structure shows independent variable, and financial performance shows dependent variable. Independent variable classified four ratios., financial debt, total debt equity, total asset debt and interest coverage ratio and dependent variable classified four

ratios., return on assets, return on equity, operating profit margin and return on capital employed. It hasselected 13 steel industrial companies and using various statistical tools (standard deviation, correlation matrix, anova) for testing hypothesis for employed.

Jothi & Geethalakshmi (2016), focused on the profitability & financial position of selected companies of Indian automobile industry. In this study, they used statistical toolslike ratio analysis, mean, standard deviation, correlation the study found that there is a positive relationship between profitability, short term and long term capital.

Neelofar Kamal (2017), analyzed the impact of make in India initiatives for Indian automobile industry. The study used the secondary data. The researcher researches the concept of make in India that has really succeeded in providing employment opportunities and also it leads to increase India's manufacturers market, because of strong domestic market with increase demand. The main aim of make in India initiative job creation and skill enhance in25 sectors including automobiles. In conclusion, the economic survey says that more than 70% of total FDI, inflows to India during the last 15 years.

Kanupriya & Sandeep Kumar (2018), focused on the export and production trend in automobile Industry. It shows automobile industry performing major role in Indian economy. The international players considered India has the best destination for their business setup in Indian market, particularly automobile sector. It concludes the inflow of FDI in automobile industry has increase mode ".

Durgesh Agnihotri and Pallavi Chaturvedi (2019), A sudden decline in demand for light motor vehicles is currently threating the Indian automotive industry**.** The situation was quite different 2-3 years ago. India was predicted to be one of the largest growth markets for the automotive industry. By 2020, India will have the largest vehicle market worldwide, according to many experts. Yet, it seemed impossible after observing the current situation. People in India haven't driven in more than a century. Nonetheless, the 1980s saw anindustrial boom as Maruti arrived in India. But, the following globalization, when the majority of the world's automakers arrived in India and set up shop, genuine growth occurred. As middle-class discretionary income& standard of living started to rise, this item kept getting bigger. Also, the rise of the automobile industry was greatly aided by government liberalization policies in India, such as lower import tariffs, more open banking, and lower taxes. Everything ran smoothly until 2009-2010. The automobile

industry developed like nothing else during this time period 2000-2010. Yet for the past two years to three years, the automobile industry has stopped growing consistently. The automobile sector is facing serious issues as a result of bad government policies, an increase in gas prices, and the growth of the used car market. Only a small percentage of automakers are meeting expectations, and rests are fast declining.

Satyendra Kumar et al., (2020), demonstrated that how the automobile industry has been impacted by COVID-19 and technical advancements. The Indian auto industry must assure technological innovation, effective marketing, and an adequate customer service feedback system in order to overcome the challenges provided by the pandemic. About 3.49 million Passenger and commercial vehicles and other types of vehicles were sold in India in 2020, making it the fifth-largest auto market. The company, which employs almost 32 millionpeople, was the seventh-largest commercial vehicle market in 2019. A burgeoning middle class and a young population have made the two-wheelers category the markets largest by volume. Also supporting the sectors expansion was the corporations rising interest in investigating rural markets. Between April 2000 and December 2020, the industry attracted FDI worthUS$25.40 billion. By 2026, the Indian automotive market is anticipated to be worth $300 billion. The figures from March 2020 demonstrate how the COVID-19 pandemic lockdown and the change from Bharat stage (BS4) to Bharat stage (BS6) emission standards have had a detrimental effect on the automotive industry.

Raj and Kumar (2021), focused on the slowdown in the economy and gross domesticproduct (GDP) is a major issue for the auto sector. Travel, tourism, and auto shows are all impacted by COVID-19. Utilizing cutting- edge technology like image processing, artificial intelligence, deep learning, and the conversion of conventional cars into intelligent, autonomous ones, it simplifies, eases and ensures the safety of transportation. The study aims to analyze the market using sales and production data gathered from the International des constructeurs d' Automobile (OICA) organization across various regions and measures taken to overcome the COVID-19 recession by analyzing similar situations and challenges faced in the smart and autonomous vehicles. The difficulties that autonomous vehicles have while using their camers and processing the images and videos they capture are explored. An analysis of the sales and production of automobiles demonstrates the link between the market and GDP or the economy.

Dhiman and Grag (2022), examined the measures taken to combat the COVID-19 related economic downturn by looking at related problems faced by passenger cars. This report focuses on "How to manage present Disruptions and get ready for the "New Normal", as well as "Which is the impact of COVID-19 on the Automotive value chain".

Balani and Pritwani (2023), studied the Indian automobile industry is quite experienced and skilled, it continues to grow rapidly decade by decade in all areas, whether we are discussing its contribution to India's GDP, employment sector, exports, manufacturingsection. Or sales category. From all perspective, we can state that it is an extremely important industry for India. As a whole, the Indian automobile industry contributed 7% of the country's GDP in FY2020 and 49% of the manufacturing GDP. However, due to COVID-19, GDP growth somewhat slowed down by 0.5%. Despite this, Indian continues to lead the globein the two-wheelers market. As a result, we will examine the growth of the Indian automobile industry in this research paper from every angle, including investment in the industry. Its impact on the GDP and employment, Government attempts to support it, production, and sales.

Methodology

CHAPTER - III

METHODOLOGY

The methodology of the present study entitled “” is discussed under the following heads:

- Profile of the study area
- Collection of data
- Techniques Analysis
- Trend Analysis
- Descriptive statistics
- Correlation matrix
- Analysis of variance (ANOVA)
- Compound Annual Growth Rate (CAGR)

I. PROFILE OF THE STUDY AREA:

INDIA – It is one of the oldest civilizations in the world with a kaleidoscopic variety and rich cultural heritage. It has achieved all-around socio – economic progress since its independence. India has become self – sufficient in agricultural production and isnow one of the top industrialized countries in the world and one of the few nations to have gone into outer space to conquer nature for the benefit of the people. It covers an area of 32, 87,263 sq.km, Extending from the snow-covered Himalayan heights to the tropical rain forests of the south. As the 7th largest country in the world, India stands apartfrom the rest of Asia, marked off as it is by mountains and the sea, which give the countrya distinct geographical entity. Bounded by the Great Himalayas in the north, it stretches southwards and at the Tropic of cancer, tapers off into the Indian Ocean between the Bay of Bengal on the east and the Arabian Sea on the west.

Lying entirely in the northern hemisphere, the mainland extends between latitudes8degree 4’ and 37degree 6’ north, longitudes 68degree 7’ and 97degree 25’

east and measure about 3,214 Km from north to south between the extreme latitudes and about 2,933Km from east to west between the extreme longitudes. It has a land frontier ofabout 15,200 Km. The total length of the coastline of the mainland, and Andaman & Nicobar Islands is 7,516.6 Km

GEOGRAPHY:

- **LOCATION:** The Indian Peninsula is separated from mainland Asia by the Himalayas. The country is surrounded by the Bay of Bengal in the east, the Arabian Sea in the west, and the Indian Ocean to the south.

- **GEOGRAPHIC COORDINATES:** Lying entirely in the Northern Hemisphere, the country extends between 8degree 4’ and 37degree 6’ latitudes north of the equator, and 68degree 7’ and 97degree 25’ longitudes east of it.

- **AREA:** 3.3 million sq. km

- **BORDER COUNTRIES:** Afghanistan and Pakistan to the north – west; china , Bhutan and Nepal to the north; Myanmar to the east; and Bangladesh to the east of west Bengal. Sri Lanka is separated from India by a narrow channel of sea, formedby Palk strait and the gulf of manner.

- **COASTLINE:** 7,517km encompassing the mainland Lakshadweep Islands and the Andaman & Nicobar Island.

- **CLIMATE*:*** The climate of India can be broadly be classified as a tropical monsoon one. But, in spite of much of the northern part of India lying beyond the tropical zone, the entire country has tropical climate marked by relatively high temperature and dry winters. There are four seasons:

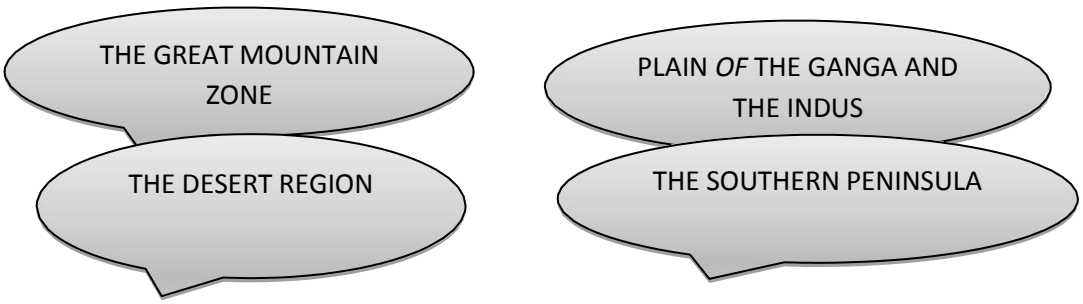
TABLE – 3.1

SEASONAL CATEGORIES

WINTER	December – February
SUMMER	March – June
SOUTH –WEST MONSOON	June – September
POST MONSOON SEASON	October – November

SOURCE: National portal of India

TERRAIN: The mainland comprises of four regions, namely



- **NATURAL RESOURCES:** Coal, iron ore, manganese ore, mica, bauxite, petroleum, titanium ore, chromite, natural gas, magnesite, limestone, arable land, dolomite, barytes, kaolin, gypsum, apatite, phosphorite, steatite, fluorite, etc.,

- **NATURAL HAZARDS:** Monsoon floods, flash floods, earthquake, droughts, and landslides

- **ENVIRONMENT –CURRENT ISSUES:** Air pollution control, energy conservation, solid waste management, oil and gas conservation, forest conservation, etc.

- **ENVIRONMENT – INTERNATIONAL AGREEMENTS:** Rio declaration on environment and development, Cartagena protocol on biosafety, Kyoto protocol to the United Nations framework convention on climatic changes, world Trade agreement, Helsinki protocol to LRTAP on the reduction of Sulphur emission of nitrogen oxides or their trans boundary fluxes (NOx protocol), and Geneva protocol to LRTAP concerning the control of emission of volatile organic compounds or their trans boundary fluxes (VOCs protocol).

- **NOTE:** India occupies a major portion of the south Asian subcontinent

- **POPULATION:** India's population, as on march 11, 2023 stood at 1,416,385,124. The population of India in 2022 was 1,417,173,173, a **0.68%** increase from 2021. The population of India in 2021 was 1,407,563,842, a 0.8% increase from 2020.

- **ETHNIC GROUPS:** All the five major racial types -Australoid, Mongoloid, Europoid, Caucasian, and Negroid find representation among the people of India.

- **RELIGIONS:** Hindus make up 79.8% of India's population and Muslims account for 14.2%; Christians, Sikhs, Buddhists and Jains account for most of the remaining 6%.

- **LANGUAGES:** There are 22 different languages that have been recognized by the constitution of India; of Which Hindi is an official Languages. Article 343(3) empowered parliament to provide by law for continued use of English for official purposes.

- ***LITERACY:*** According to the provisional results of the census 2021, the 84.4 percent of male population and 71.5 percent of female population

II. COLLECTION OF DATA:

The study is based on secondary data. The data for the present study is collected from Society of Indian Automobile Manufacturers for the periods 2011- 2021.

III. TECHINQUES OF ANALYSIS:

- **Trend analysis**

Trend analysis is the process that studies statistical data and recorded market behaviour over a specific period to generate valuable insights employing this data for strategizing future business plans. It helps the main characteristics of the market and the consumers associated with it.

- **Descriptive statistics:**

Descriptive statistics are brief informational coefficients that summarize agiven data set, which can be either a representation of the entire population or a sample of a population. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include standard deviation, variance, minimum and maximum variables, Kurtosis and skewness.

The most recognized types of descriptive statistics are measures of center: the mean, median and mode which are used at almost all levels of mathematicsand statistics. The mean or the average is calculated by adding all the figures within the data set and then dividing by the number of figures within the set.

- **Correlation Matrix**

A correlation matrix is simply a table which displays the correlation coefficients for different variables. The matrix depicts the correlation between all the possible pairs of values in a table. It is a powerful tool to summarize a large dataset and to identify and visualize patterns in the given data.

- **Analysis of Variance (ANOVA) - Single factor:**

  Analysis of variance or ANOVA can be used to compare the means between two or more groups of values

- **Compound Annual Growth Rate**

  Compound Annual Growth Rate (CAGR) is a business and investing specific term for the geometric progression ratio that provides a constant rate of return over the time period. CAGR is not an accounting term, but it is often used to describe some element of the business, for example revenue, units delivered, registered users, etc. CAGR dampens the effect of volatility of periodic returns that can render arithmetic means irrelevant. It is particularly useful to compare growth rates from various datasets common domain such as revenue growth of companies in the same industry or sector. CAGR is equivalent to the more generic exponential growth rate when the exponential growth interval is one year.

Results and Discussion

CHAPTER - IV

RESULTS AND DISCUSSIONS

The major findings of the study are presented and discussed as follows:

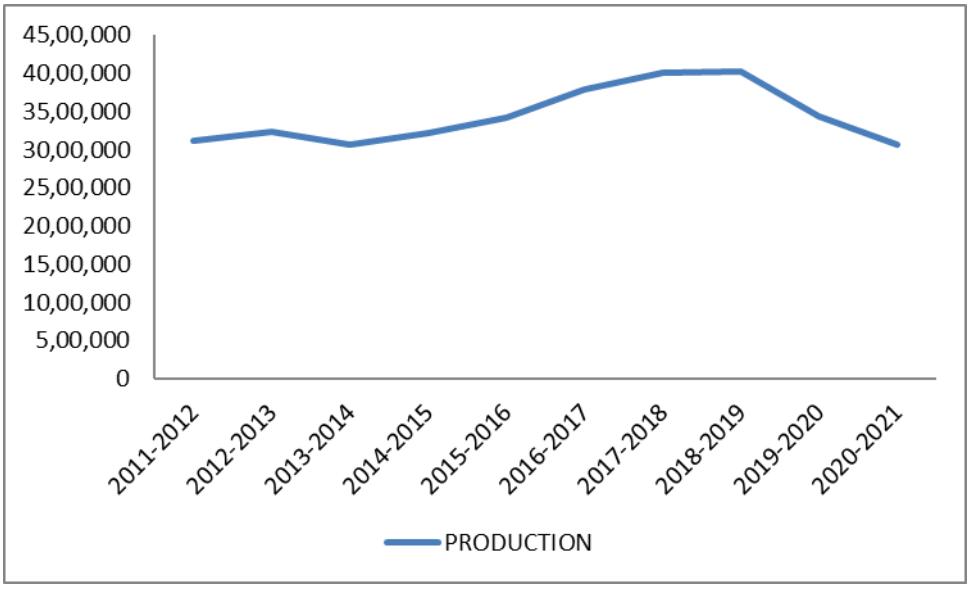
1. TREND ANALYSIS - PASSENGER VEHICLES:

(i) PASSENGER VEHICLES - PRODUCTION

The automotive industry comparises a wide range of companies and organizations involved in the design, development, manufacturing, marketing, selling, repairing, and modifying of motor vehicles. Figure 4.1 represents production of passenger vehicles for period 2011 - 2021

FIGURE - 4.1

PASSENGER VEHICLES- PRODUCTION



SOURCE: Estimation based on secondary data (2011-2021)

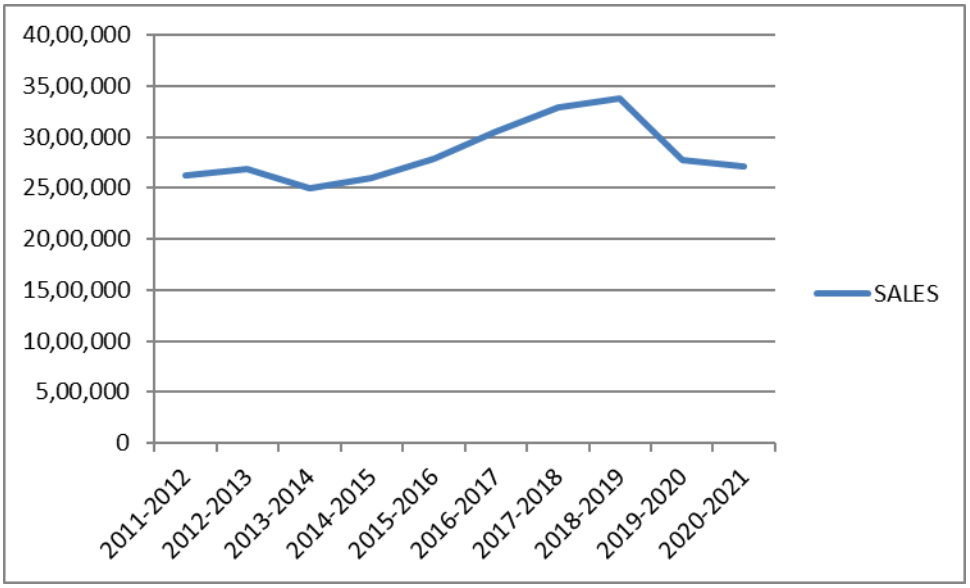
The automobile production shows increased trend from 2011-2012, in production followed by 2013-2014 and there has been decreasing trend in production during 2013because of excise duty announced by the government in the interim budget. While 2014 - 2018, there is continuous increase in production till 2018- 2019. Due to pandemic, there has been decreased trend in production for the year 2019- 2021

(ii) SALES:

Figure 4.2 represents sales of passenger vehicles for the period of 2011- 2021

FIGURE - 4.2

PASSENGER VEHICLES- SALES



SOURCE: Estimation based on secondary data (2011-2021)

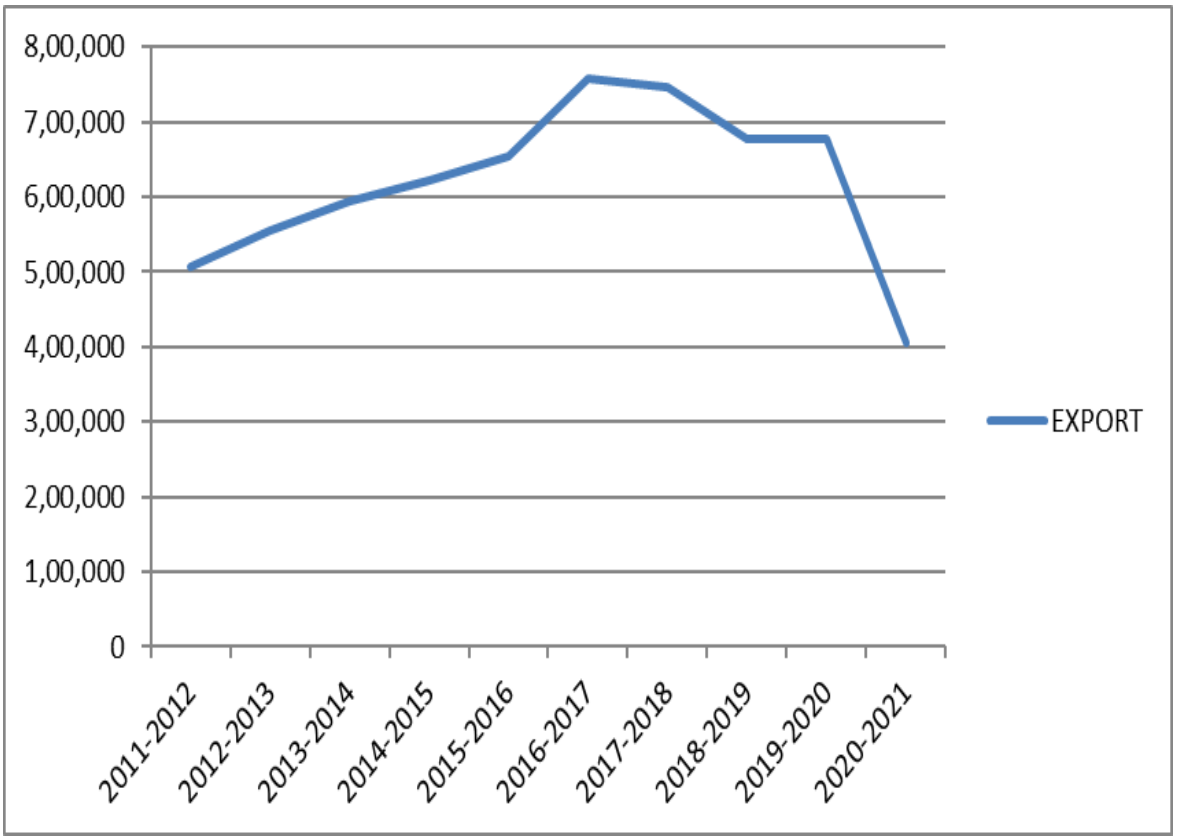
In 2011-2012 the sales of passenger vehicles increasing trend where as it decreasing trend during 2013- 2014. From 2014- 2015 to 2019- 2020 the sales of passenger vehicles have increased in 2020 – 2021, a decline of 224 percent due to COVID-19 pandemic has put brakes on the sector

(iii) EXPORT:

Goods and services produced in one country but supplied to buyers in another are known as Export. International trade is made up of exports and imports. Exports are critical to market democracies because they provide people and businesses with access to a larger market for their products. Figure 4.3 represents exports of passenger vehicles for the period 2011- 2021.

FIGURE – 4.3

PASSENGER VEHICLES- EXPORT



SOURCE: Estimation based on secondary data (2011-2021)

The export of passenger vehicles in had been increased from 2011- 2012 till 2016- 2017. In 2017- 2018 to 2019-2020, there will be slight decrease in the export because of the lingering impact of GST refund and also affected overseas shipments in 2020- 2021, the export of passenger vehicles shows decreasing trend because of the corona virus pandemic across the globe.

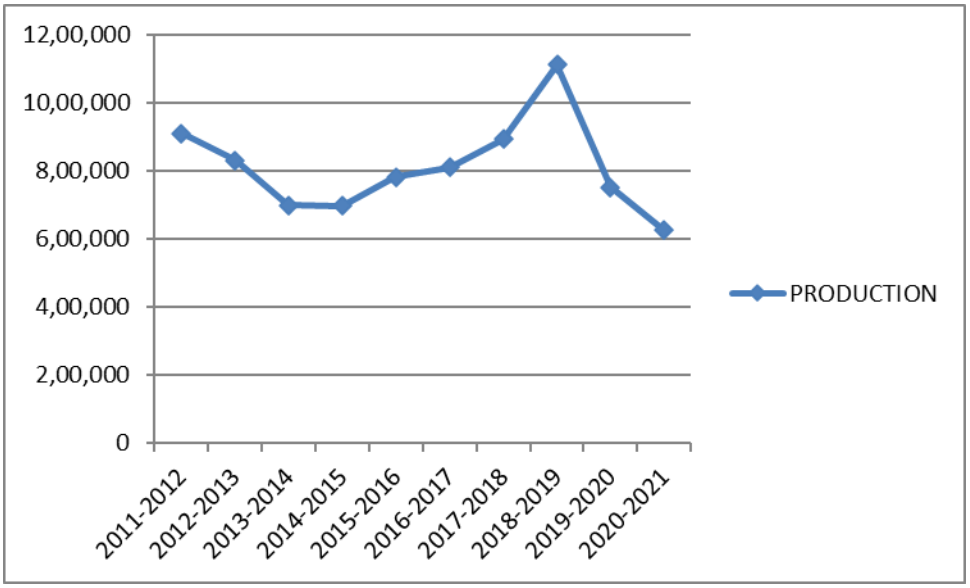
2. TREND ANALYSIS-COMMERICAL VEHICLES:

(i) PRODUCTION

Figure 4.4 represents production of passenger vehicles for period 2011 - 2021

FIGURE – 4.4

COMMERICAL VEHICLES - PRODUCTION



SOURCE: Estimation based on secondary data (2011-2021)

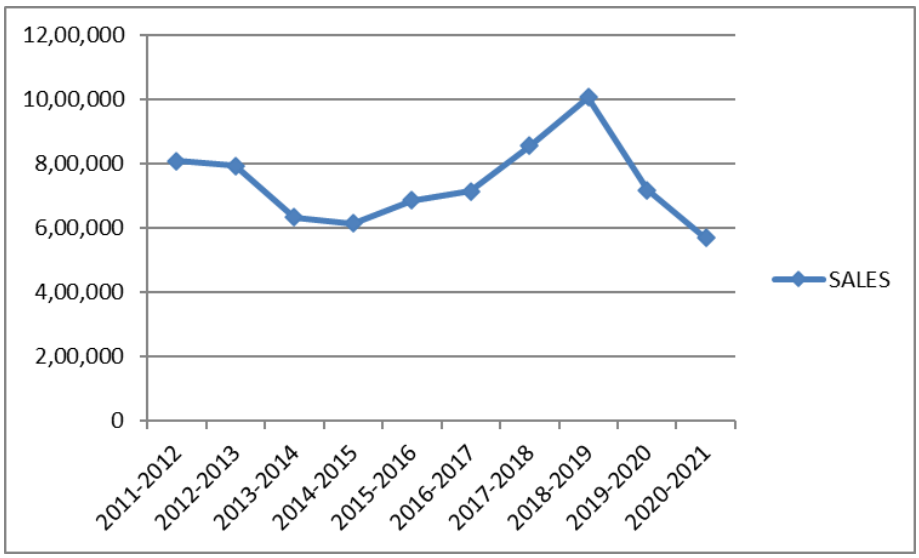
The automobile production shows decreased trend from 2011-2016 because of recession while there is an upward trend in this sector from 2017-19. In 2019-2021, there is again a continuous decrease in the production because of weak rural demand and economic slowdown.

(ii) SALES

Figure 4.5 represents sales of passenger vehicles for the period of 2011- 2021

FIGURE – 4.5

COMMERICAL VEHICLES - SALES



SOURCE: Estimation based on secondary data (2011-2021)

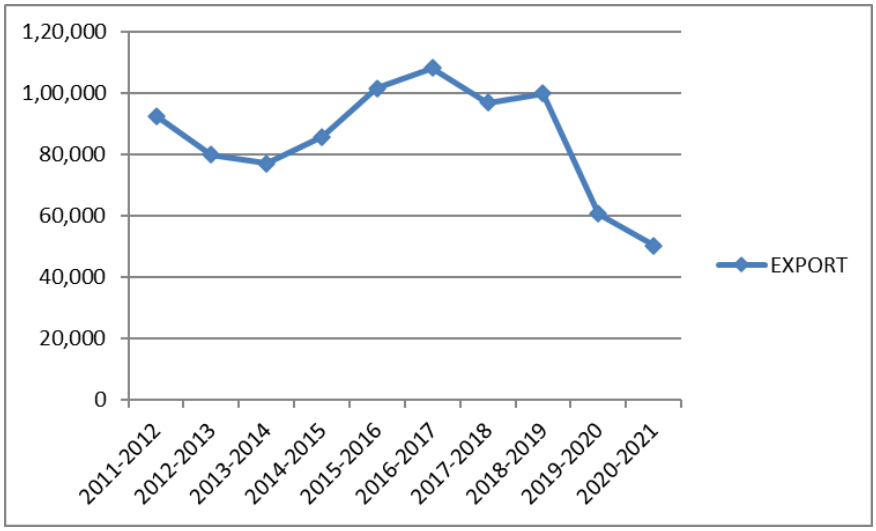
In 2011- 2015 the sales of commercial vehicles witnessed a decreasing trend due to lower replacement volume of vehicles whereas 2016-2019 had an increased sales in commercial vehicle. In 2019-2021, a decline of commercial vehicles occurred due to COVID-19.

(iii) EXPORT

Figure 4.6 represents exports of passenger vehicles for the period 2011- 2021.

FIGURE – 4.6

COMMERICAL VEHICLES - EXPORT



SOURCE: Estimation based on secondary data (2011-2021)

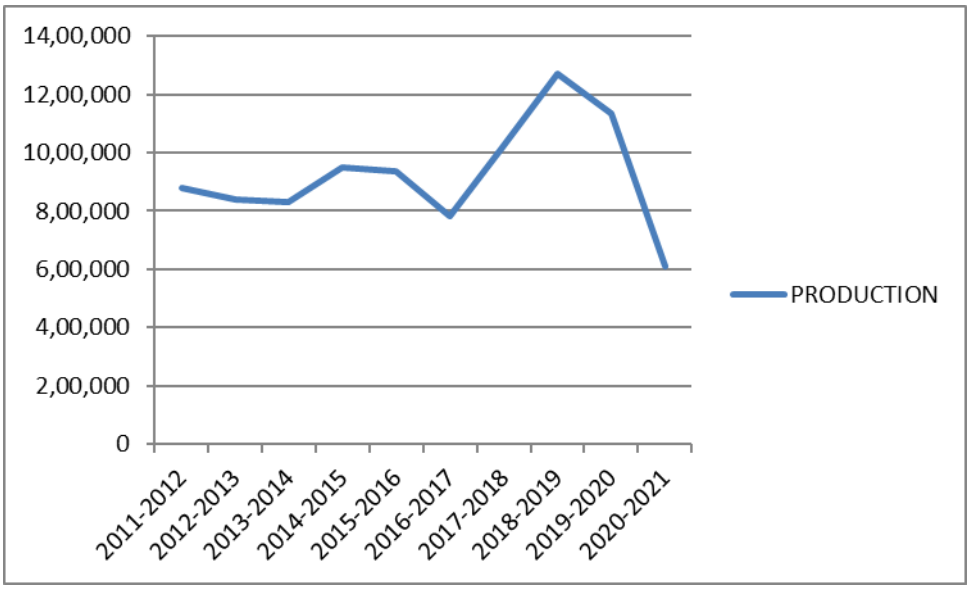
The export of commercial vehicles had decreased from 2011-2014 because of recession. In 2014- 2017, there was slight increase in the export sector. In 2017-2018 the export sector shows a decrease because of GST. In 2020- 2021 the export sector had decreased due to COVID 19 pandemic.

3. TREND ANALYSIS-THREE WHEELERS(i)PRODUCTION

Figure 4.7 represents production of passenger vehicles for the period 2011- 2021

FIGURE- 4.7

THREE WHEELERS - PRODUCTION



SOURCE: Estimation based on secondary data (2011-2021)

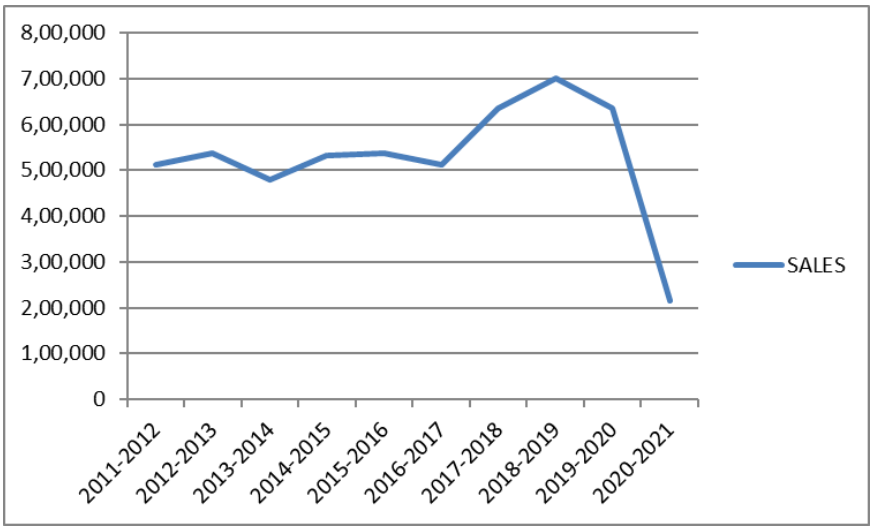
The automobile production shows decreasing trend from 2011- 2017 due to hike offuel prices, in production followed by 2018- which had an increase in production sector.While in 2020-2021, there has been decrease in production because of the pandemic.

(ii) SALES

Figure 4.8 represents sales of Three wheelers for the period 2011-2021

FIGURE – 4.8

THREE WHEELERS- SALES



SOURCE: Estimation based on secondary data (2011-2021)

In 2011-2017 the sales of three wheelers decreased due to increased fuel price, whereas between 2016-2017 there has been currency devaluation. In 2017- 2019 the sales of three wheelers had increased. In 2020- 2021 the three wheelers have declined in sales sector because of COVID-19.

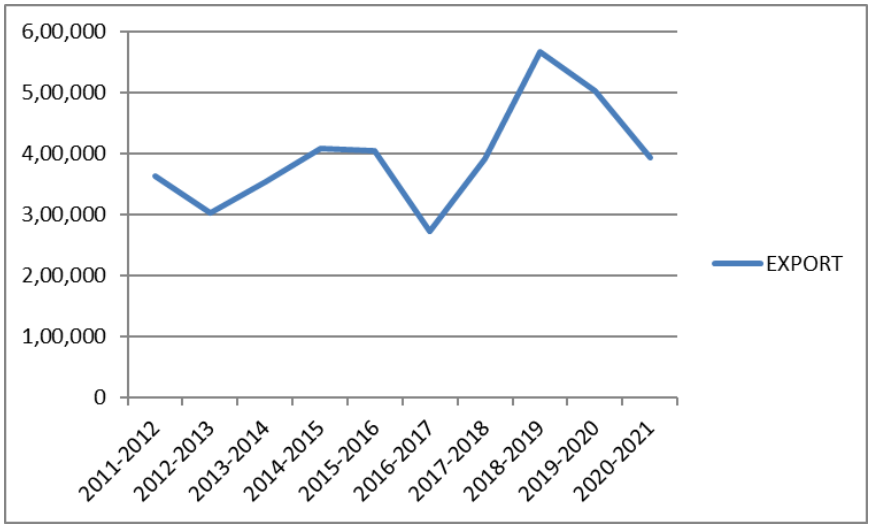
(iii) EXPORT

Figure 4.8 represents export of three wheelers for the period 2011- 2021

FIGURE – 4.9

THREE-WHEELER- EXPORT

T



SOURCE: Estimation based on secondary data (2011-2021)

From 2011-2012, on account of inflation, there was a decline in the export of three wheelers. In 2013-2015 there was a slight increase in the export sector of three wheelers. After 2015-2019, inflation led to a fall in the export of three wheelers. In 2020-2021 the export of three wheelers shows decreasing trend because of the pandemic.

4.TWO WHEELERS

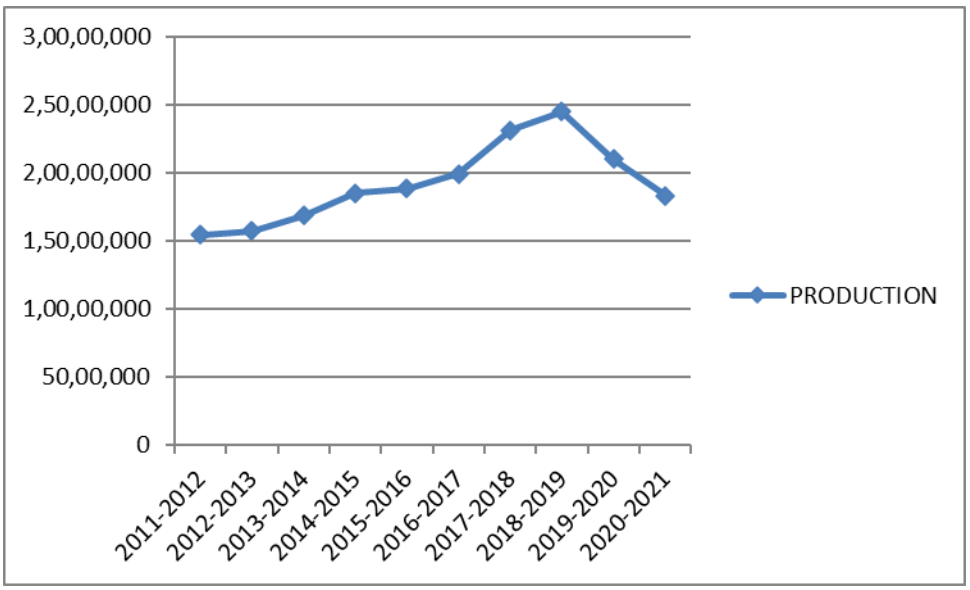
PRODUCTION & SALES & EXPORT:

(i) PRODUCTION

Figure 4.10 represents production of two wheelers for the period 2011- 2021.

FIGURE- 4.10

TWO WHEELERS- PRODUCTION



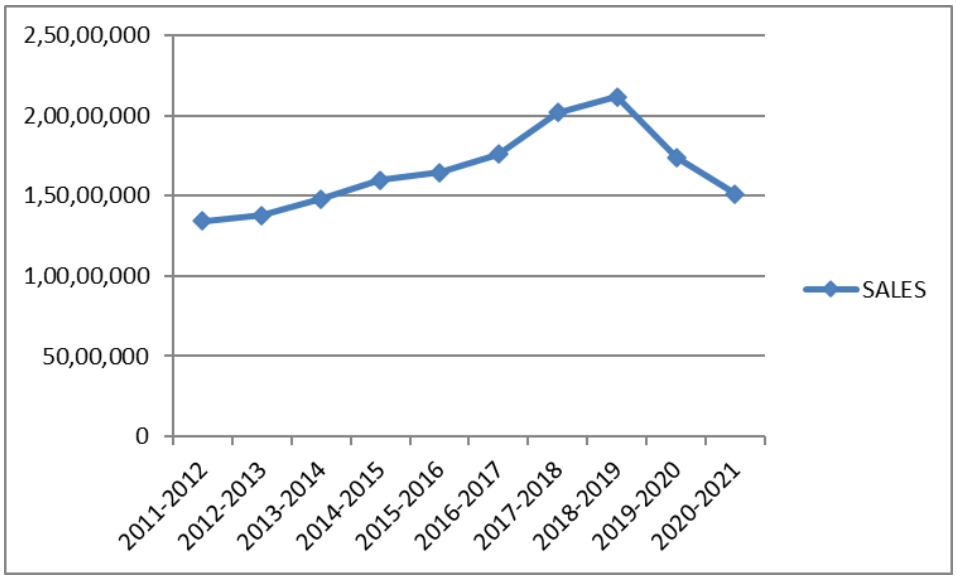
SOURCE: Estimation based on secondary data (2011-2021)

(ii) SALES:

Figure 4.11represents sales of Three wheelers for the period 2011-2021

FIGURE – 4.11

TWO WHEELERS - SALES



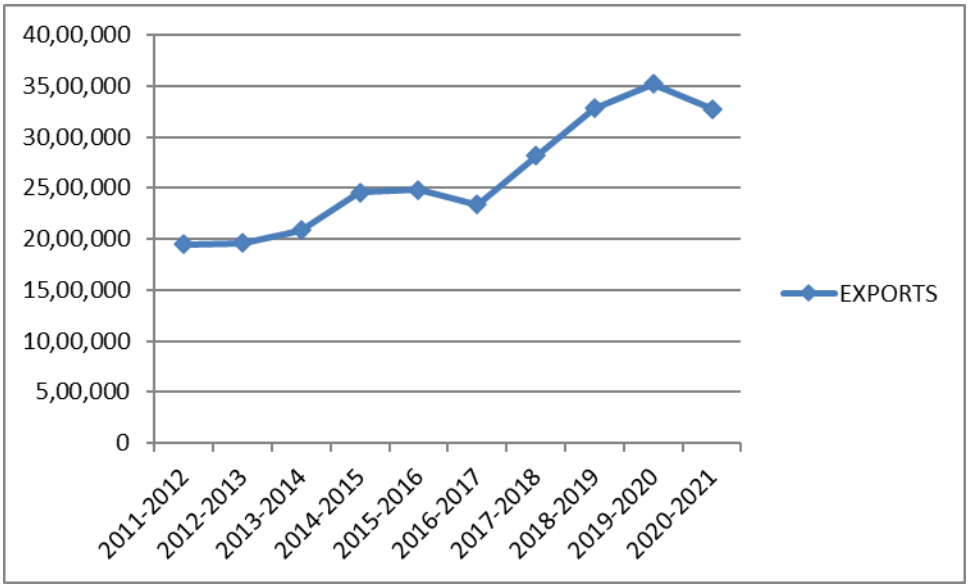
SOURCE: Estimation based on secondary data (2011-2021)

(iii) EXPORT

Figure 4.12 represents exports of passenger vehicles for the period 2011- 2021

FIGURE – 4.12

TWO WHEELERS- EXPORTS



SOURCE: Estimation based on secondary data (2011-2021)

For the two wheelers (i.e.) production, sales &export of the two wheelers vehicles, has continuous increased from the year 2011-2020, After the year 2020, there is problem arises, which was the introduction of BS-6. So, decline in production & sales of the two wheelers. Also, there is a big problem arises to entire world (i.e.) COVID so, there was a greatdecreased in all sectors of the two wheelers industry. In the year 2017, because of implementof GST in India.

DESCRPTIVE STATISTICS

TABLE - 4.1

DOMESTIC PRODUCTION OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	3,123,528	9,11,574	8,77,711	1,54,53,619
2012-13	3,233,561	8,31,744	8,39,742	1,57,21,180
2013-14	3,072,651	6,98,864	8,30,120	1,68,79,891
2014-15	3,220,172	6,97,083	9,49,021	1,84,99,970
2015-16	3,413,859	7,82,814	9,33,950	1,88,29,786
2016-17	3,791,540	8,10,286	7,83,149	1,99,29,485
2017-18	4,010,373	8,94,551	10,21,911	2,31,47,057
2018-19	4,026,047	11,12,176	12,68,723	2,45,03,086
2019-20	34,34,013	7,52,022	11,33,858	2,10,36,294
2020-21	30,62,221	6,24,939	6,11,171	1,83,49,941

SOURCE: Estimated based on secondary data (2011-2021)

TABLE - 4.1(a)

DESCRPTIVE STATISTICS

COLUMN 1		COLUMN 2		COLUMN 3		COLUMN 4	
MEAN	3438796.5	MEAN	811605.3	MEAN	924935.6	MEAN	19235031
STANDARD ERROR	118407.0065	STANDARD ERROR	43801.72	STANDARD ERROR	58588.37	STANDARD ERROR	945539.2
STANDARD DEVIATION	374435.8314	STANDARD DEVIATION	138513.2	STANDARD DEVIATION	185272.7	STANDARD DEVIATION	2990058
SAMPLE VARIATION	1.40202E+11	SAMPLE VARIATION	1.92E+10	SAMPLE VARIATION	3.43E+10	SAMPLE VARIATION	8.94E+12
KURTOSIS	-1.084166162	KURTOSIS	1.512957	KURTOSIS	0.513331	KURTOSIS	-0.50625
SKEWNESS	0.741347842	SKEWNESS	0.996007	SKEWNESS	0.335491	SKEWNESS	0.522528
COUNT	10	COUNT	10	COUNT	10	COUNT	10

SOURCE: Estimation based on secondary data (2011-2021)

It is observed from the above table that the average yearly production for the column 4(i.e., Two wheelers) are highest, followed by column 1 (i.e., passenger vehicles), column 2 (i.e.,commercial vehicles) and column 3(i.e., Three wheelers). Again, as far as the consistency in the data with regard to domestic production is concerned, commercial vehicles top the list (as sample variation is the least i.e., 1.92E+10), followed by passenger vehicles, Threewheelers, Two wheelers.

TABLE - 4.2

DOMESTIC SALES OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	2,618,072	8,09,532	5,13,251	1,34,35,769
2012-13	2,686,429	7,93,150	5,38,291	1,37,97,748
2013-14	2,503,685	6,32,738	4,79,634	1,48,05,481
2014-15	2,601,111	6,14,961	5,31,927	1,60,04,581
2015-16	2,789,678	6,85,704	5,38,092	1,64,55,911
2016-17	3,046,727	7,14,232	5,11,658	1,75,89,511
2017-18	3,287,965	8,56,453	6,35,698	2,01,92,672
2018-19	3,377,436	10,07,319	7,01,011	2,11,81,390
2019-20	27,73,575	7,17,688	6,36,569	1,74,17,616
2020-21	27,11,457	5,68,559	2,16,197	1,51,19,387

SOURCE: Estimated based on secondary data (2011-2021)

TABLE – 4.2(a)

DESCRIPTIVE STATISTICS

COLUMN 1		**COLUMN 2**		**COLUMN 3**		**COLUMN 4**	
MEAN	2839613.5	MEAN	740033.6	MEAN	530232.8	MEAN	16600007
STANDARD ERROR	94205.7066	STANDARD ERROR	41274.44	STANDARD ERROR	41303.37	STANDARD ERROR	811013.3
STANDARD DEVIATION	297904.6014	STANDARD DEVIATION	130521.2	STANDARD DEVIATION	130612.7	STANDARD DEVIATION	2564649
SAMPLE VARIATION	88747151551	SAMPLE VARIATION	1.7E+10	SAMPLE VARIATION	1.71E+10	SAMPLE VARIATION	6.58E+12
KURTOSIS	-0.317274128	KURTOSIS	0.601643	KURTOSIS	3.785859	KURTOSIS	-0.37523
SKEWNESS	0.977738425	SKEWNESS	0.795548	SKEWNESS	-1.48059	SKEWNESS	0.667901
COUNT	10	COUNT	10	COUNT	10	COUNT	10

SOURCE: Estimation based on secondary data (2011-2021)

It is observed from the above table that the average yearly sales for the column 4(i.e., Two wheelers) are highest, followed by column 2 (i.e., commercial vehicles), column 1 (i.e. passengervehicles) and column 3(i.e. Three wheelers). Again, as far as the consistency in the data with regard to domestic sales is concerned, commercial vehicles top the list (as sample variationis the least i.e., 1.7E+10), followed by, Three wheelers, Two wheelers, passenger vehicles

TABLE:4.3

DOMESTIC EXPORT OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	5,07,318	92,663	3,62,876	19,47,198
2012-13	5,54,686	79,944	3,03,088	19,60,941
2013-14	593,507	77,056	3,53,392	20,83,938
2014-15	622,470	85,782	4,07,957	24,57,597
2015-16	6,53,889	1,01,689	4,04,441	24,81,193
2016-17	7,58,830	1,08,271	2,71,894	23,39,273
2017-18	7,47,287	96,867	3,91,002	28,15,016
2018-19	6,76,193	99,931	5,67,689	32,80,841
2019-20	6,77,311	60,713	5,02,169	35,20,376
2020-21	4,04,400	50,334	3,92,941	32,77,724

SOURCE: Estimated based on secondary data (2011-2021)

TABLE – 4.3(a)

DESCRIPTIVE STATISTICS

COLUMN 1		**COLUMN 2**		**COLUMN 3**		**COLUMN 4**	
MEAN	619589.1	MEAN	85325	MEAN	395744.9	MEAN	2616410
STANDARD ERROR	34515.5715	STANDARD ERROR	5890.067	STANDARD ERROR	27476.14	STANDARD ERROR	183082.4
STANDARD DEVIATION	109147.8207	STANDARD DEVIATION	18626.03	STANDARD DEVIATION	86887.19	STANDARD DEVIATION	578957.3
SAMPLE VARIATION	11913246760	SAMPLE VARIATION	3.47E+08	SAMPLE VARIATION	7.55E+09	SAMPLE VARIATION	3.35E+11
KURTOSIS	0.252487664	KURTOSIS	-0.19285	KURTOSIS	0.699395	KURTOSIS	-1.3713
SKEWNESS	-0.691602548	SKEWNESS	-0.79439	SKEWNESS	0.7378	SKEWNESS	0.407235
COUNT	10	COUNT	10	COUNT	10	COUNT	10

SOURCE: Estimation based on secondary data (2011-2021)

It is observed from the above table that the average yearly Export for the column 4(i.e., Two wheelers) are highest, followed by column 1 (i.e., passenger vehicles), column 3 (i.e., Three wheelers) and column 2(i.e. Two wheelers). Again, as far as the consistency in the data with regard to domestic export is concerned, two wheelers top the list (as sample variation is the least i.e., 3.35E+11), followed by, Three wheelers, commercial vehicles, passenger vehicles.

TABLE – 4.4

CORRELATION MATRIX

DOMESTIC PRODUCTION OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	3,123,528	9,11,574	8,77,711	1,54,53,619
2012-13	3,233,561	8,31,744	8,39,742	1,57,21,180
2013-14	3,072,651	6,98,864	8,30,120	1,68,79,891
2014-15	3,220,172	6,97,083	9,49,021	1,84,99,970
2015-16	3,413,859	7,82,814	9,33,950	1,88,29,786
2016-17	3,791,540	8,10,286	7,83,149	1,99,29,485
2017-18	4,010,373	8,94,551	10,21,911	2,31,47,057
2018-19	4,026,047	11,12,176	12,68,723	2,45,03,086
2019-20	34,34,013	7,52,022	11,33,858	2,10,36,294
2020-21	30,62,221	6,24,939	6,11,171	1,83,49,941

SOURCE: Estimated based on secondary data (2011-2021)

TABLE - 4.4(a)

CORRELATION MATRIX

	COLUMN 1	**COLUMN 2**	**COLUMN 3**	**COLUMN 4**
COLUMN 1	1			
COLUMN 2	0.697158199	1		
COLUMN 3	0.618333872	0.688068	1	
COLUMN 4	0.877885072	0.503685	0.687136	1

SOURCE: Estimation based on secondary data (2011-2021)

The above correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12= +0.697158199,that between column 2(commercial vehicles) and column 3(three wheelers) is r23=+0.688068, that between the column 3 (three wheelers) and column 4(Two wheelers) is r34=+0.687136and that between column 4(Two wheelers) and column 1(passenger vehicles) is r41= +0.877885072. Here, all the values are positive and greater than 0.50, so we can fairlyinterpret that all the four variables +0.877885072, this value implies that there is almost perfectly positive correlation between the domestic production of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, so we can say that the domestic production of both types of vehicles are settinga positive and upward trend. Moreover, these two categories can be clubbed as vehicles sold to personal consumers.

TABLE - 4.5

DOMESTIC SALES OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	2,618,072	8,09,532	5,13,251	1,34,35,769
2012-13	2,686,429	7,93,150	5,38,291	1,37,97,748
2013-14	2,503,685	6,32,738	4,79,634	1,48,05,481
2014-15	2,601,111	6,14,961	5,31,927	1,60,04,581
2015-16	2,789,678	6,85,704	5,38,092	1,64,55,911
2016-17	3,046,727	7,14,232	5,11,658	1,75,89,511
2017-18	3,287,965	8,56,453	6,35,698	2,01,92,672
2018-19	3,377,436	10,07,319	7,01,011	2,11,81,390
2019-20	27,73,575	7,17,688	6,36,569	1,74,17,616
2020-21	27,11,457	5,68,559	2,16,197	1,51,19,387

SOURCE: Estimation based on secondary data (2011-2021)

TABLE - 4.5(a)

CORRELATION MATRIX

	COLUMN 1	**COLUMN 2**	**COLUMN 3**	**COLUMN 4**
COLUMN 1	1			
COLUMN 2	0.740427829	1		
COLUMN 3	0.534676535	0.742457	1	
COLUMN 4	0.915879078	0.583857	0.601915	1

SOURCE: Estimation based on secondary data (2011-2021)

The above correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12=+0.740427829, that between column 2(commercial vehicles) and column 3(three wheelers) is r23=+0.742457 that between the column 3 (three wheelers) and column 4(Two wheelers) is r34=+0.601915 and that between column 4(Two wheelers) and column 1(passenger vehicles) is r41=+0.915879078. Here, all the values are positive and greater than 0.50, so we can fairly interpret that all the four variables +0.915879078, this value implies that there is almost perfectly positive correlation between the domestic Sales of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, so we can say that the domestic sales of both types of vehicles are setting a positive and upward trend. Moreover, these two categories can be clubbed as vehicles sold to personal consumers.

TABLE - 4.6

DOMESTIC EXPORT OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	5,07,318	92,663	3,62,876	19,47,198
2012-13	5,54,686	79,944	3,03,088	19,60,941
2013-14	593,507	77,056	3,53,392	20,83,938
2014-15	622,470	85,782	4,07,957	24,57,597
2015-16	6,53,889	1,01,689	4,04,441	24,81,193
2016-17	7,58,830	1,08,271	2,71,894	23,39,273
2017-18	7,47,287	96,867	3,91,002	28,15,016
2018-19	6,76,193	99,931	5,67,689	32,80,841
2019-20	6,77,311	60,713	5,02,169	35,20,376
2020-21	4,04,400	50,334	3,92,941	32,77,724

SOURCE: Estimation based on secondary data (2011-2021)

TABLE - 4.6(a)

CORRELATION MATRIX

	COLUMN 1	**COLUMN 2**	**COLUMN 3**	**COLUMN 4**
COLUMN 1	1			
COLUMN 2	0.650840395	1		
COLUMN 3	0.114471518	-0.14767	1	
COLUMN 4	0.106766251	-0.40201	0.76014	1

SOURCE: Estimation based on secondary data (2011-2021)

The above correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12=+0.650840395, that between column 2(commercial vehicles) and column 3(three wheelers) is r23= -0.14767that between the column 3 (three wheelers) and column 4(Two wheelers) is r34=+0.76014 and that between column 4(Two wheelers) and column 1(passenger vehicles) is r41=+0.106766251. Here, all the values are Negative and greater than 0.50, so we can fairly interpret that all the four variables +0.106766251, this value implies that there is almost perfectly positive correlation between the domestic export of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, so we can say that the domestic export of both types of vehicles are setting a positive and upward trend. Moreover, these two categories can be clubbed as vehicles sold to personal consumers

ANALYSIS OF VARIANCE(ANOVA)

The quality of the population means (i.e., equality of average yearly different types of categories in different types of automobiles) during the period 2011-2012 to 2020-2021, we are using the techniques of Analysis of variance (ANOVA) and F-test.

Null Hypothesis (i.e.) There is no significant difference among the average yearly types of categories in different types of automobiles during the period 2011-12 to 2020-21

Alternative Hypothesis (i.e.) There is a significant difference among the averageyearly types of categories in different types of automobiles during the period 2011-12 to 2020-21

TABLE - 4.7

DOMESTIC PRODUCTION OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	3,123,528	9,11,574	8,77,711	1,54,53,619
2012-13	3,233,561	8,31,744	8,39,742	1,57,21,180
2013-14	3,072,651	6,98,864	8,30,120	1,68,79,891
2014-15	3,220,172	6,97,083	9,49,021	1,84,99,970
2015-16	3,413,859	7,82,814	9,33,950	1,88,29,786
2016-17	3,791,540	8,10,286	7,83,149	1,99,29,485
2017-18	4,010,373	8,94,551	10,21,911	2,31,47,057
2018-19	4,026,047	11,12,176	12,68,723	2,45,03,086
2019-20	34,34,013	7,52,022	11,33,858	2,10,36,294
2020-21	30,62,221	6,24,939	6,11,171	1,83,49,941

SOURCE: Estimated based on secondary data(2011-2021)

TABLE - 4.7(a)

ANALYSIS OF VARIANCE(ANOVA)

ANOVA: SINGLE FACTOR					
SUMMARY					
Groups	**Groups**	**Count**	**Sum**	**Average**	**Variance**
Column 1	3123528	9	31264437	3473826	1.44E+11
Column 2	911574	9	7204479	800497.7	2.02E+10
Column 3	877711	9	8371645	930182.8	3.83E+10
Column 4	15453619	9	1.77E+08	19655188	8.07E+12

SOURCE: Estimation based on secondary data (2011-2021)

ANOVA						
Source of variation	SS	D.f.	MS	F	P-Value	Fcritical
Between Groups	2.20859E+15	3	7.36E+14	355.8893	1.2E-24	2.90112
Within Groups	6.61955E+13	32	2.07E+12			
Total	2.27478E+15	35				

SOURCE: Estimation based on secondary data (2011-2021)

It is evident from the above ANOVA table (table 4.7(a)), the F- statistics is calculated to be355.8893 i.e., $F_{calculated}$ =355.8893

Again, at 5% level of significance, for 3 and 32 d.f., the critical value or the tabulatedvalue of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

Now, since $F_{calculated} > F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of differenttypes of automobiles during the period 2011-12 to 2020-21.

TABLE - 4.8

DOMESTIC SALES OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	2,618,072	8,09,532	5,13,251	1,34,35,769
2012-13	2,686,429	7,93,150	5,38,291	1,37,97,748
2013-14	2,503,685	6,32,738	4,79,634	1,48,05,481
2014-15	2,601,111	6,14,961	5,31,927	1,60,04,581
2015-16	2,789,678	6,85,704	5,38,092	1,64,55,911
2016-17	3,046,727	7,14,232	5,11,658	1,75,89,511
2017-18	3,287,965	8,56,453	6,35,698	2,01,92,672
2018-19	3,377,436	10,07,319	7,01,011	2,11,81,390
2019-20	27,73,575	7,17,688	6,36,569	1,74,17,616
2020-21	27,11,457	5,68,559	2,16,197	1,51,19,387

SOURCE: Estimation based on secondary data (2011-2021)

TABLE - 4.8(a)

CORRELATION MATRIX

ANOVA: SINGLEFACTOR					
SUMMARY					
Groups	**Groups**	**Count**	**Sum**	**Average**	**Variance**
Column 1	2618072	9	25778063	2864229	9.3E+10
Column 2	809532	9	6590804	732311.6	1.85E+10
Column 3	513251	9	4789077	532119.7	1.92E+10
Column 4	13435769	9	1.53E+08	16951589	6.01E+12

SOURCE: Estimation based on secondary data (2011-2021)

ANOVA						
Source of variation	SS	D.f.	MS	F	P-Value	Fcritical
Between Groups	1.66757E+15	3	5.56E+14	362.1411	9.19E-25	2.90112
Within Groups	4.91173E+13	32	1.53E+12			
Total	1.71669E+15	35				

SOURCE: Estimation based on secondary data (2011-2021)

It is evident from the above ANOVA table (table 4.8(a)), the F- statistics is calculated to be 362.1411 i.e., $F_{calculated}$ =362.1411

Again, at 5% level of significance, for 3 and 32 d.f., the critical value or the tabulated value of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

Now, since $F_{calculated} > F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of differenttypes of automobiles during the period 2011-12 to 2020-21.

TABLE - 4.9

DOMESTIC EXPORT OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	5,07,318	92,663	3,62,876	19,47,198
2012-13	5,54,686	79,944	3,03,088	19,60,941
2013-14	593,507	77,056	3,53,392	20,83,938
2014-15	622,470	85,782	4,07,957	24,57,597
2015-16	6,53,889	1,01,689	4,04,441	24,81,193
2016-17	7,58,830	1,08,271	2,71,894	23,39,273
2017-18	7,47,287	96,867	3,91,002	28,15,016
2018-19	6,76,193	99,931	5,67,689	32,80,841
2019-20	6,77,311	60,713	5,02,169	35,20,376
2020-21	4,04,400	50,334	3,92,941	32,77,724

SOURCE: Estimation based on secondary data (2011-2021)

TABLE - 4.9(a)

ANOVA - EXPORT

ANOVA: SINGLE FACTOR					
SUMMARY					
Groups	**Groups**	**Count**	**Sum**	**Average**	**Variance**
Column 1	507318	9	5688573	632063.7	1.17E+10
Column 2	92663	9	760587	84509.67	3.83E+08
Column 3	362876	9	3594573	399397	8.34E+09
Column 4	1947198	9	24216899	2690767	3.15E+11

SOURCE: Estimation based on secondary data

ANOVA						
Source of variation	SS	D.f.	MS	F	P-Value	Fcritical
Between Groups	3.76522E+13	3	1.26E+13	149.7399	6.54E-19	2.90112
Within Groups	2.68214E+12	32	8.38E+10			
Total	4.03343E+13	35				

SOURCE: Estimated based on secondary data (2011-2021)

Now, it is evident from the above ANOVA table (table 4.9(a)), the F- statistics is calculatedto be 149.7399 i.e., $F_{calculated}$ =149.7399

Again, at 5% level of significance, for 3 and 32 d.f., the critical value or the tabulated value of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

Now, since $F_{calculated} > F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of differenttypes of automobiles during the period 2011-12 to 2021

COMPOUND ANNUAL GROWTH RATE

TABLE - 4.10

DOMESTIC PRODUCTION OF AUTOMOBILE

NET PRODUCTION				
YEAR	**PASSENGER VEHICLES**	**COMMERICAL VEHICLES**	**THREE-WHEELERS**	**TWO-WHEELERS**
201-12	3,123,528	9,11,574	8,77,711	1,54,53,619
2012-13	3,233,561	8,31,744	8,39,742	1,57,21,180
2013-14	3,072,651	6,98,864	8,30,120	1,68,79,891
2014-15	3,220,172	6,97,083	9,49,021	1,84,99,970
2015-16	3,413,859	7,82,814	9,33,950	1,88,29,786
2016-17	3,791,540	8,10,286	7,83,149	1,99,29,485
2017-18	4,010,373	8,94,551	10,21,911	2,31,47,057
2018-19	4,026,047	11,12,176	12,68,723	2,45,03,086
2019-20	34,34,013	7,52,022	11,33,858	2,10,36,294
2020-21	30,62,221	6,24,939	6,11,171	1,83,49,941
MEAN	34,38,797	8,11,605	9,24,936	1,92,35,031
SD	374435.8314	138513.1994	185272.6862	2990057.564
CV	10.88857196	17.06657157	20.03087417	15.54485449
CAGR	-0.20%	-3.70%	-3.55%	1.73%

SOURCE: Estimation based on secondary data (2011-2021)

The mean value was the highest in Two wheelers (i.e.) 1,92,35,031 followed by passenger vehicles (i.e.) 34,38,797. The net production of all the automobile sectors reflected that they were the mean ratios in most of the years. Hence, it could be concluded that the net productionwas satisfactory position in all the sectors.

The compound annual growth rate of the three sectors shows the negative growth rate, among the companies first placed occupied by commercial vehicles had the highest growth rate (-3.70%) while there was a negative growth rate in two sectors of automobile companies

The co-efficient of variation showed that the net production of passenger vehicles (10.88857196) and two wheelers (15.54485449) and commercial vehicles (17.06657157) andthree wheelers (20.03087417)

TABLE – 4.10(a)

CAGR-ANOVA(PRODUCTION)

ANOVA						
Source of variation	SS	D.f.	MS	F	P-Value	Fcritical
Between Groups	2.34E+15	3	7.81E+14	342.0996	1.67E-26	2.866266
Within Groups	8.22E+13	36	2.28E+12			
Total	2.43E+15	39				

SOURCE: Estimation based on secondary data (2011-2021)

F test of net production has been made and it is exhibited in the above table. The table reveals that the p value of f is greater than 0.05, the null hypothesis is accepted at five percent level, not significance. The hypothesis “there is no difference between the years andcategories of automobile on the net production” is disproved. It is concluded

that, there is nodifference between the years and categories of automobile.

TABLE – 4.11

DOMESTIC SALES OF AUTOMOBILE

NET SALES				
YEAR	**PASSENGER VEHICLES**	**COMMERICAL VEHICLES**	**THREE-WHEELERS**	**TWO-WHEELERS**
2011-12	2,618,072	8,09,532	5,13,251	1,34,35,769
2012-13	2,686,429	7,93,150	5,38,291	1,37,97,748
2013-14	2,503,685	6,32,738	4,79,634	1,48,05,481
2014-15	2,601,111	6,14,961	5,31,927	1,60,04,581
2015-16	2,789,678	6,85,704	5,38,092	1,64,55,911
2016-17	3,046,727	7,14,232	5,11,658	1,75,89,511
2017-18	3,287,965	8,56,453	6,35,698	2,01,92,672
2018-19	3,377,436	10,07,319	7,01,011	2,11,81,390
2019-20	27,73,575	7,17,688	6,36,569	1,74,17,616
2020-21	27,11,457	5,68,559	2,16,197	1,51,19,387
MEAN	28,39,614	7,40,034	5,30,233	1,66,00,007
SD	2,97,905	130521.2	130612.7	2564649.146
CV	10.49103	17.6372	24.63309	15.44969
CAGR	0.35%	-92.98%	-8.28%	1.19%

SOURCE: Estimation based on secondary data (2011-2021)

The mean value was the highest in Two wheelers (i.e.) 1,66,00,007 followed by passenger vehicles (i.e.) 28,39,614. The net sales of all the automobile sectors reflected that they werethe mean ratios in most of the years. Hence, it could be concluded that the net sales were satisfactory position in all the sectors.

The compound annual growth rate of the two sectors shows the negative growth rate, among the companies first placed occupied by commercial vehicles had the highest growth rate (-92.98%) while there was a negative growth rate in two sectors of automobile companies

The co-efficient of variation showed that the net sales of three wheelers (24.63309) and commercial vehicles (17.6372) and Two wheelers (15.44969) and passenger vehicles (10.49103)

TABLE – 4.11(a)

CAGR-ANOVA(SALES)

ANOVA						
Source of variation	SS	Df	MS	F	P-Value	Fcritical
Between Groups	1.77E+15	3	5.90759E+14	352.67758	9.84E-27	2.866266
Within Groups	6.03E+13	36	1.67507E+12			
Total	1.83E+15	39				

SOURCE: Estimation based on secondary data (2011-2021)

F test of net production has been made and it is exhibited in the above table . The table reveals that the p value of f is greater than 0.05, the null hypothesis is accepted at five percent level, not significance. The hypothesis “there is no difference between the years andcategories of automobile on the net sales” is disproved. It is concluded that, there is no difference between the years and categories of automobile.

TABLE- 4.12

NET EXPORT OF AUTOMOBILE

YEAR	PASSENGER VEHICLES	COMMERICAL VEHICLES	THREE WHEELERS	TWO WHEELERS
2011-12	5,07,318	92,663	3,62,876	19,47,198
2012-13	5,54,686	79,944	3,03,088	19,60,941
2013-14	593,507	77,056	3,53,392	20,83,938
2014-15	622,470	85,782	4,07,957	24,57,597
2015-16	6,53,889	1,01,689	4,04,441	24,81,193
2016-17	7,58,830	1,08,271	2,71,894	23,39,273
2017-18	7,47,287	96,867	3,91,002	28,15,016
2018-19	6,76,193	99,931	5,67,689	32,80,841
2019-20	6,77,311	60,713	5,02,169	35,20,376
2020-21	4,04,400	50,334	3,92,941	32,77,724
MEAN	3,52,457	85,325	3,95,745	26,16,410
SD	109147.8	18626.03	86887.19	578957.348
CV	30.96769	21.82951	21.95535	22.12793
CAGR	-2.24%	-6%	1%	5%

SOURCE: Estimation based on secondary data (2011-2021)

The mean value was the highest in Two wheelers (i.e.) 26,16,410 followed by Three wheelers (i.e.) 3,95,745. The net Export of all the automobile sectors reflected that they were the mean ratios in most of the years. Hence, it could be concluded that the net Export was satisfactory position in all the sectors.

The compound annual growth rate of the two sectors shows the negative growth rate, among the companies first placed occupied by passenger vehicles had the highest growth rate (-2.24%) while there was a negative growth rate in two sectors of automobile companies

The co-efficient of variation showed that the net Export of passenger vehicles (30.96769) and Two wheelers (22.12793) and Three wheelers (21.95535) and commercial vehicles (21.82951)

TABLE – 4.12(a)

CAGR-ANOVA(EXPORT)

ANOVA						
Source of variation	SS	D.f.	MS	F	P-Value	F Critical
Between Groups	3.93923E+13	3	1.31E+13	147.952	2.67E-20	2.866266
Within Groups	3.19501E+12	36	8.88E+10			
Total	4.25874E+13	39				

SOURCE: Estimated based on secondary data (2011-2021)

F test of net production has been made and it is exhibited in the above table. The table reveals that the p value of f is greater than 0.05, the null hypothesis is accepted at five percent level, not significance. The hypothesis “there is no difference between the years and categories of automobile on the net Export” is disproved. It is concluded that, there is no difference between the years and categories of automobile. This study attempts to indicate the

Summary and Conclusion

CHAPTER-V

SUMMARY AND CONCLUSION

Untimely, peoples are using Animals or carts (Donkeys, horses, camels, bulls, etc.,) for traveling the persons from one place to another place, not only traveling, carrying goods from one place to another place. But now, the peoples are using automobile industries (i.e.) two wheelers, three wheelers to travel or carrying the goods from one place to another. In India, the automobile industry is one of the most important sectors in economic growth and fortunate sectors in country has presence in GVCs (Global Value Chains)

Before 1478, no one can imagine the car. It was first designed by the LEONARDO DA VINCI by ‘’self –propelled car ‘’. Now –a-days, no one can imagine without a machine (i.e.) Automobile industry. The history of automobile is expressed to development and brought into the world. In Indian passengers’ vehicle, Asia is the 7th largest market and 10th largest market in the world.

In 80 years ago, Indian automobile market was nothing because India has no automobile manufacturer. After Independence, the Government has put effort develop the automobile industry. Beginning of automobile industry in India, the progress rate is low. But now, the situation is different. There is a lot of transport option like motor cycles, cars, SUVs etc.., Major automobile companies are BAJAJ, HERO MOTOCORP, MARUTI SUZUKI, MAHINDRA & MAHINDRA HYUNDAI, TATA MOTORS, TVS and CHEVROLET

etc. This study attempts to indicate the growth performance of automobile industry in Indiawith the following objectives.

- To analyze the recent trends in automobile production, sales and exports in India
- To examine the sales performance of different types of automobiles from 2011-2021 in India

Hypothesis formulated for the study were

- **Null Hypothesis (i.e.)** There is no significant difference among the average yearly types ofcategories in different types of automobiles during the period 2011-12 to 2020-21

- **Alternative Hypothesis (i.e.)** There is a significant difference among the averageyearly types of categories in different types of automobiles during the period 2011-12 to 2020-21

MAJOR FINDINGS

The major findings of the study were summarized below

- The automobile production shows increased trend from 2011-2012, in production followed by 2013-2014 and there has been decreasing trend in production during 2013 because of excise duty announced by the governmentin the interim budget. While 2014 -2018, there is continuous increase in production till 2018- 2019. Due to pandemic, there has been decreased trend in production for the year 2019- 2021

- In 2011-2012 the sales of passenger vehicles increasing trend where as it decreasing trend during 2013- 2014. From 2014- 2015 to 2019- 2020 the sales of passenger vehicles have increased in 2020 – 2021, a decline of 224 percent due to COVID-19 pandemic has put brakes on the sector

- The export of passenger vehicles in had been increased from 2011- 2012 till2016- 2017. In 2017- 2018 to 2019-2020, there will be slight decrease in theexport because of the lingering impact of GST refund and also affected overseas shipments in 2020- 2021, the export of passenger vehicles shows decreasing trend because of the corona virus pandemic across the globe

- The automobile production shows decreased trend from 2011-2016 because ofrecession while there is an upward trend in this sector from 2017-19. In 2019- 2021, there is again a continuous decrease in the production because of weak rural demand and economic slowdown.

- In 2011- 2015 the sales of commercial vehicles witnessed a decreasing trend due to lower replacement volume of vehicles whereas 2016-2019 had anincreased sales in commercial vehicles. In 2019-2021, a decline of commercial vehicles occurred due to COVID-19

- The export of commercial vehicles had decreased from 2011-2014 because of recession. In 2014- 2017, there was slight increase in the export sector. In 2017-2018 the export sector shows a decrease because of GST. In 2020- 2021 the export sector had decreased due to COVID 19 pandemic.

- The automobile production shows decreasing trend from 2011- 2017 due to hike of fuel prices, in production followed by 2018-which had an increase in production sector. While in 2020-2021,there has been decrease in production because of the pandemic

- In 2011-2017 the sales of three wheelers decreased due to increased fuel price, whereas between 2016-2017 there has been currency devaluation. In 2017- 2019 the sales of three wheelers had increased. In 2020- 2021 the three wheelers have declined in sales sector because of COVID-19.

- From 2011-2012, on account of inflation, there was a decline in the export of three wheelers. In 2013-2015 there was a slight increase in the export sector ofthree wheelers. After 2015-2019, inflation led to a fall in the export of three wheelers. In 2020-2021 the export of three wheelers shows decreasing trend because of the pandemic.

- For the two wheelers (i.e.) production, sales &export of the two wheelers vehicles, has continuous increased from the year 2011-2020, After the year 2020, there is problem arises, which was the introduction of BS-6. So, declinein production & sales of the two wheelers. Also, there is a big problem arisesto entire world (i.e.) COVID so, there was a great decreased in all sectors of the two wheelers industry. In the year 2017, because of implement of GST in India.

- That the average yearly production for the column 4(i.e.) Two wheelers) are highest, followed by column 1 (i.e.) passenger vehicles), column 2 (i.e.) commercial vehicles) and column 3(i.e.) Three wheelers). Again, as far as theconsistency in the data with regard to domestic production is concerned

, commercial vehicles top the list (as sample variation is the least (i.e.)., 1.92E+10), followed by passenger vehicles, Three wheelers, Two wheelers.

- The average yearly sales for the column 4(i.e.) Two wheelers) are highest, followed by column 2 (i.e.) commercial vehicles), column 1 (i.e.) passenger vehicles) and column 3(i.e.) Three wheelers). Again, as far as the consistency in the data with regard to domestic sales is concerned, commercial vehicles top the list (as sample variation is the least (i.e.)., 1.7E+10), followed by, Three wheelers, Two wheelers, passenger vehicles

- That the average yearly Export for the column 4(i.e.) Two wheelers) are highest, followed by column 1 (i.e.) passenger vehicles), column 3 (i.e.) Three wheelers) and column 2(i.e.) Two wheelers). Again, as far as the consistency in the data with regard to domestic export is concerned, two wheelers top the list (as sample variation is the least i.e., 3.35E+11), followed by, Three wheelers, commercial vehicles, passenger vehicles.

- correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12= +0.697158199, that between column 2(commercial vehicles) and column 3(three wheelers) is r23= +0.688068, that between the column 3 (three wheelers) and column 4(Two wheelers) is r34= +0.687136and that between column 4(Two wheelers) and column 1(passenger vehicles) is r41=

  +0.877885072. Here, all the values are positive and greater than 0.50, so we can fairly interpret that all the four variables +0.877885072, this value implies that there is almost perfectly positive correlation between the domestic production of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, sowe can say that the domestic production of both types of vehicles are setting a positive and upward trend. Moreover, these two categories can be clubbed as vehicles sold to personal consumers.

- correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12=+0.740427829, that between column 2(commercial vehicles) and column 3(three wheelers) is r23=+0.742457 that between the column 3 (three wheelers) and column

4(Two wheelers) is r34=+0.601915 and that between column 4(Two wheelers) and column 1(passenger vehicles) is r41=+0.915879078. Here, all the values are positive and greater than 0.50, so we can fairly interpret that all the four variables +0.915879078, this value implies that there is almost perfectly positive correlation between the domestic Sales of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, so we can say that the domestic sales of both types of vehicles are setting a positive and upward trend. Moreover, thesetwo categories can be clubbed as vehicles sold to personal consumers.

- correlation matrix reveals that the value of correlation matrix coefficient between column 1(passenger vehicles) and column 2 (commercial vehicles) is r12=+0.650840395, that between column 2(commercial vehicles) and column 3(three wheelers) is r23= -0.14767that between the column 3 (three wheelers) and column 4(Two wheelers) is r34=+0.76014 and that between column 4(Twowheelers) and column 1(passenger vehicles) is r41=+0.106766251. Here, allthe values are Negative and greater than 0.50, so we can fairly interpret that all the four variables +0.106766251, this value implies that there is almostperfectly positive correlation between the domestic export of Two wheelers and that of passenger vehicles. As both types of vehicles are purchased by the personal consumers for their own use, so we can say that the domestic export of both types of vehicles are setting a positive and upward trend. Moreover, these two categories can be clubbed as vehicles sold to personal consumers.

- ANOVA table, the F- statistics is calculated to be 355.8893

  i.e., $F_{calculated}$ =355.8893

  Again, at 5% level of significance, for 3 and 32 d.f., the critical valueor the tabulated value of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

  Now, since $F_{calculated} > F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of different types of automobiles during the period 2011-12 to 2020-21.

- ANOVA table, the F- statistics is calculated to be 355.8893 i.e., $F_{calculated}$=355.8893

  Again, at 5% level of significance, for 3 and 32 d.f., the critical valueor the tabulated value of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

  Now, since $F_{calculated}$ >$F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of different types of automobiles during the period 2011-12 to 2020-21.

- ANOVA table, the F- statistics is calculated to be 149.7399 i.e., $F_{calculated}$=149.7399

  Again, at 5% level of significance, for 3 and 32 d.f., the critical valueor the tabulated value of F is 2.90112 i.e., $F_{tabulated}$ =2.90112

  Now, since $F_{calculated}$ >$F_{tabulated}$, so we reject the null hypothesis and conclude that there is a significant difference among the average yearly different categories of different types of automobiles during the period 2011-12 to 2021

- The mean value was the highest in Two wheelers (i.e.) 1,92,35,031 followedby passenger vehicles (i.e.) 34,38,797. The net production of all the automobile sectors reflected that they were the mean ratios in most of the years. Hence, it could be concluded that the net production was satisfactory position in all the sectors.

- The mean value was the highest in Two wheelers (i.e.) 1,92,35,031 followed by passenger vehicles (i.e.) 34,38,797. The net production of all the automobilesectors reflected that they were the mean ratios in most of the years. Hence, it could be concluded that the net production was satisfactory position in all the sectors.

  The compound annual growth rate of the three sectors shows the negative growth rate, among the companies first placed occupied by commercial vehicles had the highest growth rate (-3.70%) while there was a negative growth rate in two sectors of automobile companies

  The co-efficient of variation showed that the net production of passenger vehicles (10.88857196) and two wheelers (15.54485449) and commercial vehicles (17.06657157) and three wheelers (20.03087417)

- F test of net production has been made and it is exhibited.It reveals that the p value of f is greater than 0.05, the null hypothesis is accepted at five percent level, not significance. The hypothesis “there is nodifference between the years and categories of automobile on the net production” is disproved. It is concluded that, there is no difference between the years and categories of automobile.

- The mean value was the highest in Two wheelers (i.e.) 1,66,00,007 followed by passenger vehicles (i.e.) 28,39,614. The net sales of all the automobile sectors reflected that they were the mean ratios in most of the years. Hence, it could be concluded that the net sales were satisfactory position in all thesectors.

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- The mean value was the highest in Two wheelers (i.e.) 26,16,410 followed by Three wheelers (i.e.) 3,95,745. The net Export of all the automobile sectors reflected that they were the mean ratios in most of the years. Hence, it could beconcluded that the net Export was satisfactory position in all the sectors.

The compound annual growth rate of the two sectors shows the negative growth rate, among the companies first placed occupied by passenger vehicles had the highest growth rate (-2.24%) while there was a negative growth rate in two sectors of automobile companies

The co-efficient of variation showed that the net Export of passenger vehicles (30.96769) and Two wheelers (22.12793) and Three wheelers (21.95535) and commercial vehicles (21.82951)

- F test of net production has been made and it is exhibited. It reveals that the p value of f is greater than 0.05, the null hypothesis is accepted at five percent level, not significance. The hypothesis “there is nodifference between the years and categories of automobile on the net Export”is disproved. It is concluded that, there is no difference between the years andcategories of automobile. This study attempts to indicate the

CONCLUSION

To conclude, the performance of Automobile production, sales and exports shows fluctuation trend from 2011- 2021. The reasons for fluctuation may be due to the reasons like recession, GST, excise duty announced by Government Interim budget, lower replacement volume of vehicles, COVID-19.

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Annexure

ANNEXURE

CATEGORIES OF PASSENGER VEHICLES

PASSENGER VEHICLES			
YEAR	**PRODUCTION**	**SALES**	**EXPORT**
2011-12	3,123,528	2,618,072	5,07,318
2012-13	3,233,561	2,686,429	5,54,686
2013-14	3,072,651	2,503,685	593,507
2014-15	3,220,172	2,601,111	622,470
2015-16	3,413,859	2,789,678	6,53,889
2016-17	3,791,540	3,046,727	7,58,830
2017-18	4,010,373	3,287,965	7,47,287
2018-19	4,026,047	3,377,436	6,76,193
2019-20	34,34,013	27,73,575	6,77,311
2020-21	30,62,221	27,11,457	4,04,400

SOURCE:SIAM statistics(2011-2021)

CATEGORIES OF COMMERICAL VEHICLES

COMMERICAL VEHICLES			
YEAR	**PRODUCTION**	**SALES**	**EXPORT**
2011-12	9,11,574	8,09,532	92,663
2012-13	8,31,744	7,93,150	79,944
2013-14	6,98,864	6,32,738	77,056
2014-15	6,97,083	6,14,961	85,782
2015-16	7,82,814	6,85,704	1,01,689
2016-17	8,10,286	7,14,232	1,08,271
2017-18	8,94,551	8,56,453	96,867
2018-19	11,12,176	10,07,319	99,931
2019-20	7,52,022	7,17,688	60,713
2020-21	6,24,939	5,68,559	50,334

SOURCE: SIAM statistics(2011-2021)

CATEGORIES OF THREE WHEELERS

THREE –WHEELERS			
YEAR	**PRODUCTION**	**SALES**	**EXPORT**
2011-12	8,77,711	5,13,251	3,62,876
2012-13	8,39,742	5,38,291	3,03,088
2013-14	8,30,120	4,79,634	3,53,392
2014-15	9,49,021	5,31,927	4,07,957
2015-16	9,33,950	5,38,092	4,04,441
2016-17	7,83,149	5,11,658	2,71,894
2017-18	10,21,911	6,35,698	3,91,002
2018-19	12,68,723	7,01,011	5,67,689
2019-20	11,33,858	6,36,569	5,02,169
2020-21	6,11,171	2,16,197	3,92,941

SOURCE: SIAM statistics(2011-2021)

CATEGORIES OF TWO-WHEELERS

TWO-WHEELERS			
YEAR	**PRODUCTION**	**SALES**	**EXPORT**
2011-12	1,54,53,619	1,34,35,769	19,47,198
2012-13	1,57,21,180	1,37,97,748	19,60,941
2013-14	1,68,79,891	1,48,05,481	20,83,938
2104-15	1,84,99,970	1,60,04,581	24,57,597
2015-16	1,88,29,786	1,64,55,911	24,81,193
2016-17	1,99,29,485	1,75,89,511	23,39,273
2017-18	2,31,47,057	2,01,92,672	28,15,016
2018-19	2,45,03,086	2,11,81,390	32,80,841
2019-20	2,10,36,294	1,74,17,616	35,20,376
2020-21	1,83,49,941	1,51,19,387	32,77,724

SOURCE:SIAM statistics (2011-2021)