# Sales Forecasting of Global Automobiles Trends using ARIMA Model

**Mandeep Nim[1] Kunal Swami[2]**
[1,2]Medi-Caps Institute of Science and Technology, Indore, India

*Abstract*— Automobile manufacturers are subject to the demands of a vast international pool of customers. Economic conditions affect overall industry sales. Today, the automobile sector in India is aptly described as the next sunrise sector of the Indian economy. Trends of production, sales and exports have been analyzed in the present paper with reference to the Indian automobile sector. The sales of vehicles in countries like Europe, America, Africa, NAFTA countries, and India have been considered to forecast the future sales. Data for sales between the periods of 2005 to 2018 have been collected and analyzed using the ARIMA forecasting technique. Results depict that future trends in vehicle sales are likely to vary considerably across the developed countries and India. It is concluded that in Europe, America, Africa and NAFTA countries, vehicle sales are expected to be broadly flat. In India, vehicle sales are expected to continue to increase due to population increases as well as high income elasticity and rising income levels.

***Keywords:*** Sales of vehicles, Indian Automobile Industry, Future Trends of Automobile, ARIMA Forecasting Technique

## I. INTRODUCTION

The Automotive Industry globally is one of the largest industries and the major drivers for economic growth. The industry has a strong multiplier effect because of its deep forward and backward linkages with the rest of the industry (DHI, 2011).

With the gradual liberalization of the automobile sector in India since 1991, the number of manufacturing facilities has grown progressively (Arbor, Ramchand and Andrea, 1993). The Indian automotive industry produces a wide variety of vehicles: passenger cars, commercial vehicles, multi-utility vehicles, two, three wheelers, tractors and other agricultural equipment. The Indian automobile industry is dominated by two wheelers, which account for 75% of the total vehicles sold in the country (K & T, 2011). In the passenger car segment, India is mainly a small car market.

In view of the huge potential of the automotive sector, the Government of India prepared a ten year strategic vision plan for the industry known as The Automotive Mission Plan 2006-16 (DHI, 2016) which was formally released by the Honorable Prime Minister in January, 2007. The AMP 06-16 lays down a 10 year roadmap for the automotive industry covering every aspect of its growth. It includes broad direction on fiscal policies, emissions, safety and globalization, enhancing competitiveness, skill development, testing and homologation, Research & Development, etc.

Indian Automobile Industry was third-largest automobile industry by 2016. By 2020, India's share in the global passenger vehicle market will touch 8 per cent which was 4.68 per cent in 2014 (Nag, 2011). India is World's second-largest two wheeler manufacturer. The two wheeler productions will increase from 18.5 million in year 2015 to 34 million by year 2020. The passenger vehicle sales will believe to be nearly triple by 2020 and passenger vehicle production will increase from 3.2 million in 2015 to 10 million in 2020 (Gulati, 2012).

Today, the automobile sector in India is aptly described as the next sun rise sector of the Indian economy. This sector has been growing at a CAGR of 15% over the last 5-7 years (DHI, 2011). The industry has developed its clusters which have large number of companies with their vendor base. The major Indian automotive hubs are in Pune region (Maharashtra), NCR region, Pithampur (Madhya Pradesh), Chennai, and Uttaranchal. Gujarat is emerging as the latest major automotive hub.

## II. INDUSTRY COMPOSITION

| | |
|---|---|
| Passenger Vehicles | 13 |
| Commercial Vehicles | 3 |
| Three Wheelers | 3 |
| Two Wheelers | 81 |
| Grand Total | 100 |

Source: www.siamindia.com

Table 1: Domestic Market Share for 2017-18

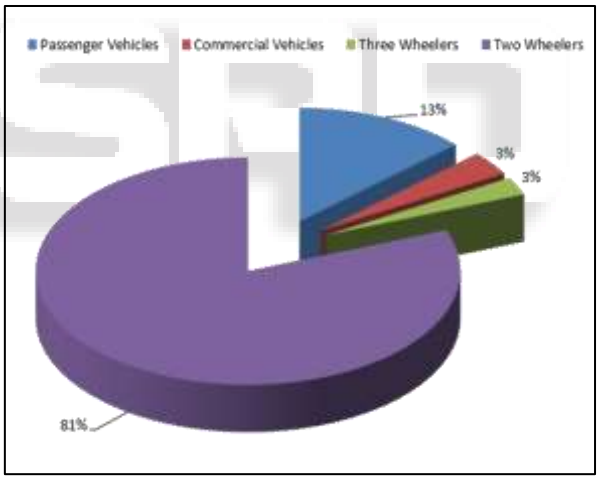


Fig. 1: Domestic Market Share for 2017-18

As per the data presented in figure 1, the market share of two wheelers is at the top with 81% followed by passenger vehicles. At present India has 19 manufacturers of passenger cars & multi utility vehicles, 14 manufacturers of commercial vehicles, 16 of 2/3 wheelers and 12 for tractors besides 5 manufacturers of engines (IBEF, 2017). This includes virtually all the major global OEMs (Original Equipment Manufacturers) as well as home grown companies. In 2010-11, India surpassed France, UK and Italy to become the 6th largest vehicle manufacturer globally. Today, it is the largest manufacturer of tractors, second largest manufacturer of two wheelers, 5th largest manufacturer of commercial vehicles and the 4th largest passenger car market in Asia. Today, the automobile industry in India provides direct and indirect employment to 13.1 million people. The production of vehicles, domestic sales trends and exports is given in Table 2, 3 & 4.

 

*A. Automobile production trends*

| Category | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|---|---|---|---|
| Passenger Vehicles | 23,57,411 | 29,82,772 | 31,46,069 | 32,31,058 | 30,87,973 | 32,20,172 | 34,65,045 | 38,01,670 | 4010373 |
| Commercial Vehicles | 5,67,556 | 7,60,735 | 9,29,136 | 8,32,649 | 6,99,035 | 6,97,083 | 7,86,692 | 8,10,253 | 894551 |
| Three Wheelers | 6,19,194 | 7,99,553 | 8,79,289 | 8,39,748 | 8,30,108 | 9,49,021 | 9,34,104 | 7,83,721 | 1021911 |
| Two Wheelers | 1,05,12,903 | 1,33,49,349 | 1,54,27,532 | 1,57,44,156 | 1,68,83,049 | 1,84,99,970 | 1,88,30,227 | 1,99,33,739 | 23147057 |
| Grand Total | 1,40,57,064 | 1,78,92,409 | 2,03,82,026 | 2,06,47,611 | 2,15,00,165 | 2,33,66,246 | 2,40,16,068 | 2,53,29,383 | 2,90,73,892 |

Source: www.siamindia.com.

Table 2: Automobile Production Trends in India

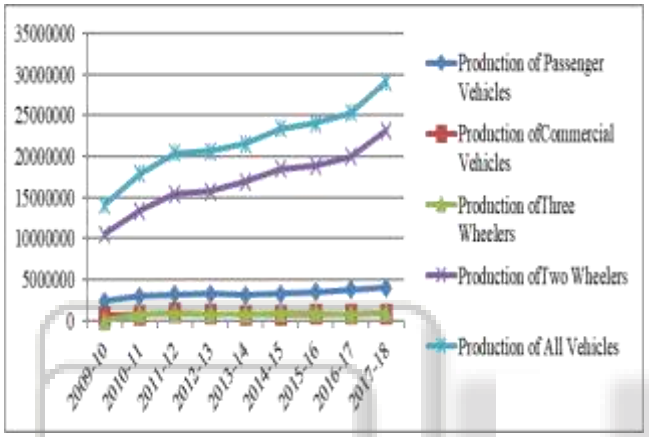


Fig. 2: Automobile Production Trends in India

The industry produced a total of 23,366,246 vehicles which includes passenger vehicles, commercial vehicles, three wheelers and two wheelers in April-March 2015 whereas the same was 21,500,165 in April-March 2014, showing a growth of 8.68 percent over the same period last year. Similarly a total 29,073,892 vehicles including Passenger Vehicles, Commercial Vehicles, Three Wheelers, and Two Wheelers were produced in April-March 2018 as against 25,330,967 in April-March 2017, registering a growth of 14.78 percent over the same period last year. The production of two wheelers has shown tremendous growth as compared to other vehicles since 2009.

*B. Automobile domestic sales trends*

The sales of Passenger Vehicles grew by 3.90 percent in April-March 2015 over the same period last year. The sales of two wheelers have shown a downfall between the period of 2010 and 2012. But after 2012, two wheeler segments have shown excellent growth in sales.

| Category | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|---|---|---|---|
| Passenger Vehicles | 19,51,333 | 25,01,542 | 26,29,839 | 26,65,015 | 25,03,509 | 26,01,111 | 27,89,208 | 30,47,582 | 32,87,965 |
| Commercial Vehicles | 5,32,721 | 6,84,905 | 8,09,499 | 7,93,211 | 6,32,851 | 6,14,961 | 6,85,704 | 7,14,082 | 8,56,453 |
| Three Wheelers | 4,40,392 | 5,26,024 | 5,13,281 | 5,38,290 | 4,80,085 | 5,31,927 | 5,38,208 | 5,11,879 | 6,35,698 |
| Two Wheelers | 93,70,951 | 1,17,68,910 | 1,34,09,150 | 1,37,97,185 | 1,48,06,778 | 1,60,04,581 | 1,64,55,851 | 1,75,89,738 | 2,01,92,672 |
| Grand Total | 1,22,95,397 | 1,54,81,381 | 1,73,61,769 | 1,77,93,701 | 1,84,23,223 | 1,97,52,580 | 2,04,68,971 | 2,18,62,128 | 2,49,72,788 |

Source: www.siamindia.com.

Table 3: Automobile Domestic Sales Trends in India

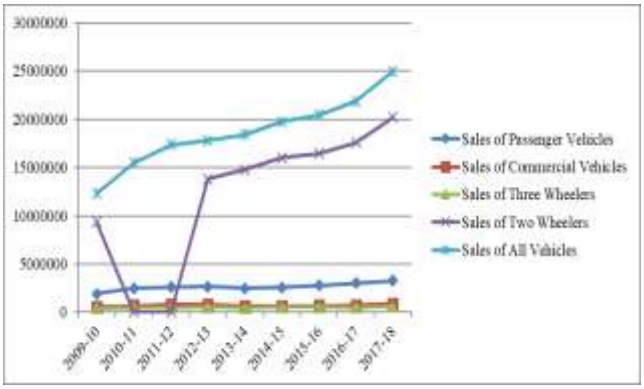


Fig. 3: Automobile Domestic Sales Trends in India

The sale of Passenger Vehicles grew by 7.89 percent in April-March 2018 over the same period last year. The overall Commercial Vehicles segment grew by 19.94 percent in April-March 2018 as compared to the same period last year. Medium & Heavy Commercial Vehicles (M&HCVs) had shown a growth of 12.48 percent and Light Commercial Vehicles shown a growth of 25.42 percent in April-March 2018 over the same period last year.

*C. Automobile Exports Trends*

| Category | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|---|---|---|---|
| Passenger Vehicles | 4,46,145 | 4,44,326 | 5,08,783 | 5,59,414 | 5,96,142 | 6,22,470 | 6,53,053 | 7,58,727 | 7,47,287 |
| Commercial Vehicles | 45,009 | 74,043 | 92,258 | 80,027 | 77,050 | 85,782 | 1,03,124 | 1,08,271 | 96,867 |
| Three Wheelers | 1,73,214 | 2,69,968 | 3,61,753 | 3,03,088 | 3,53,392 | 4,07,957 | 4,04,441 | 2,71,894 | 3,81,002 |
| Two Wheelers | 11,40,058 | 15,31,619 | 19,75,111 | 19,56,378 | 20,84,000 | 24,57,597 | 24,82,876 | 23,40,277 | 28,15,016 |
| Grand Total | 18,04,426 | 23,19,956 | 29,37,905 | 28,98,907 | 31,10,584 | 35,73,806 | 36,43,494 | 34,79,169 | 40,40,172 |

Source: www.siamindia.com

Table 4: Automobile Exports Trends from India

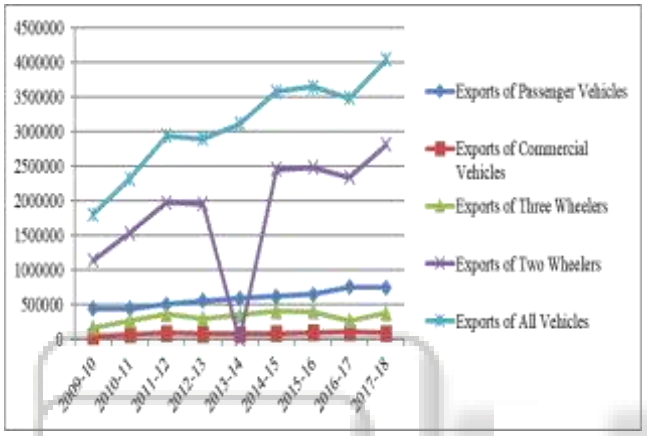


Fig. 4: Automobile Exports Trends from India

In April-March 2015, overall automobile exports grew by 14.89 percent over the same period last year. Passenger Vehicles, Commercial Vehicles, Three Wheelers and Two Wheelers grew by 4.42 percent, 11.33 percent, 15.44 percent and 17.93 percent respectively during April-March 2015 over the same period last year. Although the exports two wheelers have declined sharply in the period of 2013-14, there was again rise in its exports afterwards. In April-March 2018, overall automobile exports increased by 16.12 percent. Two and Three Wheelers Segments registered a growth of 20.29 percent and 40.13 percent respectively, while Passenger Vehicles and Commercial Vehicles declined in April-March 2018.

In 2010-11, the total global demand of passenger vehicles was 73 million units, of which the volume in India was 2.4 million units (4%). It is estimated that by 2020, Asia, Pacific and Africa region will witness a demand of 54 million passenger vehicles out of a total global demand of 108 million units (50%), of which the demand from India will be 10 million units which is equal to 8% of total demand (Gupta, 2013). Further, in 2020, the market /production for commercial vehicle, tractors and two wheelers in India is expected to reach 2.7 million, 1 million and 34 million units respectively, thereby making India the third largest vehicle market in the world. This will translate to an overall industry turnover of USD 162 billion, with the component industry attaining a turnover of USD 113 billion (IBEF, 2017). However, for this potential to be fully realized, a lot of effort, both by the industry and the Government, will be required.

## III. MATERIALS AND METHODS

The data related to production, sales and exports of vehicles of Indian manufacturers from 2009 to 2017 have been collected from Society of Indian Automobile Manufacturers (SIAM) which has been used for analyzing a pattern or trends. The graphical presentation of the same data has been given. Global sales data of all vehicles have also been collected from OICA website (OICM, 2017). The yearly data of the period from 2005 to 2017 have been collected. The data was related to many countries like Europe, America, Africa, NAFTA and India. ARIMA forecasting technique is used to analyzed and forecast the sales of vehicles for coming six years.

ARIMA is an acronym for Auto Regressive Integrated Moving average. This technique is used in context of time series data to forecast or predict the future points in the series (Masih and Nim, 2017). ARIMA models are applied in some cases where data show evidence of non-stationarity, where an initial differencing step (corresponding to the "integrated" part of the model) can be applied one or more times to eliminate the non-stationarity.

The AR part of ARIMA indicates that the evolving variable of interest is regressed on its own lagged (i.e., prior) values. The MA part indicates that the regression error is actually a linear combination of error terms whose values occurred contemporaneously and at various times in the past. The I (for "integrated") indicate that the data values have been replaced with the difference between their values and the previous values (Masih and Nim, 2017).

A non-seasonal ARIMA model is classified as an "ARIMA(p,d,q)" model, where:

- p is the number of autoregressive terms,
- d is the number of non-seasonal differences needed for stationarity, and
- q is the number of lagged forecast errors in the prediction equation.

The forecasting equation is constructed as follows. First, let y denote the $d^{th}$ difference of Y, which means:

If d=0: $y_t = Y_t$

If d=1: $y_t = Y_t - Y_{t-1}$

If d=2: $y_t = (Y_t - Y_{t-1}) - (Y_{t-1} - Y_{t-2}) = Y_t - 2Y_{t-1} + Y_{t-2}$

Note that the second difference of Y (the d=2 case) is not the difference from 2 periods ago. Rather, it is the first-difference-of-the-first difference, which is the discrete analog

 

of a second derivative, i.e., the local acceleration of the series rather than its local trend.

In terms of y, the general forecasting equation is:

$$\hat{y}_t = \mu + \phi_1 y_{t-1} + \ldots + \phi_p y_{t-p} - \theta_1 e_{t-1} - \ldots - \theta_q e_{t-q}$$

Here the moving average parameters (θ's) are defined so that their signs are negative in the equation, following the convention introduced by Box and Jenkins (Masih and Nim, 2017).

## IV. Results and Discussion

On the basis of data collected, ARIMA technique has been used to forecast the sales of all vehicles from different parts of the world. The analysis is given in the following section:

### *A. Forecast of Sales of Vehicles*

#### *1) Europe*

– Model: ARIMA(0,1,0)
– Coefficients: sigma^2 estimated as 1490198002307: log likelihood=-185.21

AIC=372.41 AICc=372.81 BIC=372.9

| Year | Forecast | Sales at 80% Confidence Interval | | Sales at 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | Lo 80 | Hi 80 | Lo 95 | Hi 95 |
| 2018-19 | 20916025 | 19351588 | 22480462 | 18523425 | 23308625 |
| 2019-20 | 20916025 | 18703577 | 23128473 | 17532378 | 24299672 |
| 2020-21 | 20916025 | 18206341 | 23625709 | 16771920 | 25060130 |
| 2021-22 | 20916025 | 17787151 | 24044899 | 16130825 | 25701225 |
| 2022-23 | 20916025 | 17417838 | 24414212 | 15566009 | 26266041 |
| 2023-24 | 20916025 | 17083953 | 24748097 | 15055376 | 26776674 |

Table 5: Forecast of Sales of Vehicles in Europe

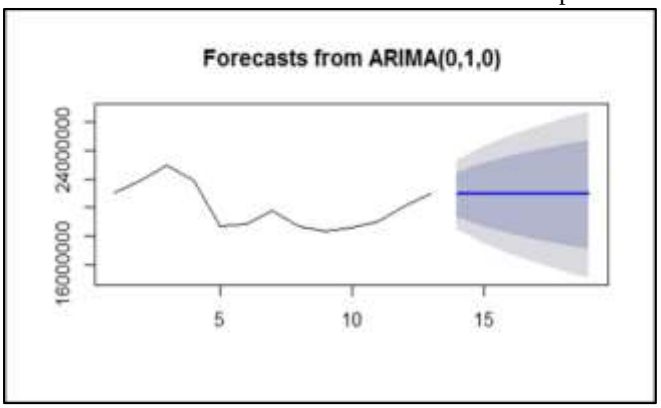


Fig. 5: Graphical Forecast of Sales of Vehicles in Europe

Using ARIMA (0, 1, 0) number of sales of vehicles were predicted for Europe for 6 years. It was predicted that sales will remain constant for the coming period. The overall sales in period from 2005 to 2017 remain constant except the period of 2008 -2009 where some decline trends have been observed which is due to global recession.

#### *2) America*

– Model: ARIMA(0,1,0)
– Coefficients: sigma^2 estimated as 2827269960302: log likelihood=-189.05 AIC=380.1 AICc=380.5 BIC=380.58

| Year | Forecast | Sales at 80% Confidence Interval | | Sales at 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | Lo 80 | Hi 80 | Lo 95 | Hi 95 |
| 2018-19 | 25788942 | 23634079 | 27943805 | 22493363 | 29084521 |
| 2019-20 | 25788942 | 22741505 | 28836379 | 21128289 | 30449595 |
| 2020-21 | 25788942 | 22056609 | 29521275 | 20080832 | 31497052 |
| 2021-22 | 25788942 | 21479215 | 30098669 | 19197784 | 32380100 |
| 2022-23 | 25788942 | 20970521 | 30607363 | 18419803 | 33158081 |
| 2023-24 | 25788942 | 20510626 | 31067258 | 17716455 | 33861429 |

Table 6: Forecast of Sales of Vehicles in America

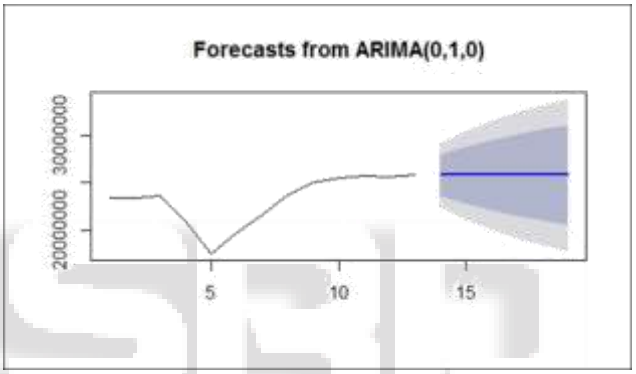


Fig. 6: Graphical Forecast of Sales of Vehicles in America

Using ARIMA (0, 1, 0) number of sales of vehicles were predicted for America for 6 years. It was predicted that sales will remain constant for the coming period of 6 years. Evidence for the United States and Canada suggests that the reduction in car sales since mid-2008 has been magnified by the lack of access to credit, leading many households to postpone their car purchases.

#### *3) NAFTA*

– Model: ARIMA(2,0,0) with non-zero mean
– Coefficients:

| | ar1 | ar2 | mean |
|---|---|---|---|
| | 1.3379 | -0.6668 | 18359296.7 |
| s.e. | 0.1815 | 0.1885 | 986120.7 |

sigma^2 estimated as 1617338799471: log likelihood=-200.57

AIC=409.14 AICc=414.14 BIC=411.4

| Year | Forecast | Sales at 80% Confidence Interval | | Sales at 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | Lo 80 | Hi 80 | Lo 95 | Hi 95 |
| 2018-19 | 20109790 | 18479981 | 21739599 | 17617213 | 22602367 |
| 2019-20 | 18786043 | 16063746 | 21508339 | 14622649 | 22949436 |
| 2020-21 | 17763026 | 14482505 | 21043546 | 12745903 | 22780148 |
| 2021-22 | 17276999 | 13848864 | 20705135 | 12034119 | 22519880 |

 

| | | | | | |
|---|---|---|---|---|---|
| 2022-23 | 17308886 | 13878961 | 20738811 | 12063268 | 22554504 |
| 2023-24 | 17675624 | 14207205 | 21144044 | 12371134 | 22980115 |

Table 7: Forecast of Sales of Vehicles in NAFTA

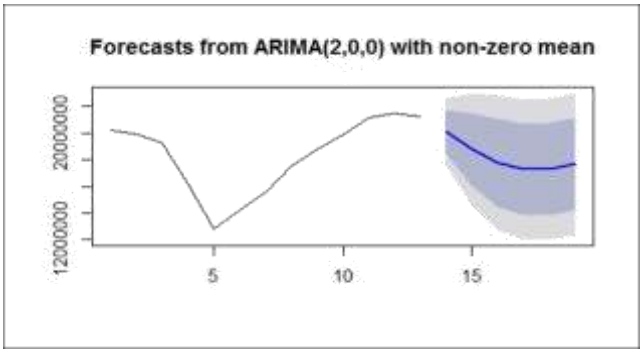


Fig. 7: Graphical Forecast of Sales of Vehicles in NAFTA

Using ARIMA (2, 0, 0) number of sales of vehicles were predicted for NAFTA countries for 6 years. It was predicted that sales will have a declining trends for the coming period of 6 years after which it will remain constant. Since Mexico, United States and Canada are the members of NAFTA, the consequences of possible recession had also effect on the vehicle sales in this region. Hence a decline in vehicle sales during 2008-2009 can be seen in the figure 7.

*4) Africa*

– Model: ARIMA(0,1,1)

– Coefficients: ma1 = 0.8759 s.e. = 0.3410 sigma^2 estimated as 10584825323: log likelihood=-155.71 AIC=315.43 AICc=316.76 BIC=316.4

| Year | Forecast | Sales at 80% Confidence Interval | | Sales at 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | Lo 80 | Hi 80 | Lo 95 | Hi 95 |
| 2018-19 | 1174347 | 1041992.9 | 1306700 | 971929.1 | 1376764 |
| 2019-20 | 1174347 | 893828.4 | 1454865 | 745331.0 | 1603362 |
| 2020-21 | 1174347 | 800363.4 | 1548330 | 602388.7 | 1746305 |
| 2021-22 | 1174347 | 725975.8 | 1622717 | 488622.6 | 1860071 |
| 2022-23 | 1174347 | 662282.8 | 1686410 | 391212.6 | 1957481 |
| 2023-24 | 1174347 | 605679.5 | 1743014 | 304645.3 | 2044048 |

Table 8: Forecast of Sales of Vehicles in Africa

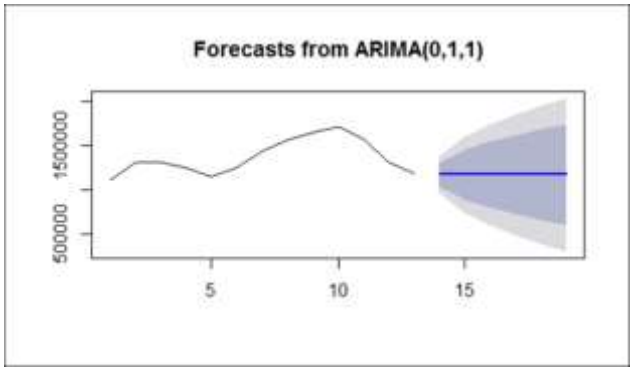


Fig. 8: Graphical Forecast of Sales of Vehicles in Africa

Using ARIMA (0, 1, 1) number of sales of vehicles were predicted for Africa for 6 years. It was predicted that sales will remain constant for the coming period of 6 years. The sales of vehicles in Africa for the period from 2005 to 2017 shows almost constant trends except for the recent period 2012-13 where some increasing trend is witnessed.

*5) India*

– Model: ARIMA(0,1,0) with drift

– Coefficients: Drift = 214757.00 s.e. = 74973.13 sigma^2 estimated as 73584284498: log likelihood=-166.64 AIC=337.27 AICc=338.6 BIC=338.24

| Year | Forecast | Sales at 80% Confidence Interval | | Sales at 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | Lo 80 | Hi 80 | Lo 95 | Hi 95 |
| 2018-19 | 4232296 | 3884657 | 4579935 | 3700628 | 4763964 |
| 2019-20 | 4447053 | 3955417 | 4938689 | 3695161 | 5198945 |
| 2020-21 | 4661810 | 4059681 | 5263939 | 3740934 | 5582686 |
| 2021-22 | 4876567 | 4181289 | 5571845 | 3813231 | 5939903 |
| 2022-23 | 5091324 | 4313979 | 5868669 | 3902478 | 6280170 |
| 2023-24 | 5306081 | 4454543 | 6157619 | 4003765 | 6608397 |

Table 9: Forecast of Sales of Vehicles in India

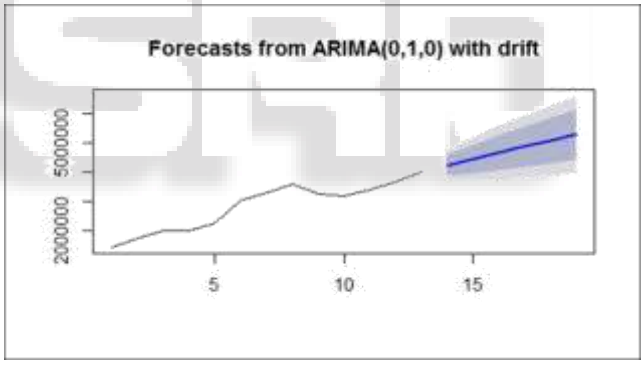


Fig. 9: Graphical Forecast of Sales of Vehicles in Europe

Using ARIMA (0, 1, 0) number of sales of vehicles were predicted for India for 6 years. It was predicted that sales will have a increase at a faster pace for the coming period of 6 years. In contrast with the developed countries, car ownership levels in India are very low and incomes have now risen to a level where the income elasticity of vehicle ownership per capita is typically high (Dargay *et al.*, 2007). The combination of low car ownership per capita, a high income elasticity, and rapidly rising income levels means that trend car sales in India are increasing extremely rapidly and are likely to do so for the foreseeable future.

## V. CONCLUSION & IMPLICATIONS

Future trends in vehicle sales are likely to vary considerably across the developed countries and India. Global automotive demand is likely to remain stable in next coming years, roughly in line with prior expectations and varying by region. In high-income countries, car ownership per capita is likely to be relatively close to saturation and therefore future

 

developments are likely to be driven by a slow increase in vehicles per capita. In Europe, America, Africa and NAFTA countries, vehicle sales are expected to be broadly flat. In India, vehicle sales are expected to continue to increase due to population increases as well as high income elasticity and rising income levels.

The study will be helpful to industry people in understanding the trends in global automobile sales. They can adopt appropriate strategy to tap the potential in the industry and also apply appropriate strategy to overcome the challenges of global automobile trends. The study will be helpful to academicians in further extending the research with more data and variables.

## VI. RECOMMENDATIONS FOR FUTURE STUDIES

The included the data from 2005 to 2018 only. The other researcher can take the data for periods before 2005 for more elaborative analysis and comparison. The country specific analysis can also be done for specific comparison of various markets. The study used ARIMA model as a forecasting technique. Future research can be conducted by comparing the results of incorporating other forecasting techniques in the analysis. The other parameters affecting sales of automobile vehicles have not been incorporated in the present study. These parameters can be explored and incorporated in future studies. The more comprehensive model explaining the sales trends of automobiles is possible.

## REFERENCES

[1] Arbor, A., Ramchand, K. and Andrea, D. J., 1993. The Indian automobile industry-a primer describing its evolution and current state. University of Michigan Transportation Research Institute Office for the Study of Automotive Transportation.
[2] Dargay, J. et al., 2007. 'Vehicle Ownership and Income Growth , Worldwide : 1960-2030', Energy Journal, Vol. 28, No. 4, pp. 1–32.
[3] Gulati, V., 2012. National Electricity Mobility Mission Plan 2020, Department of Heavy Industry.
[4] Gupta, N. S., 2013. Indian auto market to be third largest by 2020: Report. [Online] Available at: https://timesofindia.indiatimes.com/business/india-business/Indian-auto-market-to-be-third-largest-by-2020-Report/articleshow/19111812.cms [Accessed 21 April 2018].
[5] IBEF, Feb. 2017. Automobiles, India Brand Equity Foundation.
[6] K, R. & T, R., 2011. Impact of Foriegn Direct Investment on India's Automobile Sector- With reference to Passenger Car Segment. Research Journal of Science and IT Management, 1(1), pp. 22-41.
[7] Masih, J. & Nim, D., 2017. Trend Forecasting of Twitter Followers for Plan International. International Journal of Mechanical and Production Engineering Research and Development (IJMPERD, pp. 87-96, doi: 10.24247/ijmperddec20179.
[8] Masih, J., Gadhe, S. & Sharma, A., 2017. Forecasting Follower Trends on Facebook for NGO through ARIMA. International Journal of Current Microbiology and Applied Sciences, pp. 666-678.
[9] Nag, B. (2011). Trade liberalization and international production networks: Experience of the Indian automotive sector, Studies in Trade and Investment, in: Fighting Irrelevance: The Role of Regional Trade Agreements in International Production Networks in Asia. Chapter 5. United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), pp. 1–33.
[10] OICM, 2017. Sales Statistics. [Online] Available at:http://www.oica.net/category/sales-statistics/ [Accessed 2018].
[11] DHI, "Automotive Mission Plan (2006- 2016)", Department of Heavy Industry, Ministry of Heavy Industry and Public Enterprises, pp.1-55, Dec. 2006
[12] SIAM, 2015. National Electric Mobility Mission Plan 2020, TechSci Research

 