International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 7; Issue 4(L); April 2018; Page No. 12127-12130
DOI: http://dx.doi.org/10.24327/ijcar.2018.12130.2126

Review Article

FORECASTING SALES OF HONDA MOTOR VEHICLES THROUGH SAS SOFTWARE

Hemasekhar P., Madhu Sudan G and Bupathi Naidu M

Department of Statistics, Sri Venkateshwara University, Tirupati-517502, AP, India

A R T I C L E I N F O

Article History:

Received 12th January, 2018
Received in revised form 24th February, 2018 Accepted 10th March, 2018
Published online 28th April, 2018

Key words:

Time Series Analysis, Forecasting Methods, SAS, SPSS and MS Excel.

A B S T R A C T

In Business, Industry, Management and Administrative areas are need for planning is most important because the lead time for decision making ranges from several years in case of capital investments to a few days or hours for transportation or production schedules to a few seconds for telecommunication routing or electrical utility loading. So forecasting is an important aid in efficient planning.
From decades two wheeler vehicles are much needed for every home and every person in their lives. In this paper we are going to forecast a sample sales of Honda motor vehicles in Renigunta, Chittoor (Dist) A.P.

Copyright©2018 ***Hemasekhar P et al.*** *This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*

INTRODUCTION

Honda has been the world's largest motorcycle manufacturer since 1959, as well as the world's largest manufacturer of internal combustion engines measured by volume, producing more than 14 million internal combustion engines each year. Honda became the second-largest Japanese automobile manufacturer in 2001. Honda was the eighth largest automobile manufacturer in the world behind General Motors, Volkswagen Group, Toyota, Hyundai Motor Group, Ford, Nissan, and PSA Peugeot Citroën in 2011.

Honda was the first Japanese automobile manufacturer to release a dedicated luxury brand, Acura, in 1986. Aside from their core automobile and motorcycle businesses, Honda also manufactures garden equipment, marine engines, personal watercraft and power generators, and other products. Since 1986, Honda has been involved with artificial intelligence/robotics research and released their ASIMO robot in 2000. They have also ventured into aerospace with the establishment of GE Honda Aero Engines in 2004 and the Honda HA-420 HondaJet, which began production in 2012. Honda has three joint-ventures in China (Honda China, Dongfeng Honda, and Guangqi Honda).

In 2013, Honda invested about 5.7% (US$6.8 billion) of its revenues in research and development. Also in 2013, Honda became the first Japanese automaker to be a net exporter to the United States, exporting 108,705 Honda and Acura models, while importing only 88,357.

Corresponding author:* **Hemasekhar P
Department of Statistics, Sri Venkateshwara University, Tirupati-517502, AP, India

Source of Data

The data related to sales of Honda bikes collected from Honda showroom nearby Renigunta road Tirupati, Andhra Pradesh during 2011-2015

Variables studied: Sales-Year, Color, and Model wises

Objectives

1. To compute summary statistics of sales related to Year wise, Color wise, Model wise.
2. To forecast sales Year wise, Color wise and Model wise.

Statistical Techniques & Software Used

For analyzing the data we make the use of Base SAS software

Base SAS Software

It's the foundation for all SAS software. Along with an easy-to-learn, flexible programming interface; ready-to-use programs for manipulation, information storage and retrieval, descriptive statistics and reporting; a centralized metadata repository; and a macro facility that reduces programming time and maintenance headaches.
Benefits

Integrated data across environments: Based on an open, cross-platform architecture, Base SAS is hardware –agile environment infrastructure, enabling us to unify our computing efforts and get a single view of your data

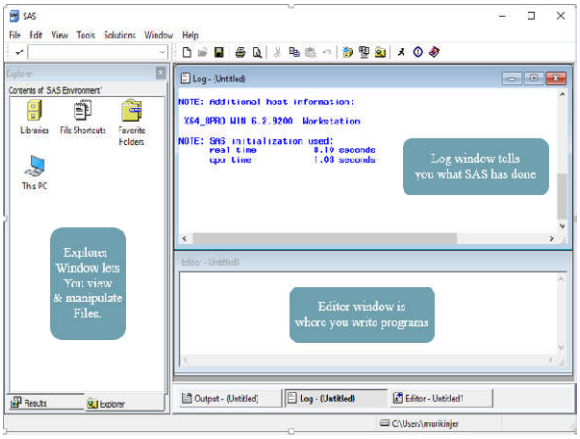
Read, format and analyze any data: From small data issues to large complex data problems, programmers can read, format, analyze and report on data quickly, regardless of format.

Make programming fast and easy: An intuitive and easy-to-learn programming language and packaged programs called procedures significantly reduce the amount of code needed to deliver information.

Deliver reports to mobile devices: Base SAS provides maximum reporting flexibility. You can easily create reports in standard office formats such as RTFs, PDFs, Microsoft PowerPoint, HTML, and an e-books format that can be read with iBooks®, on the iPad®, and iPhones®. Produce reports and visualizations of analytic results automatically from statistical procedures and deliver them on the platforms and applications people use most.

Maximizing Computing resources: Multithreaded, scalable and high- performance capabilities take advantage of parallel processing so we get the most from our computing resources and produce faster answers

Access industry- standard data security: SAS/SECURE is delivered as part of Base SAS and provides access to industry - standard data encryption, including the Advanced Encryption Standard (AES). So we can encrypt SAS data on disks, and increase security for stored passwords.SAS UI on

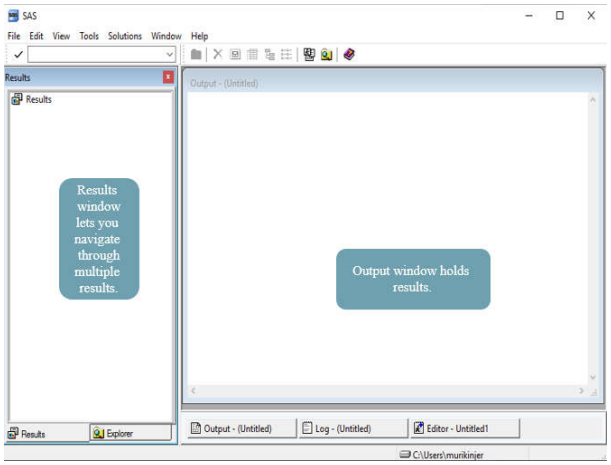


Windows OS

We can easily import or export the data from other sources like Excel (.xls), SPSS (.sav), dBASEfile (.dbf), Paradox file (.db),etc.

File → Import data

It will shows an popup menu having the name import wizard, and proceed with instructions like source of data, path of the file etc.



Combining SAS data sets

Use a Single SET statement with multiple data sets to concatenate the specified data sets. That is the number of observations in the new data set is the sum of the number of observations in the original data sets, and the order of the observations is allthe observations from the first data set followed by all the observations from the second data set and so on.

/* A sample base SAS program to combine multiple data sets at a time */

```
Data overall ;
Set 2011 2012 2013 2014 2015 ;
Run ;
```

The above code in SAS environment concatenates all data sets related to different years and later we can import it to Excel or SPSS for further Analysis.

Statistical Analysis and presentation of results

To achieve our objective-1 we analyze data and interpret the results as follows.

For the given data we make analysis as

1. Year wise
2. Color wise
3. Model wise

Year wise sales

YEAR	SALES
2011	2898
2012	3365
2013	3177
2014	4135
2015	3178

Summary statistics

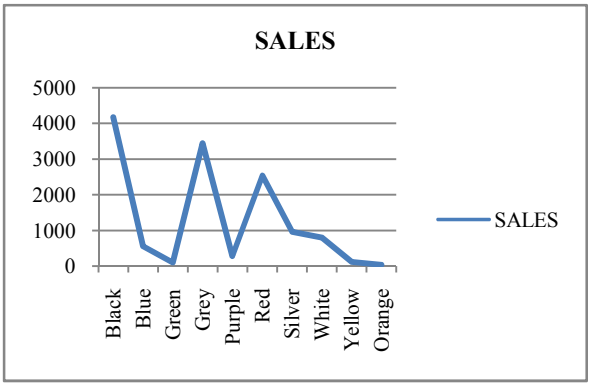
Mean	3350.6
Standard Error	209.7933745
Median	3178
Mode	#N/A
Standard Deviation	469.1122467
Sample Variance	220066.3
Kurtosis	2.900752613
Skewness	1.531865084
Range	1237
Minimum	2898
Maximum	4135
Sum	16753
Count	5

Color wise sales during 2011-2015

Colour	Sales
Black	4169
Blue	555
Green	104
Grey	3444
Purple	282
Red	2537
Silver	962
White	799
Yellow	117
Orange	38

Summary statistics

Mean	1300.7
Standard Error	480.0139361
Median	677
Mode	#N/A
Standard Deviation	1517.937347
Sample Variance	2304133.789
Kurtosis	-0.263510234
Skewness	1.124235481
Range	4131
Minimum	38
Maximum	4169
Sum	13007
Count	10

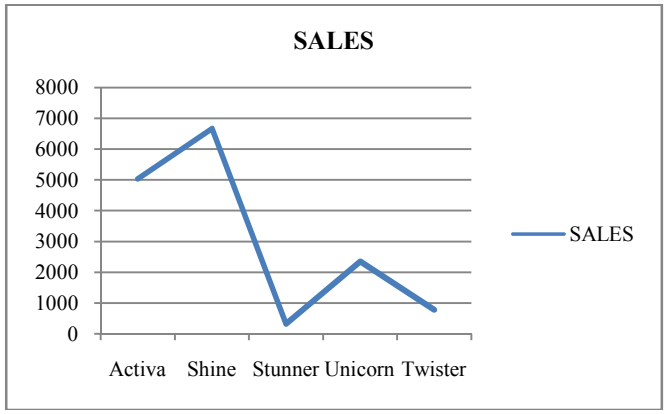


Model wise sales

MODEL	SALES
Activa	5040
Shine	6670
Stunner	321
Unicorn	2348
Twister	784

Summary Statistics

Mean	3032.6
Standard Error	1227.55829
Median	2348
Mode	#N/A
Standard Deviation	2744.90379
Sample Variance	7534496.8
Kurtosis	-2.0297782
Skewness	0.49533845
Range	6349
Minimum	321
Maximum	6670
Sum	15163
Count	5



Year * Color (Cross table)

For this we set up null hypotheses as follows,

H_{01}: The mean sales between different colors are equal and are not significant

H_{02}: The mean sales between different years are equal and are not significant

Year/ color	Black	Blue	Green	Grey	Orange	Purple	Red	Silver	White	Yellow
2009	462	115	10	565	3	92	323	282	25	12
2010	618	159	42	747	10	71	549	203	69	50
2011	583	225	24	582	9	6	581	116	153	29
2012	1436	53	18	880	10	12	563	182	335	15
2013	1064	1	10	665	6	98	520	178	217	11

ANOVA: Two-Factor without Replication

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	144360.08	4.00	36090.02	1.74	0.16	2.63
Columns	4137738.98	9.00	459748.78	22.20	0.00	2.15
Error	745667.52	36.00	20712.99			
Total	5027766.58	49.00				

Since F calculated value < F critical value, we accept null hypotheses and we say that The mean sales between different years are equal and are not significant.

Year * Model (Cross table)

For this we set up null hypotheses as follows,

H_{01}: The mean sales between different models are equal and are not significant

H_{02}: The mean sales between different years are equal and are not significant

Year/Model	Activa	Shine	Stunner	Twister	Unicorn
2009	907	1355	104	0	414
2010	996	1241	125	342	382
2011	972	1310	51	276	333
2012	1322	1647	35	81	612
2013	843	1117	6	66	607

ANOVA: Two-Factor Without Replication

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	134228.56	4	33557.14	1.661	0.207	3.006
Columns	6044744.6	4	1511186.1	74.800	0.000	3.006
Error	323245.44	16	20202.84			
Total	6502218.6	24				

Since F calculated value < F critical value, we accept null hypotheses and we say that the mean sales between different years are equal and are not significant.

To achieve objective –V, we perform the chi-test in Excel for the following cross tables obtained from SPSS

Year * Color (Cross table)

We set up null hypothesis as H_0: There is no association in sales between years and colors

(or) The sales are independent with respect to years and colors

Year/ Color	Black	Blue	Green	Grey	Orange	Purple	Red	Silver	White	Yellow	Total
2011	462	115	10	565	3	92	323	282	25	12	1889
2012	618	159	42	747	10	71	549	203	69	50	2518
2013	583	225	24	582	9	6	581	116	153	29	2308
2014	1436	53	18	880	10	12	563	182	335	15	3504
2015	1064	1	10	665	6	98	520	178	217	11	2770
Total	4163	553	104	3439	38	279	2536	961	799	117	12989

Expected frequencies

605	80	15	500	6	41	369	140	116	17	1889
807	107	20	667	7	54	492	186	155	23	2518
740	98	18	611	7	50	451	171	142	21	2308
1123	149	28	928	10	75	684	259	216	32	3504
888	118	22	733	8	59	541	205	170	25	2770
4163	553	104	3439	38	279	2536	961	799	117	12989

CHITEST	PVALUE	4.2884E-268
CHIDIST	P(X>x)	1
CHIINV	CHISQUARE	5.5208

Since p-value is less than 0.05, We reject H_0 conclude that there is significant difference between Years and colors.

Year * Model (Cross table)

We set up null hypothesis as H_0: There is no association in sales between years and model

(or) The sales are independent with respect to years and model

Year/Model	Activa	Shine	Stunner	Twister	Unicorn	Total
2011	907	1355	104	0	414	2780
2012	996	1241	125	342	382	3086
2013	972	1310	51	276	333	2942
2014	1322	1647	35	81	612	3697
2015	843	1117	6	66	607	2639
TOTAL	5040	6670	321	765	2348	15144

Expected Frequencies

925	1224	59	140	431	2780
1027	1359	65	156	478	3086
979	1296	62	149	456	2942
1230	1628	78	187	573	3697
878	1162	56	133	409	2639
5040	6670	321	765	2348	15144

CHITEST	PVALUE	5.456E-184
CHIDIST	P(X>x)	1
CHIINV	CHISQUARE	0.58313142

Since p-value is less than 0.05, We reject H_0 and conclude that there is significant difference between Years and models.

CONCLUSIONS

ANOVA two-way analysis

1. There is no significance difference between years with colors wise
2. There is no significance difference between year with model wise

Chi-Square test

1. There is association in sales between years and colors
2. There is association in sales between years and models

References

1. Thomopouls, N.T (1980): Applied Forecasting Methods. Engle Wood Cliffs, N.J, Prentice Hall.
2. Sullivan, William G. and Wayne Claycambe. W (1977): Fundamentals of Forecasting. Prentice Hall. Virginia.
3. Bovas, Abraham and Johannes Ledolter (1983): Statistical Methods for Forecasting, John Wiley & Sons. New York.
4. Box, G.E.P and Jenkkins, G.M (1976): Time Series Analysis Forecasting and Control, Holden Day, San Francisco.
5. Anderson, T.W (1971): The Statistical Analysis of Time Series, John Wiley, New York.
6. Markidakis, S Steven C. Wheel Wright and Victor E. Mcgee (1983): Forecasting: Methods and Applications, 2nd Edition, New York, John Wiley & Sons.

How to cite this article:

Hemasekhar P *et al* (2018) 'Forecasting Sales of Honda Motor Vehicles Through Sas Software', *International Journal of Current Advanced Research,* 07(4), pp. 12127-12130. DOI: http://dx.doi.org/10.24327/ijcar.2018.12130.2126

****