Sales Forecast of My Country's Own Brand Cars Based on Spss

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Abstract

The forecast research of brand car sales is carried out. The research results show that the cubic curve method can effectively predict the sales volume of my country's own brand automobiles, which provides a more feasible method for the forecasting research on the development of the automobile industry.

Keywords

Self-Owned Brand Car; Current Situation Research; Sales Forecast.

1. Introduction

1.1. Article Background

Self-owned brand cars are a popular word in the report of the 18th National Congress of the Communist Party of China, the National 14th Five-Year Plan and the 14th Five-Year Plan of Shanghai . Only when my country's auto companies have produced car brands that can compete with established auto companies in developed countries, can my country truly transform from a big auto country to a powerful auto country.

The research takes a different approach, adopts the empirical research method of questionnaire survey, and combines qualitative and quantitative analysis methods to study the marketing strategy of self-owned brand cars in first-tier cities. Its theoretical significance and practical significance are as follows:

(1) Theoretical Significance Throughout the domestic research on automobile marketing, few scholars have studied the marketing strategy of automobiles in a certain city, and few scholars have adopted empirical research methods. Most of them study the marketing strategy of a certain car brand, and the methods used are basically qualitative analysis. The research takes self-owned brand cars as a whole, and uses questionnaires to conduct field research in Shanghai, which provides theoretical guidance for the marketing of self-owned brand cars in Shanghai and other first-tier cities. In the process of analyzing the marketing environment of self-owned brand automobiles, the research makes full use of the multiple linear regression method to study the macro environment, and analyzes and combines the analytic hierarchy process to study the internal and external comprehensive environment of self-owned brand cars. In order to reduce the shortcomings of qualitative analysis, this kind of analytical thinking can be used for reference by other scholars in the future. This has a major role in developing a targeted marketing strategy.

(2) Auto-owned brand refers to a symbol, image or design that can effectively promote consumers to buy their auto products and even generate auto brand loyalty through independent development through independent development under the premise of owning independent intellectual property rights. , The development of the automobile industry can obviously drive the development of upstream and downstream industries, create more output value, tax and employment, and promote the rapid development of the national economy. After nearly ten years of development from scratch, China's self-owned brand vehicles have overcome multiple difficulties such as a weak foundation and a severe competitive environment, and have achieved gratifying results. According to the statistics of the China

Association of Automobile Manufacturers: In 2009, the sales volume of China's own brand cars was 221.73 accounting for 30.9% of the automobile market, and the market share increased by 1 percentage point year-on-year, ranking second of Japanese cars are 8 percentage points higher. At the same time, a group of domestic self-owned brand automobile enterprises represented by Great Wall, Zhonghua, Chery and Geely vigorously developed overseas markets and occupied certain overseas markets in the difficult competition with foreign brands.

1.2. Research Methods

(1) The literature research method makes full use of the school library paper resources, electronic database resources and Internet resources to understand the research status of domestic and foreign scholars in this field, so as to find a breakthrough in research. These resources include monographs, journals, dissertations, statistical yearbooks and development reports, etc., which provide a certain reference value for research questionnaire design and research ideas.

(2) Questionnaire survey method Questionnaire survey method is a type of empirical analysis method, which obtains real first-hand information, which is of great significance for formulating targeted marketing strategies. Through the questionnaire survey, we can understand the demographic characteristics of car owners and the purchasing behavior of the survey respondents.

(3) Data Statistical Analysis and Research Use SPSS and Excel to analyze the data obtained from the survey, so as to understand the basic situation of the survey respondents, and to study the factors that affect the survey respondents' car purchases and the influencing factors on brand preference. And make full use of the cross-analysis method in SPSS to dig the relationship between the factors.

(4) Qualitative analysis and quantitative analysis methods If only qualitative analysis methods are used, it is very likely that subjective and arbitrary deviations will occur; only quantitative analysis may cause the analysis process to lose practical significance due to the complexity of the model built. Therefore, the research attempts to combine the two methods can play the role of extracting the essence and removing the dross, making the analysis process more reasonable.

2. China's Own Brand Car Sales Forecast

2.1. Spss Curve Estimation and Prediction

Using the curve prediction module in the data analysis function of SPSS, based on the sales volume of my country's own brand cars from 2001 to 2010 (Table 1), the sales volume of my country's own brand cars is analyzed and forecasted.

Table 1. Based on the Sales Volume of My Country's Own Brand Cars

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sales	12.14	26.81	46.53	48.4	72.7	98.3	124.5	130.8	221.73	293.3

Use SPSS curve estimation to make regression analysis prediction. The data in Table 1 were imported into SPSS statistical software, and the statistical results obtained are shown in Table 2.

Table 2. The statistical results obtained

Equation	R^2	f	df1	df2	sig	C	b1	b2	b3
Quadratic Curve	0.967	102.77	2	7	0	34.277	-11.858	3.596	
Cubic Curve	0.986	144.639	3	6	0	-23.473	39.363	-7.51	0.673
Exponential Curve	0.958	183.497	1	8	0	13.319	0.314		

According to the analysis and calculation results of spss, three prediction equations and graphs of auto sales of independent brands can be obtained respectively. The formulas are as follows

Quadratic curve: $\hat{y}_1 = 34.277 - 11.858t + 3.596t^2$

cubic curve: $\hat{y}_2 = -2078.429 + 80064.028t - 5400.762t^2 + 653.639t^3$

Exponential curve: $\hat{y}_3 = 13.193e^{0.314t}$

The goodness of fit of the three models is 0.967, 0.986 and 0.985, respectively, the goodness of fit is high , and the concomitant probability Sig. value is less than 0.001, passing the F test. According to the spss fitting curve, the forecast data of automobile sales in each year are calculated respectively, as shown in Table 4. As can be seen from Figure 3 and Table 4, the fitted value of the cubic curve is closer to the recent actual value, so it is more reasonable to use the cubic curve model for prediction.

2.2. Exponential Smoothing Method Sales Forecast

The exponential smoothing method is to predict the future of the phenomenon by calculating the exponential smoothing value and matching a certain time series forecasting model. The principle is that the exponentially smoothed value of any period is the weighted average of the actual observed value of the current period and the exponentially smoothed value of the previous period. In the application of exponential smoothing method, αthe choice of smoothing index is particularly important . αThe larger the value, the greater the share of the new data, and the less the share of the original forecast value; and vice versa. Generally speaking, the value of α mainly depends on the prediction purpose. If selected α = 0.1~0.3, the influence of seasonal fluctuations and the influence of irregular changes can be mostly eliminated; α = 0.6~0.8, the prediction sensitivity can be improved, so that new changes can be quickly tracked and observed .

Table 3. Exponential smoothing method sales forecast

Years	Sales	Quadratic Curve Prediction	Cubic Curve Prediction	Exponential Curve Prediction
2001	12.14	26.01	9.05	18.23
2002	26.81	24.95	30.6	24.96
2003	46.53	31.07	45.2	34.16
2004	48.4	44.38	56.89	46.77
2005	72.7	64.89	69.72	64.02
2006	98.3	92.59	87.71	87.64
2007	124.5	127.48	114.92	119.96
2008	130.8	130.8	155.37	164.22
2009	221.73	221.73	213.1	224.8
2010	293.3	293.3	292.16	307.72

Calculate the initial value as follows: $S_0^{(1)} = S_0^{(2)} = S_0^{(3)} = \frac{x_1 + x_2 + x_3}{3}$

In the formula, $S_0^{(1)}$, $S_0^{(2)}$, $S_0^{(3)}$ are the primary, secondary, and tertiary exponential smoothing values of the 0th period; x_1, x_2, are x_3 the annual sales from 2001 to 2003 , respectively.

Calculated: $S_0^{(1)} = S_0^{(2)} = S_0^{(3)} = 28.5$. Calculate the first, second, and third exponential smoothing values respectively

$$S_t^{(1)} = \alpha x_t + （1 - \alpha）S_{t-1}^{(1)}$$
$$S_t^{(2)} = \alpha S_t^{(1)} + （1 - \alpha）S_{t-1}^{(2)}$$
$$S_t^{(3)} = \alpha S_t^{(2)} + （1 - \alpha）S_{t-1}^{(3)}$$

where: α is the smoothing index, and $0 \leq \alpha \leq 1$ t is the current period in which the prediction model is located; $S_t^{(3)}$ is the triple exponential smoothing value of the t-th period. At that time $\alpha = 0.3$, the calculation results are shown in Table 5. $\alpha = 0.6$ At that time , the calculation results are shown in Table 6.

Calculate the undetermined coefficient and establish the prediction model as:

$$\hat{y}_{t+T} = a_t + b_t T + c_t T^2$$

in:

$$a_t = 3S_t^{(1)} - 3S_t^{(2)} + S_t^{(3)}$$
$$b_t = \frac{\alpha}{2（1-\alpha）}\left[(6 - 5\alpha)S_t^{(1)} - 2(5 - 4\alpha)S_t^{(2)} + （4 - 3\alpha）S_t^{(3)}\right]$$
$$c_t = \frac{\alpha^2}{2（1-\alpha）^2}(S_t^{(1)} - 2S_t^{(2)} + S_t^{(3)})$$

where is the $\hat{y}_{t+T}$ forecast value of the t + T period, t is the current period of the forecast model : T is the interval between the current period and the forecast period; a_t , b_t , are the undetermined coefficients c_t of the triple exponential smoothing method , respectively; $S_t^{(3)}$ smooth value.

Table 4. Exponential smoothing value calculation result

years	sales	St1	St2	St3
-	-	28.5	28.5	28.5
2001	12.14	23.59	27.03	28.06
2002	26.81	24.56	26.29	27.53
2003	46.53	31.15	27.75	27.59
2004	48.4	36.32	30.32	28.41
2005	72.7	47.24	35.39	30.51
2006	98.3	62.56	43.54	34.42
2007	124.5	81.14	54.82	40.51

(1) At that time , the prediction model of the triple exponential smoothing method was:$\alpha = 0.3$
$$\hat{y}_{t+T} = 488147.4 + 85650.81T + 4002.1T^2$$
(2) At that time , the prediction model of the triple exponential smoothing method was:$\alpha = 0.6$
$$\hat{y}_{t+T} = 500247.2 + 100475.3T + 5958.556T^2$$

2.3. Prediction Conclusion

Based on the above two forecasting methods, the forecast of the 2008-2010 sales volume of self-owned brand vehicles by spss cubic curve estimation and exponential smoothing method can be obtained respectively, see Table 7

Table 7. 2008-2010 Prediction of Self-owned Brand Automobile Sales

Years	Actual Sales	Cubic Curve Prediction	Exponential Smoothing Predicts α=0.3	Exponential Smoothing Predicts α=0.6
2008	130.8	169.56	136.48	170.49
2009	221.73	218.83	155.69	247.66
2010	293.3	275.3	177.1	351.81

It can be seen from the table that the results of the cubic curve forecast are relatively close to the actual sales, and its accuracy is higher than $\alpha = 0.3$ that of the exponential smoothing method. $\alpha = 0.6$ Sales are not very effective. Therefore, spss cubic curve prediction is most meaningful here, and it can effectively reveal the changing trend of self-owned brand car sales.

3. Research Conclusions and Research Prospects

3.1. Research Conclusion

Under the positive effect of a series of national policies and measures to expand domestic demand, adjust the structure, and maintain growth , and vigorously promoted by the "Automobile Industry Adjustment and Revitalization Plan" , China's automobile industry has achieved stable and rapid development . The steady growth of automobile production and sales, and the optimization of the market demand structure have made significant progress in mergers and acquisitions . In the face of the globalized international market, the key to improving the international competitiveness of China's auto industry is whether or not to own a strong Chinese brand . Chinese auto companies should pay full attention to the cultivation and protection of their own brands, enhance their technological R&D and innovation capabilities, and promote the continuous development of China's own brands of cars . This research is intended to provide a more effective method for the development forecasting research of the automobile industry, hoping to play a positive role in promoting the development of China's automobile industry .

3.2. Research Outlook

The area investigated and implemented in this paper is mainly concentrated in the central urban area, and future research can be expanded to other cities in the implementation area. In this way, by comparing and analyzing the differences in purchasing behaviors of buyers in different cities, differentiated marketing strategies in line with their respective regions can be formulated. The research mainly uses the marketing theory to carry out the analysis, and the future research can also be carried out from the perspectives of economics, sociology, psychology, etc.

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work experience:

2020.3-2022.2 Cardiovascular Institute of Xiamen University Affiliated Cardiovascular Hospital During the two-year tenure, assist the department to manage various affairs of the laboratory, assist the project declaration of each department in the hospital, laboratory reagents, consumables, material procurement and expense reimbursement.

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