Effect of COVID-19 Towards Cosmetics in China

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Abstract. The prevalence of COVID-19 had a certain impact on many industries, including the cosmetics market. Accessing this study, we aim to investigate the cosmetics market during COVID-19 and to quantify total profit of this market. We have collected and organized relevant sales data on the Chinese cosmetics market during the epidemic period from 2019 to 2022. Besides, this paper used single factor equation analysis and linear regression methodology to test the collected data. Further more, This paper has depicted the constantly changing characteristics of this industry through statistical analysis of the data. This paper finds the correlation between the cosmetics market and economic data. There is a strong positive correlation between the growth of certain economic data and the growth of the cosmetics market. The findings reveal that the demand for cosmetics did not decrease during the epidemic. Also, the non-contact consumption methods had increased. The study clearly demonstrates the changing characteristics of the industry, and identifies key factors affecting the development of the industry.

Keywords: Cosmetics; Consumers; Sales relevant; Economy.

1. Introduction

After years of development, the Chinese cosmetics industry has formed a large and active market. With the continuous growth and upgrading of consumer demand for beauty and skincare, there is still vast development space and opportunities in the Chinese cosmetics industry. In 2022, the market size of China's cosmetics industry reached approximately 485.8 billion yuan, a year-on-year increase of 6.7%, serving approximately 1.4 billion people. This growth is mainly due to the pursuit of beauty, attention to appearance, and increased awareness of health among domestic consumers. In addition, with the development of e-commerce platforms, online channels have gradually become an important channel for cosmetics sales, further driving the growth of market size [1].

The initial effects of COVID-19 firstly appeared in China and the WHO defined it a pandemic on 11 March 2020 (WHO, 2020). It has the emergence of new lifestyle habits such as reduced social activities and wearing masks to cover the face had an impact on the cosmetics market [2]. Has there been any change in the cosmetics industry? What kind of change has happened? What are the development prospects of the cosmetics industry?

To Identify the impact of the COVID-19 pandemic on cosmetic buying behaviour is the principal purpose of this research. Based on the research results, the factors that should be paid attention to in the development of the cosmetics market is clear [3, 4]. COVID-19 had an impact on cosmetics market. Several literature reviews the change of cosmetics market during the epidemic, for example, consumer buying behavior, preferences of specific consumer groups, consumer psychology, channels of online. Because of COVID-19 pandemic lockdown policies, people started working in home [5, 6]. The era of mask essential due to infectious diseases has arrived. The demand for basic skincare and makeup products has decreased. Special attention towards private care was becoming truly significant to individuals during COVID-19. Affected by the epidemic, the demand for disinfection and sterilization products has increased. The demand for alcohol, hand sanitizer, dry cleaner, mouthwash, body lotion and other products has increased significantly, especially hand sanitizer [7, 8].

After experiencing the epidemic, many of the attitudes of Chinese consumers have changed. Consumer skincare concepts from more beautiful to healthier. During the post pandemic period, the significance of skincare was no longer simply 'for the sake of beauty', but for the sake of better health. At the same time, after experiencing the epidemic, the concept of skincare has become more

professional, and the pursuit of skincare has also become higher. Some research indicates that with the increasing awareness of environmental protection, the position of green cosmetics in the cosmetics industry is becoming increasingly important. The increasing attention of consumers towards the safety and environmental friendliness of products has driven the development of the trend towards green cosmetics. Green cosmetics, due to their lack of chemical components, can effectively reduce skin irritation and reduce the risk of allergies. This is in line with the modern consumer's pursuit of product safety, thereby promoting the development of the green cosmetics market. [9, 10].

2. Methods

2.1. Data Source

To identifying the relationship and hypothesis specifically to obtain evidence of a causal relationship from the existing variables are the main goal of this study. By using a type of conclusive research this research analyzed quantitatively from the resulting data.

The data used by the research institute comes from relevant industry websites and the official website of the National Bureau of Statistics .This analysis included a total of 960 sample data, which collected monthly cosmetics sales across the country from 2019 to 2022, including characteristics such as gender structure, age structure, sales channels, as well as relevant data such as the consumer price index of statistical departments, retail price index of cosmetics products, total retail sales of social consumer goods, urban survey unemployment rate, and disposable income of residents.

A pre-test was carried out before research. Through observation of the analysis object 'sales revenue', 96 missing data were found, with a minimum value of 0.6 and a maximum value of 71, an average value of 11.61, a median of 7.6, and a standard deviation of 10.47. Figure 1 and Figure 2 display data has a good positive distribution.

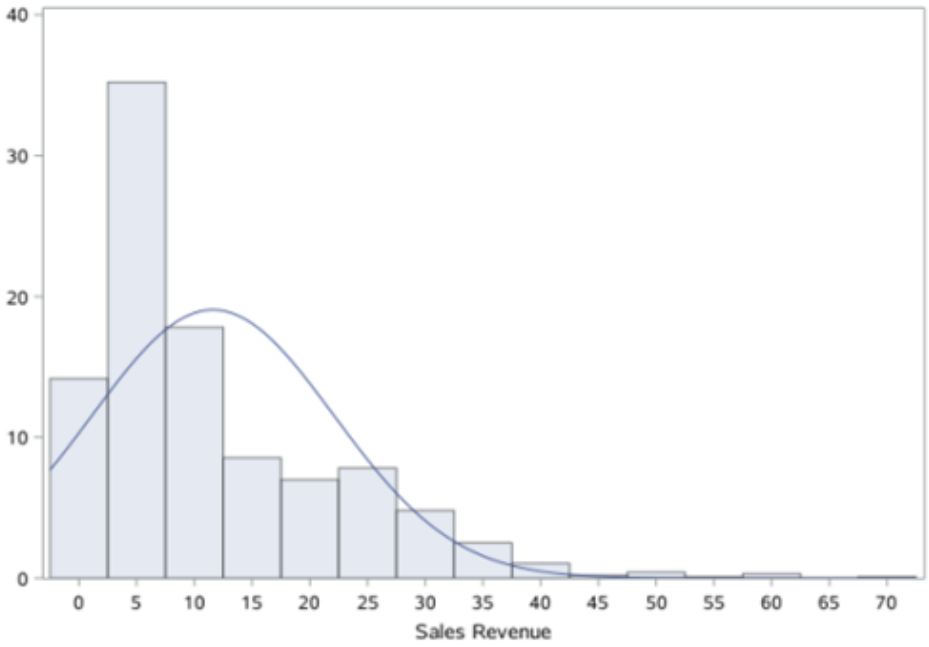

Fig. 1 Distribution of Sales revenue

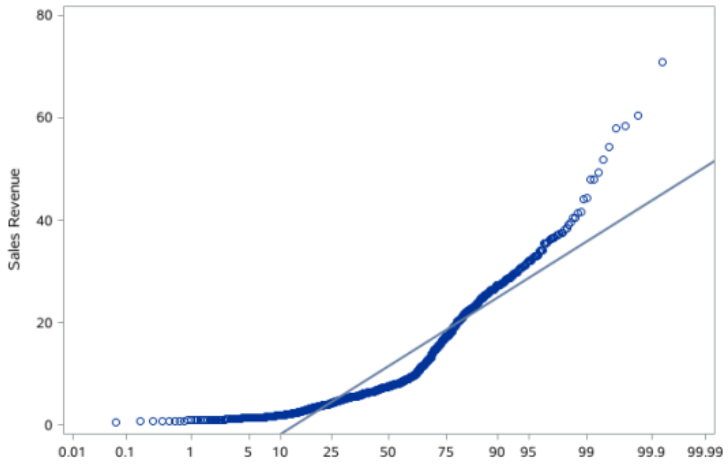

Fig. 2 Distribution Probability of Sales revenue

2.2. Hypothesis

The hypothesis of this study is based on a comparison of cosmetics sales over different periods, assuming that cosmetics sales are influenced by certain economic data and even further affect the overall structure. The major hypotheses presented by this study are given as following:

H1: There is a significant positive relationship between consumer price index of residents and cosmetics sales.

H2: There is a significant positive relationship between retail price index of cosmetics and cosmetics sales.

H3: There is a significant positive relationship between total retail sales of social consumer goods and cosmetics sales.

H4: There is a significant positive relationship between rate of urban survey unemployment and cosmetics sales.

H5: There is a significant positive relationship between per capital disposable income of residents and brand cosmetics sales.

2.3. Methods Introduction

One-way variance analysis: It is the use of a completely randomized grouping method, where subjects are randomly assigned to various treatment groups, and the differences between the means of each group are compared for statistical significance, in order to infer the effects of treatment factors. The study used ANOVA to analyze the impact of months on cosmetics sales. Figure 3 shows there are no outliers in each group of data and Each population follows a normal distribution, and the variance of each population is the same.

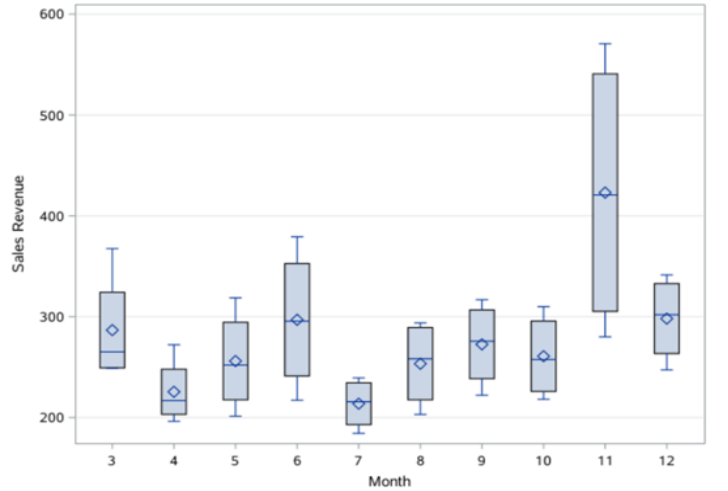

Fig. 3 Monthly Distribution of Sales Revenue

Linear regression analysis: It is a regression analysis that models the relationship between one or more independent and dependent variables using a least squares function called a linear regression equation. Its expression is y=w'x+e, where e represents a normal distribution with an error of mean 0. The factor analysis carried out by this study was focusing on consumer price index of residents, total retail sales of social consumer goods, retail sales of social consumer goods, rate of urban survey unemployment, and per capital disposable income of residents.

3. Results and Dsiscussion

3.1. Descriptive Statistics

We conducted statistical analysis on various data dimensions of annual cosmetics sales, and through analysis and observation, we found the characteristics of the data composition of the analyzed objects. From 2019 to 2022, the sales of cosmetics showed a continuous growth trend, with an average annual growth rate of 13% (Fig 4).

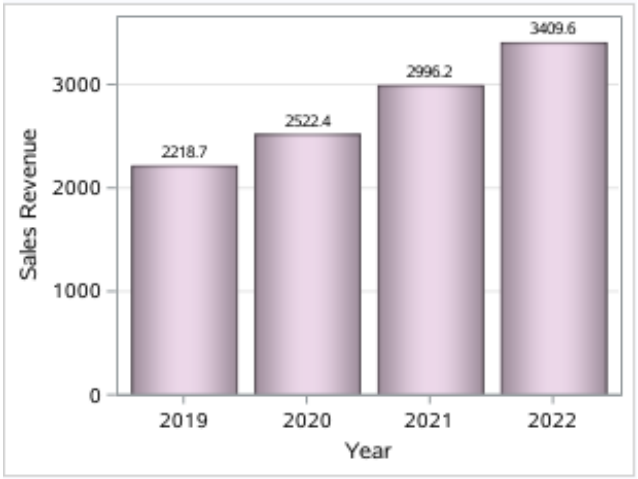

Fig. 4 Sales Revenue of 2019 - 2022

From the perspective of sales age structure, the highest proportion is between 25 and 29 years old, the lowest proportion is between 45 and 50 years old, and those under 35 years old are the main consumers of cosmetics (Fig 5).

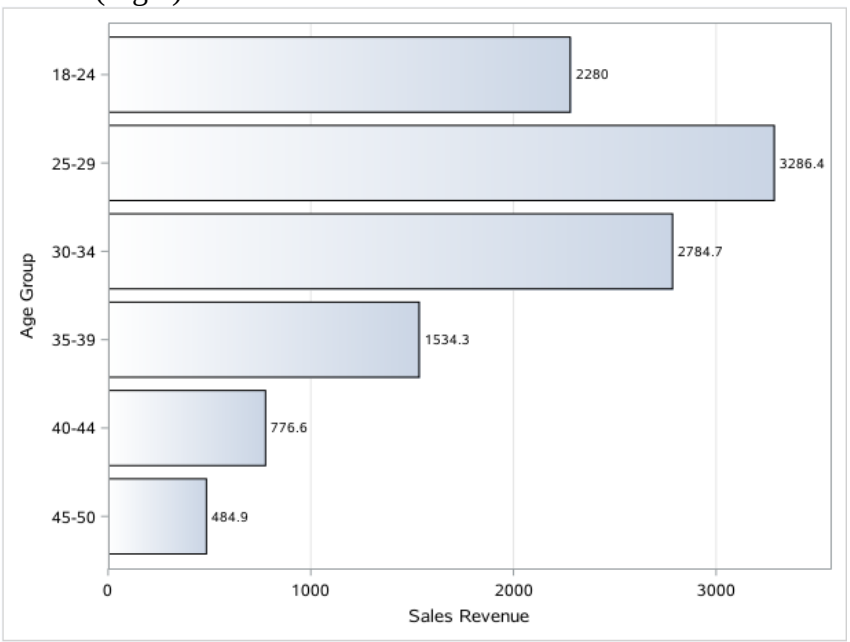

Fig. 5 Structure of Age in Sales Revenue

From the perspective of gender structure, women spend much more money on cosmetics than men (Fig 6).

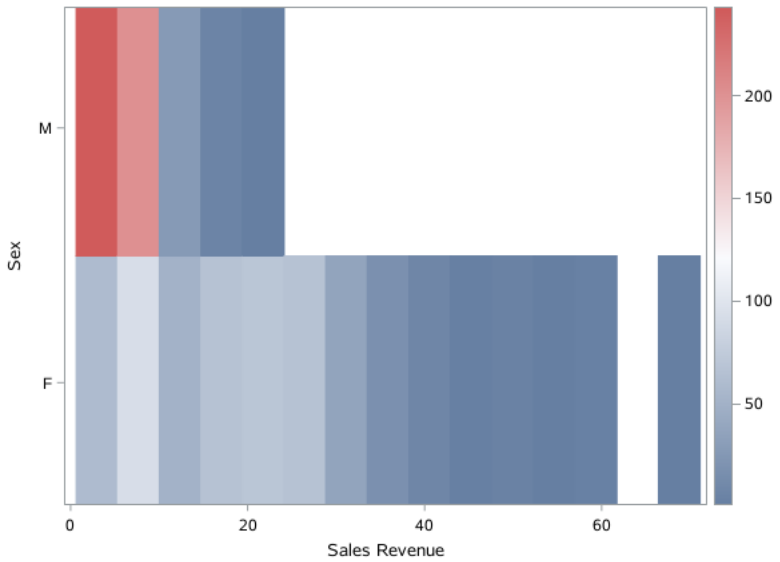

Fig. 6 Structure of Gender in Sales Revenue

From the perspective of sales channels, online and offline sales are basically equivalent, but due to the impact of the epidemic, the proportion of online sales has slightly increased year by year (Fig 7).

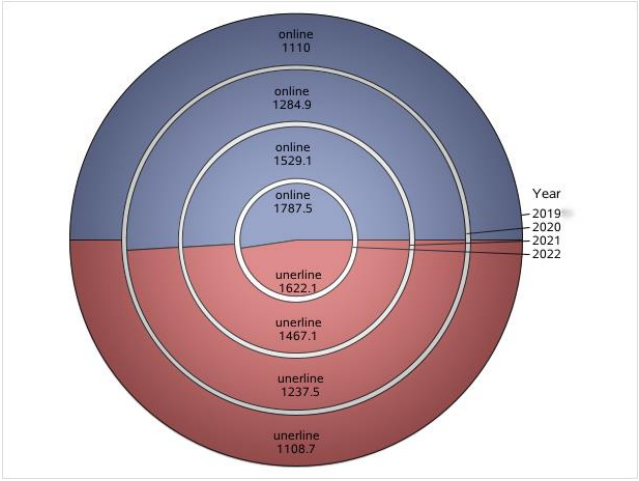

Fig. 7 Channels of Sales Revenue

3.2. One-way Variance Analysis

The study set the significance level to 0.05. In the test, our null hypothesis is that the variables follow a normal distribution. If the P-value of the test result is less than the 0.05 level, we reject the null hypothesis. Otherwise, we accept the null hypothesis. Due to the limited sample data, the main focus is on the S-W (Shapiro Wilk) test results. From the test results (Table 1), the p-values of each data are greater than 0.05 and have a positive distribution. Except for November, the mean and variance of each group of data are basically the same (Table 2). Perform a homogeneity of variance test. The study used Levene's homogeneity of variance test. From the results (Table 3), it can be seen that the F-value is 8.43, and the p-value is greater than 0.05, indicating that there is not much difference in data fluctuations among the groups and there is homogeneity of variance. Analyze whether there is a difference in sales revenue between months, using "month" as the independent variable and "sales revenue" as the dependent variable for one-way ANOVA. Table 4 shows that the F-value is 2.05, and the P-value is 0.121, more than 0.05, indicating no significant difference in sales between months. The study uses the LSD method for multiple comparisons between groups (Table 5,

Table 6). Although there is no significant difference in sales between months, November is significantly different from other months.

Table 1. ANOVA Test Results

Month	Kolmogorov-Smirnov		Cramer-von Mises		Anderson-Darling	
	D Value	P Value	W-Sq	P Value	A-Sq	P Value
3	0.292	Pr>D >0.150	0.081	Pr>W-Sq 0.147	0.465	Pr>A-Sq 0.109
4	0.273	Pr>D >0.150	0.052	Pr>W-Sq >0.250	0.309	Pr>A-Sq >0.250
5	0.170	Pr>D >0.150	0.021	Pr>W-Sq >0.250	0.167	Pr>A-Sq >0.250
6	0.173	Pr>D >0.150	0.024	Pr>W-Sq >0.250	0.169	Pr>A-Sq >0.250
7	0.235	Pr>D >0.150	0.037	Pr>W-Sq >0.250	0.234	Pr>A-Sq >0.250
8	0.265	Pr>D >0.150	0.046	Pr>W-Sq >0.250	0.287	Pr>A-Sq >0.250
9	0.212	Pr>D >0.150	0.030	Pr>W-Sq >0.250	0.199	Pr>A-Sq >0.250
10	0.238	Pr>D >0.150	0.038	Pr>W-Sq >0.250	0.241	Pr>A-Sq >0.250
11	0.245	Pr>D >0.150	0.048	Pr>W-Sq >0.250	0.292	Pr>A-Sq >0.250
12	0.229	Pr>D >0.150	0.034	Pr>W-Sq >0.250	0.221	Pr>A-Sq >0.250

Table 2. Descriptive Statistics of Sales Revenue of Month

Month	Number	Sales Revenue	
		Mean	SD
3	4	286.675	55.905
4	4	225.525	33.052
5	4	256	50.335
6	4	296.9	70.681
7	4	213.75	25.236
8	4	253.35	43.204
9	4	272.575	42.364
10	4	260.825	42.381
11	4	423.025	139.641
12	4	298.1	42.775

Table 3. F-test of Levene

Source	DF	SQ	MS	F	Pr > F
Month	9	6.36E+08	70705814	8.43	<.0001
SER	30	2.52E+08	8385389		

Table 4. Welch ANOVA

Source	DF	F Value	Pr > F
Month	9	2.05	0.121
SER	12.146		

Table 5. Descriptive Statistics of Sales Revenue of Month

Month	Sales Revenue LSMEAN	Number of LSMEAN
3	286.675	1
4	225.525	2
5	256	3
6	296.9	4
7	213.75	5
8	253.35	6
9	272.575	7
10	260.825	8
11	423.025	9
12	298.1	10

Table 6. LS Mean of Month

Pr > |t| (For H0) : LSMean(i)=LSMean(j) DV: Sales Revenue										
i/j	1	2	3	4	5	6	7	8	9	10
1		0.177	0.493	0.818	0.109	0.457	0.752	0.563	0.004	0.798
2	0.177		0.496	0.117	0.792	0.534	0.296	0.431	0.0001	0.111
3	0.493	0.496		0.362	0.347	0.952	0.710	0.913	0.0007	0.349
4	0.818	0.117	0.362		0.07	0.333	0.586	0.421	0.007	0.978
5	0.109	0.792	0.347	0.07		0.378	0.193	0.295	<.0001	0.066
6	0.457	0.534	0.952	0.333	0.378		0.667	0.867	0.0006	0.32
7	0.752	0.296	0.710	0.586	0.193	0.667		0.792	0.001	0.568
8	0.563	0.431	0.913	0.421	0.295	0.867	0.792		0.0009	0.406
9	0.004	0.0001	0.001	0.007	<.0001	0.0006	0.001	0.0009		0.008
10	0.798	0.111	0.349	0.978	0.066	0.32	0.568	0.406	0.008	

Figure 8 displays that November data deviating from other months. The shopping festival on November 11th every year releases a large amount of consumption potential, which is also evident in the cosmetics market.

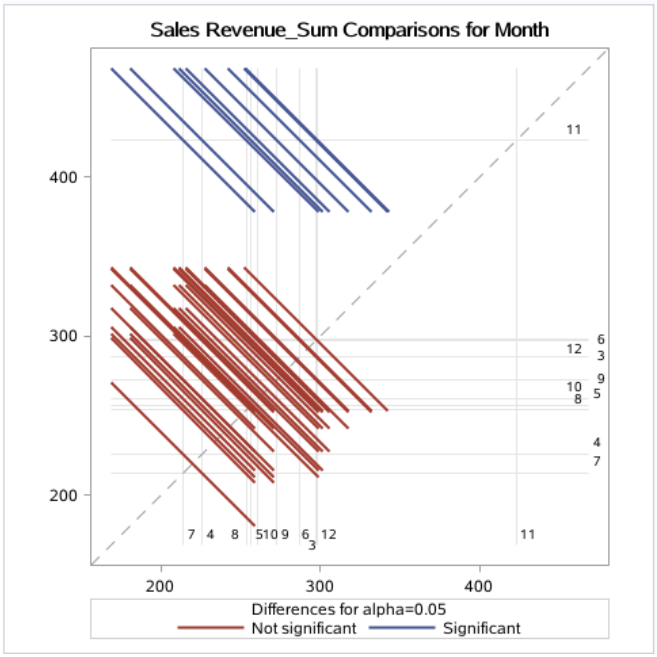

Fig. 8 Monthly Distribution of Sales Revenue

3.3. Linear Regression Analysis

The study uses sales revenue as the dependent variable, and separately use the consumer price index of residents (X1), retail price index of cosmetics (X2), total retail sales of social consumer goods (X3), rate of urban survey unemployment (X4), and per capital disposable income of residents (x5) as independent variables for analysis. A single effect analysis was conducted on each of the five variables, fitting equations using the least squares method.

The regression result is as following: Total retail sales of social consumer goods (X3) have a completely consistent linear relationship with sales revenue. The linear relationship between var3 and sales can be described by the following equation.

$$y = 351.361 - 847.881 * X_3 \quad (1)$$

Figure 9 provided a good linear relationship between dependent variable and argument (X3). F value of Retail price index of cosmetics (X2) is 15.17, the probability of Pr > F is much smaller than

0.05, 97.15% probability falls within the confidence interval. It is also a significant linear relationship with the dependent variable. Figure 10 provided a good linear relationship between dependent variable and argument (X2). The linear relationship between X3 and sales can be described by the following equation.

$$y = 351.361 + 308.602 * X_2 \quad (2)$$

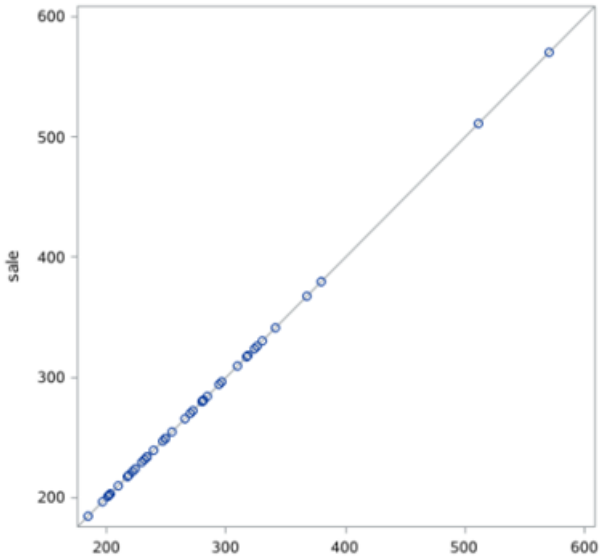

Fig. 9 Regression prediction About X3

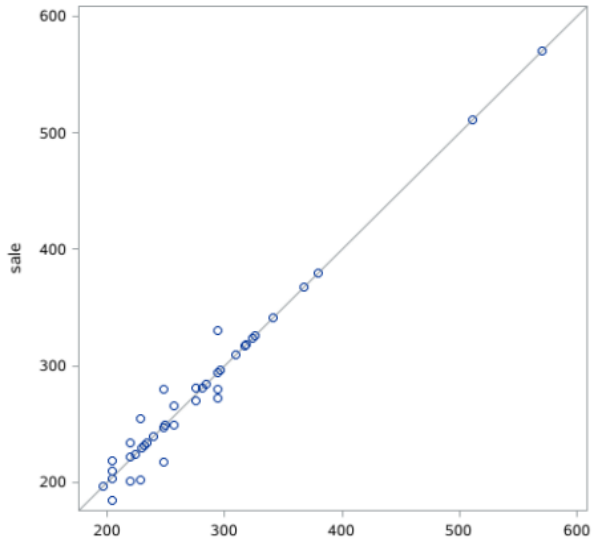

Fig. 10 Regression prediction About X2

R-squared of consumer price index of residents (X1) is 0.713. R-squared of rate of urban survey unemployment (X4) is 0.252. R-squared of per capita disposable income of residents (X5) is 0.591. The linear relationship between the three argument and the dependent variable is not significant.

The cross analysis results of all five independent variables show an absolute linear regression relationship with the dependent variable. Figure 11 provided a good linear relationship between dependent variable and argument. The linear relationship can be described by the following equation.

$$y = 351.361 – 860.336 * X_1 * X_2 * X_3 * X_4 * X_5 \quad (3)$$

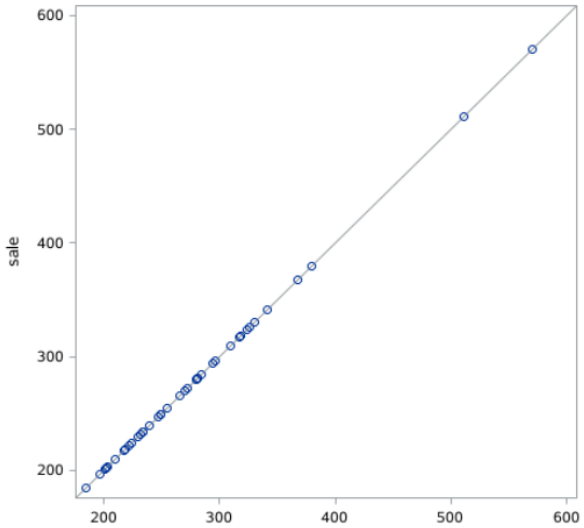

Fig. 11 Regression prediction about multiple independent variables

4. Conclusion

Through this analysis and research, it was found that the cosmetics market did not shrink due to the epidemic, but still showed a growth trend. However, because of certain changes in the sales channels of cosmetics caused by the epidemic, the online sales share has increased. At the same time, cosmetics have a high correlation with the total retail sales of consumer goods and the per capital disposable income of residents, indicating that cosmetics have become a necessity in people's daily lives. More over the growth of residents' income will drive the development of the cosmetics industry. Through analysis, it can be seen that although the purchaser of cosmetics is relatively concentrated in women and young people aged distribution is wide. In addition men also account for a certain proportion, indicating that the cosmetics industry has a wide range of expansion targets.

Against the backdrop of the rapid development of the digital economy, the cosmetics industry will inevitably accelerate its digital transformation, and online channels such as e-commerce platforms and social media will continue to play an important role. Online channels and offline physical stores will gradually merge to form a marketing model of online and offline interaction, improving consumer experience and service quality. With the continuous expansion of the cosmetics audience, the pursuit of personalization will become increasingly tiring, and the customized cosmetics market will usher in development opportunities. Brands need to pay attention to the individual differences and personalized needs of consumers, and provide customized products and services. The cosmetics industry should closely monitor economic development, consumer market conditions, and changes in per capital income of residents, in order to adjust production and operation strategies in a timely manner and form stronger market competitiveness.

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