# Research on the Influencing Factors of Online Mobile Phone Sales using Linear Regression

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**Abstract.** The main objective of this study was to comprehensively explore the factors affecting online mobile phone sales using linear regression models. In recent years, the mobile phone market has developed rapidly, the competition is increasingly fierce, the popularity has gradually increased, and the mobile phone has become a necessary product. This paper aims to explore the key factors affecting online mobile phone sales, including market background, platform and channel, products, marketing strategy, consumer behavior, price, customer service and case analysis, and empirically analyze the specific impact of each factor on sales results. Then, the Kaggle dataset is used to analyze the impact of mobile phones with different functions on sales, and which types of mobile phones are most favored by customers. Based on this, this paper puts forward a series of targeted optimization strategies to improve the effect of online mobile phone sales. Based on the above analysis, there are many factors affecting online mobile phone sales. If an enterprise wants to stand out in the fiercely competitive market, it must start from the market background and comprehensively consider various factors such as platform and channel, product, marketing strategy and customer service. At the same time, with the continuous development of science and technology, enterprises also need to continue to pay attention to the market dynamics, constantly innovate and improve sales strategies, to adapt to the changing market environment.

**Keywords:** Online mobile phone sales, multiple linear regression, influence factors.

## 1. Introduction

In recent years, the Internet has occupied an increasing proportion in people's lives in China. According to the data released by the National Data Administration of China, the national Internet penetration rate will be 73.0% in 2021, which reached 75.6% in 2022. 97.2% of minors in China have access to the Internet [1]. According to the latest data, as of the end of April this year, the total number of 5G package users of the three major telecom operators reached 1.213 billion [2]. At the same time, the number of web pages, the total amount of Internet consumption, and the penetration rate of broadband have all increased to varying degrees. Internet economy is a general term for economic activities with Internet technology as the platform, network as the medium, and application technology innovation as the core. It is the sum of economic activities generated based on the Internet. At the current stage of development, it mainly includes five types: e-commerce, Internet finance, instant messaging, search engines, and online games. Internet economy is a new economic phenomenon in the era of information networking, which is a part of the digital economy.

The opposite of the Internet economy is the real economy. The real economy refers to the total value of goods produced by a country. The results show that the use of the Internet has significantly promoted the transformation of residents' consumption structure from subsistence to development and enjoyment consumption, and promoted the upgrading of household consumption. After controlling for selectivity in the use of the Internet, these conclusions remain robust. Heterogeneity analysis further shows that the use of the Internet is more conducive to improving the optimization and upgrading of consumption structure of urban households, households in the eastern region and central region [3]. It is the economy created by humans on Earth through the use of ideas and tools. Economic activities including the production and circulation of material and spiritual products and

services. This includes material production and service sectors such as agriculture, industry, transportation and communication, commercial services, construction, and cultural industries. This also includes the production and service sectors of spiritual products such as education, culture, knowledge, information, art, and sports. In China, the rapid development of online economy and the transmission of COVID-19 lead to the regression of the offline economy, or real economy. According to the survey, by 2022, the national online shopping replacement rate (the replacement rate of online consumption to offline consumption) will reach 80.7%. It can be observed that the proportion of online consumption is increasing among the Chinese population, and more and more physical stores are engaging in online sales. Among the surveyed college students, 91.7% believe that the function of electronic products is entertainment consumption, 88% of college students believe that electronic phones are convenient for learning and work, 33% agree that electronic products are a symbol of identity and status, and 10.5% of people realize that mobile phones are valuable [4, 5].

With the development of society and technology, smartphones have become increasingly popular and useful. In the face of the prolonged replacement cycle of the global mobile phone market and the intensification of competition in the smartphone industry, mobile phone products can no longer meet the diverse needs of consumers by relying solely on hardware upgrades and parameter competition, and the industry urgently needs to find a new development direction. In this context, the introduction of AI technology has provided new momentum for the development of the industry [6]. Relevant companies said that with the arrival of the replacement cycle, AI and other technologies are gradually popularized and applied in mobile phones and notebooks, and the consumer electronics market is expected to grow in 2024 [7]. A smartphone is a type of mobile phone that has an independent operating system, independent running space, and can be installed by users through third-party service providers such as software, games, navigation, etc. At present, the overall domestic mobile phone market has continued to improve. According to the statistics recently released by the China Academy of Information and Communications Technology, the shipment of mobile phones in the domestic market in December 2023 will be 28.275 million units, a year-on-year increase of 1.5%. In January-December 2023, the overall shipment of mobile phones in the domestic market totaled 289 million units, a year-on-year increase of 6.5%. The data growth rate for January 2024 (+68.1%) is higher [8]. It can also achieve wireless network access through mobile communication networks. In 2022, the total number of smartphones held by the Chinese population reached 15607996 million, even more than the number of Chinese citizens. Meanwhile, among the 1.051 billion internet users, 99.6% of them use mobile phones to access the internet [9]. According to the data, by the end of 2024, global shipments of PCs and smartphones with built-in generative AI are expected to reach 200 million units [10]. The study aims at analyzing the factors influencing the online sales of mobile phones, especially focus on which type of features can interest customers to the fullest extent.

## 2. Methods

### 2.1. Data Source

The dataset used in this paper is fetched from the Kaggle website. It records 7 different factors, including weight, running speed, price, etc. This dataset contains 1098 sets of data, which can fully illustrate the research question.

### 2.2. Indicators Selection

This paper carefully choses specific metrics deepens the relationship between the type of phone's features and sales. Finally, we randomly sampled 500 results, including seven variables (phone size, weight, operating speed, endurance, brand influence, screen material, price).

Through the investigation of the data, we have tried to delve deeper into the issues surrounding the different types of cell phones versus people's liking for different cell phone feature models. While acknowledging the strengths of these data, it is important to recognize their limitations, especially the challenges associated with favoritism across different types of smartphones. These considerations are

critical to maintaining the integrity and validity of the analysis. The nuanced choice of metrics also has a considerable impact on what is being investigated and forms the cornerstone of revealing the multifaceted aspects of cell phone types and people's favoritism. With this comprehensive approach, the goal is to provide a valuable contribution to the current knowledge base in this area, shedding light on the complex relationship between the impact of smartphone model on sales volume and consumer behavior in terms of favoritism (Table 1).

**Table 1**. List of variables

| Variable | Logogram | Meaning |
|---|---|---|
| Size | $x_1$ | <6inch(1),6-6.5inch(2),7inch(3) |
| Weight | $x_2$ | The weight of the mobile phone |
| Speed | $x_3$ | The operating speed of the mobile phone |
| Endurance | $x_4$ | The battery life of the mobile phone |
| Brand | $x_5$ | The brand of the mobile phone |
| Screen | $x_6$ | The resolution ratio of the screen |
| Price | $x_7$ | The price of the phone |

### 2.3. Method Introduction

In statistics, linear regression is a method of modeling and analyzing the relationship between one or more explanatory variables and the dependent variable. The main purpose of this method is to determine whether there is a correlation between many variables and to predict the variable of interest by constructing a model. During regression analysis, it can be classified into linear or nonlinear types based on their interrelationships. By introducing correlation test results, quantitative analysis objectives can be determined. By considering the influence of many other factors, effective estimation of enterprise value can be made. At the same time, in order to improve the accuracy of data processing results, the entire single factor analysis results must be completed through SPSS statistical analysis software. Therefore, in the entire quantitative analysis process, more diverse factors need to be considered in order to further improve the accuracy of data processing.

## 3. Results and Discussion

### 3.1. Descriptive Analysis

The analysis in this paper shows that there are many factors Influencing online mobile phone sales. As the Figure 1 shows:

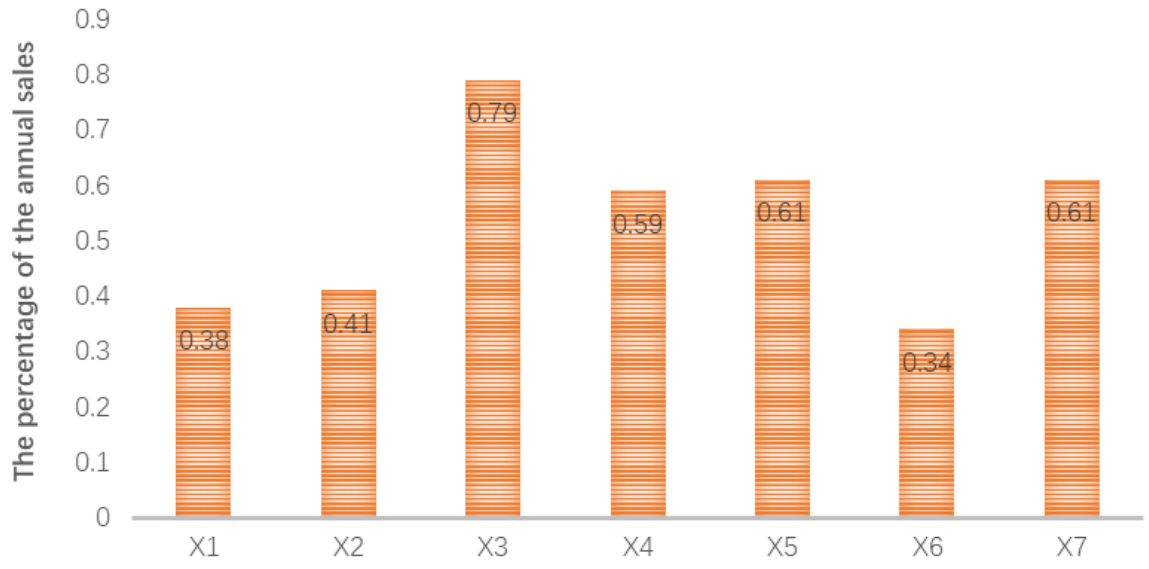



**Fig. 1** Correlation results

By analyzing the data, the Pearson correlation coefficient was obtained, and it can be found that these data have varying degrees of impact on mobile phone sales. Among them, the speed of the mobile phone has the greatest impact on online sales, and the resolution of the phone screen has the smallest impact. The most surprising thing is that these seven variables are positively correlated with mobile phone sales, especially price. As the price rises within a certain range, sales actually increase. In summary, various factors affect the sales of mobile phones, and people are also eager to buy phones with high cost-effectiveness and good quality.

### 3.2. Model Results

After analyzing the Pearson correlation matrix of various factors, multiple regression analysis was conducted. The general mathematical model for multiple linear regression is:

$$E(Y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_7 x_7 + e \quad (1)$$

In the above formula: $\beta_0$ is a constant term, and e is a residual term. Table 2 shows the regression coefficients of the multiple linear regression equation model. From the table 2, it can be considered that all seven independent variables have a significant impact on the dependent variable Y. Based on the data above, the relevant multiple linear regression equation can be obtained:

$$E(Y) = 1379.652 + 4.575x_1 + 5.077x_2 + \cdots + 6.982x_7 \quad (2)$$

**Table 2**. Regression coefficient table

| | B | S.E. | Beta | T | significance | VIF |
|---|---|---|---|---|---|---|
| Constant | 1379.652 | 272 | - | 5.194 | 0.000 | - |
| X1 | 4.575 | 0.392 | 0.132 | 9.715 | 0.000 | 2.383 |
| X2 | 5.077 | 15.919 | 0.013 | 0.319 | 0.750 | 2.710 |
| X3 | 16.451 | 20.815 | 0.117 | 0.334 | 0.738 | 4.405 |
| X4 | 7.641 | 27.411 | 0.126 | 2.396 | 0.017 | 3.008 |
| X5 | 7.431 | 9.484 | 0.129 | 4.250 | 0.000 | 3.010 |
| X6 | 2.312 | 1.367 | 0.202 | 5.321 | 0.000 | 1.01 |
| X7 | 6.982 | 9.798 | 0.096 | 3.055 | 0.002 | 2.981 |

The multivariate correlation coefficient R obtained from this model definition is 0.778, the coefficient R-squared for fitting multiple linear regression is 0.592, and the adjusted R-squared is 0.602. The model has a good fit.

In order to improve the accuracy of the model, we set time as another variable, trying to predict the sales of mobile phones in each month after it is published (Figure 2).

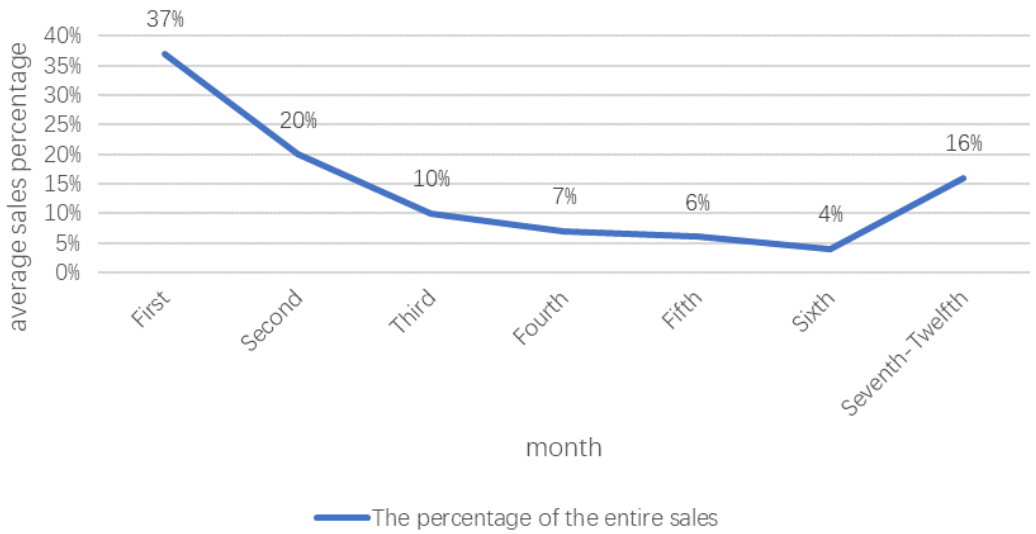



**Fig. 2** The percentage of the entire sales plot

It can be indicated that the first couples of months after publishing have the most significant sales, and the average sales increased monthly. The sum of the last six months is less than the sales on the first month.

## 4. Conclusion

This study uses a multiple linear regression model that takes satisfaction as the dependent variable, using size, weight, speed, endurance, brand, screen, price. Also, this paper considers some control variables such as number of purchases, frequency of purchases. To ensure the accuracy of the research results. This paper analyzes a large amount of sales data to obtain a series of statistical results and calculate the degree of influence of the respective variables on consumer satisfaction. When analyzing online phone sales, we found that speed and brand had a significant impact, and when it came to sales in the first month, brand influence and the impact of price changes have greatly increased. Based on the regression modeling, recommendations are made for merchants to improve their sales methods and enhance customer satisfaction in order to increase sales in the future.

## Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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