An Empirical Model for the Chinese Cosmetic Industry

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ABSTRACT

The Chinese cosmetic market is developing rapidly in recent years and has become one major aspect of Chinese consumption. This paper uses a multiple regression model to analyze the factors affecting the cosmetics industry in China. The paper would firstly look at related research in this field and present the incentive for studying this market. Then this paper would conduct a market analysis of the Chinese cosmetics industry and compare the Chinese cosmetics market's trend with the other markets selected. After providing readers with solid background information, this paper selects representative cosmetic companies listed in the Chinese stock market and analyzes the relationship between the development of the Chinese cosmetics industry and operating costs, R&D expenses, and selling expenses through a ten-year data analysis, using the gross margins of sales as the dependent variable. This paper concludes that the gross margin of sales is negatively related to the cost of production, positively related to the cost of sales, and negatively related to R&D expenses.

Keywords: Empirical Study, Chinese Cosmetic Industry, Public Companies

1. INTRODUCTION

Since the reform and opening up of China in 1978, the Chinese economy has grown rapidly. Chinese consumers have more disposable income, which will also increase the number of Chinese consumers using cosmetics [1]. In the wake of economic growth and due to the rapid growth and intensification of urbanization with the continued development of social media, millennials and Generation Z are dominating the total cosmetic consumer base. The growth of Generation Z has been accompanied by the booming Chinese market economy, and their potential seems to be greater than previous generations. Most post-70s and post-80s believe that the quality of international brands and imported goods are more reliable than domestic products, and therefore they are superior to domestic products. But Generation Z is more concerned about the cost-effectiveness of products. "Why not buy something cheap and beautiful together?" This is the shopping mantra of this generation [2]. As a result, the Cosmetics market in China grew at a significant CAGR during 2016-2020 and is expected to continue to grow in the next four years (2021-2025) as per capita expenditure on personal appearance, female population, and online penetration of cosmetics all continue to increase [3]. However, most of the high-end cosmetics market in China is now occupied by foreign enterprises, and most Chinese cosmetics are competing in the low-end cosmetics market. Looking for breaking the monopoly of foreign enterprises in middle and high-end cosmetics has become a breakthrough point for domestic brands to dominate the domestic market. What factors have influenced the development of China's cosmetics industry and what the impact is is a question to ponder.

The Fama-French 3-factor model and the CAPM can help entrepreneurs improve their ability to estimate stock returns, and the CAPM is favored by many investors because of its simple and intuitive calculation method. Other models, such as the Fama-French 3-factor model, have been extended with the CAPM model to identify various factors associated with it that can help improve the model's ability to predict stock returns, such as the book-to-market ratio and firm size [4].

This paper is inspired by the Fama-French 3-factor model and creatively uses the empirical analysis of multiple regression models to address the industry's development. More specifically, the objective of this paper is to analyse the future market trend of China's

domestic middle and high-end cosmetics based on the analysis of the recent market situation of several of China's domestic middle and high-end cosmetics. The process involves the construction of a multiple linear regression model to analyse the data. This paper will also use supplementary data and diagrams to illustrate the data so that the thesis can be understood more obviously. The motivation of this paper is to study what factors affect the development of Chinese cosmetics companies, to provide suggestions for the development and research of the cosmetics industry. The importance of this paper is reflected in that it fills the gap of academic research in this field and provides new ideas for the development of the Chinese cosmetics market.

2. MARKET ANALYSIS

2.1.General Information of Chinese Cosmetics Market

To start the discussion of the factors that influence the Chinese cosmetics industry, it is necessary to discuss the general picture of the Chinese cosmetics market first. This part of the paper will present some analysis of the market share, amount of sales, and product richness with the support of data. It is expected that the readers will have sufficient knowledge of the current situation of the Chinese cosmetics market after reading this part of the paper.

The Chinese cosmetics market is currently dominated by foreign brands and this situation is the same for both high-end and general cosmetics. For high-end cosmetics products, 8 out of 10 are foreign brands. The top three high-end cosmetics brands are L'oreal Estee, Lauder, and LVMH with a market share of 18%, 13%, and 8%. The Chinese brand with the highest market share is Adolph which owns about 3.5% of the market share. However, during the years from 2012 to 2018, the share of Chinese brands in China's cosmetics market has been increasing. From an initial share of less than 8 percent to about 14 percent. During this period, brand concentration and enterprise concentration remain constant, and brand concentration increases slightly.

Table 1. 2020 Top 10 Chinese High-End Cosmetics Companies [7]

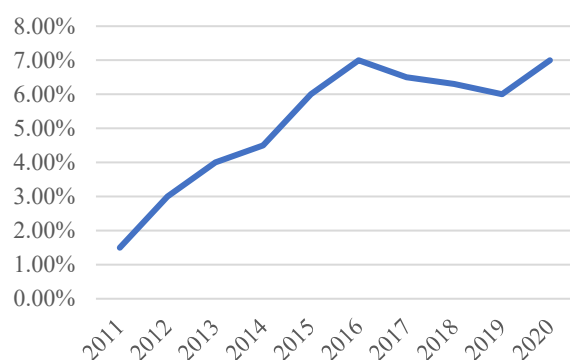| Rank	Name	Origin	Market Share(%)
1	L'Oréal	France	18
2	The Estée Lauder	America	13
3	LVMH	France	8
4	Shiseido	Japan	5.5
5	Adolph	China	3.5
6	Amorepacific Corporation	South Korea	3.5
7	Procter & Gamble	America	3.5
8	Botanee	China	3
9	LG	South Korea	2
10	Chanel	France	2

Figure 1. 2011-2020 Top 20 Chinese Cosmetic Companies Market Share (%) [8]

In terms of marketing volume, in 2019, the sales of beauty makeup at the double 11 e-commerce shopping festival were 11.2 billion, and the sales of personal care beauty makeup were 63.2 billion. In the same period of 2020, the sales of beauty makeup increased by 38% to 15.4 billion yuan, and the sales of personal care beauty makeup increased by 43% to 90.9 billion yuan.

In terms of product richness of cosmetics, cosmetics include 11 categories: skincare products, hair care products, color makeup, etc. Among them, skincare products, hair care products, oral care, make-up, and bath products account for the main body in China, accounting for more than 88% in total. Due to the gradual enhancement of women's consumption power and the continuous promotion of cosmetics through e-commerce channels, China's cosmetics products are constantly high-end and refined, and the industry scale is also in the stage of accelerated growth. After the expansion of the scale, the types of cosmetics have become more abundant. Many companies use high-tech capabilities to produce the products they want to target. For example, blooming

biotech is committed to two technical platforms of microbial fermentation and cross-linking, and has established a whole industry chain business system from raw materials to medical end products, functional skincare products, and functional foods. Its total value can reach 82732.8 million yuan. And Winona, a brand of Botanee Group Co. Ltd., is a brand focusing on the research and development of sensitive skin products. Winona uses high-tech biotechnology to provide a variety of products to improve skin problems. The effects of these products include soothing skin, repairing skin, improving skin dryness, and so on. And more gentle and safe, suitable for consumers with sensitive skin. The total market value of Botanee Group Co. Ltd. also reached 97423.764 million yuan.

In terms of the price range, low, medium, and high-end cosmetics account for different proportions in China's cosmetics market. They also target different consumer groups. For example, Lafang China Co. Ltd. and Shanghai Jahwa United Co. Ltd. mainly produce products at prices suitable for the consumption level of most people. Botanee Group Co. Ltd. focuses on the R & D of medium and high-end cosmetics, and the price range positioning is also high.

2.2. Information of Chinese Cosmetic Companies

This section will introduce more details of Chinese cosmetic companies. More specifically, this section will look at the ratio of chosen Chinese public cosmetic companies to the whole market, their value, and their profit.
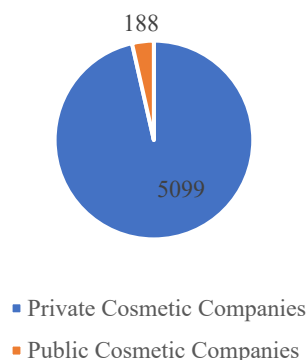

Figure 2. The ratio **of** Chinese Public Cosmetic Companies relatively to Chinese Private Cosmetic Companies

Currently, there are about 188 public cosmetic-related companies in the Chinese stock market and there are 5287 companies that are allowed to produce cosmetic products in China and the public cosmetic companies are 3.5% of the total cosmetic companies. This suggests that the Chinese cosmetic market is an attractive and competitive industry and can be expected that there will

be increasing cosmetic companies being public in the future.

Looking at the 10 representative cosmetic companies, their total market value is about 200 hundred billion yuan. This is 0.4% of the total stock market value. Their average beta is 0.93 so they are quite stable and coherent with the market performance. Therefore, public cosmetic companies in China still only take a small percentage of the market and have great potential to develop.

The potential of Chinese cosmetic companies can be supported by its growth. In 2020, the top 10 representative public cosmetic companies obtained an average revenue of 2.6 billion yuan and an average profit of 0.3 billion yuan. The whole market's growth rate in 2020 was 1% and this was mainly because of the pandemic. It is predicted that the growing speed for 2021, 2022, and 2023 are about 16%, 10%, and 10% respectively. Therefore, the Chinese cosmetic market is expanding and developing rapidly.
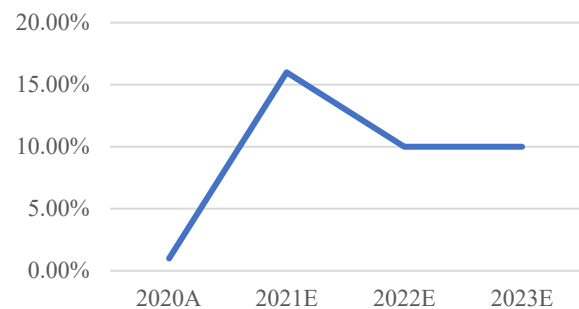

Figure 3. Chinese Cosmetic Market Expected Growth Rate [9]

2.3. Global Comparison

The significance of studying the Chinese cosmetic industry is its relatively greater growth rate compared to the global market. By doing some comparative analysis between the data of the global cosmetic industry and the Chinese cosmetic industry, the difference can be visualized.

Take the US cosmetic industry as an example. It is predicted that the US Beauty & Personal Care industry has a growth rate of 2.5%/2.6%/2.6% for 2021/2022/2023 respectively.[5] For Japan, the predicted CAGR between 2019-2024 is 3.5%[12] and for South Korea, the CAGR between 2021-2026 is 5.22%.[13] All three markets show significant differences between the predicted growth rate for the Chinese cosmetic industry, which is 16%/10%/10% respectively. China's high-end cosmetics market share is 25%, the lowest among them despite its strong and rapid growth rate.[6] China's high-end cosmetic market had a growth rate of 28% while its public cosmetics market had a growth rate of

7%.[11]This suggests the potential and opportunities in the current Chinese cosmetic industry.

On the other hand, the top 10 brands in the global cosmetic industry are presented in the table below.[10] It is shown that the brands that dominate Chinese high-end cosmetic companies also dominate the global cosmetics market. At the same time, there aren't any Chinese cosmetic companies on the ranking even though the growth rate of Chinese cosmetics is much higher than other markets' performance. This suggests that even though the Chinese cosmetics market is growing rapidly, Chinese cosmetics companies are not majorly benefiting from the growth. This also prompted the study, that is, the factors affecting the development of Chinese cosmetic companies.

Table2. Top10 Cosmetic Companies in the US

Name	Market Value
Johnson's	14.12M
Chanel	$11.48M
L'Oreal Paris	$10.74M
Gillette	$8.14M
Neutrogena	$6.98M
Nivea	$6.85M
Dior	$6.32M
Clinique	$5.38M
Shiseido	$5.24M
Guerlain	$5.06M

3. MODEL BUILDING

3.1. Methods

Chinese mid-to high-end cosmetic companies are concentrating on listing on the Shanghai Stock Exchange or Shenzhen Stock Exchange because they need to raise extensive capital to expand market share and improve profitability. Hence, this paper chose seven representative Chinese listed cosmetic companies as research objects, namely Yunnan Botanee Bio-Tech Grp Co., Ltd. (300957.SZ), Proya Cosmetics Co., Ltd. (603605.SH), Bloomage Biotechnology Corp Ltd. (688363.SH), SYoung Group Co., Ltd. (300740.SZ), Guangdong Marubi Biotechnology Co., Ltd. (603983.SH), Shanghai Jahwa United Co., Ltd. (600315.SH) and Lafang China Co., Ltd. (603630.SH). Quarterly financial ratios of these seven companies from 2011 to 2021, including gross margin (GM), operating

cost divided by net profit (OCR), selling expenses divided by net profit (SER) and R&D expenses divided by net profit (RDR), are obtained from WIND. A multi-factor linear regression model is established to explore which factors have significant impacts on the development of Chinese cosmetic companies, in which RDR is chosen as the dependent variable and OCR, SER and RDR are considered as the independent variables.

3.2. Hypothesis

Common business sense dictates that Chinese cosmetic manufacturing companies typically have relatively high gross margins, which also represent the level of growth of these companies. Marketing is a frequently used tool to increase sales but increases their cost burden, while cost reduction of manufacturing is another tool to improve growth levels. R&D expenses are a long-term investment that may adversely affect gross margins in the short term, but create technological barriers to competitiveness in the long term. Hence, this paper makes a primary hypothesis that the GM is negatively correlated with OCR and RDR, and positively correlated with SER.

The primary hypothesis is , in which stands for the industry factors, stand for how these factors, OCR, SER and RDR influence the GM of Chinese cosmetic manufacturing companies and stands for the residual term.

3.3. Assumption

Based on the "bounded rationality" theory assumption, this paper draws some basic theories assumptions: First, there are large amount of cosmetics companies in China's securities market; Second, all Chinese cosmetics companies are affected by three factors: production cost, sales expense and R&D expense. Fourth, all Chinese cosmetics companies can subjectively control the three factors of production cost, sales cost and research and development cost to a certain extent; Fifthly, there are no factors other than production cost, sales cost and R&D cost that are related to cosmetics companies. Note that this article excludes external factors such as policies and focuses on internal factors. Fifth, the net sales profit rate is the main embodiment of the operating conditions of cosmetics companies.

From the expression of the model, it can be seen that this model belongs to multiple regression model, and its basic statistical assumptions are as follows: First, RGM, RDR, SER and OCR are not related to random error terms ; Second, the Zero-mean assumption: ; Third, the Homoscedasticity assumption, which means the variance of is a uniform constant:; Fourth, no self-correlation assumption; Fifth, there is no linear correlation between the explanatory variables. That is, there is no exact linear relationship between the two explanatory variables; Sixth,

assume that the random error term obeys a normal distribution with zero mean and S2 variance: .

3.4. Model Theory

This essay took approximately 3/4 of the randomly disrupted data as a trained set and makes a multi-factor linear regression. The assumed model is established according to the significant results displayed below:

Table3. Regression Results of the model

	Estimate	Std. Error	t value	Pr(>|t|)	Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Intercept)	64.74430	0.79541	81.397	< 2e-16	***
OCR	-2.23323	0.35762	-6.245	7.21e-09	***
SER	2.51397	0.40275	6.242	7.31e-09	***
RDR	-0.24995	0.08983	-2.782	0.0063	**

3.5. Prediction and Inspection

Then the rest of the data were used to inspect the applicability of the model and the mean of the difference of the predicted and real GMs is only -1.253112 and it can be believed that it is a viable model. The comparison of predicted GMs and original ones are shown below, which proves that the model predicts values that differ very little from the true values and can predict the direction.
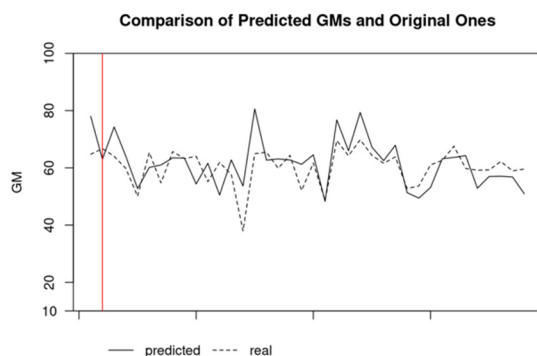

Figure 4. Comparison of Predicted GMs and Original Ones
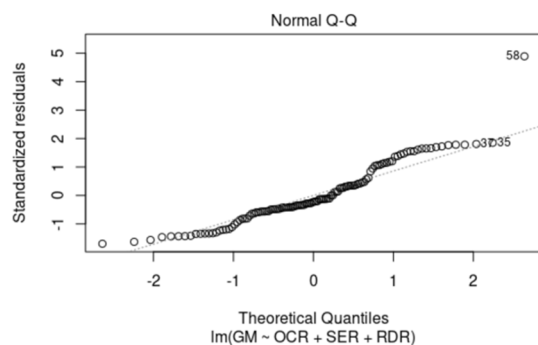
3.6. Results

Figure 5. QQ-Plot of the empirical model for Chinese Cosmetic Industry

The model on the Chinese cosmetics industry explains the relationship between net sales margin and production costs, R&D expenses, and selling expenses. The results show that the gross margin of sales is negatively related to the cost of production, positively related to the cost of sales, and negatively related to R&D expenses. QQ-plot shows the significant fit of this model, and the predictiveness of the model is demonstrated by comparing the predicted net sales margin of this model with the true net sales margin.

4. CONCLUSION

This paper innovatively uses the principles of portfolio pricing models in capital markets to develop a model to study the Chinese cosmetics industry, illustrating the impact of three factors, operating costs, R&D expenses and selling expenses, on the net sales margin of Chinese cosmetics companies. Despite the limitations in the level of data detail and the way accounting standards are calculated, we can conclude to some extent that Chinese cosmetic companies need to improve their marketing to increase sales, and improve their production processes and material selection to reduce production costs. However, the considerations regarding R&D costs are interesting. Although net sales margin and R&D expenses are negatively correlated, which contradicts our hypothesis, the correlation is not as significant as production costs or selling expenses. It can be argued that because developing new technologies and production processes requires considerable R&D expenses, while the longer R&D cycle and uncertain R&D results cause a time lag for R&D expenses to translate into a positive effect on the net sales margin, R&D expenses and net sales margin are negatively correlated for the time being, and then the deep capability changes brought by R&D will bring a long-term reflection on the company's strength. This issue is

expected to be resolved subsequently with the enrichment of data. Better models are also welcome, such as considering the range at which selling expenses would best image net sales margin, as high selling expenses may crowd out other costs and expenses. This paper sheds a lot of light on the development of China's cosmetics industry and also provides new ideas for empirical research based on industry development. Much will be gained if a more significant model can be created and contributed to the Chinese cosmetic industry.

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