

Research on Overseas Market Demand Forecasting Model for Light Industry Products Based on Data Mining

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Abstract. Light industrial products have a significant share in international trade, and with the passage of time, the export volume of these products is also increasing year by year. From the revenue reports of Hikvision over the past 10 years, it can be seen that the sales of light industrial products, both domestically and internationally, are steadily increasing. Among the eight categories of light industrial products exported from China, five categories including tobacco and alcohol, textiles, cosmetics, gold and jewelry, and furniture show a positive growth in the number of exports. In the Vietnamese market, manufacturing and transportation are among the sectors that have the greatest impact on the growth of the Vietnamese economy. Surveys indicate that the volume of cargo transportation in Vietnam is increasing year by year, leading to a rising demand for transportation AGV robots. In the forecast model for cargo volume in the Vietnamese market, it is predicted that the volume of cargo transportation will gradually increase in the future, and therefore, the demand for pallet robots will also gradually increase with changes in cargo volume.

Keywords: light industrial products, overseas markets, demand forecasting, data analysis

1. Introduction

With the progress of the times, the competition between enterprises is also increasing, and the overall uncertainty of the world is also growing. Many enterprises ensure their survival in such a competitive environment by opening up another channel abroad. After years of development, our country has become a major power in light industry. In 2021, the added value of light industry accounted for 16.9% of the national industrial added value, and the output of more than 100 categories of light industrial products ranked first in the world. Therefore, many enterprises tend to engage in foreign trade for light industrial products, but in the process of trade, they may encounter problems such as accurate grasp or prediction of demand. The main purpose of this article is to investigate the preferences of some overseas markets for certain light industrial products and to predict and analyze the demand of the target market. The research results have important application value for light industrial product enterprises to explore overseas markets.

Liu Zhipeng [1] studied the current situation and development trend of Guangxi border trade culture, by comparing the policies of the China-Vietnam border, conducting field investigations on the quality of life of border residents, analyzing the methods of border residents' trade behavior, and collecting data such as Shuolong Town and Vietnamese people holding RMB. Through the rapid development of the express delivery industry benefiting the border residents, the practice of interaction should follow the norms of interaction, and concluded that the quality of life of border residents has been improved in border trade activities, and cultural exchanges between China and Vietnam have also been deepened. Xu Baosheng [2] studied the foreign market situation of building ceramic products, by writing about the demand for building ceramic products in the international market, the current foreign market's taste for building ceramic products and the position of China's building ceramic products in the international market, and collected data on the popularity of glazed tiles, mosaic tiles, etc. in foreign countries, as well as the style of the products themselves. By analyzing the advantages and disadvantages of these building ceramic products, some methods of improvement were concluded, which promoted the growth of the sales volume of these building ceramic products. Ren Xianzheng [3] studied the development of light industry product exports, proposed methods to improve the development of light industry in the trade market, adopted data from the "Sixth Five-Year Plan" period, the "Fifth Five-Year Plan" period, etc., and used the comparison of the total export volume of light industry in different years to fluctuate up and down, and summarized the reasons for this series of events. It was concluded that active foreign trade exchanges should be carried out, consolidation of exports to some

places should be strengthened, quality should be strictly controlled, and a positive export outlook should be established, among other measures that can promote export volume.

Chen Chengqi et al. [4] studied the structure of Shanghai's light industry export commodities, proposed methods to fully utilize the advantages of Shanghai's light industry commodities, and strengthen the management of "pre 托" to improve the structure of Shanghai's light industry export commodities. The article also collected data on sewing machines, Shanghai's population and land, and the degree of mechanization, using its own favorable conditions to make it an important base for light industry product exports. It concluded that low-cost, low-consumption products should be vigorously developed, and the sense of responsibility should be strengthened. Li Ming [5] studied the import and export data of China's light industry products, and the results showed that China has become a major exporter of light industry products in the world. Furthermore, it proposed that developing green light industry products with wooden shoes as a direction will become an important economic growth point. Data was collected on the benefits of different types of wooden shoes made from different woods in "Compendium of Materia Medica", and what types of shoes people prefer, and concluded that green light industry products can be vigorously developed according to people's needs. Liao Xiaohong et al. [6] studied the current situation and trend of the layout of international production capacity cooperation in China's light industry, proposed methods to carry out overseas investment, industrial structure adjustment, enhance the core influence of enterprises, expand the influence of proprietary brands, respond to trade frictions, and maintain industry interests. Data was collected on the value-added ratio of light industry from 2009 to 2015, and the foreign trade situation of China's light industry, and a descriptive statistical model was constructed. It was concluded that international production capacity cooperation can not only promote the transformation of light industry, but also resolve overcapacity, broaden trade channels, and improve the quality of effective supply.

Jiang Tisong [7] studied the current stage of China's export strategy, proposing that based on China's situation and the needs of the international market, China should fully leverage its advantage of abundant resources, adjust the structure of export goods according to the principle of balancing domestic and international considerations. He collected data on the proportion of China's primary products in total exports, the proportion of industrial manufactured goods exports, and the market share of other products in the international market over the past 40 years. He concluded that implementing "two transformations" is necessary, with the current export goods focusing on light and textile products, while placing hopes on the development of electrical machinery and high-tech industries. Liu Linlin [8] studied the intra-industry trade of light industrial products between China and emerging market countries, writing about Cao Fang and others' research on the intra-industry trade of specific products and the three stages of intra-industry trade. She collected data on China's exports of light industrial products to various emerging market countries and used the Grubel-Lloyd Index (GLI), the Bergstrand Index (G), and the Marginal Intra-Industry Trade Index (MIIT) to construct tabular data. She concluded that China has strong intra-industry trade with Asian countries, a high degree of competition in light industrial products, and that inter-industry trade dominates with African and North American countries. China should vigorously promote the trade of light industrial products, adjust the industrial structure, increase product differentiation, thereby strengthening intra-industry trade and enhancing competitiveness. Chang Zhongze et al. [9] studied the impact of diversified overseas investment by Chinese manufacturing enterprises on business performance, proposing that horizontal cross-border mergers and acquisitions are more efficient, followed by vertical cross-border mergers and acquisitions, and mixed cross-border mergers and acquisitions are less efficient. They collected data on Chinese A-share listed manufacturing companies from 2009 to 2018, the dispersion of overseas investment industries, and corporate business performance, etc. They used the entropy index method, screened sample enterprise age, and adjusted fixed effects to conduct robustness tests on the results, constructing a fixed effects model, variable descriptive statistics, and many other data integration methods. They concluded that China should balance the relationship between specialization in main business and diversification in international investment; increasing investment in innovation and enhancing core competitiveness is the fundamental way to improve corporate business performance; and that industrial policy support should guide the direction of corporate investment. Cheng Mingwang et al. [10] studied the current situation and development trend of Sino-Vietnamese trade. They collected data on Sino-Vietnamese trade from 1991 to 2001, the main import and export commodities of China to Vietnam in 2001, and the structure ratio of China's import and export, and integrated these data into tables. They concluded that the goods exported from China to Vietnam are mainly motorcycles, electrical and mechanical products, refined oil, and textiles. The goods exported from Vietnam to China are mainly crude oil, mineral resources, and agricultural products. Although the levels of economic development in China and Vietnam are similar, there is still strong complementarity between the two economies in terms of natural resources, science and technology, and industrial structure. The paper points out that with China's accession to the WTO, it will alleviate Vietnam's trade deficit with China, and China should reduce the proportion of exports of primary products to Vietnam and increase the proportion of exports of industrial manufactured goods with higher technological and capital content.

In summary, the foreign trade of light industrial products greatly benefits the economic growth of enterprises. Our country should optimize the economic structure; strengthen cultural exchanges and industrial structure complementarity with neighboring countries; and continue to strongly support the foreign trade of light industrial products. Enterprises in various regions should leverage their local advantages to achieve more output with less consumption; actively engage in innovation activities; investigate the popularity of light industrial products in export countries and adjust export quantities accordingly. This article will first investigate the revenue situation of light industrial products, then use tables to determine the export change rates of some light industrial products at home and abroad and the changes in the volume of shipments to the Vietnamese market. And thus derive a

forecast model for the volume of shipments to Vietnam, predict the demand for AGV robots, and finally reach the conclusion of this article.

2. Light Industry Market Research

2.1. Hikvision Light Industry Product Market Analysis

Hikvision, a technological innovation company. The company's products mainly focus on light industrial products such as artificial intelligence robots, and thus the changes in Hikvision's revenue can reflect the changes in the sales volume of light industrial products.

By examining the data from Donews, we can obtain the revenue situation of Hikvision from 2014 to 2023 as shown in Figure 1.

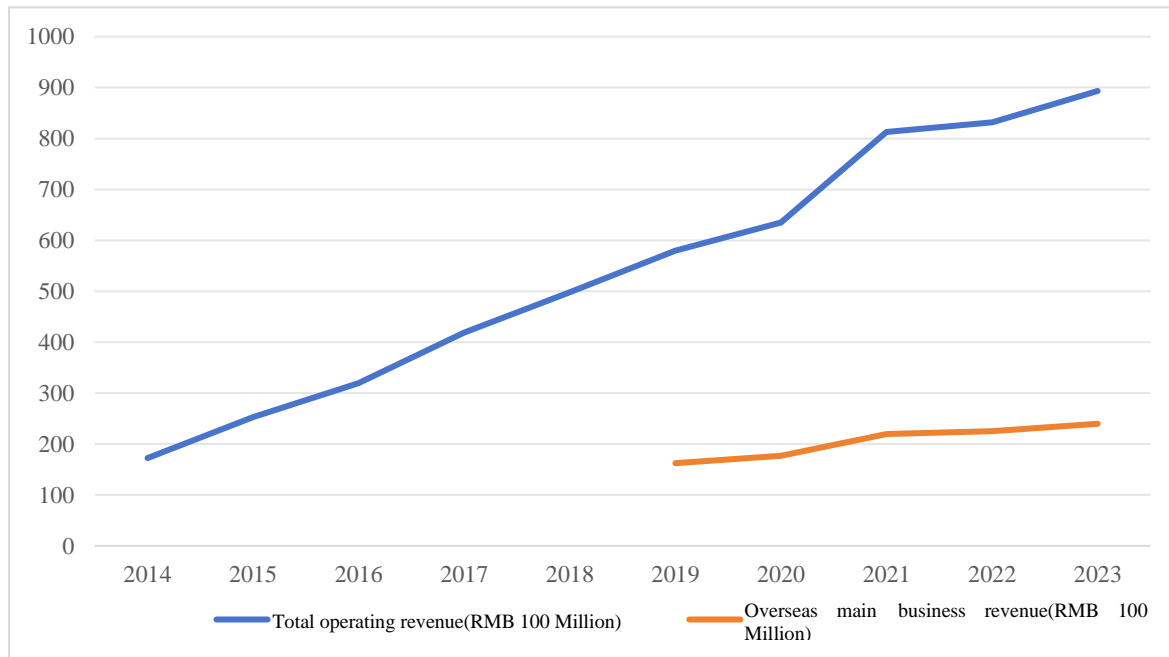


Figure 1. Hikvision's operating revenue from 2014 to 2023

From the table, we can conclude that Hikvision's total operating revenue has increased significantly. Compared to the total operating revenue, the growth trend of revenue from overseas main business is slower, and it was not until 2019 that there was specific revenue from overseas operations. From these data, it can also be concluded that the demand for light industrial products is increasing year by year, and exporting light industrial products can yield considerable profits.

2.2. Analysis of Domestic and International Markets

From January to April 2024, eight categories of key commodities exported from China exceeded \$9 billion, with exports of plastic products, footwear, toys, luggage and similar containers, and ceramic products showing an upward trend; while exports of household appliances and furniture and their parts showed a downward trend. At the 7th China International Import Expo, enterprises participating in the categories of food and agricultural products, consumer goods, medical devices, and healthcare accounted for the vast majority of the total. Clothing products present a diversified characteristic globally, with developed countries being the main consumption locations. However, due to the rapid economic growth in recent years, emerging markets such as Asia have also become an important growth pole for the global clothing market. Clothing has evolved from its initial basic functions of warmth and covering to meet contemporary demands such as fashion, quality, and environmental friendliness.

By collecting and analyzing the data provided by the National Bureau of Statistics, the export change rate of ten categories of light industrial products overseas is obtained as shown in Table 1.

Table 1. Export Change Rate of Ten Categories of Light Industrial Products

Retail sales of the 10 categories of light industry goods increased year-on -year	Grain, oil, food	Drink class	Tobacco and alcohol	Textile class	Cosmetics class	Gold, silver and jewelry	Daily necessities	Home appliances, audio and video equipment	Cultural and office supplies category	Furniture class
Years										
2023	5.7	3.2	10.6	12.9	5.1	13.3	2.7	0.5	-6.1	2.8
2022	8.7	5.3	2.3	-6.5	-4.5	-1.1	-0.7	-3.9	4.4	-7.5
2021	10.8	20.4	21.2	12.7	14.0	29.8	14.4	10.0	18.8	14.5
2020	9.9	14.0	5.4	-6.6	9.5	-4.7	7.5	-3.8	5.8	-7.0
2019	10.2	9.0	7.4	8.0	9.6	7.4	13.7	8.9	3.0	10.1
2018	10.1	9.0	7.3	8.1	10.5	8.1	13.4	8.3	4.0	9.8

From the table, we can conclude that in the past six years, the retail sales growth of grain and oil, food, beverage, and cultural and office supplies has shown a downward trend, while the retail sales growth of the remaining seven categories of goods has shown an upward trend. Among these, the growth in retail sales of tobacco and alcohol, textiles, cosmetics, gold and silver jewelry, and furniture has increased significantly. Therefore, companies can consider selecting these five categories of light industrial goods as targets for overseas exports.

3. Construction of a Forecast Model for Light Industrial Products in the Vietnamese Market

3.1. Market Analysis of Light Industrial Products in Vietnam

Vietnam's youthful population structure, along with local advantages in manufacturing and exports, has attracted a large number of foreign enterprises. The Vietnamese market is largely youth-oriented, thus showing a strong preference for fashion, technology, and promotional activities; moreover, the overall trend of the Vietnamese market is on the rise and has exceeded market expectations. Vietnam's economic growth is mainly driven by manufacturing, exports, and services, with agriculture and the food industry also showing significant potential. Among these, the manufacturing sector has seen the best growth, partly because it was originally a relatively small part of Vietnam's economy. Therefore, despite the service sector not rising as much as construction, because of its higher overall proportion, it has a greater impact on Vietnam's GDP growth. Within Vietnam's service sector, wholesale and retail, transportation, and warehousing are the most significant. In the process of transportation and warehousing, the efficiency of cargo handling is crucial. A pallet robot from Kunshan Tianjin Gang Metal Products Co., Ltd. can improve the efficiency of cargo handling. When the volume of cargo is large, using conventional manual transportation may not meet the expected efficiency levels. There are too many uncontrollable factors with human labor during cargo handling, such as temperature, physical condition, and other reasons. The pallet robot can avoid most of these situations, so when the volume of cargo is large, the need and quantity of pallet robots to save costs will also greatly increase.

This article draws line chart (Figure 2) by collecting data on the volume of goods transported from September 2021 to September 2022 in Vietnam.

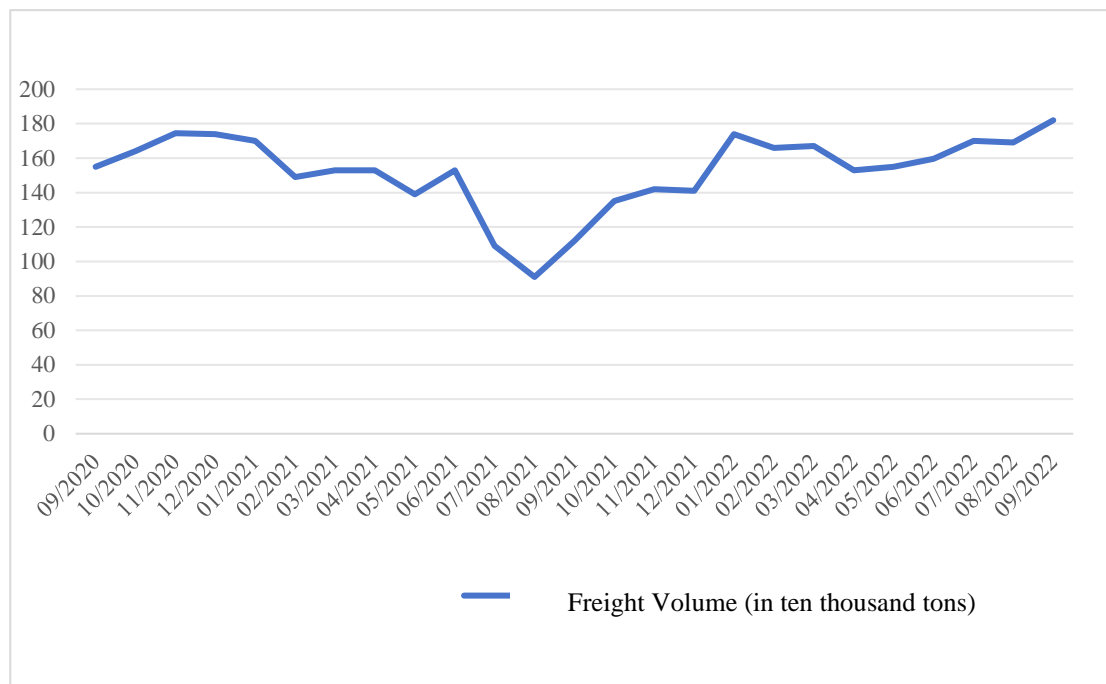


Figure 2. Data changes in cargo volume from September 2021 to September 2022 in Vietnam

According to Figure 3.1, it can be concluded that the overall trend of cargo volume in Vietnam is on the rise, thus the possibility of needing tray robots increases significantly. In August 2021, the cargo volume reached its lowest peak at approximately 900,000 tons; in September 2022, it reached its peak at about 1,830,000 tons.

3.2. Forecast Model Construction

This article uses a polynomial regression model to fit and analyze the freight volume data of Vietnam, obtaining the following predictive model.

$$y = 0.3x^2 - 7.4342x + 182.75 \quad (1)$$

$R^2 = 0.4249$ indicates that the fitting effect is quite good. According to the above model, the freight volume for Vietnam can be predicted. The prediction results are as follows: the freight volume for October is estimated to be 1.923 million tons, and for November, it is estimated to be 2.067 million tons.

3.3. Application Analysis of Forecasting Model

Based on the freight volume forecasting model for Vietnam provided in Section 3.2, an estimate of the demand for industrial pallet robots in the Vietnamese market can be obtained (estimating the market size for pallet robots in Vietnam).

4. Conclusion

Exporting light industry products overseas is a very good choice in today's era. Among the light industrial exports from our country, products such as tobacco and alcohol, textiles, cosmetics, gold and jewelry, daily necessities, home appliances, audio-visual equipment, and furniture have a greater tendency. In international trade, it is important to investigate the development situation of the local country and inspect the changes in related enterprises that might need the light industrial products of our company. We should always maintain a proactive innovative concept, adapt to the trends of the times and the needs to develop new products to meet new demands and improve user experience. In the Vietnamese market, transportation and service industries are the leading forces of local economic growth. Domestic enterprises can take these two industries as a guide and export related light industrial products.

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