Dean&Francis
ISSN 2959-6157

A Research of the Development of New Retail and the Application of Statistics to the New Retail Market

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Abstract:

New retail has been the main trend of the future retail market. Statistics plays a key role in sales and inventory of new retail. However, there is little research on combining new retail and statistics worldwide. In this paper, the concept and development of new retail are summarized, and the time series, regression, and mean-variance models from statistics are used. Case analyses are made to clarify the application and value of each of the three models in the new retail market. Besides, the limitations of the three models are also revealed. This article points out that in an increasingly competitive market environment if the market pays more attention to sustainable development, it will be particularly important to use scientific statistical methods to make decisions. This will help optimize inventory management and improve operational efficiency, effectively segment customer groups, comprehensively evaluate marketing strategies, improve customer experience, and strengthen risk management. In this way, companies will gain a significant competitive advantage, thereby enhancing market competitiveness and long-term sustainable development potential.

Keywords: New retail, time series, regression analysis, mean-variance

1 Introduction

In the context of a developing digital economy, the popularization of artificial intelligence has changed customers' shopping habits and expectations. E-commerce has failed to meet the demands of consumers, so a new shopping model that combines online and offline shopping, which is known as new retail, has made its appearance on the stage. According to the statistics of iResearch, the new retail market size in China was approximately 6.2 trillion RMB in 2022, which is expected to scale up to 9.4 trillion RMB by 2025. The research by Forward shows that the new retail market size in China exceeded 7 trillion RMB in 2023, and the development of China's new retail market is mainly promoted by fast-rising new forms, such as fresh markets and community-based group buying.

ISSN 2959-6157

New retail values online and offline feedback. It makes analyses with big data online and sends messages to target customers. It also collects the most honest feedback and experience from customers. Traditional offline shops and markets are inferior to new retail in shopping space and cost performance. New retail solves the problems of experience lacking and logistics for e-commerce. However, new retail has disadvantages, such as information security, technological reformation, and the pressure of competition from the diversified market. A new retail format requires enterprises to make new retail strategies. Statistical methods play an indispensable role in this process [1].

In the paper, articles about new retail are reviewed to elucidate the concept and development process of new retrial. It aims to highlight the importance of mean-variance, time series, and regression models from statistics in the making of marketing strategies in new retail.

2. Concept and Development of New Retail

2.1 Concept of New Retail

New retail is an emerging business model reconstructed from the traditional retail model based on big data, artificial intelligence, and the Internet. It is a further integration of online and offline markets, devoted to creating seamless and personalized shopping experiences for customers. The key point of new retail is to satisfy the increasingly diversified needs of consumers by using data techniques to improve operation efficiency, inventory, and customer relationship management and achieve precision marketing.

The research by Wang in 2018 shows that new retail enhances individualized marketing strategies and improves inventory management using big data [2]. New retail pays attention to improving both sales volume and customer satisfaction. Chen argues that new retail is an important transition from the traditional retail model, and it combines social commerce with physical retail environments [3]. According to Gao, consumers become more inclined to choose new retail because of its flexibility and convenience [4]. Sun holds that artificial intelligence is the key force driving the development of new retail by offering insights into consumer behavior and upgrading the supply chain at the technological level [5]. Liu deems new retail as a reimagined retail strategy, which focuses on technology-driven consumer-centered experience [6]. The new retail model propels traditional retailers to rethink their operation methods to enhance their competitiveness. Generally, new retail aims to provide a more efficient and convenient shopping experience for consumers and improve the operation efficiency and profitability of retailers through technological application and channel integration.

2.2 Development Process

New retail has been a chief direction in the transformation of the retail industry in recent years. It aims to improve consumers' shopping experience and enterprise operation efficiency through technological innovation and business model transformation. The development of new retail is related to technological advances and resulted from changes in market demand. New retail originated in the 1990s when e-commerce emerged due to internet popularization. As Zhang said, the rise of e-commerce has changed the way people shop and spurred traditional retailers to apply the new retail model [7]. This change is the initial exploration of new retail.

With the rapid development of the internet and the extensive use of smartphones in the 21st century, the way people shop has changed greatly. According to Kushwaha's report, the introduction of mobile technology requires retailers to remake commercial strategies so that they can meet the need for convenient shopping by consumers [8]. In this stage, retailers begin to realize the importance of integrating online and offline shopping.

Alibaba proposed the concept of new retail in 2016, which emphasizes the application of big data and cloud computing in the retail sector. Liang argues that new retail provides a personified shopping experience for consumers through data analysis [9]. The new concept attracts wide attention from the industry rapidly and becomes the direction of retail transformation. With the further development of technology, new techniques, such as artificial intelligence and the Internet of Things, begin to find their application in the retail industry. Chang thinks that the application of artificial intelligence not only increases operation efficiency but also improves greatly customer experience [10]. The new techniques enable retailers to acquire an accurate understanding of consumer needs. Moreover, enterprises should also make adjustments to their management mode. According to Huang's report, new retail requires enterprises to make flexible management strategies, which help them respond to rapid changes in the market [11] and enable them to take the lead in competition. In the future, new retail will be further integrated into cross-border e-commerce, social media, and other sectors, promoting the sustainable development of the industry. It is expected by Gupta that new retail is going to lead the future of the global retail industry and form a complete ecosystem [12]. As mentioned above, new retail constantly combines technology and market needs in its development process.

Every link from the emergence of e-commerce to the application of artificial intelligence jointly promotes the transformation and innovation of the retail industry.

3. Application of Statistics Knowledge to New Retail Markets

Time series, regression, and mean-variance models are important statistical means that can be used to analyze data from different dimensions. Such analyses are needed in marketing. Data analyses reveal customer preferences and improve inventory management.

3.1 Time Series Model

The time series model shows the sales trend, seasonal fluctuations, and periodic changes, which provide scientific evidence for the making of marketing decisions.

Basic concepts of the time series analysis

The time series analysis is a statistical technique used to identify the pattern and trend in data through the analysis of a series of time-related data. Sales data is one of the most important time series for the market. The analysis of sales data will reveal the changing trend of the sales volume of a market, whether it is ascending or descending, and also the pattern of seasonal fluctuations. According to Hyndman, the time series analysis helps enterprises predict future sales trends so that they can make more effective marketing strategies [13].

3.1.1 Sales prediction and strategy optimization

Time series models, such as Autoregressive Integrated Moving Average (ARIMA), and seasonal decomposition can be used to predict the sales of a market. Markets adjust inventory, optimize promotional activities, and develop marketing strategies based on the predicted results. Accurate sales predictions can not only reduce inventory costs but also improve customer satisfaction [14]. Zhang used the ARIMA model to analyze the sales data of a supermarket, and the research results show that the model makes effective predictions on sales for the next three months, with accuracy reaching 85% [15]. Markets can prepare inventory in advance based on historical sales data so that they can meet customer needs during holidays or seasonal offers.

The time series analysis also shows seasonal and periodic changes in sales data of markets. Chen holds that a good understanding of seasonal fluctuations in sales helps retailers to make better promotional activities [16]. For example, the sales of some products may rise greatly in certain seasons and markets can offer targeted promotions in peak seasons to maximize the sale volume.

The time series analysis can also be made to assess the effect of different promotional activities. The comparison of sales data before and after promotions reveals the effectiveness of a marketing strategy. Xu thinks that enterprises can quantify the effect of promotions on sales through time series analysis. In this way, they will be able to optimize the marketing strategy [17]. Chen's research suggests that the time series analysis of sales data collected from promotional and non-promotional periods quantifies the influence of promotional activities on sales [16]. A study reports that promotional activities increase the average sale volume by about 30% [18]. The data-driven decision-making process enables markets to stay flexible in fierce market competition.

3.1.2 The apprehension of the future trend

With the development of big data technology, more external variables, such as weather, economic indicators, and social events, can be incorporated into the time series analysis to improve prediction accuracy. Li remarks that to introduce external factors into the time series model can greatly improve the accuracy of prediction on sales [19]. The multi-dimensional analysis method helps markets to acquire a more comprehensive understanding of the market dynamics and to make adjustments to marketing strategies in time.

3.1.3 Summary

Taken above, the time series analysis is of great significance in the marketing strategy analysis of new retail markets. Markets can accurately predict sales, identify seasonal and periodic changes, assess the effect of promotional activities, and apprehend future trends through thorough analyses of sales data. The analyses provide scientific evidence for decision-making so that markets can gain an advantage in competition.

3.2 Regression Model

The regression analysis is a statistical method for studying the relationship between one or more independent variables (predictor variable) and the dependent variable (response variable). When used in the marketing strategy analysis of new retail markets, the regression model assesses the effect of different marketing activities on sales, profit, and other key performance indicators.

As a powerful statistical tool, regression analysis is extensively used in the new retail market to help enterprises through data digging to find key factors that influence sales, customer satisfaction, and market trends. With the development of big data and artificial intelligence technologies, the application of regression analysis in the new retail industry has become increasingly important as it provides scientific evidence for the strategic decision-making

ISSN 2959-6157

of enterprises.

First, the regression analysis predicts the sales trend effectively. Through historical sales data analysis, enterprises identify factors that play significant effects and then build mathematical models to predict future sales performance. For instance, Liu's research focuses on the application of the linear regression model in retail sales prediction. It proves that some factors such as seasonal changes and promotional activities have a great influence on sales volume [20]. Chen's research reveals that the multiple linear regression model built can effectively predict the monthly sale volume of a market, with the coefficient of determination (R^2) reaching 0.92. It indicates that the model has a good fitting effect [21]. The regression analysis enables new retail enterprises to make better sales strategies in intense market competition.

Second, the regression analysis also evaluates the effectiveness of promotional activities. Enterprises can quantify the influence of different promotional strategies on consumers' purchasing decisions through the construction of a regression model. Nath conducted a study on e-commerce promotions in 2020, and the regression analysis shows that discount greatly increases consumers' willingness to buy. The regression analysis provides important theoretical support for the optimization of marketing strategies of new retail enterprises [22].

Third, the regression analysis plays an important role in the study of customer behavior. The analysis of the purchase history and behavior features of customers shows factors that influence customer satisfaction and loyalty. In Chen's research, the multiple linear regression analysis shows that the age, income, and family size of customers have a huge impact on the type of products they buy. For example, the rate of buying healthy food rises by 15% with every increase of ten years in age. It is also found that a higher income leads to a higher overall buying frequency of customers, especially for high-end products [23]. According to Homburg's study, there is a significant regression relationship between the repurchase decisions in customers and service and product quality. Therefore, new retail enterprises can improve customer satisfaction through customer segmentation and personal services [24].

Fourth, the regression analysis can be used for inventory optimization in supply chain management. Enterprises can predict customer needs and optimize the inventory strategy through the regression analysis of the inventory level and sales data. Choi's research shows that the regression analysis reduces inventory costs and promotes the service level [25]. In Zhang's study, the multiple regression model is used to analyze the influence of the sale volume, seasons, and promotional activity on the inventory level. The results show that the regression coefficients of the sales volume, season, and promotional activity are 0.7, 0.4, and 0.3, respectively. Zhang's research provides support for the decision-making in inventory management of markets and facilitates inventory upgradation in different conditions [26].

Taken above, the regression analysis plays an indispensable part in the new retail market. It helps enterprises with sales prediction and promotional effect assessment and also provides scientific evidence for customer behavior analysis and inventory management. With the continuous development of data analysis technology, regression analysis will continue to play an essential part in the new retail industry, promoting its further development.

3.3 Mean-Variance Model

The mean-variance model offers an effective tool for quantitative analysis of new retail markets. It finds the optimal balance between risk and benefit to help market management make the most proper decisions.

The mean-variance model was proposed by Harry Markowitz. It balances between expected return and risk (variance). In new retail markets, commodities are deemed assets. In the analysis of different commodity combinations, historical data are used to calculate the expected return and fluctuations of various commodities, to determine the optimal combination. Markowitz's research in 1952 shows that the mean-variance optimization method improves the investment return and reduces the risk of markets [27].

In addition, the mean-variance model applies not only to the making of financial investment decisions but also to the making of marketing strategies and merchandise pricing. El-Haj (2019) found that customer satisfaction and loyalty can be improved when a reasonable commodity combination is employed by a market [28]. More importantly, markets can achieve profit maximization with limited resources through the analysis of the synergistic effect of various products [29].

Generally, the mean-variance model provides a systematic and data-driven method to optimize the commodity combination and increase the competitiveness of new retail markets. The use of this analysis tool not only brings real economic gains but also facilitates the sustainable development of the market industry [30].

4. Conclusion

The rise of new retail brings unprecedented challenges and opportunities for the market industry in the era of digitization and rapid technological development today. New retail is not just a simple integration of online and offline shopping, but a new consumer experience and business model redefined based on data and technology. Using sta-

tistics for strategy optimization is extremely important for markets to stand out in fierce competition.

Data becomes one of the important assets of enterprises in the new retail environment. Statistics provides useful data analysis tools for market management. Through thorough analysis of customers' purchase behavior, market trends, and sales data, markets can make more accurate marketing strategies. This data-driven decision-making method enables markets to adjust strategies in real-time to respond to the changing market environment.

Markets face a higher level of risk and more uncertainties in the new retail environment. Statistics provides theoretic support for risk management. Markets can construct risk assessment models to quantify different types of risks and develop strategies to cope with them. Assessing the risk with statistical methods helps retailers make more robust decisions in complex business environments. The scientific decision-making method lowers the bad effect caused by uncertainties.

Consumers pay more and more attention to corporate social responsibility and sustainable development in the new retail era. Through the evaluation of environmental impact and social responsibility, markets will be able to be more transparent to consumers about the efforts they made to achieve sustainable development. Transparency not only enhances the trust level of consumers but also lays the foundation for the long-term development of markets.

The application of statistics to strategy optimization for new retail markets has great significance. Markets can gain an advantage in competition through data-driven decision-making, inventory management optimization, customer segmentation, marketing strategy assessment, risk management enhancement, and sustainable development. With the continuous development of data analysis technology, more statistical tools and methods will be applied to the operation and management of new retail markets in the future, serving as a more powerful force driving the further development of new retail markets.

References

[1] Li M., Zhu Y., Su J. Exploring the driving path of marketing efficiency for new retail enterprises based on fsQCA. Business Economics Research, 2024, (16): 130-134.

[2] Wang Y., Li Z. A study on the new retail model based on big data technology. Journal of Retailing, 2018, 45: 120-127.

[3] Chen K., Pang Z. New retail: A review and future directions. Journal of Business Research, 2020, 48(11): 1207-1228.

[4] Gao S., Jiang Y. The impact of new retail on consumer buying behavior. International Journal of Retail & Distribution Management, 2021, 132: 103-112.

[5] Sun L., Zhang M. Exploring the role of artificial intelligence in new retail. Journal of Retailing and Consumer Services, 2021, 114: 106-114.

[6] Liu P., Zhao J. The future of retail: New retail models and strategies. Journal of Retailing and Consumer Services, 2022, 60(5): 1230-1248.

[7] Zhang Y., Wang S., Li J. E-commerce: A new retail paradigm. International Journal of Information Management, 2013, 33(1): 202-210.

[8] Kushwaha T., Singh S. The impact of mobile technology on retailing. Journal of Retailing and Consumer Services, 2016, 31: 12-21.

[9] Liang T., Chen H., Wang Y. Exploring the 'new retail' concept. Journal of Retailing and Consumer Services, 2017, 78: 286-295.

[10] Chang P., Huang M. Artificial intelligence in retail. Journal of Retailing, 2018, 45: 308-317.

[11] Huang Y., Zhang M., Li H. Management strategies for new retail. International Journal of Retail & Distribution Management, 2019, 57(8): 1609-1620.

[12] Gupta S., Jain R. Future trends in retailing. Journal of Business Research, 2020, 48(11): 1123-1129.

[13] Hyndman R. J., Athanasopoulos G. Forecasting: Principles and Practice. OTexts, 2018.

[14] Zhang J., Wang L. Sales forecasting in retail: A time series approach. Journal of Retailing and Consumer Services, 2020, 55: 102-109.

[15] Zhang Y., Liu J., Wang X. Time series forecasting for retail sales using ARIMA model. Journal of Retailing and Consumer Services, 2020, 55: 102-104.

[16] Chen K., Liu Y. Seasonality in retail sales: Implications for marketing strategies. International Journal of Retail & Distribution Management, 2021, 49(6): 675-688.

[17] Xu W., Zhang P. Evaluating marketing campaign effectiveness using time series analysis. Journal of Business Research, 2022, 138: 120-130.

[18] Chen X., Wang Y., Zhang R. Evaluating the impact of promotional activities on sales using time series analysis. Marketing Science, 2022, 41(3): 456-470.

[19] Li C., Sun Y. Incorporating external variables in time series forecasting for retail. Journal of Retailing, 2021, 97(4): 563-577.

[20] Liu Y., Chen P., Zhang J. An empirical study on the forecasting model of retail sales. Journal of Retailing and Consumer Services, 2018, 41: 351-359.

[21] Chen J., Huang Y. Sales forecasting in retailing using multiple linear regression analysis. Journal of Business Research, 2020, 113: 475-482.

[22] Nath S., Jha A., Saha P. Evaluating the effectiveness of promotional strategies in an online retail context. Journal of Business Research, 2020, 112: 295-302.

[23] Chen X., Li Y. Understanding consumer purchase behavior in new retail: A regression analysis approach. International Journal of Retail & Distribution Management, 2020, 48(5): 467-

ISSN 2959-6157

483.
[24] Homburg C., Jozić D., Kuehl N. Customer experience management: Toward implementing an evolving marketing concept. Journal of Marketing, 2017, 81(1): 50-68.
[25] Choi T. M., Cheng T. C. E., Wu J. RFID technology in retailing: A review and future research directions. International Journal of Production Economics, 2018, 207: 222-234.
[26] Zhang Y., Lin J. Inventory management in retail: A regression analysis approach. International Journal of Production Economics, 2023, 249: 108-120.
[27] Markowitz H. Portfolio selection. The Journal of Finance, 1952, 77: 211-214.
[28] El-Haj S. A mean-variance approach to inventory decision making. International Journal of Production Economics, 2019, 22(3): 111-115.
[29] Hwang J., Kwon S. The impact of product variety on retail performance: A mean-variance analysis. Journal of Retailing and Consumer Services, 2020, 21: 123-124.
[30] Dahl J. Operational strategies in grocery retailing: A unified framework. Journal of Retailing, 2019, 59: 130-133