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The Influence of Financial Forecast Optimization Based on Data Modeling on Decision Support

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Abstract: With the wide application of big data and AI technologies, the auxiliary function of data models for enterprises' financial forecasting is becoming increasingly significant. The introduced and optimized model can more accurately improve the accuracy and effectiveness of enterprise financial forecasting and enhance the decision support ability of enterprise decision-makers. This paper mainly expounds the basic idea of the data model, reveals the key nodes in the process of using the data model to improve the financial forecasting of enterprises, and combines the discussion of the impact of forecasting improvement on decision-making efficiency, effect and synergy, providing a reference framework for enterprises to establish an intelligent and scientific decision-making mechanism.

1. Introduction

Facing the rapidly changing characteristics in the market, enterprises have an increasingly strong demand for financial forecasting. However, traditional forecasting methods, which are based on experience and static information analysis, can no longer meet the needs of rapidly changing and complex business activities. Instead, through the technology of data models to establish, analyze and understand massive amounts of data, Thus, it can significantly enhance the accuracy and efficiency of financial forecasting, adjust the company's resource allocation, improve risk control, and promote the transformation of the intelligent decision-making process. The financial forecasting strategy based on the data of the combination of artificial intelligence and big data technology is gradually becoming an important weapon for companies to enhance their competitiveness and has an increasingly significant impact on decision assistance systems. Therefore, it is worthy of in-depth study and discussion.

2. The basic concepts of data modeling

2.1 The definition of data modeling

Based on the understanding and structured formal expression of business processes, business entities and relationships, a structured data model is established to clarify the main variables, attributes and logical relationships, and to construct the data architecture used for computing,

analysis and prediction. From a broad perspective, data modeling encompasses both the modeling of the data itself and the indirect modeling of variables on the algorithm model. In the financial industry, one of the core applications is to rely on the internal patterns and correlations of financial indicators mined from past data to provide the basis and reference information for prediction and decision-making. With the development of artificial intelligence and big data, it is no longer solely dependent on fixed one-dimensional tables to design data structures. Data modeling is a dynamic, intelligent, and continuously iterative process, which is directly used for both information processing and intelligent decision-making analysis.

2.2 Elements of Data Modeling

Data analysis modeling encompasses several key elements, namely data sources, data structures, variable definitions, model logic, and result representations. Among them, the data source determines from which aspect the input information of the model comes and the quality of the information; The data structure is related to how the input information is processed in the model and affects the performance (efficiency) of the model and its interpretation. Variable definition describes the definitions of each information factor of the model and its operators, and it is the guarantee for the model to ensure the quality of information. Model logic reveals the establishment of relationships among variable definitions and operators, which is the key for the model to fulfill its prediction function. Result representation is a way to present the model achievements, providing guidance and basis for later evaluation and decision-making in the form of results, indicators, conclusions, etc. The data elements are interrelated and mutually restrictive, forming a comprehensive framework structure for establishing a data model, which has a significant impact on the stability, readability and applicability of the model (see Table 1).

Table 1. Common Data Modeling Methods and Applicable Scenarios

Model type	Feature description	Applicable scenarios
Linear regression	It has a simple structure and strong interpretability	Single variable relationship prediction
Time series model	Capture the trends and periodicity of data changes over time	Sales volume and cash flow forecast
Decision tree model	Easy to understand and capable of handling nonlinear problems	Multifactor judgmental prediction
Neural network model	The model is complex and highly adaptable	Big data-driven nonlinear prediction
Integrated learning model	High accuracy and strong anti-interference ability	Prediction of high-dimensional complex data

3. Financial forecasting optimization path based on data modeling

3.1 Improvement of Data quality

Improving data quality is the primary task for improving the financial forecasting model. A multi-source data integration scheme should be constructed, including key data such as finance, business and market, to maintain the integrity of the data. Automatic acquisition of the data should be carried out to enhance its real-time performance and consistency. On the other hand, it is necessary to establish a scientific data cleaning process to clean up the missing content, abnormal content and duplicate content in the data, so as to maintain the accuracy of the data. It is also necessary to determine a unified data model and measurement standards to reduce the impact of

changes caused by the output of the data model and the different data structures of each system. Establish a data quality assessment system to conduct regular evaluations and measurements in terms of accuracy, completeness and consistency. Establish a data management specialist, promote the standardized development of data standards, and ultimately achieve a data quality control cycle. A good and reliable data source is an important factor for accelerating the speed of model establishment and the basis for improving the accuracy of the prediction model. (See Figure 1).

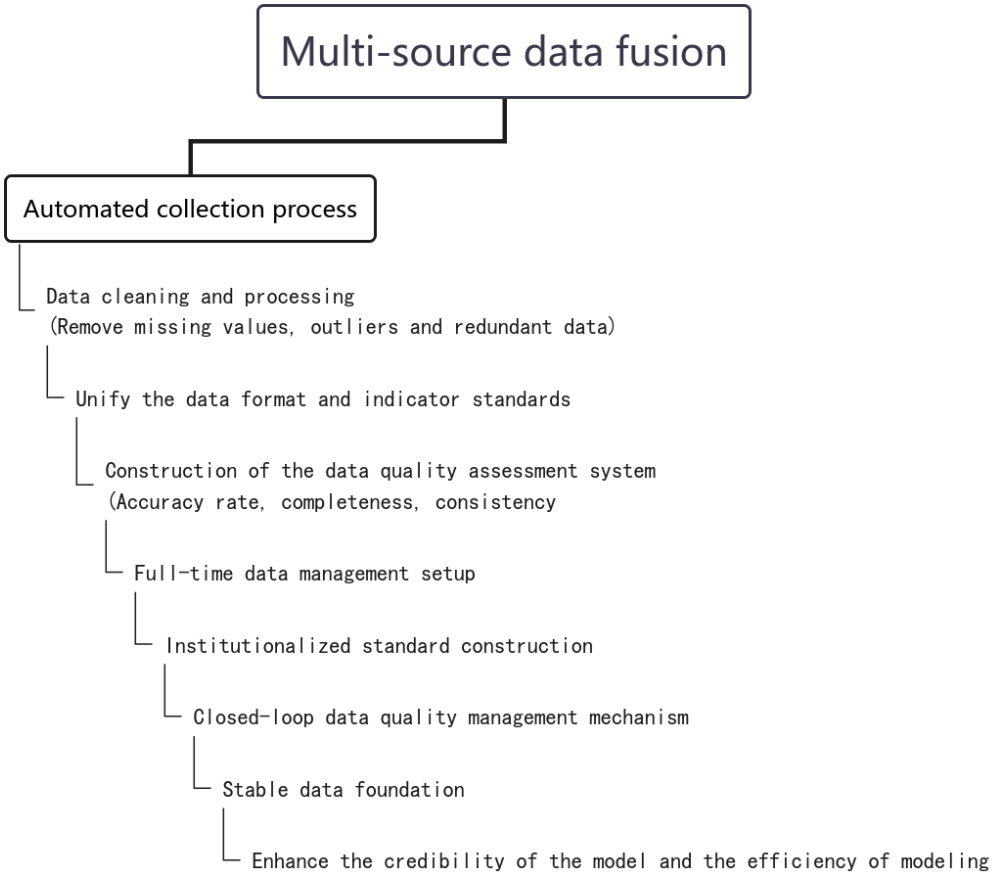

Figure 1. Flowchart of Data Quality improvement in financial Forecasting

Apart from the quality of the data itself, whether there is clear traceability during the process of data acquisition and processing is an important prerequisite for ensuring data quality. The functional data responsible persons of each link can be clarified by establishing standardized requirements for data flow, thereby reducing or eliminating errors caused by human interference.

3.2 Model Structure Optimization

The appropriate model architecture must be selected in order to simulate the relationships among financial data and have a certain degree of universality. When making a choice, an appropriate method should be selected based on the characteristics of the data, such as establishing a dynamic model using data with time series features; For example, complex relational data adopts deep-level construction techniques. On this basis, the method of integrating multiple models should also be utilized to optimize the robustness and predictive anti-interference ability of the model. Variables

should also be simplified as much as possible, and unnecessary features should be eliminated to reduce the complexity of the model. Examine the optimization in aspects such as model design, network construction, network connection and setting functions to transmit information more clearly and reasonably. To this end, the corresponding structural scheme effects of various structural schemes were calculated based on the training samples and verification samples and repeatedly optimized. A good model structure can better represent the characteristics of financial data, so the overall prediction effect can be better improved during the optimization process. To enhance the effect of the model structure design scheme, it is necessary to optimize the model structure in combination with the characteristics of the data to make it more suitable for the actual needs of the enterprise. This can not only simplify the variables but also improve the robustness and predictive anti-interference performance of the model structure.

3.3 Parameter Tuning and Training

The core element that affects the convergence speed and accuracy of the model is parameter adjustment. Different choices are made for different requirements, such as grid search, random search and probabilistic search, etc., to solve the hyperparameter problem; Meanwhile, set appropriate parameters such as the number of learning periods, learning rate and batch size to help the model achieve better performance while maintaining stability. When dividing the training set and the test set, it is necessary to pay attention to achieving balance to avoid offset between the training set and the test set, which may affect the performance of the model. Introducing the regularization mechanism into the model can reduce the possibility of overfitting and improve the generalization performance. Strict training steps and supervision of the training process and inspection process would be more beneficial. This can better control the parameter tuning process of the model and is more conducive to the re-training process of the model. As long as the design of the training link is reasonable, it is possible to generate a financial prediction model with high accuracy and good adaptability. During the training process of the model, a dynamic monitor is added. This system can monitor the performance of the model during its operation, so as to quickly discover the convergence problems of the model, or monitor the changes in losses, or detect the decline in model performance and other issues, making the entire training process more stable. The monitoring diaries of the training process, error change trends and gradient change data, etc. can be used for the adjustment of parameters during the subsequent retraining of the model. During the training process, in-depth comparisons and analyses of the performance of each sub-module or algorithm module are conducted to better construct more reliable and effective parameters and further improve the performance of the model.

3.4 Model Iterative Optimization

Model iteration is an iterative optimization process that continuously improves the model training of existing models. Establish regular retraining to enable the model to make adjustments and optimizations based on new data. The strategies of incremental training or online learning have been adopted to enhance the real-time adaptability of the model to new input data. Compare the performance of the model versions at different time points on the test set and select the better version.

When evaluating the effect of each round of iteration, the root mean square error (RMSE) can be used as the core indicator, and the calculation formula is as follows:

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(\hat{y}_i - y_i)^2} \tag{1}$$

Among them, $\hat{y}_i$ is the predicted value of the model, y_i is the true value, and n is the sample size. The smaller the RMSE is, the lower the prediction error of the model is, indicating that the optimization effect of this round of iteration is good.

Establish a model version management system, record the change content and performance indicators of each modification, and effectively track and manage the model; Set up a feedback mechanism for receiving prediction errors and importing them into the model for re-learning to achieve the goal of improving the accuracy and quality of the prediction cycle. Through a continuous and regular correction process, develop a self-improving financial forecasting system to enhance the enterprise's ability to respond and adapt to various environmental changes.

4. The influence of financial forecast optimization on decision support

4.1The influence of financial forecast optimization on decision support

Through the optimization of financial forecasting, achieve efficient overall decision-making for enterprises. By using the models constructed through data, enterprises can predict their future financial situation in a relatively short period of time and also improve the time from financial analysis to decision-making. Traditional pure manual analysis is time-consuming and inefficient. The repeated data processing and the assumption of repeated verification all pose obstacles to the timeliness and effectiveness of decision-making. However, by using the enhanced model, enterprises can quickly compare the financial change trends in various situations through the visually visible prediction results and key indicators, and make corresponding rapid response decisions and resource allocation accordingly. Moreover, because this model is highly automated and has strong data processing scalability, it increases many options, enabling enterprises to cope with complex environments and enhance the rapid response ability of managers. At the same time, as the burden and workload of the finance department are reduced, it can pay more attention to data analysis and strategy planning work, transforming the role of finance from back-end financial support to front-end led work. In simple terms, the optimization of financial forecasting forms an efficient and real-time response decision support system, reducing the lag and delay of information, helping business activities respond quickly and promoting organizational operation. It can also provide timely decision support for enterprises in emergency situations or abnormal business operations. The model can quickly make a series of assumptions in response to various situations, which will help the leadership to make rapid evaluations and choices under urgent time constraints, thereby saving a significant amount of decision-making time.

4.2Enhanced decision-making accuracy

Optimizing financial forecasting plays an important role in the accuracy of a company's decision-making. In the traditional decision-making process, company decisions are often completed based on fixed reports or personal experience, making it difficult to obtain a comprehensive grasp of future changes in financial information. However, relying on the optimized report data modeling method, historical data, market data, and internal and external variables of the company can be combined, and high-quality predictions and outlooks of future trends can be made by using a strict data architecture. This prediction result is based on extensive data research and algorithmic operations, avoiding errors caused by human subjective judgment and making the

decision-making more objective and scientific.

When quantitatively evaluating the effect of prediction optimization, the prediction error improvement rate index can be introduced to measure the improvement in accuracy brought about by model improvement. Its calculation formula is as follows:

$$\text{Improvement rate} = \frac{\text{Error factor - New Error}}{\text{Error factor}} \times \text{One hundred percent} \tag{2}$$

Among them, the original error represents the average prediction error of the model on the test set before optimization，The error is newly the error value of the optimized model.The higher the improvement rate is, the more significant the contribution of model optimization to the accuracy of decision-making is.

For enterprises, improving the financial budgeting work is of great significance. In the daily work of enterprises, decisions are made based on fixed reports or their own experience, making it difficult to fully grasp all future changes in financial information. The method of establishing models through the improved data can combine past records, market information, and various internal and external factors of the enterprise, and rely on rigorous data structures to make high-quality predictions and expectations for future development trends. The predicted data has the results of massive data analysis and algorithm operations. It avoids subjectively and wrongly judging the objectivity and scientificity of enterprise decisions.

4.3 Strengthening of risk control capabilities

Improved financial forecasting can enhance a company's ability to identify and respond to financial crises. By using modeling to identify abnormal situations and fluctuation patterns in the past, companies can obtain warning signals and take early countermeasures before threats arrive. High-quality predictive tools have the ability to detect the changing trends of key indicators such as cash flow disruption and excessive debt-to-asset ratios, which are of better help for early risk identification. This model can also be used to create a scenario simulation system to dynamically display the company's financial situation in various preset scenarios, enabling company managers to have better coping capabilities when subjected to external force impacts. Compared with the old method of statistical analysis relying on financial reports, this prediction system established based on data provides higher timeliness and sharper insights, which plays a significant role in enhancing the positive value of financial supervision. From these data, the company can take corresponding actions such as adjusting the capital structure, reducing expenditures or postponing investments to accurately understand the risk exposure. The risk classification generated by this model can be used to directly export the early warning system, thereby triggering the governance intervention activation mechanism at the upper level, and transforming the post-passive response into active prevention and control. In addition, the results of this risk assessment can also be used to guide the design of targeted hierarchical and regionalized response measures, making the allocation of resources more reasonable.

4.4 Collaborative Optimization of Enterprise Management

Financial forecasting improves decision-making ability and significantly enhances the synergy within the company. The richer the content included in the financial forecasting model is, the more it emphasizes that financial data is no longer exclusive to the finance department but becomes a common reference indicator for all departments of the entire organization. For the action plans that can be obtained under the same prediction conclusion, all business departments should uniformly

follow them to enhance the stability and coordination in the implementation of the organizational strategy. Managers at all levels of the company can formulate plans, allocate resources and adjust countermeasures based on the same predictive information to avoid unnecessary consumption and misjudgment and wrong decision-making caused by data differences. Taking financial forecasting as a fundamental tool for organizational communication helps eliminate barriers between departments and improve cross-departmental collaboration. The way information flows depends on model-driven standardization and normalization, thereby further amplifying the visibility and influence of data within the enterprise. From passive response to active prediction, the transformation of management methods promotes the establishment of a comprehensive framework for joint action. In fact, the improvement of financial forecasting promotes the new construction of the operational logic within the company, making its operation systematic, flexible and forward-looking, thereby forming a data-based collaborative management framework.

Improve the quality of prediction and further enhance the internal coordination system and processes of the enterprise. When the prediction results of the model were gradually integrated into the operation of the enterprise, the enterprise began to operate in a way based on data communication and cooperation. In the process of providing the estimated values and when applying these predicted values, each department has established an understanding of the logic of business data and financial standards, eliminated the information barriers among each other, and enhanced the agility of the company's overall decision-making response.Based on the parallel management involving cross-project and cross-regional operations, a consistent financial forecasting model can also serve as the fundamental equipment for synchronous and collaborative management, providing resource coordination support from a global perspective to the organization (see Table 2).

Table 2. Comparative Analysis of the Impact of Financial Forecast Optimization on Decision Support

Influence dimension	Traditional way	Changes after optimization
Decision-making efficiency	Manual processing is slow and has a long cycle	Information is scattered and communication is difficult
Decision-making accuracy	Experience-driven and prone to bias	Data-driven, high precision
Risk control	Lagging response, passive response	Early warning and proactive prevention and control
Management synergy	Information is scattered and communication is difficult	Early warning and proactive prevention and control

In the form of predictive collaboration, the enterprise integrates vertical and horizontal cooperation from front to back, left to right, and up and down, and operates the various businesses and employees of the enterprise in a coordinated manner. The management cooperation of the enterprise is vertically coordinated from top to bottom and horizontally coordinated from left to right, highlighting the overall coordinated and efficient operation management concept and institutional arrangement, and enhancing the organizational execution ability.

5. Conclusion

The role of using data for model modeling in financial forecasting is significant. This approach greatly facilitates the speed of information processing and ensures its accuracy. With continuous efforts to improve in aspects such as the quality of data processing, model structure, parameter learning, and model prediction response, the financial management work of enterprises has also

completed the transformation from an experience-oriented model to a data-centered model. Enhancing the accuracy and forward-looking nature of financial forecasting into the decision-making of enterprises can effectively improve their ability to deal with various business problems in the market and make scientific judgments for their decisions.

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