A method of forecasting trade export volume based on back-propagation neural network

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Abstract

Financial forecasting has been greatly improved in recent years, but at long horizons, forecast accuracy may be low. Foreign trade plays an important role in introducing advanced technology and equipment, expanding employment opportunities, increasing government revenue and promoting economic growth. The main purpose of this paper is to predict the export volume of foreign trade through a back-propagation neural network (BPNN). To shed light on the characteristics of foreign trade and the export volume calculation method, this paper uses BPNN for forecasting. This method has a unique and advanced advantage in solving nonlinear problems and is very suitable for solving forecasting and decision-making problems related to nonlinear financial systems. By establishing multifactor and single-factor export forecasting models, the export volume of a single Chinese city in recent years is forecasted and compared with the actual export volume. The forecasting accuracy of our model is more than 30% higher than that of the traditional forecasting method, and the application is also approximately 15% more accurate than the traditional method, indicating that the method used in this paper is more in line with the growth trend of the actual export data. As a key part of the economic system, foreign trade is an important force driving economic growth. Therefore, developing foreign trade is a suitable path to pursue growth.

Keywords Backpropagation neural network · Foreign trade export · Forecasting method · Export volume

1 Introduction

In a competitive market environment, the pure profit motive has been unable to meet the requirements of corporate sustainability, and companies have begun to develop further toward cooperation, sharing risks through the establishment of solid partnerships, information, and success. In this context, an increasing number of companies are beginning to attach importance to and establish a complete set of corporate supply chain partnerships. In doing so, while securing their own development, they can also enhance their core competitiveness.

Evolutionary algorithms are a general calculation method for economic problems. Compared with traditional evolutionary algorithms, such as genetic algorithms, evolutionary algorithms have been successfully used to deal with complex combinatorial optimization problems, image processing, artificial intelligence research and problems in other fields, although evolutionary algorithms themselves have certain problems, such as premature maturity and slow convergence speed. Neural networks are composed of a large number of neurons connected with adjustable weights and can analyze large-scale distributed storage information at the same time and learn spontaneously. BPNN, as a black-box supervised learning algorithm, can theoretically approximate any function during training, showing extremely strong mapping capabilities. The aforementioned neurons can solve XOR and other types of problems that simple perceptrons cannot. The research in this paper enriches and expands the current
literature on export trade forecasting, and its conclusions can provide a scientific reference for the government to formulate export policies.

Fuzzy system theory is a system theory that expresses the fuzziness contained in a system in the form of fuzzy sets and can deal with this fuzziness. To address the shortcomings of the previous studies summarized above, this paper proposes a nonlinear forecast of the total export volume based on neural networks and conducts empirical forecasts and macroeconomic analysis on the index system that affects future export trade. Studying export trade forecasts will lay a good foundation for further research. The forecasting results of two standard forecasting models are compared with those of three traditional methods: linear moving average forecasting, exponential smoothing and automatic forecasting. The comparison results show that the neural network export volume forecasting model has higher forecasting accuracy and a better data fit; finally, the model is evaluated.

The main organization of the article is as follows.

The introduction presents the main purpose of the research, namely, to predict the export volume of foreign trade through BPNN.

Among the methods of analyzing the characteristics of foreign trade and calculating export volume, a BPNN is used for prediction. It has unique and advanced advantages in solving nonlinear problems and is very suitable for solving nonlinear financial system forecasting and decision-making problems.

The analysis section forecasts the export volume in recent years and compares it with the actual export volume.

The conclusion shows that the method adopted in this paper is consistent with the actual export data growth trend. As an important part of the economic system, foreign trade is an important force driving economic growth.

2 Related work

Foreign trade forecasters have learned many lessons at home and abroad. Jiang B analyzes the importance of and methods for international forecasting. The international forecasting system is based on the analysis of the results of a global forecasting study. The concepts and foundations of the artificial intelligence network and the forecasting system are analyzed, as are their advantages, disadvantages and associated results. Different types and algorithms of vascular network models have been trained and developed. Virtual networking and advanced system technology are combined to create a predictive model. Then, taking into account external characteristics and the role of many factors, these evolutionary vascular network models are used for international market forecasting and the whole process of creating vascular growth forecasting models and vascular development networks. The whole modeling process is aimed at predicting the size of changes in exports and obtaining the best forecast results [1]. Grossmann SH proposed several indicators based on widespread PMI tests, which provided early indications of foreign activity [2]. Yatsenko established a direct link between increased exports to China and GDP growth in Ukraine under the reform agenda, attempting to explain the weaknesses and strengths of the approach and threats related to the pandemic. Using the model of gravity of international trade, other researchers have studied the impact of factors such as the global crisis and the creation of a free trade zone in Uzbekistan–China on foreign trade. The model data predict the expansion of foreign trade by 2022 through the creation of the free trade area, and the research further outlines the direction of development of strategic and trade relations [3]. Bin J analyzes the importance of and methods for conducting trade and export forecasts. The Trade and Export Forecast Index System is developed based on analyzing the research results of the trade and export forecast. The author explains the concepts and principles of artificial neural networks and fuzzy system theory and analyzes their strengths, weaknesses, and complementarities [4]. Zhu E trained and tested a model forecasting USD, EUR, JPY, and HKD exchange rates for the period between November 2017 and July 2018 in MATLAB using a multilayer neural network algorithm. The results show that exchange rate changes are regular and that different currencies have different change characteristics [5]. To determine the impact of the COVID-19 virus on the G8, Al-Najjar H employed a correlation analysis and an artificial neural network model [6]. Architecture selection is a basic problem in the use of ANNs. Wang R proposed an architecture selection algorithm based on multicriteria decision-making for single-hidden layer feedforward neural networks trained by extreme learning machines. Experimental comparisons demonstrated the feasibility and effectiveness of the method [7]. These studies have provided some evidence on the phenomenon of interest in this study, but due to some problems related to their sample data and study periods, the results are questionable. Multicriteria decision-making refers to decisions considering a finite (or infinite) set of conflicting and incommensurable alternatives.

3 Foreign trade export volume forecasting method

3.1 Neural network algorithm

The artificial neural network algorithm is based on biology and is simulated according to the characteristics of the
biological neural network. From the perspective of information processing, the human brain’s neuron network is abstracted, a simple model is established, and different networks are formed according to different connection methods. Each neuron connects to synapses \[8\]. In the human cerebral cortex, there are nearly 10 billion neurons and 60 trillion corresponding nerve synapses and connectors. The neurons of organisms are mainly composed of synapses, cell bodies, dendrites, and axons. However, a single neuron’s activity cannot meet the organism’s brain activity needs, which are not a simple accumulation of the functions of each part but the coordination of many units and various processing systems of the human body to meet the needs of human life activities \[9\].

The structure of a simple feedforward neural network and BPNN is shown in Fig. 1:

BPNN is currently a widely used learning algorithm. It is composed of three layers of neurons and belongs to the structure of a feedforward neural network \[10, 11\]. The expression for it is as follows:

\[
y = f\left( \sum_{i=1}^{n} w_{ij}x_i - \delta \right)
\]

where \(\delta\) is the threshold value, and the definition error is:

\[
J(W, b)_p = \frac{1}{2} \| y^p - y \|^2
\]

including:

\[
J(W, b) = \frac{1}{q} \sum_{p=1}^{q} J(W, b)
\]

It can be expressed as:

\[
w^{(l)}_{ij} = w^{(l)}_{ij} - \eta \frac{\partial J(W, b)}{\partial w^{(l)}_{ij}}
\]

Assuming that we expect the quantity value of the i-th output neuron to be \(d_i\), the forecasting error of the i-th neuron and error function of the output layer is:

\[
E = \frac{1}{2} \sum_{i} e_i^2 = \frac{1}{2} (d_i - y_i)^2
\]

The error equation can be written as:

\[
\Delta \phi_{ij} = -\eta \frac{\partial E}{\partial \phi_{ij}} \quad i = 1, 2, ..., n
\]

For each input \(x(k)\), calculate the output \(y(k)\) of each layer.

\[
Y(k) = [y_1(k), y_n(k)], y'_j(k) = \phi\left(s'_j(k)\right) = \frac{1}{1 + e^{-s'_j(k)}}
\]

\[
s'_j(k) = \sum_{i=0}^{N_{ij}} w'_{ji}y_{i-1}(k) = \left(W'_j\right)^iy^j(k)
\]

\[
\left(W'_j\right)^T = \left[w'_{j0}, w'_{j1}, ..., w'_{jN_{ij}}\right], w'_{j0} = -\theta'_j,
\]

\[
(Y'^j(k))^T = [1, y'_1(k), ..., y'_N(k)]
\]

Thus, the general situation can be derived; that is, for any i-th layer, there are

\[
\Delta w'_{ji}(k) = \delta'_i(k)y'_{i-1}(k)
\]

The BPNN is used to train the data according to the above steps. Due to the fact that the BPNN error can be transmitted backward, in the process of using data to train the network, the weight between each layer is continuously adjusted until the obtained data are close to the expected result \[12, 13\]. Up to this point, the BPNN still uses a relatively large number of feedforward learning algorithms, and it has an irreplaceable role in pattern recognition, intelligent control and other fields. A feedforward neural network is one of the simplest neural networks, where neurons are arranged in layers. Each neuron is connected

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(a) Simple feedforward neural network structure

(b) BP neural network topology

Fig. 1 Simple feedforward neural network and Back-Propagation Neural Network (BPNN)
only to neurons in the previous layer, receives the output of the previous layer and outputs it to the next layer without feedback between layers.

A BPNN is a multilayer feedforward neural network trained according to the error back-propagation algorithm.

The algorithm first analyzes the adaptation value; the quality of the adaptation value will have a direct impact on the GA performance. For some problems, the adaptation value can be solved by simple mathematical calculations, while for certain complex problems, two methods must be combined to solve them. When there are some important restrictions, it is possible to give priority to the adaptation value with a specific penalty function [14, 15]. Assuming that the methods are all arranged, the adaptation value is recalculated, the calculation results are sorted by size, and the probability of selecting copies is determined according to the proportion of the size of the adaptation value. If the objective function value of \( n \) sample data \( J_i \) is obtained, and \( J_1 < J_2 < \ldots < J_n \), the adaptation value can be calculated by the following formula:

\[
f_i = \frac{k r_i}{n} \quad i = 1, 2, \ldots, n
\]  

A certain mean compensation is required for the predicted value, and the exponential weighted moving average (EWMA) algorithm is used for compensation.

\[
X_i(h) = \lambda X_i(h - 1) + (1 - \lambda) \frac{1}{t_N} \sum_{i}^{N} t_i
\]  

Then, the expression to obtain \( X_i(h) \) is:

\[
X_i(h) = - \sum_{k=1}^{\infty} \delta(k) X_i(h - k) + \sum_{i=1}^{p} \varphi_i
\]  

After the number of steps \( h > q \) is predicted, the moving average term will not exist, and the predicted value will be completely determined by the autoregressive term. For the initial value of the sequence, that is, the value of the sequence when \( t \leq 0 \), \( 0 \) can be used instead, or the backward forecasting technique can be used to derive it [16].

### 3.2 Foreign trade

Since the financial and economic crisis, the global economic situation has been in a state of vulnerability. The increase in unemployment in Western countries has brought many destabilizing factors to society. However, nearly ten years have passed since the economic crisis. Emerging economies and developing countries have gradually become important forces in the world economy, and the global economic situation as a whole is in a state of recovery.

With the financial crisis, the global economy suffered an enormous blow; however, the consumption and production capacity of countries such as China, Africa, and some Middle Eastern countries are steadily improving, especially with the rise of China, which has brought enormous new momentum to the global economy [17]. The status of developing countries in future global economic dynamics will steadily increase.

From the perspective of China’s macroeconomic trends, the country’s economic development level has continuously improved in recent years, and at the same time, its new economy has emerged as an indomitable force for development [18, 19]. For example, information technology and e-commerce have gradually gained a firm foothold, and the sharing economy has become popular. In addition, the new economic system in terms of new energy and environmental protection will continue to improve. Technological innovation and technological development will be an important factor in future economic development, and human resources will be an important guarantee for the development of the economy in various countries.

Although China is still the most densely populated country in the world, the cost of labor and land has continued to rise in recent years. Its population dividends have gradually disappeared. In addition, with the development of society, people are becoming increasingly educated, and increasingly fewer people are willing to work in factories. Therefore, China’s competitive advantage in foreign trade must be gradually transformed from leveraging its labor cost advantage to developing a technological advantage; however, this transformation has not yet been fully realized. In recent years, as traditional competitive advantages have weakened, the foreign trade situation has remained delicate and complex. In particular, the traditional export competitive advantage of the foreign trade industry has further weakened, and new advantages have not yet been formed. The traditional competitive advantage of China’s export sector has mainly been its low-cost production and large quantities of sales.

Although traditional linear forecasting models such as time-series forecasting and linear regression forecasting have the advantages of intuition, simplicity, and robust interpretation, they are difficult to solve for forecasting problems of strong nonlinear systems. Due to power considerations and the multiple factors and nonlinear characteristics of the international trading system, nonlinear forecasting methods must be used. Research shows that BPNN has made progress in predicting nonlinear problems. It can map any nonlinear problem, which is very useful for solving nonlinear problems. This method has unique, advanced advantages and is very suitable for predicting dynamic nonlinear export trade systems. The flowchart of modeling and forecasting is shown in Fig. 2:
3.3 Impact indicators of export trade

Exports are influenced by domestic and international factors and are a nonlinear system. Although traditional linear forecasting has the advantages of intuition, simplicity and robust interpretation, it is inappropriate for addressing problems related to predicting powerful and complex systems. A network is a weak system with weak mapping power and strong family power and tolerance. It has unparalleled advanced capabilities for solving inequality problems and is very good for solving forecasting and decision-making problems related to noncritical economic systems. The general practice is to evaluate the data and intelligence collected by market research, such as export volume, unit price, quality specifications, and product characteristics, to confirm their accuracy and authenticity; to standardize the quality requirements of export products and import and export trade policy and determine pricing factors; and to determine the market scope based on export product performance, quality and price requirements.

The use of BPNN for export forecasting can be divided into two steps. The first is to train the BPNN with historical data, and the second is to use the trained BPNN to predict the value of exports at some point in the future. The specific steps are as follows:

1. Sample data with good typicality and high correlation as the training and test samples. If overly specialized data are selected, the generalizability of the trained BPNN will be weakened, and the forecasting ability will be reduced. In addition, the number of selected sample observations should be moderate, neither too low nor too high; if too few observations are used, the fitting ability of the obtained network will be poor; if too many are used, the calculation will be demanding, which may cause the network to overfit or even lead to the ultimate failure of forecasting.

2. Determining the structure and training parameters of the BPNN. Different network structures and training parameters have a great influence on the forecasting results. Some networks may therefore not converge. Even if results are obtained, their accuracy will vary. Therefore, during the experiment, different training parameters (such as the number of hidden layer nodes and training times) should be continuously selected to train the network and obtain better results.

3. Training the network. Training the BPNN is a very important part of the entire commodity export forecasting process. If the network is not well trained, it may not converge, or the accuracy of the forecasting may not meet the corresponding...
requirements. If this occurs, the network must be reconstructed and retrained. Then, we must check whether the reconstructed network meets the accuracy requirements; otherwise, it is necessary to repeat this process until a satisfactory result is obtained.

(4) Result analysis and evaluation. We analyze the output results of the network to see whether the network error meets the requirements of practical applications and whether the generalizability of the network is good. If it meets the requirements, the trained BPNN can be used to predict commodity exports.

This work refers to the results of previous research and focuses on the large geographical area, birth conditions and preferred export market policy area of Zhejiang Province. The macroeconomic factors affecting the total amount of international trade in Zhejiang can be divided into four categories: system factors, physical conditions, policy factors and global system factors. Systemic factors include those such as the state of the national economy, the inflation rate and housing savings, the use of foreign capital, investments in fixed assets and technological progress. Physical factors include the total economic value of the area, capacity, living resources and labor costs, and policy factors include exchange rates and international incentives. Finally, global system factors include international economic growth, imports and exports, international industry indicators, nonprofit trade barriers and trade relations. The data of the indices capturing these variables are shown in Table 1.

Multiple linear regression is performed on the 5 indicators in Table 1 to obtain the regression analysis results shown in Table 2.

The fit of the multiple regression is good. The regression line has a higher fit than the real trend line. However, from an economic point of view, the results of this multiple regression analysis deviate from the actual export trade situation. The total output value is correlated with the export volume in the same direction, and the multiple regression effect is negatively correlated and thus cannot explain the actual economic outcomes.

4 Experiments and results

4.1 Regression results

The correlation between the export value and influencing factors is shown in Table 3.

The threshold for screening influencing factors according to the correlation coefficient is set to 0.1 to eliminate those with a small coefficient of correlation with the target variable. As seen from Table 3, the five influencing factors selected in this article meet the requirements.

The trade volume is subjected to a ternary linear regression, as shown in Table 4:

The inclusion of the individual indicators X1, X2, and X4 does not significantly improve the regression effect. Although the $R^2$ increases, neither X1 nor X4 pass the test, and the coefficient on the dependent variable X4, reflecting the relationship between urban and rural residents’ savings and the amount of savings, decreases from the initial positive correlation to a negative correlation. This reversal in sign on the coefficient of export trade does not correspond to the true economic significance, in contrast to the result of the abnormal linear regression of a single indicator. To summarize the results of the linear regression analysis, it can be concluded that there is an interaction between the various indicators of influence—that is, that the export trade system is a nonlinear system with multiple influencing factors and that a nonlinear forecasting method should be applied for forecasting.

4.2 Algorithm forecasting and results

The indicators that affect export trade in our city of interest are tested as model parameters and applied to forecast the export trade volume. When the multifactor forecasting model is used for forecasting, this article takes five key macroscopic quantitative parameters that affect the export trade volume as the input dimensions of the model. The parameter time voltage $T$ is also called the input level parameter, which is replaced in the network integration attribute, so the number of model integration dimensions is 6. After repeated experiments, the number of neurons in a single hidden layer is finally determined, and a BPNN model is established. The actual value of the city’s export volume, model forecasting results and errors are shown in Fig. 3.

From the historical data of the city’s export trade volume, it can be seen that before 2000, the development of export trade was unstable, with large ups and downs. Since

| Table 1 | Data of various impact indicators |
|---------|----------------------------------|
| Year    | X1 | X2  | X3  | X4       | X5  |
| 2016    | 1352.46 | 450.64 | 42,478 | 878.1 | 742.34 |
| 2017    | 1472.13 | 552.75 | 44,567 | 997.52 | 795.94 |
| 2018    | 1623.54 | 714.26 | 51,307 | 11,324.24 | 842.69 |
| 2019    | 1934.59 | 974.71 | 56,523 | 1373.41 | 884.24 |
| 2020    | 2124.97 | 114.82 | 61,780 | 1794.32 | 891.87 |
2000, although export trade declined in 2001, it has basically maintained a growth trend. The actual and predicted values are shown in Fig. 4, and the error values are shown in Fig. 5:

The main reasons for the ups and downs in export trade are national policies, changes in the international market, economic conditions and unexpected factors. At the same time, to control inflation, the state has adopted stricter fiscal policies, increased bank loan interest rates, lowered preferential policies for foreign trade companies, and raised loan interest rates by 1.08%. Lowering the tax rate directly reduces the cost of export products; however, due to the early timing and insufficient amount of the tax cut, it considerably squeezed the funding for export enterprises, increased the burden on corporate interests, and increased loan interest rates. The export of enterprises has led to slow growth of the export trade.

In the simulation of the forecasting algorithm, since the optimal embedding dimension and delay time of the time series cannot be determined, the delay time is set to 1. The embedding dimension is determined by multiple training methods. The neural network with the best forecasting effect is used as the algorithm forecasting network, and the maximum number of neurons is limited at the same time. The results can be obtained as shown in Fig. 6.

The increase in the time scale, the volatility of the sequence is smoothed to a certain extent, so the number of clusters of burst points is significantly reduced, but there are still individual single-peak burst points.

### Table 2: Multiple regression results of main indicators

| Variable                                | Coefficient | Standard error | t  |
|-----------------------------------------|-------------|----------------|----|
| Export value                            | -5241.32    | 1624.5         | -0.031 |
| Gross product                           | -87.26      | 35.42          | -1.798 |
| Fixed asset investment                  | 172.35      | 69.42          | 0.175  |
| Actual utilization of foreign capital   | 0.234       | 0.341          | 1.087  |
| Year-end balance of savings deposits    | 12.45       | 57.33          | 0.098  |
| Exchange rate                           | 82.34       | 36.45          | 1.035  |

### Table 3: Regression results of individual impact indicators and export value

| Regression term | X1     | X2     | X3     | X4    | X5     |
|-----------------|--------|--------|--------|-------|--------|
| X1              | 1.000  | –      | –      | –     | –      |
| X2              | 0.885  | 1.000  | –      | –     | –      |
| X3              | 0.939  | 0.988  | 1.000  | –     | –      |
| X4              | 0.918  | 0.892  | 1.000  | –     | –      |
| X5              | 0.726  | 4.381  | 0.998  | 3.871 | –1.204 |
| Y               | 0.902  | 0.954  | 0.961  | 0.975 | 0.974  |
The forecasting results of the two BPNN forecasting models established in this paper are closer to the real value in each time period, the forecasting error is within 4%, the forecasting accuracy is high, and the data fitting degree is significantly better than that under the moving average forecasting and exponential smooth forecasting models. The autoregressive forecasting is shown in Fig. 7:

It can be seen that the forecast of export trade volume based on BPNN is better than that based on the traditional linear forecasting method. The forecast accuracy and data fitting effect of the multifactor BPNN forecast and the single time-series BPNN forecast are significantly better than those of the traditional linear forecasting method. Therefore, it can be concluded that the export forecast model and the predicted result can be used as the forecast value of the relevant department’s estimated export trade volume.

5 Discussion

5.1 Neural network forecasting

A neural network is an accurate forecasting and decision-making system used in the field of financial management. The results of previous research show that network technology is very good for predicting and decision-making problems in inefficient financial systems. After analyzing the specific characteristics of the export market system, this article summarizes the key indicators of the impact of the export market system and uses the first five factors that influence related sectors as the export volume forecasting
model. The forecast results for the export market size based on the network with many BPNN factors are comparable to those based on the network with the export trade volume time series. Both sets of results have high predictive accuracy and good data recovery outcomes. The accuracy of the single-factor forecasting model is higher than that of the multivariate forecasting model.

However, predictions based on a single time series can also be subject to sudden and irregular interference from factors such as data laws and store them in matrix weights through learning and training, which will lead to distortion of the model and its economic significance. Single-factor forecasting is thus not as clear as multifactor forecasting. In actual export volume forecasting, the two forecasting models can be used in combination.

### 5.2 Forecast results

The main manifestations of trade policies are tariff and nontariff policies or measures. Since the root causes of the global financial crisis have not been completely eliminated, the contradictions and difficulties it has brought about have not been fundamentally resolved. Many uncertainties and instabilities exist in the development of the world economy, severely intensifying countries’ competition over various resources. At the same time, due to the rise of protectionism in international trade policies, the development of international trade is increasingly at risk. These situations may pose problems for China’s industry and trade.

This model is based on BPNN and is calculated and solved accordingly. Compared to the forecast results of the custom linear model, the forecast results of the two models have higher forecasting accuracy and better data retrieval and are more in line with the actual export volume and real development of the economy. The prognostic results show that the predictive accuracy of the export volume forecast is higher for the single-factor model than for the multifactor forecasting model. The reason is that multifactor forecasting cannot cover all the possibilities and quantitative factors that affect the export volume, which reduces the accuracy of the model forecast. In the time-series forecasting model, the international export volume time series is the result of all factors, so the model has the highest forecasting accuracy. However, predictions based on a time series can also hide sudden and unstable factors. For example, through learning and training data rules, the model is distorted, and the economic significance of a series forecasting model does not appear as predicted.

### 6 Conclusion

Export trade is affected by various factors, such as domestic and foreign politics and economic conditions, and is also restricted by the geographical environment and local conditions, which means that the export trade system is characterized by nonlinear, multifactor, and time-varying complexity. This paper uses econometric methods to construct the supply and demand function of Chinese products, estimate relevant parameters, and then establish a BPNN model to analyze and predict the supply and demand of Chinese products, import and export trade volume, and trade market structure. Of course, this article also has some limitations. The data studied in this article come from relevant websites on the city of interest. There may be some errors in the actual data. The neural network algorithm in this article uses only BPNN, which must be executed using multiple algorithms. Through comparison, the best algorithm solution can be found. In future work, data collection should be strengthened, and multiple algorithms should be used for optimization calculations. China’s trade plays a very important role in expanding employment opportunities, improving people’s living standards and stabilizing economic society. Analyzing the current foreign trade situation and forecasting the import and export volume will further promote the development of trade, and thus, it has very important practical significance.

### Declarations

**Conflict of interest** The author declares that there is no conflict of interest with any financial organizations regarding the material reported in this manuscript.

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