

The Interaction between China's Goods Trade Imports and Export Development --Empirical Analysis Based on VAR Model with Co-integration Test

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Abstract: International trade theory believes that goods import and export have different relationships in different countries, this paper uses the year of 1978 to 2020's Chinese goods import and export data to establish a VAR model and co-integration test of the econometric model for empirical analysis, this paper found that: (1) imports and exports of goods trade show a positive relationship, there is a unique co-integration relationship; (2) From the VAR model can be analyzed obtained that the import of goods trade is the Granger cause of export, that is, the export of goods can promote the development of goods import. Therefore, it is believed that there is a development interaction between the import and export of goods in China, and China should improve the relationship between import and export by driving the export with import, so as to develop our foreign trade stably.

Keywords: Goods Import; Goods Export; VAR Model; Cointegration Test

1. Introduction

1.1. Background of the Study

China's reform and opening up has been a huge boost to economic growth. Since China's reform and opening up, its economy has shifted from an inefficient planned economy to a more efficient market economy and from closed to developed. Under this transformation, China's economy has developed rapidly and become a well-deserved manufacturing power, and its comprehensive national power has been increasing, especially after China joined the WTO and began to develop strongly towards the world in a comprehensive manner, and its influence on the world economic landscape has been increasing. However, with the increasing degree of opening up to the outside world, China's import and export of goods is also accelerating, and the relationship between import and export is not very clear reveals some problems, for example, the structure of import and export is not very reasonable, and the dependence degree of oil and other resource goods import is too high. As the most basic and important part of foreign trade, the role of the relationship between imports and exports cannot be ignored. Therefore, analyzing the relationship between imports and exports from different perspectives is particularly important for formulating long-term trade in goods development policies that can adapt to China's economic growth rate. In particular, the relationship between import and export trade of goods, the continuous accumulation of China's comparative advantage in goods trade, for the optimization of China's import and export economic structure also has important reference relevance^[1] It is also important to optimize the economic structure of China's imports and exports.

The current relationship between imports and exports has been studied by a large number of scholars for a long time. Generally, scholars believe that there are four types of relationships between imports and exports of foreign trade: one view is that exports of foreign trade drive imports. Ren Yongju (2003) believes that in the short term in China, China's foreign trade imports affect exports, and most domestic processing trade enterprises import because of exports^[2]. Yin, Zhonghua and Song, Weiming (2009) further studied the correlation between exports and imports using woody forest products, showing that exports of woody forest products have a significant positive correlation with imports of logs, while imports of logs show a non-significant correlation with exports of woody forest products^[3]. The second view is that foreign trade is not significantly correlated with imports. The second view is that imports of foreign trade drive exports. In the study of the relationship between imports and exports, Zhang He et al.

(2005) analyzed that the growth rate of imports significantly affects the growth rate of exports^[4] Liu (2005), in his study of the incentives of export tax rebates on exports using cointegration test model, concluded that in the long run there is an incentive effect of imports on exports in China^[5]. Tolga Tiryaki (2019) developed a business cycle model for a small, single-sector open economy and concluded that the countercyclicality of net exports increases with the share of imported inputs. A third view, represented by Husted, uses quarterly U.S. trade data from 1967-1989 to show that there is a long-run relationship between exports and imports, estimating a positive sign on the cointegration coefficient^[6]. Arize (2002) also provides evidence of a long-run equilibrium relationship between exports and imports in the Indian economy using Johansen-based cointegration analysis and a single equation approach^[7]. They both argue that imports and exports of international trade promote and influence each other. The fourth view is that there is no particular correlation between the two, but only shows some correlation in individual countries. The findings of Fountas and Wu (1999) are in sharp contrast, as they argue that the hypothesis of no long-run relationship between imports and exports cannot be rejected, thus implying that the U.S. trade deficit may be unsustainable^[8] Using unit root and cointegration methods, Konya and Singh (2008) allow for a structural breakthrough in 1992-93 and find no evidence of cointegration between Indian exports and imports for the period 1949-50 to 2004-05^[9].

Currently, scholars mainly study the relationship between the import and export of goods and economic growth, ignoring the relationship between the import and export of trade in goods. Bingjin Fan and Jintian Wang (2005) argue that in the long run imports present a certain inhibitory effect on economic growth, but the inhibitory effect of this effect is much smaller than its promotional effect^[10] The effect of import is much smaller than that of promotion. Yao Zhanqi (2009) illustrates that the export of service trade is positively related to fund growth from the perspective of service trade, and the import of service trade has a more significant impact on economic growth than the export of service trade^[11]. The effect of import of service trade on economic growth is more significant than that of export of service trade. Zhang Luqing and Wang Weiwei (2010) further confirmed the unilateral effect of imports on economic growth and trade from the perspective of import demand function by using the boundary cointegration test^[11]. Zhang Xiaoyu (2019) argues that at some important time points, the effects of trade exports and imports on economic growth show different positive effects in Chengdu^[12]. By constructing a source-sink interaction matrix analysis framework, Xiong Chenran et al. (2021) point out that China's imports and exports have a two-way interaction relationship on the economic relations of neighboring countries^[13].

Many scholars have also studied the equilibrium relationship between import and export trade. Wang Qunyong (2004) talked about the existence of a certain degree of constraint on the long-run equilibrium relationship between imports and exports using jealousy data and vector error correction models^[14]. Li Xin (2011) further analyzes the error correction model from the perspective of prices and obtains that there is a significant correlation between prices and imports and exports in the short run, and in the long run, regardless of the situation, imports and exports will be in an equilibrium state^[15]. In the long run, regardless of the situation, exports and imports will be in an equilibrium.

Based on the existing studies, this paper uses VAR model and cointegration test to study and analyze the relationship between exports and imports of trade in goods. Compared with the existing literature, the contributions of this study are: (1) This paper is a realistic reference to study the relationship between exports and imports from the perspective of trade in goods, and analyze the intrinsic influence mechanism and promotion relationship. (2) The VAR model is used, i.e., the model is constructed by taking each endogenous variable in the system as a function of the lagged values of all endogenous variables in the system, thus extending the univariate autoregressive model to a vector autoregressive model composed of multiple time series variables, which can reduce the uncertainty in the joint cubic system model due to subjective judgment errors and thus can study the relationship between exports and imports more precisely.

1.2. Significance of the Study

The study of China's import and export relations has important practical significance. After 1978 year of reform and opening up, China's foreign trade has been expanding, China's import and export trade began to grow rapidly, after joining the WTO more domestic enterprises to provide more opportunities for fair competition, China has become a big trading country. However, a large trading country is not the same as a strong trading country, China's foreign trade in the existence of problems can not fail to attract our attention.

China's total import and export trade has been increasing year by year. China's foreign imports and exports grew from US\$20.64 billion in 1978 to US\$620.77 billion in 2002, and the total value of imports

and exports reached a new high of US\$851.21 billion in 2003. China's economic and trade pattern has changed, but the substantial export products are still mainly labor-intensive products, industrial value-added is not high. And trade partners are too concentrated, risk resistance is not enough, China's trade partners are still relatively concentrated in Eurasia and the Americas, especially a limited number of major countries in the world, such as the top 3 were Japan, the United States and the European Union, the trade volume of these three accounted for nearly half of the total. This trade pattern does not have sufficient risk resistance. Traditional industries with advantages by the international market is relatively large impact. China's traditional advantageous industries are mainly some labor-intensive industries, and in recent years the international market for these industrial goods has shrunk. The study of the relationship between import and export of goods can provide an important reference significance for effectively solving the above problems.

The import and export of goods is the primary issue that must be faced in regulating China's foreign imports and exports. Along with the implementation of China's foreign trade optimization strategy, which has led to changes in the structure and relationship of foreign trade to varying degrees, a clear understanding of the relationship between China's imports and exports is something that policy authorities must take into account when designing economic strategies and policies.

2. Theoretical Analysis of Import-export Relationship

2.1. The Main Theory of International Trade in Import and Export

The development of international trade theories concerning imports and exports has broadly gone through four major stages: classical, neoclassical, neo-trade theory, and new classical international trade theory. Classical and neoclassical international trade theories are premised on assumptions such as perfectly competitive markets, emphasize the interactivity of trade, and mainly explain inter-industry trade. After World War II, with the new peach of global trade as an opportunity, the new trade theory came into being, explaining new trade phenomena from the perspective of imperfect competition, economies of scale, technological progress and other pairs. Neoclassical international trade theory, on the other hand, explains trade by specialization division of labor, and tries to agree the traditional trade theory and new trade theory within the framework of an emerging classical trade theory.

Classical international trade theories mainly include the theory of absolute advantage, the theory of comparative advantage and the theory of protected trade.

The theory of absolute advantage is proposed by Adam Smith on the basis of the theory of division of labor, he pointed out that the basis of international trade depends on the absolute difference of labor productivity and production cost of the products produced by each country, he humanities in the international division of labor, countries should specialize in the production of products with absolute advantage, export products with absolute advantage, import products with absolute disadvantage, which will make the most effective use of the resources of each country, better promote the import and export of each country, is the maximum benefit for each country. This will make the most effective use of the resources of each country, better promote the import and export of each country, is each country to obtain the maximum benefit.

The theory of comparative advantage British economist David Ricardo as early as the 19 century first proposed a principle that a country in two products producers have an absolute advantage over another country, but the degree of advantage of one of the products is greater, we say that this commodity has a comparative advantage, the other product has a comparative disadvantage, a country with a comparative advantage exports products in which the country has a comparative advantage, imports have a comparative disadvantage products.

Protective trade theory, also known as infant industry protection theory, was proposed by German economist Friedrich Lister 1841in , who argued that an industry should be protected until it grows to be competitive, and it is the industry that grows to the optimal size.

The neoclassical international trade theory mainly includes factor endowment theory. The factor endowment theory was proposed by the Swedish economist Elie Heckscher with1919 the year and was further confirmed by R öhring in the 1930year. The core of the theory is that under the premise of equal technology level of two countries, the difference of comparative cost is generated by the factor abundance and factor intensity of products between two countries, and countries should produce and export those products that use their own abundant factors and export those products that use scarce factors intensively.

This results in improvements for all participating countries.

The new trade theory mainly includes preference similarity theory, dynamic trade theory and product life cycle theory. The product life cycle theory was proposed by Raymond Vernon with 1966 years. The theory emphasizes the standardization process of products and points out that the demand for production factors is different at different stages of the product's life cycle, and the abundance of production factors that different countries have determines the stage of production and export status of the country's products.

Trade theories continue to be enriched and developed as globalization progresses. Since the 20th century, the emerging classical trade theory has been developed, these theories rely on the new framework of emerging classical economics, the cause of trade is attributed to the division of labor brought about by the economy of specialization and transaction costs of the conflict between the results, so as to give a new explanation of the causes of international trade ideas, so that trade theory will return to the increasing returns to scale caused by the division of labor, is a kind of endogenous dynamic advantage model. It is a model of unification of trade theory and trade policy, a unification of domestic trade and international trade, and a new development of trade theory that can integrate various trade theories instead.

2.2. Import Substitution Strategy

Import substitution strategy is also known as "inward development strategy". Import substitution was introduced in the 1950s and 1960s by two economists from developing countries, Prebisch and Singh, and has since been pursued to varying degrees by many developing countries in Asia, Africa and Latin America. It is a strategy of replacing imports with domestic products, or, in other words, promoting domestic industrialization by limiting imports of industrial manufactures. It is the strategy of reducing or completely eliminating the import of that commodity for the purpose of economic autonomy, with the domestic market being supplied exclusively by domestic producers. Since the implementation of this strategy must be accompanied by trade protection policies, it is not conducive to the promotion of domestic labor productivity and industrial technological progress, and even more so to the export of products. It is too long and is not conducive to further economic development.

Import substitution generally goes through two stages. In the first stage, a number of final consumer goods industries are first established and developed in order to replace imports with domestically produced consumer goods, and then enter the second stage when domestically produced consumer goods can replace imported goods and meet domestic market demand. In the second stage, import substitution shifts from consumer goods to the production of capital goods and intermediate goods, which are in short supply in the country. After these two stages of development, the import point industries become increasingly mature and lay the foundation for full-scale industrialization. The core of the theory lies in the use of trade protection policies to protect the development of the domestic economy and change the structure of imported goods.

2.3. Export-oriented strategy

Export-oriented strategy, also known as export substitution strategy, is a product of export-oriented economic development strategy. This strategy was first proposed by Lannes in 1973 (2007), based on David Ricardo's "theory of comparative advantage", which refers to the measures taken by the state to promote the development of export-oriented industrial sectors, replace traditional primary exports with non-traditional exports, expand foreign trade, diversify export products, in order to promote the development of industry and the economy as a whole. The core element is that developing countries should aim to produce industrial products with advantages in terms of cost and price, and to improve the terms of trade by exporting to developed countries to boost imports and economic growth. The export-oriented strategy focuses on the positive effect of exports on economic development by deep processing of primary products and then organizing the export of products to replace the export of primary products.

In recent years, the more consistent view on export-oriented strategy is that exports have become one of the "troika" to drive economic growth, especially when domestic demand is insufficient, exports can expand external demand to make up for the lack of domestic demand.

In the short term, export-oriented strategies can help a country achieve high economic growth by relying on international markets, but long-term reliance on export-oriented strategies is not feasible. The outbreak of the Asian financial crisis revealed the limitations of export-oriented strategies. Compared with import-substitution trade strategy, the most important feature of export-led strategy is to

continuously promote the process of market economy, through the removal of various policy restrictions, give full play to the advantages of low-wage labor in developing countries, and expand the exports of labor-intensive industries, so as to drive economic development. However, since the export markets are mainly developed countries, the excessive pursuit of exports will result in a tendency of "dualization" within the industrial system. That is, the over-expansion of export industries and the relative shrinkage of domestic industries, which is the origin of the sharp shrinkage of the semiconductor industry in Korea.

3. Empirical Analysis

Based on the previous international economic theory, this paper establishes a VAR model and cointegration test method to conduct empirical analysis using Chinese data.

3.1. Data Source

In this paper, the data of 1978 to 1997's import and export value of goods are taken from the Compilation of Information of New China's Fifty Years of Statistical Construction, and the data of year 1998 to 2020 are taken from the China Statistical Yearbook. In order to make the data comparable, this paper takes the 1978 year as the base period and uses 1978 the price index to correct the variables, changing them from nominal variables to real variables. In order to eliminate the heteroskedasticity of the time series of China's goods imports and exports, the above two data are taken as logarithms to LNX denote the goods exports variable and LNM the goods imports variable.

3.2. Model Design

3.2.1. Model Analysis

This paper presents an empirical study with the help of VAR model proposed by Christopher Sims. It has been established that there is some direct effect relationship between imports and exports of a country. The vector autocorrelation (VAR) model, which constructs the model by taking each endogenous variable in the system as a function of the lagged values of all endogenous variables in the system, thus extending the univariate autoregressive model to a vector autoregressive model consisting of multiple time series variables, can reduce the uncertainty in the joint cubic system model due to subjective errors in judgment, and thus can study the relationship between imports and exports more precisely. relationship. As a result, the VAR model is used in this paper, and the basic model is as follows.

$$\begin{pmatrix} LNX \\ LNM \end{pmatrix} = \begin{pmatrix} LNX_{t-1} \\ LNM_{t-1} \end{pmatrix} + \begin{pmatrix} LNX_{t-2} \\ LNM_{t-2} \end{pmatrix} + \begin{pmatrix} LNX_{t-3} \\ LNM_{t-3} \end{pmatrix} + \dots + \begin{pmatrix} e_{1t} \\ e_{2t} \end{pmatrix}, t = 1, 2, \dots, T \quad (1)$$

Where LNX denotes the amount of goods exported and LNM denotes the amount of goods imported e as random interference terms.

3.2.2. Smoothing Test of Time Series

In order to make sure that there is no random trend or definite trend in the time series, which would otherwise give rise to the problem of "pseudo-regression" we usually perform a smoothness test. Pseudo-regression, also known as spurious regression, means that sometimes the data are highly correlated simply because they have an upward or downward trend over time at the same time, but are not really related. The trend term, seasonal term, etc. in the data cannot be eliminated and thus cannot be accurately analyzed in the residual analysis.

And the time series data are not obtained by random sampling, we use is a smooth time series as a sample, establish a classical econometric model, and conduct a smoothness test, the smoothness of the time series can replace the random sampling assumption.

Therefore, when performing data analysis of time series is, in order to prevent problems arising from non-stationary series, we usually test the stationarity of time series variables, which is generally judged by unit root. In this paper, the ADF test is used to determine the smoothness of the time series.

$$\text{Model1: } \Delta X_t = \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t \quad (2)$$

$$\text{Model2: } \Delta X_t = \alpha + \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t \quad (3)$$

$$\text{Model3: } \Delta X_t = \alpha + \beta T + \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t \quad (4)$$

The original hypothesis $H_0 : \delta = 0$, i.e., the existence of a unit root. The parameter estimation by X_{t-1} looks at the test of the t-statistic of the parameter to determine whether a higher-order autocorrelation has a unit root.

3.2.3. Co-integration Test

There are two methods of cointegration tests; the first is the Engle-Granger test for two variables proposed by Engle and Granger used in this paper, and the second is a multiple cointegration test based on a vector autoregressive model proposed by Johanson and Juselius, called Johanson test. While in this paper there are only two variables, it is convenient and concise to use the bivariate Engle-Granger test, so this paper uses the bivariate Engle-Granger test to analyze the time series.

First, the unbalanced error is calculated using ordinary least squares estimation of variance.

$$\hat{Y}_t = \hat{\alpha}_0 + \hat{\alpha}_1 X_t \quad (5)$$

$$e_t = Y_t - \hat{Y}_t \quad (6)$$

e_t The smoothness of the re-performing. If it e_t is I(0), then Y,X is considered to be cointegrated of order (1,1). Otherwise, the variables Y and X are considered not cointegrated. The ADF test is used in the smoothness test e_t . Since the cointegrating regression already contains an intercept term, there is no need to use the intercept term in the test model; if the cointegrating regression also contains a trend term, there is no need to use the time trend term in the test model. Model1 used.

$$\Delta e_t = \delta e_{t-1} + \sum_{i=1}^m \theta_i \Delta e_{t-i} + \varepsilon_t \quad (7)$$

To perform the test, the parameter estimation by e_{t-1} looks at the test of the t-statistic of the parameter to determine whether a higher-order autocorrelation has a unit root. If the null hypothesis of unit root is rejected, it means that the error term e_t is a smooth series, thus indicating that Y and X are cointegrated, and conversely, Y and X are not cointegrated.

3.2.4. Vector Error Correction Model

In this paper, the error correction model (ECM) proposed by Davidson, Hendry, Spar, and Yeh is used. The error correction model is used to explain the short-run change relationship of variables. In the case where a long-run equilibrium relationship already exists, this relationship constitutes the error correction term, and then a short-run model is established, which treats the error correction term as an explanatory variable, together with other explanatory variables reflecting short-run fluctuations, to establish a short-run model that can further go to verify the development of the interaction between China's goods exports and imports in the short run. Therefore, this paper establishes the following vector error correction model.

$$Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_t + \delta + \mu_t \quad (8)$$

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + (\beta_1 + \beta_2) X_{t-1} - (1 - \delta) Y_{t-1} + \mu_t \quad (9)$$

$$\Delta Y_t = \beta_1 \Delta X_t - (1 - \delta) \left(Y_{t-1} - \frac{\beta_0}{1 - \delta} - \frac{\beta_1 + \beta_2}{1 - \delta} X_{t-1} \right) + \mu_t \quad (10)$$

$$\Delta Y_t = \beta_1 \Delta X_t - \lambda (Y_{t-1} - \alpha_0 - \alpha_1 X_{t-1}) + \mu_t \quad (11)$$

Where $\lambda = 1 - \delta$, $\alpha_0 = \frac{\beta_0}{1 - \delta}$, $\alpha_1 = \frac{\beta_1 + \beta_2}{1 - \delta}$ and if the parameter in Eq. (11) α_0, α_1 is considered equal to the corresponding parameter in Eq. (5), then the term in parentheses in Eq. (11) is the unbalanced error term in period t-1. Eq. (11) can be written as:

$$\Delta Y_t = \beta_1 \Delta X_t - \lambda ecm_{t-1} + \mu_t \quad (12)$$

Where ecm denotes the error correction term, there is equation (12) can be known, in general $|\delta| < 1$, there $0 < \lambda < 1$. We can analyze the correction effect of ecm accordingly: if 1t-moment Y is greater than the long-term equilibrium solution $\alpha_0 + \alpha_1 X$, ecm is positive, then it $-\lambda * ecm$ is negative, making it ΔY_t decrease; if 1t-moment Y is less than the long-term equilibrium solution $\alpha_0 + \alpha_1 X$, ecm is negative, then $-\lambda * ecm$ it is positive, making it ΔY_t increase. This highlights the control of the long-run disequilibrium error on Y_t .

3.3. An Empirical Study on the Interaction between Import and Export Development of China's Trade in Goods

3.3.1. Descriptive Analysis

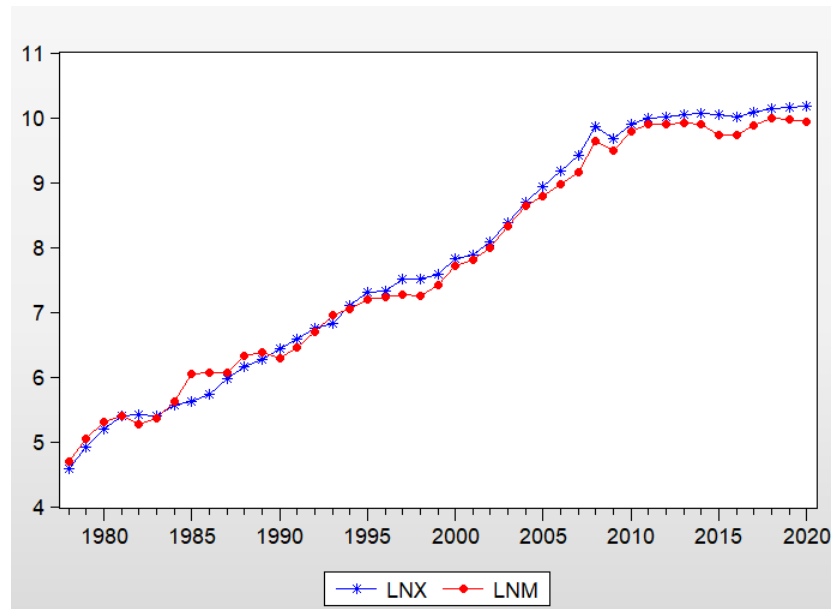


Figure 1: Exports of goods, goods import variables trends

From the figure1 can be obtained, in 1987-2020 years, China's goods imports, goods exports are in an upward trend, the two time series of changes basically maintain a synchronous upward trend, we see from the graph, the preliminary determination of the two has a fairly consistent change characteristics, in the long term the positive correlation is significant. From 1978 the year after the reform and opening up, China's export trade rose sharply, import and export mo aunts rose significantly faster, in 1997 the year, Thailand's financial crisis, the resulting financial turmoil rippled through Southeast Asia and the world financial markets, affecting China's foreign goods import and export trade, but the general trend of year-on-year growth is still maintained. 2002 In the year of China's accession to the WTO, the international market space expanded, promoting the rapid growth of the foreign economy and the national economy, bringing huge development space for China's foreign trade, China's import and export of goods trade maintained a high growth trend until the outbreak of the U.S. financial crisis in the 2008 year, including the United States, the global economy is in a downturn, China was also affected by the financial crisis, China's foreign trade contraction, import and export China was also affected by the financial crisis.

3.3.2. Unit Root Test

Before conducting the cointegration test, to ensure the accuracy and correctness of the model results,

the single integer order of the LNX sum LNM must be obtained by the unit root test. In this paper, we take ADF test LNX and LNM smoothness and single integer order, and determine the lag order according to the Akaike information criterion (AIC) and Schwarz criterion (SC).

Table 1: Trade imports, exports of unit root test results

Variables	ADF test value	Inspection form (C, T, k)	T-statistic critical value			AIC value	SC Value
			1%	5%	10%		
LNX	1.949584	(C, 0, 1)	3.596616	2.933158	2.604867	1.312929	1.230182
LNM	1.649857	(C, 0, 1)	3.596616	2.933158	2.604867	0.926824	0.844077
Δ LNX	5.757512	(C, T, 0)	4.192337	3.520787	3.191277	1.280391	1.155007
Δ LNY	5.447541	(C, 0, 0)	3.600987	2.935001	2.605836	0.926824	0.844077

Note: Δ denotes first-order difference; in the test form (C, T, k), C denotes the test equation with a constant term, T denotes with a time trend term, and k denotes the number of lags used; the number of lags is chosen according to the Akaike information criterion (AIC) and the Schwarz criterion (AIC) and Schwarz information criterion (SC); the measurement software is Eviews 8.0.

From the results of the above tabular test, it can be obtained that the null hypothesis of the existence of unit root is not rejected at 5% level of significance, and both exports of goods trade and imports of goods trade are non-stationary time series, and the variables after first-order difference pass the stationarity test at 5%, indicating that both exports of goods trade and imports of goods trade variables are first-order single integer I(1) series.

3.3.3. Co-integration Test

While determining the lag order of the cointegration test through the smoothness test, a VAR model with a normally distributed lag of 1 the residual term is chosen to ensure the validity of the parameter estimation. After we determine it, we conduct the cointegration test for the export value of goods LNX and import LNM value of goods. So in this paper, the Engle-Granger test of two variables is used to analyze the time series: the results are as follows.

First, the following covariance regression is done for LNX and LNY using ordinary least squares.

$$\hat{LNX}_t = -0.382463 + 1.059028LNM_t \quad (13)$$

Then, the smoothness of the residual series e_t in equation (13) is tested again. The ADF test is used in e_t the smoothness test, and the x-order lags are chosen under the Akira pool information criterion (AIC) and the Schwartz information criterion (SC), and the Lagrange multiplier test finds no autocorrelation at this point, so the appropriate test model is.

$$\Delta e_t = -0.457444e_{t-1} + \varepsilon_t \quad (14)$$

When conducting the test, the estimated parameters e_{t-1} of the pass the test with the t-statistic P-value 0.0009 and reject the null hypothesis of unit root, implying that the error term e_t is a smooth series, thus indicating that LNY and LNX are cointegrated, so that LNM there is a cointegration relationship between the export value of goods LNX and the import value of goods at 5% level of significance and e_t is I(0), then it is considered that Y,X is cointegrated of order (1,1). It shows that overall it can be considered that the export value of goods LNX and import value of goods have a stable and interactive development relationship in the long LNM run.

3.3.4. Vector Error Correction Model

From Granger's expression theorem, we know that if X and Y are cointegrated, then the long-run equilibrium relationship between them can always be expressed in an error correction model for the disequilibrium relationship between them in the short run. In this paper, after finding that there is a long-run interaction between the export value of goods LNX and the import LNM value of goods to develop an equilibrium relationship, the interaction in the short run can be explained using an error correction model.

The long-run equilibrium relationship is first modeled as an ordinary least squares estimation of the value of exports of goods LNX and imports LNM of goods with the following equations.

$$L\hat{N}X_t = -0.382463 + 1.059028LNM_t \quad (15)$$

Among them, the relationship between the value of exports of goods LNX and the value of imports LNM of goods shows a significant long-term development interaction between the two.

Then, the short-term dynamic relationship is constructed. We perform cointegration tests to determine the long-run interaction between the export value of goods LNX and the import LNM value of goods, and carry out the construction of the error correction model by means of first-order difference in the form of 1 lags. The following vector error correction model in the form of differencing is determined.

$$\Delta Y_t = 0.636478X_t - 0.345659ecm_{t-1} + \mu_t \quad (16)$$

ecm_{t-1} The negative value of the parameter estimates in the previous period is consistent with the homecoming correction mechanism, which is different from zero at 5% level of significance, indicating the correction of the unbalanced error in the previous period to the amount of goods exports in the latter period. In equation (15) cointegration regression in the long-run elasticity of exports of goods to imports of goods 1.059028, in equation (16) the long-run elasticity of exports of goods to imports of goods 0.636478, indicating that in the short term, a 1% increase in the growth rate of imports, the rate of increase in exports increased by 0.636478%, from the short term, China's exports and imports also have a strong correlation between the previous year's unbalanced error of imports and exports of goods in the ratio 0.346 of the current The growth rate of exports in the current year is corrected.

3.3.5. Granger Causality Test

After determining that there is a long-run and short-run relationship between goods trade exports and imports, it is not enough to prove that there is a causal relationship between the two, so this paper adopts Granger causality test to prove the causal relationship between the two, we use 1987-2007 year, 2008-2020 year and 1987 -2020 year data for Granger causality test, Granger causality test has two methods: one is for causality between non-cointegrating series The second one is for causality between cointegrating series, which is tested by VAR model; the second one is for causality between cointegrating series, which is tested by VEC model. In this paper, there is a cointegration relationship between goods exports and imports, and the second test method is chosen.

1987-2007 year Granger causality test is shown in Table 2.

Table 2: Granger causality test results for exports and imports of goods trade, 1987-2007

Lag length	The original hypothesis H ₀	Sample size	Causality F-test value	P-value of the causality F-test value	Conclusion
1	Granger reasons why LNX is not LNM	29	0.99136	0.3286	Accept H ₀
	Granger reasons why LNM is not LNX	29	5.54910	0.0263	Reject H ₀
2	Granger reasons why LNX is not LNM	28	1.94402	0.1659	Accept H ₀
	Granger reasons why LNM is not LNX	28	3.26580	0.0564	Accept H ₀
3	Granger reasons why LNX is not LNM	27	1.00368	0.4117	Accept H ₀
	Granger reasons why LNM is not LNX	27	2.80883	0.0658	Accept H ₀
4	Granger reasons why LNX is not LNM	26	0.94263	0.4633	Accept H ₀
	Granger reasons why LNM is not LNX	26	4.49210	0.0117	Reject H ₀

2008-2020 Year Granger causality tests are shown in Table 3.

Table 3: Granger causality test results for exports and imports of trade in goods, 2008-2020

Lag length	The original hypothesis H ₀	Sample size	Causality F-test value	P-value of the causality F-test value	Conclusion
1	Granger reasons why LNX is not LNM	12	0.54530	0.4791	Accept H ₀
	Granger reasons why LNM is not LNX	12	0.62392	0.4499	Accept H ₀
2	Granger reasons why LNX is not LNM	11	2.87350	0.1333	Accept H ₀
	Granger reasons why LNM is not LNX	11	8.29551	0.0187	Reject H ₀
3	Granger reasons why LNX is not LNM	10	2.37578	0.2779	Accept H ₀
	Granger reasons why LNM is not LNX	10	6.04665	0.0868	Accept H ₀

1987-2020 Year Granger causality tests are shown in Table4.

Table 4: Granger causality test results for exports and imports of trade in goods, 1987-2020

Lag length	The original hypothesis H_0	Sample size	Causality F-test value	P-value of the causality F-test value	Conclusion
1	Granger reasons why LNX is not LNM	42	1.96716	0.1687	Accept H_0
	Granger reasons why LNM is not LNX	42	1.03497	0.3153	Accept H_0
2	Granger reasons why LNX is not LNM	41	2.32676	0.1121	Accept H_0
	Granger reasons why LNM is not LNX	41	0.51360	0.6027	Accept H_0
3	Granger reasons why LNX is not LNM	40	1.33626	0.2793	Accept H_0
	Granger reasons why LNM is not LNX	40	0.45175	0.7178	Accept H_0

As can be seen from the table2, the first and fourth orders of the model reject "LNM is not the Granger cause of LNX" but not "LNX is the Granger cause of LNM" at 5% significance level in the period of 1987 to 2007, indicating that there is a unidirectional Granger causality between LNX and LNM. There is a unidirectional Granger causality between LNX and LNM, during the 1978 to 2007 period, LNM is the Granger cause of LNX and LNX is not the Granger cause of LNM, so imports of goods trade promote the development of exports, while exports of goods trade do not significantly affect the development of imports of goods trade.

As can be seen from the table in3, in the period of 2008 to 2020, when testing the second order of the model, "LNM is not the Granger cause of LNX" is rejected at the 5% significance level, but "LNX is the Granger cause of LNM" is not rejected, indicating that there is a unidirectional Granger causality between LNX and LNM. The results show that there is a unidirectional Granger causality between LNX and LNM, which in2008 to 2020 LNM is the Granger cause of LNX and LNX is not the Granger cause of LNM, imports of goods trade promote the development of exports, while exports of goods trade do not significantly affect the development of imports of goods trade. The results show a similar causal relationship with the period of 1987-2008

However, in this paper, when the Granger causality test is conducted for 1978-year2020, it can be seen from the table4 that the import and export of China's goods do not have a causal relationship regardless of the lags of several periods. However, there is a similar causal relationship before and after the 2008year, that is, the import of China's trade in goods affects the export. Therefore, this paper argues that the reason for this phenomenon is due2008 to the financial crisis in the United States in the year, which led2008 to the singularity of the import and export data in the year. After the outbreak of the financial crisis 2008in the year and the collapse of the financial system, the difficulty of the line's operation led to problems in the real economy, resulting in a downturn in world import and export trade. After the financial crisis, the widespread unfolding of trade protectionism had a great impact on China's foreign trade, and China implemented an export-oriented trade strategy before the2008 year, in which trade protectionism caused a continuous decline in the growth rate of China's trade surplus in the 2008first three quarters of the year Import and export of goods and services contributed to economic growth than last year fell8.9 by one percentage point year-on-year, the pull of economic growth fell1.2 by one percentage point year-on-year. After the impact of the financial crisis, many problems were exposed, so China formulated a new import and export strategy according to its own actual situation, so this paper argues that the U.S. financial crisis in the 2008year and the change in China's import and export strategy are important reasons for the overall non-significant causality in the 1987-2020 period.

4. Conclusion

This paper uses VAR and error correction models to test the cointegration of the relationship between the development of goods trade exports and imports in China 1987-2020 year, and Granger causality tests are conducted on this basis. The empirical regressions yielded the following results.

(1) In the long run, the export and import variables of China's trade in goods are non-stationary time series, but there is a stable long-term equilibrium relationship between exports and imports of China's trade in goods, there is a unique significant cointegration relationship, imports and exports have a strong positive correlation trend. Imports of goods have a unidirectional effect on exports, and the growth rate of imports has a significant effect on the growth rate of exports, with a 1% increase in exports and a 1.059028% increase in imports, and it can be concluded that China's imports of goods promote the development of exports of China's trade in goods.

(2) In the short run, there is also a strong correlation between China's exports and imports, with the current period's exports being affected by its own one-period lag and also by the one-period lag of imports.

It shows that the development of imports is essential to maintain the stable development of China's exports, and maintaining the stability of exports and imports is of great significance.

According to the above conclusions, this paper believes that we should further increase the reform and opening-up efforts, maintain the stable growth of exports and imports, further improve China's import and export trade environment, optimize China's import and export structure in order to promote China's economic development, and the following measures can be taken in promoting imports and exports:

The development of import and export credit policies to encourage enterprises to increase imports and exports. Banks can further expand the scale of short-term import and export credit insurance, and increase support for small and medium-sized enterprises and emerging markets to develop. To achieve large sets of equipment export financing insurance should be insured, to further simplify the procedure.

Strengthen the development of domestic high technology and improve the status of the global value chain. Since the reform and opening up, China's import and export trade has grown rapidly, but according to China's global trade is still in the status of processing and manufacturing, the added value of products is lower than that of developed countries, we should pay attention to adjust the import and export structure, shift the focus from labor-intensive industries to capital-intensive industries, vigorously develop high-tech industries, increase the investment of talents and capital, master the core technology, maintain the competitiveness of enterprises themselves. Promote mass innovation and entrepreneurship, and continuously improve our international position in the global production value chain.

Stabilize the new economic development and accelerate the construction of a new pattern. At present, China's import and export enterprises are suffering from the huge challenges brought about by the deterioration of the terms of trade at home and abroad. Firstly, due to the impact of the epidemic, enterprises around the country are operating in difficulty, and market demand continues to decline; secondly, due to the epidemic, the world economy is in the doldrums, domestic and foreign supply are significantly reduced, in response to the crisis, countries have implemented monetary easing policies, resulting in the import and export of goods, including prices soaring, import and export further decline. In order to reduce the impact of the crisis, we should be based on the changes in the domestic and international situation, promote supply-side structural reform, effectively improve the relationship between supply and demand, while insisting on promoting the domestic market, expanding domestic demand, stabilizing the economy, building a large domestic cycle as the main body, the domestic and international double cycle to promote each other's new development pattern.

To encourage processing and processing trade, optimize and improve the relationship between imports and exports. In China's export trade is concentrated in the processing trade category, at present, China is also a large processing trade, processing trade can not only promote the development of export trade, but also further promote the development of import trade, in addition, can also expand export earnings, increase employment, so should vigorously support processing trade, at the same time should also focus on the improvement of import and export relations, balance the relationship between import and export, to maintain stable development of goods.

Continue to strengthen imports and improve the efficiency of services. In the Granger test of this paper, we found that imports are one of the reasons for promoting exports. Expand the coverage of import credit with preferential interest rates, support and develop the import of intangible assets such as technology, and should adjust the scope of import discount policy support to promote domestic industrial upgrading. Improve the policies related to the import of consumer goods, carry out pilot import tariff reduction for some daily-use consumer goods with large domestic demand, appropriately increase the number of inbound duty-free stores at ports, reasonably expand the variety of duty-free and increase a certain amount of duty-free shopping to enrich domestic consumers' shopping choices, so as to promote import trade.

To effectively improve financing services and further improve the level of trade facilitation. Increase the financing support for enterprises with orders and benefits. Encourage the use of syndicated loans, mixed loans, project financing and other ways to support enterprises to develop the international market, international cooperation in production capacity, to promote Chinese equipment "go out". Support financial institutions to carry out export tax rebate account escrow loans and other financing business. Encourage commercial banks to carry out export credit insurance policy financing business in accordance with the principle of risk control and commercial sustainability. Vigorously expand the business of foreign exchange reserve entrusted loan platform, continue to expand the scale and coverage of foreign exchange reserve entrusted loans, and further promote the diversified use of foreign exchange reserves. Under the framework of macro and micro prudential management, steadily relax RMB offshore debt financing for domestic enterprises and further facilitate cross-border RMB two-way fund pooling

business for multinational enterprises.

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