Empirical Analysis of the Relationship between Import and Export Trade and Economic Growth in Qinghai Province

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Abstract: Under the background of "Belt and Road" initiative and high-quality development, it is of great practical significance to accurately identify the relationship between import and export trade and its economic growth in Qinghai Province. The import and export trade data of Qinghai Province from 1990 to 2022 were selected, and a VAR model was constructed on the basis of Granger causality test and Johansen cointegration test, and the relationship between the import and export trade and economic growth of Qinghai Province was analyzed by impulse response and variance decomposition method. The results show that (1) there is a long-term stable cointegration relationship between import and export trade and economic growth in Qinghai Province, and export trade is a unidirectional Granger cause of economic growth; (2) export trade has a positive contribution to economic growth, and total imports and total imports and exports have a weaker explanatory ability for economic growth; (3) in the short term, import and export trade in Qinghai Province has a certain contribution to its economic growth and is poor stability; in the long run, Qinghai Province's import and export trade does not have a significant role in promoting GDP, and its pulling effect on the economy is not significant.

Keywords: Qinghai Province; VAR model; import and export trade; impulse response.

1 Introduction

Accompanied by the continuous and profound promotion of the Belt and Road Initiative, Qinghai Province has made great progress in terms of gross domestic product, the scale of import and export trade structure, financial revenue and strength. Among them, the relationship between import and export trade and economic growth is not only an important topic in economics but also in promoting the realization of high-quality economic development in Qinghai Province. For the study of the linear correlation between economic growth and trade, many scholars have conducted diverse empirical studies, and mainly for the classical linear measurement method. Wang Fengyun (2010) analyzed based on causality test and cointegration test and found that export is the main driver of economic growth in Beijing [1]. Gao Li (2014) used CF filter analysis and found that imports are the main driver of economic growth in Gansu Province [2]. Wenhua (2017), Yang Zunliang (2020), and Zuo Jingyi (2022) used Johansen cointegration test, Granger causality test, and other models to empirically analyze the provinces

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of Jilin, Jiangsu, and Heilongjiang, and found that exports play a significant role in pushing the economic growth, and imports have a weaker explanatory ability and higher room for improvement [3-5]. Sun Fuqi (2009) established a VAR model to analyze the data of China's economic growth from 1978 to 2007 and found that there is a significant nonlinear cointegration relationship between exports, import trade and output in China's economic growth in 70 years[6]

In recent years, some scholars began to use nonlinear models to study the correlation between trade and economic growth. Deng Xuelong (2010), based on China's import and export data from 1952 to 2007, used bootstrap simulation experimental model to explore the results showed that there is a dynamic nonlinear relationship between the growth rate of import and export trade and economic growth rate [7]. Chen Fuzhong (2016) used China's provincial panel data from 1995 to 2011 to construct a nonlinear relationship identification criterion between economic growth and net exports, and found that the appropriate expansion of imports contributes to economic growth and foreign trade balance [8]. Zhang Xiaoyu and Liu Yongfu (2019) used the NARDL model and SVTVP-VAR model to find that the driving effect of export trade on economic growth has been weakening over the past 70 years of China's reform and opening up, while the driving effect of imports on economic growth has been increasing [9].

In summary, the more mature research methods for the correlation between economic growth and trade are mainly the classical linear model and nonlinear model [10]. The linear model has higher suitability for data analysis with linear relationship. As the eastern gateway of the Tibetan Plateau and an important node of the Belt and Road, the relationship between import and export trade and economic growth has rarely been explored in Qinghai [11]. Therefore, this paper constructs a linear VAR model to further clarify the relationship between import and export trade and economic growth in Qinghai province based on the panel data of import and export trade from 1990 to 2022, which will provide a reference for the future high-quality development of the economy of Qinghai province.

2 Research methodology and data sources

2.1 Research Methodology and Data Sources

①Research Methodology：Vector autoregressive modeling is one of the most commonly used operational models for unstructured system of equations modeling to deal with the analysis and forecasting of multiple correlated economic indicators [5]. It is generally used for forecasting of related time series systems and analyzing the dynamic effects of variable systems subject to random perturbations, and can to some extent solve the potential associativity bias problem in traditional structured models. In this paper, the dependent variable of the model is the total GDP of Qinghai Province Y, while the independent variables are the total exports of Qinghai Province Z, the total imports X, and the total imports and exports W. The expression of VAR(P) is (1)[5]

$$Y_t = a_1 * Y_t - 1 + a_2 * Y_t - 2 + \cdots + a_p * x_p - 1 + b_1 * x_t - 1 + b_2 * x_t - 2 + \cdots + b_q * x_t - q + B \qquad (t = 1,2,3 \ldots . T) \qquad (1)$$

where is a vector of columns of endogenous variables in dimension; is a vector of columns of exogenous variables in dimension; is the lag order; is the number of samples。

A specific model is constructed based on the variables in this paper as follows:

$$Y_{GDP} = a_1 * Y_{LNZ} + a_2 * Y_{LNW} + a_3 * Y_{LNZ} + \cdots + b_1 * X_{LNZ} - 1 + b_2 * X_{LNW} + b_3 * X_{LNW} - 3 + B \quad (2)$$

②data sources：The data samples selected in this article are the GDP of Qinghai Province for the period 1990-2022 as Y, the total import trade X, the total export trade Z, and the total import and export amount as W. The data of the article are all selected from the Statistical Yearbook of Qinghai Province, and the unit of measurement is unified as 100 million yuan RMB. The samples are firstly eliminated from heteroskedasticity, and then smooth series are obtained, and the samples are logarithmized[3].

3 Estimation and testing of the model

3.1 unit root test

In order to avoid the appearance of pseudo-regression, the first step is to determine whether the time series is smooth or not. Since it is difficult to extract smooth economic data in reality, the time series should be differenced to make it smooth, and the Augmented Dickey-Fuller test (ADF test for short) is chosen here. to meet the requirements of its subsequent VAR model.

From the EVIEWS results, since the ADF Test Statistic = -7.379492 for LnZ,ADF Test Statistic =-5.129451 for LnX,ADF Test Statistic =-4.391882 for LnW, all of them are less than 1%critical value.ADF for LnY Test Statistic=-3.625602, which is less than 5%critical value and greater than 1%critical value.In summary, the p-value of all variables is less than 0.05, then the original hypothesis can be rejected. It indicates that after the first-order differencing of the three, the series does not have a unit root and is a first-order single-integer smooth series. It meets the subsequent regression requirements and can be continued with the cointegration test.

3.2 cointegration test

Since the four groups of variables, LnZ, LnY, LnX, and LnW, are smooth after first-order differencing, in order to explore whether there is a long-run cointegration relationship between the variables, the Johansen cointegration test is applied to test for stability, and the optimal order is set to be one.

According to the empirical results of EVIEWS, the prob value of the cointegration test for the four groups of variables is less than 0.05, which indicates that the four original hypotheses are rejected, and there are at least four cointegration relationships among the four variables of LnZ, LnY, LnX, and LnW. And there is smoothness among the four variables, that is, there is a long-term equilibrium relationship. Further analyses can be carried out.

3.3 Determine the optimal order

In order to make the model conclusion there is a small difference, and therefore the optimal lag order discrimination of the cointegrated series. According to the test results in Table 1. Relaxation order test results., when the lag order is 2, three of the five test criteria are judged to be the second order, indicating that the regression model established when the lag order is the second order has a smaller error in the conclusion of the regression model, so the lag period Lag = 2 is the optimal lag order for the VAR model.

Table 1. Relaxation order test results.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	40.37877	NA	7.16e-07	-2.798367	2.604813*	2.742630*
1	52.63426	19.79733	9.73e-07	-2.510327	-1.542561	-2.231646
2	74.82918	29.02414*	6.68e-07*	2.986860*	-1.244880	-2.485233
3	84.04065	9.211466	1.48e-06	-2.464665	0.051528	-1.740093
4	100.3757	11.30889	2.71e-06	-2.490439	0.799967	-1.542921

3.4 Granger causality test

Table 2. Granger Causal test.

Null Hypothesis:	Obs	F-statistic	Prob.
DLNX does not Granger Cause DLNW	28	0.68760	0.5128
DLNW does not Granger Cause DLNX		0.68836	0.5125
DLNY does not Granger Cause DLNW	28	0.66018	0.5263
DLNW does not Granger Cause DLNY		0.65080	0.5310
DLNZ does not Granger Cause DLNW	28	1.11594	0.3447
DLNW does not Granger Cause DLNZ		1.19458	0.3209
DLNY does not Granger Cause DLNX	28	6.76628	0.0049
DLNX does not Granger Cause DLNY		1.48814	0.2467
DLNZ does not Granger Cause DLNX	28	0.34514	0.7117
DLNX does not Granger Cause DLNZ		0.93730	0.4061
DLNZ does not Granger Cause DLNY	28	0.26989	0.7658
DLNY does not Granger Cause DLNZ		0.46229	0.6356

According to the test results in Table 2, there is a unidirectional causality between LNY and LNX, i.e., exports have the ability to predict GDP growth. Other than that, there is no causal relationship between LNY and LNZ, LNX and LNZ, LNY and LNW, LNX and LNW, i.e., imports, total imports and exports are not the cause of GDP growth and do not have predictive power for GDP, and imports do not have predictive power for total imports and exports.

4 Model construction and results

Through the above analysis, the VAR(2) model is constructed here. In order to ensure the validity of the subsequent impulse response and variance decomposition, this paper chooses the VAR test plot to test the model stability. If the model tends to be stable, the characteristic root of the series is located in the unit circle [12].As can be seen from Fig. 1, all unit roots of the model are located within the unit circle, indicating that the established VAR(2) model between import and export trade and GDP of Qinghai Province is stable in the long run and has a good fit, which can be further analyzed. The results are shown in fig 1

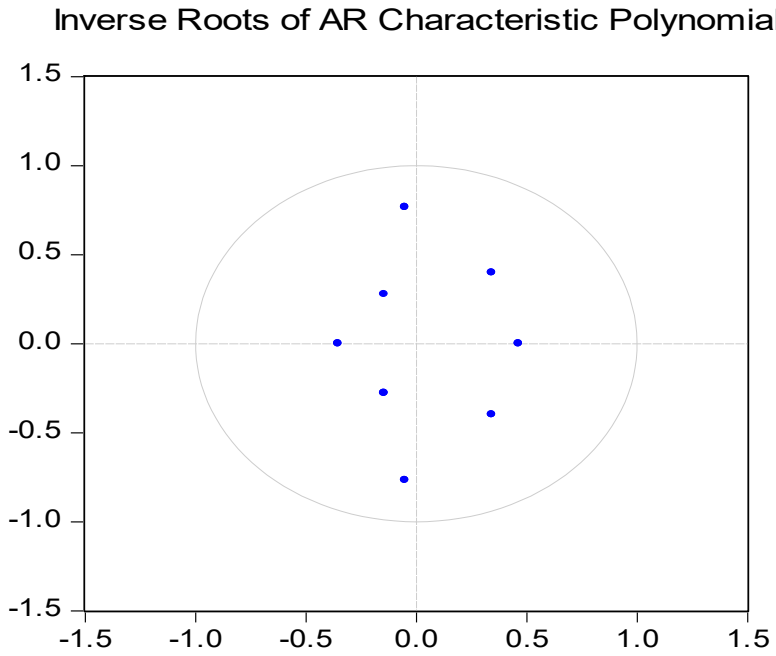

Fig. 1. AR root chart.

4.1 impulse response function

①As can be seen in Fig. 2(1), after GDP (LNY) is subjected to a positive shock from imports (LNZ), the trend of the trajectory graph is to first decline and then rise, and then show a tendency to fluctuate around the value of 0 up and down to narrow, and the amplitude of the wave is decreasing. It shows that GDP is more sensitive to shocks at the beginning and then gradually weakened.②As can be seen in Fig. 2(2), the impulse response trajectory graph of GDP to itself shows a decreasing trend, and then shows a small fluctuation around the value of 0 up and down, and the amplitude of the wave decreases. It indicates that the sensitivity of LnGDP's shock response to itself continues to weaken.③As can be seen from Fig. 2(3), the overall trend graph of GDP (LNY) after being positively shocked by exports (LNX) is first fluctuating sharply up and down around the value of 0, and then the amplitude of the wave is gradually decreasing. It indicates that the response of GDP (LNY) to the export (LNX) shock in this stage is from strong to weak.④As can be seen from Fig. 2(4), the overall trajectory graph of GDP (LNY) shows an upward, then downward, and then up and down fluctuation after being positively shocked by total exports and imports (LNW). It indicates that the response of GDP (LNY) to the shock of total exports (LNW) changes from positively sensitive to more stable.

According to the results of the impulse response function, it can be seen that the GDP of Qinghai Province has an insignificant pulling effect on its own, and the export has a larger but fluctuating and less stable pulling effect on the GDP. Import and export, imports for economic growth (GDP) has the pulling effect and the continuity of the stability is better.

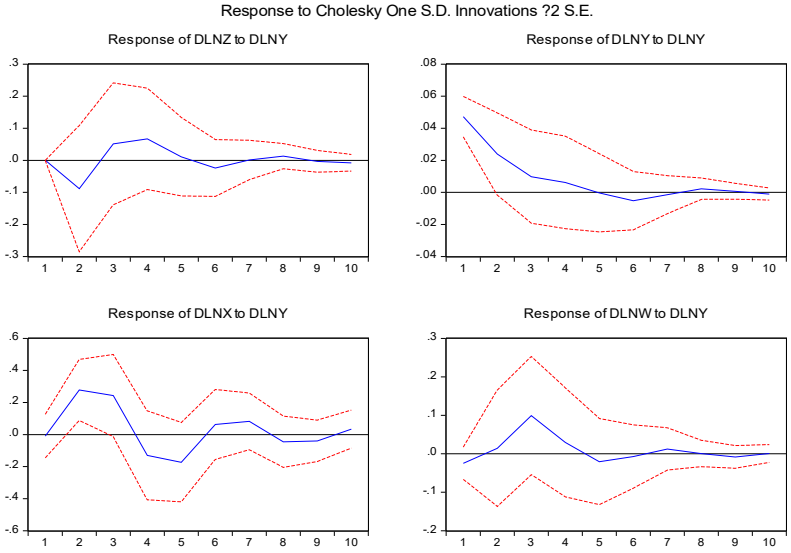

Fig. 2. The pulse response function diagram of the total amount of import, export, export, and import and export.

4.2 variance decomposition

In order to investigate the contribution of exports and imports to GDP in Qinghai Province, the variance decomposition of LNZ, LNX and LNZ is carried out. As shown in Table 3 in the first period, the contribution of export (LNX) to GDP is 3.2%, and the contribution of import (LNZ) to GDP is 0. With the increase of the number of lag periods, the contribution of export (LNX) to GDP increases gradually and stabilises at 12.4%, and the contribution of import (LNZ) to GDP increases and stabilises at 2.28%. Overall, both imports and exports in Qinghai Province contribute to GDP growth, with exports contributing more to the variance of GDP than imports, and having a more pronounced impact on GDP.

Table 3. The difference in the variance of GDP in Qinghai Province's entry and exit trade.

Period	S.E.	DLNX	DLNY	DLNZ
1	0.425323	3.279177	96.72082	0.000000
2	0.512820	9.170587	90.71126	0.118152
3	0.581378	12.35773	85.90012	1.742151
4	0.585855	12.16153	85.73394	2.104530
5	0.608958	12.17335	85.61198	2.214673
6	0.611774	12.35354	85.38016	2.266306
7	0.618723	12.43760	85.27871	2.283686
8	0.620118	12.45837	85.25991	2.281727
9	0.622402	12.46439	85.25371	2.281899
10	0.623219	12.49169	85.22399	2.284313
CholeskYordering:DLNX DLNY DLNZ				

5 Conclusion

In the context of the "Belt and Road" Initiative and high-quality development, it is of great practical significance to accurately identify the relationship between import and export trade and economic growth in Qinghai Province. At the same time, it is necessary to further study the factors affecting the import and export trade of Qinghai Province in order to better promote the economic development of Qinghai province. The following conclusions are drawn from the empirical analysis of the time series of import and export trade volume and GDP of Qinghai Province from 1990 to 2022:

(1) there is a long-term equilibrium relationship between export trade of Qinghai Province on its economic growth, and export trade is a one-way Granger cause of economic growth. From the results of Granger test, it can be seen that there is a long-term equilibrium relationship between the import and export volume, the total amount of import and export. However, there is a unidirectional causal relationship between exports and economic growth, while there is no causal relationship between imports, import and export volume and economic growth. The economic growth of Qinghai Province is not import trade growth type. (2) in the short term, the import and export trade of Qinghai Province has a certain promotion effect on its economic growth and is poorly stabilized, and in the long term, the import and export trade of Qinghai Province does not have a significant pulling effect on the economy. According to the impulse test results show that in the initial stage of import and export on economic growth have a low short-term promotion effect, the long-term view of this promotion effect there is a fluctuation downward trend. In short, the contribution of import and export trade to economic growth is low and unstable. (3) the economic growth of Qinghai Province is mainly caused by exports, and the total amount of imports and exports and imports have a weak explanatory ability for the economic growth of Qinghai Province. From the results of variance decomposition, the variance contribution of export to economic growth in Qinghai Province is larger than that of import, that is, the impact of export on economic growth is larger.

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