Linkage Relationship between Port Logistics and Regional Economy based on Eviews Software

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Abstract—**The development of port logistics and regional economy presents a linkage relationship. This paper resorted to the commonly used econometric software, namely Eviews, to undergo some empirical analysis. One of its applications, known as the Granger Causality Test, is to provide evidence about the direction of causality in economic relationships. The competitiveness of port city logistics evaluation index system was set up based on the Diamond Model, which took cargo throughput, total freight, length of transportation routes and total retail sales of social consumer goods into consideration. It set on the example of 22 cities in the Yangtze River Delta of China. Based on the accumulated statistics, it went through the methods of Unit Root Test, Co-integration Test and Granger Causality Test, and eventually proved the linkage relationship between port logistics and economy of the cities. At last, the results proved that the Eviews is applicable and effective in causality analysis between variables of port logistics and regional economy.**

Index Terms—**Eviews, Granger Causality Test, linkage relationship, port logistics, regional economy**

I. Introduction

Eviews (Econometric Views) is a statistical package for Windows and is developed by Quantitative Micro Software (QMS). As econometric software, it can be used for data processing, drawing, statistical analysis [1~3], modeling analysis [4], forecast and simulation. And it is also widely used in financial analysis, macro-economic forecasts and simulation and sales forecast. Compared with other software (such as EXCEL, SAA, SPSS), Eviews is used mainly for time series oriented econometric analysis.

When we use Eviews to analyze the nonstationary time-series, there is a method to analyze the causality between variables, namely Granger Causality Test, which is initiated by the Nobel economic prize winner, Clive W. J. Granger, in the year of 2003. Granger Causality Test is mainly used to prove the mutual influence within two variables, especially economic developing variables. Such examples as Granger Causality Test between money and income [5], energy and GDP [6], house and land prices [7], and so on. Through Granger Causality Test, Liu Nan and Li Yan analyze the interrelationship between modern logistics and economic growth of Zhejiang province in China from the perspective of supply and demand. And they find that modern logistics development and economic growth reinforces each other [8]. With the profound development of research, the objects in study become wider, which beyond the limitation of economy, such as the causal inference for biomedical informatics [9]. The preliminary results of Eviews analysis accord more with public cognition. In addition, the interface of Eviews is friendly and the software is easy to operate. However, the limitation of Granger Causality Test is that the series should be stationary and continuous. What's more, the Granger Causality Test is designed to handle variables in pairs, and may produce misleading results when the true relationship involves three or more variables. That is to say, if both series X and Y are driven by a common third process with different lags, one might still accept the alternative hypothesis of Granger Causality.

Port is always the important economic development zone, thus it receives much attention [10]. The latest research of port is mainly concentrated on the relationship between port cities [11], the study of ports in supply chain systems [12], new estimates of the aggregate demand for merchandise imports [13], evaluating the competitiveness of major ports [14~15], port logistics efficiency [16], etc. The regional economic development relies on port increasingly and is the foundation of the development of port [17]. Because of the unique geographical advantages, port cities become the leader in logistics development. In recent years, because of the interaction between port logistics and regional economy, there are more and more researches on how to make them collaborative and mutual beneficial, for instance, using Principal Component Analysis to build coordinated development model of port logistics and regional economy [18].

All in all, the application field of Eviews is very extensive. But the papers in the qualitative analysis of linkage relationship between port logistics and regional economy especially using Granger Causality Test are not frequent. Besides, those papers mostly use single factor

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such as port cargo throughput to compare with GDP. So, a specific evaluation index system is not formed. In order to improve this phenomenon, this paper selects indexes of multiple dimensions on the basis of the Diamond Model. The paper takes 22 cities of Yangtze River Delta in China as an example. According to the collected data and through the Granger Causality Test between each pair of variables, this paper eventually comes up with the causality between port logistics and regional economy by using Eviews.

In this paper, Section 2 introduces the methodology and steps of Granger Causality Test; Section 3 gives an empirical analysis of linkage relationship between port logistics and regional economy of the China Yangtze River Delta; Section 4 describes the conclusions of this study, as well as plans of further improvement.

II. The Methodology and Steps of Granger Causality Test

A. The methodology of Granger Causality

Granger Causality is a statistical concept of causality that is based on prediction. It is often used for determining whether one time series is useful in forecasting another [19]. Ordinarily, regressions reflect mere correlations, but Clive W.J. Granger, who won a Nobel Prize in Economics, argued that there is an interpretation of a set of tests that reveals something about causality.

According to Granger Causality, if a signal X “Granger-causes” (or “G-causes”) a signal Y, then the following two rules should be met:

- Past values of X should contain information that helps predict Y above and beyond the information contained in past values of Y alone.
- The values of Y should not help to predict X.

It is necessary to take the above rules into consideration whether Y “Granger-causes” X. Therefore, as for the Granger Causality Tests between two variables, whether X “Granger-causes” Y or Y “Granger-causes” X should be tested respectively.

B. The Steps of Granger Causality Test

Stationary Test: While using Granger Causality Test, the time series of all variables should be stationary. Thus, the spurious regression can be avoided. And the Dickey–Fuller Test (ADF) is applied to test the stationarity of variables stated in this paper. The model is:

$$\Delta Y_t = \alpha_0 + rT + \beta Y_{t-1} + \delta_1 \Delta Y_{t-1} + \delta_2 \Delta Y_{t-2} + \cdots + \delta_m \Delta Y_{t-m} + \varepsilon_t \quad (1)$$

Where ε_t is a classical error; $\triangle$is difference operator; α_0 is a constant; T is the trend; H_0 is the null hypothesis, which refers to $\beta=0$; H_1 is the alternative hypothesis, which means $\beta<0$. If H_0 is accepted, it means that there is a unit root in the series Y_t. That is to say, Y_t is nonstationary.

The stationary test of time series goes through the sequence of level, first difference and second difference. The test will not be finished until the series is stationary. And the unit root test is applied to this test.

Co-integration Test: Differential regression will be done if there is a unit root among the variables after the unit root test. However, some information may be missing. Thus, in order to determine whether there is a long-term stationary relationship between two variables, the Co-integration Test must be done before Granger Causality Test. And Engle-Granger is used in this paper. The first step of this stage is to construct the OLS model. The OLS model of series is:

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t \quad (2)$$

The ADF test should be done for the residual ε_t. Then, the co-integration relationship exists between $\{Y_t\}$ and $\{X_t\}$ if εt is stationary.

Granger Causality Test [20~22]: Granger suggested that to see if X Granger-causes Y, we should use:

$$Y_t = \beta_0 + \beta_1 + \cdots + \beta_p Y_{t-p} + \alpha_1 X_{t-1} + \cdots + \alpha_p X_{t-p} + \varepsilon_t \quad (3)$$

And test the null hypothesis that the coefficients of X jointly equal zero. If we can reject the assumption using the F-test, then we can come up with the conclusion that X Granger-causes Y. It should be noted that applications of this test involve running two Granger tests, one in each direction. That is, we should also run:

$$X_t = \beta_0 + \beta_1 X_{t-1} + \cdots + \beta_P X_{t-p} + \alpha_1 \Delta Y_{t-1} + \cdots + \alpha_p Y_{t-p} + \varepsilon_t \quad (4)$$

The formula (4) is used to test whether Y Granger-causes X.

III. Empirical Analysis: the Linkage Relationship Between Yangtze River Delta Port Logistics And Regional Economy

A. The Yangtze River Delta and Linkage Relationship between Port Logistics and Regional Economy

The Yangtze River Delta, also called the Golden Triangle of the Yangtze, generally comprises the triangular-shaped territory. It is located in southeastern coast of China, and is the largest city cluster in China, the sixth in the world. The Yangtze River drains into the East China Sea. The urban build-up in the area has given rise what may be the largest concentration of adjacent metropolitan areas in the world. It covers an area of 99,600 km^2 and is home to over 105 million people, of which an estimated 80 million is urban. As the region is dominated by Shanghai which is mainland China's financial center, the Port of Shanghai is China's leading commercial and financial center. The Port of Shanghai is about 430 nautical miles north of the Port of Taipei in Taiwan and 746 miles northeast of Port of Hong Kong. From a wilder perspective, it is 1200 miles away from Port of Yokohama, one of the biggest ports in Japan. Also, Shanghai port is located on the west of Port of Busan in South Korea at a distance of 817 miles.

The Yangtze River Delta region accounts for 20 percent of China's Gross Domestic Product. Yangtze River Delta region in China is rich in port resources. “To prosper city according to ports” has become one of the strategies of promoting economic development of the region. The Yangtze River Delta takes the lead in economic indexes like total imports and exports, fiscal revenue and total retail sales of consumer goods. In the process of the economic globalization, the port city cluster in Yangtze River Delta has become an important strategic resource in global economic cooperation and competition as a whole. The development of ports has played a more and more important role in regional economy and social environment, and stimulus international trade.

The Yangtze River Delta region is composed mainly of coastal port cities, with Shanghai to be its center. Other cities including Nanjing, Suzhou, Wuxi, Changzhou, Zhenjiang, Nantong, Yangzhou, Taizhou of Jiangsu province, and Hangzhou, Ningbo, Jiaxing, Huzhou, Shaoxing, Zhoushan, Taozhu of Zhejiang province. In the 10^{th} Yangtze River Delta economic coordination meeting in 2010, the Yangtze River Delta was broaden, Yancheng, Huai'an, Jinhua, Quzhou, Hefei, Maanshan also officially join in the region. Thus, the Yangtze River Delta now has 22 member cities. Fig. 1 shows the layout of the city members of the Yangtze River Delta region.

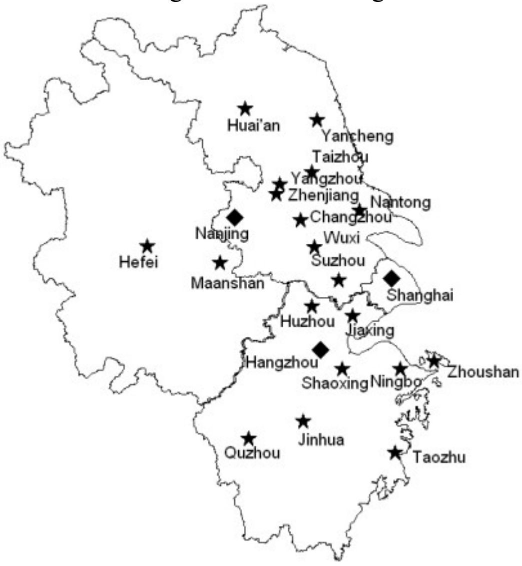

Figure 1. Cities members in Yangtze River Delta region of China

The recent decades is a fast yet steady development period for economy and other industries, including logistics, which also stands for an opportunity that Yangtze River Delta will face in the new era.

As the range of the Yangtze River Delta has broaden, which marks a deeper focus on its development, the logistics industry will meet a lot of strategic opportunities during the great-leap-forward development. How to make factors like logistics balance and keep pace with the rapidly increasing regional economy has become a hot discussion among experts and entrepreneurs, even all fields of researchers. That is what we called linkage development, which gains more and more attention with its increasing utility.

Linkage is a dynamic meaning, which refers to that the associated development of things is not isolated. They are interactive and complementary. In the background of the market economy and profound evolution of globalization, the linkage development between relevant industries is the potential trend. Linkage development lies in different regions, different industries, and even different companies. Based on its advantageous location, the logistics developing level of the Yangtze River Delta region has been far higher than other regions. Thus the research into linkage relationship between port logistics and regional economy is of great significance in positioning logistics level, establishing logistics development strategy and judging the logistics input-output ratio.

B. The Competitiveness Evaluation Index System of Port City Logistics based on the Diamond Model

The evaluation index system of port city logistics is based on the Diamond Model. The Diamond Model is an economical model developed by Michael Porter in his book *The Competitive Advantage of Nations* [23], which is suitable to analyze urban competitive advantage. The Diamond Model reveals the various factors that influence the productivity and competitive advantage at a specific area and in a particular field. The Yangtze River Delta is important in developing logistics and forming the logistics industry cluster. Therefore, it is of overall generality to resort to Diamond Model to determine the dimensions of the evaluation index system of the port city logistics competitiveness. The Diamond Model divides competitive advantage of a particular industry into several dimensions to explain why particular industries become competitive in particular locations. They are factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry, government and chance. Above all, government and chance can influence other four component factors, but they do not belong to the decisive factor. Based on the current situation and development characteristics of the Yangtze River Delta, this paper chooses a selection of indexes to evaluate the port logistics competitiveness.

In the Diamond Model, factor condition is the key point and necessary element in improving urban competitiveness. Demand condition demonstrates that the development of the logistics industry depends on internal and external service needs of a product. Related and supporting industries mainly refer to the competitiveness of the relative or adjacent industry of a chain.

Based on the condition of logistics industry of ports, we can decide some index that can be quantified to reveal the dimensions of Diamond Model. To be specific, the cargo throughput and total freight represent demand conditions, the length of transportation routes is used to represent factor condition, and total retail sales of social consumer goods is the major representative of related and supporting industries. Firm strategy, structure and rivalry differ from specific enterprises. Therefore it is not taken into consideration. The final evaluation index system of port city logistics is shown in TABLE I.

As for regional economy, we use the gross domestic product (GDP) as the evaluation index, for it is a general index reflecting the comprehensive level of the economic development.

TABLE I.
THE COMPETITIVENESS EVALUATION INDEX SYSTEM OF PORT CITY LOGISTICS

Level 1		Level 2	References
The competitiveness of port city logistics	Logistics scale	Cargo throughput(*ct*)	Demand conditions
		Total freight (*tf*)	
	Infrastructure	The length of transportation routes (*ltr*)	Factor conditions
	Relative supporting industry	Total retail sales of social consumer goods (*trs*)	Related and supporting industries

C. Data Collection of Port City Logistics and Regional Economy in Yangtze River Delta

The paper is based on the Yangtze River Delta region and its 22 municipal cities, the time period of gathered data ranges from 1984 to 2009. For each index, data is collected on the basis of each city respectively, and quantify the index by adding them together. All the statistics come from Statistical Yearbook of Yangtze River and Pearl River Delta and Hong Kong, Macao, Taiwan (2000-2010), Statistical Yearbook of China's urban(1985-2010), Statistical Yearbook of China's regional economic(2000-2010), Statistics Yearbook of Zhejiang Province and Statistics Yearbook of Jiangsu Province.

It should be pointed out that because part of the cities failed to find some data, we use difference method for the evaluation, its value has little impact on the size of the Yangtze River Delta, and the total indicators of the overall data trends remain unchanged. As for port cargo throughput, since some of the cargo throughput is small and unavailable, then we use some major port cities as a representative. The data length of transportation routes is only available from the year 1999 to 2009. See the range and explanation of variables in TABLE II.

TABLE II.
RANGE AND EXPLANATION OF EACH PAIR OF VARIABLE

No. of pairs	Object of study	Letters	Unit	Time period	Cities
1	Cargo throughput	cr	Million ton	1987-2009	Shanghai, Nanjing, Suzhou, Zhenjiang, Nantong, Hangzhou, Ningbo, Zhoushan, Taozhu
	GDP	gdp1	Billion yuan		
2	Total freight	tf	Million ton	1984-2009	All 22 cities
	GDP	gdp2	Million yuan		
3	Total retail sales of social consumer goods	trs	Million yuan	1984-2009	All 22 cities
	GDP	gdp2	Billion yuan		
4	Length of transportation routes	ltr	Kilometers	1999-2009	All 22 cities
	GDP	gdp3	Billion yuan		

To reduce heteroscedasticity, all indicators went through the conversion of natural logarithm. Such a transformation wouldn't affect the co-integration relationship between each pair of variables.

The following TABLE III presents the original data of each number of pairs in TABLE II.

TABLE III.
ORIGINAL DATA

Year	Cargo throughput (ct)	GDP_1	Total freight (tf)	GDP_2	Total retail sales of social consumer goods (trs)	Length of transportatio n routes (ltr)	GDP_3
1984			457.27	120.0	43626.89		
1985			836.89	129.0	61513.32		
1986			751.46	140.0	71185.31		
1987	270.32	116.6	1063.66	184.9	85276.13		
1988	288.61	142.0	998.82	229.7	108378.84		
1989	293.71	152.3	793.92	237.9	122392.07		
1990	268.96	179.5	830.93	281.4	125393.15		
1991	304.82	198.7	837.68	301.2	138448.63		
1992	346.22	262.9	1096.58	395.0	170014.85		
1993	377.82	412.0	1203.29	654.0	212278.31		
1994	354.72	510.5	1317.47	816.6	263015.49		
1995	374.20	657.7	1403.11	1026.3	369937.06		
1996	361.19	771.7	1501.69	1207.4	424358.53		
1997	365.42	871.7	1454.56	1354.2	457596.96		
1998	386.17	953.5	1549.47	1495.4	549348.98		
1999	435.99	1035.2	1633.18	1616.3	547537.76	106414	1616.3

TABLE III.
ORIGINAL DATA (CONTINUED)

Year	Cargo throughput (ct)	GDP_1	Total freight (tf)	GDP_2	Total retail sales of social consumer goods (trs)	Length of transportation routes (ltr)	GDP_3
2000	589.35	1164.9	1710.36	1802.6	719830.99	64213	1802.6
2001	620.80	1293.3	1838.83	1975.0	672410.16	88721	1975.0
2002	722.94	1451.7	2014.40	2233.3	805188.00	92675	2233.3
2003	906.73	1733.1	2211.28	2672.0	894341.00	102520	2672.0
2004	1141.72	2087.6	2471.87	3227.9	1055585.00	108872	3227.9
2005	1290.92	2487.0	2679.15	3810.9	1245133.42	129576	3810.9
2006	1539.88	2885.4	2944.04	4454.0	1838205.99	180126	4454.0
2007	1747.06	3415.9	3215.44	5276.5	1642895.13	191909	5276.5
2008	1844.80	3883.9	3532.57	6024.0	1990118.65	210204	6024.0
2009	1877.76	4271.8	3537.29	6711.5	2318900.00	214414	6711.5

D. Granger Causality Test

Stationary Test: All variables went through the Augmented Dickey-Fuller (ADF) Test. We can come to the results in TABLE IV.

From the stationary test, we can conclude that the ADF values of $lngdp_1$ and *lnct* are larger than critical values. They have a unit root, thus are nonstationary. After the first difference, the ADF values of $Dlngdp_1$ and *Dlnct* are smaller than critical values. Thus the null hypothesis is rejected, and we can determine they are stationary of first difference series. In the same reason, $lngdp_2$ and *lntf*, *lntrs* are also stationary of first difference series. The level series of $lngdp_3$ and *lntrs* are stationary.

TABLE IV.
ADF TEST

Series	Forms (C, T, K)	ADF values	Test critical values			Results
			1%***	5%**	10%*	
$lngdp_1$	(C, T, 3)	-2.35	-4.53	-3.67	-3.28	nonstationary
lnct	(C, T, 1)	-1.86	-4.48	-3.64	-3.26	nonstationary
$Dlngdp_1$	(C, 0, 0)	-2.90	-3.79	-3.01	-2.65	*stationary
Dlnct	(C, 0, 0)	-2.77	-3.79	-3.01	-2.65	* stationary
$lngdp_2$	(C, T, 1)	-1.98	-4.39	-3.61	-3.24	nonstationary
lntf	(C, T, 2)	-4.42	-4.32	-3.62	-3.25	*** stationary
lntrs	(C, T, 3)	-2.47	-4.44	-3.63	-3.25	nonstationary
$Dlngdp_2$	(C, 0, 0)	-3.44	-3.74	-2.99	-2.64	** stationary
Dlntf	(C, 0, 0)	-5.81	-3.79	-3.01	-2.65	*** stationary
Dlntrs	(C, 0, 0)	-6.92	-3.73	-2.99	-2.64	*** stationary
$lngdp_3$	(C, T, 1)	-3.53	-5.52	-4.11	-3.52	* stationary
lnltr	(C, T, 0)	-7.21	-5.52	-4.11	-3.52	*** stationary

Note: in the form (C, T, K), C refers to an intercept, T is trend, K is the lag. *, **, *** mean the critical point at 1%, 5%, and 10% of the significant level.

Co-integration Test: Here we use OLS to estimate regression analysis of each pair of variable. If the residuals are stationary, then we can process the Granger Causality Test. Because the range of GDP differs in each comparison group, it takes respective Co-integration Test.

Set *lnct* as independent variable, $lngdp_1$ as dependent variable, the estimated equation of OLS is:

$$\ln gdp_1 = 1.58 \ln ct - 8.29 \quad (5)$$

(10.83) (-5.23)

R^2= 0. 85 F= 117.24 DW= 0. 13

Fig. 2 shows the regression of *lnct* and $lngdp_1$, from the graph we can see that the variables have a good regression. From OLS regression we can get the resid, which we rename as e_1.

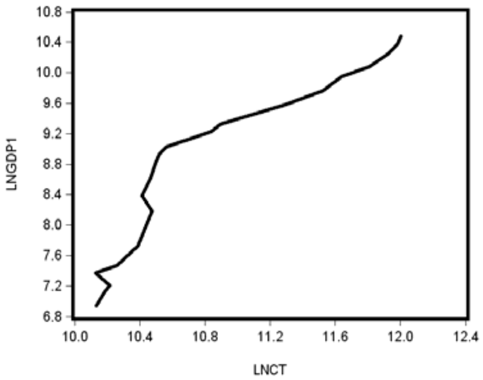

Figure 2. The regression of lngdp1 and lnct

Similarly, do the OLS test of the rest three pairs of variable.

The OLS regression of $lngdp_2$ and *lntf* is:

$$\ln gdp_2 = 2.33 \ln tf - 18.56 \quad (6)$$

$$(18.32) \quad (-12.25)$$
$$R^2 = 0.93 \quad F = 335.64 \quad DW = 1.06$$

Fig. 3 shows the floating growth trend between $lngdp_2$ and *lntf*. Also, save resid as e_2.

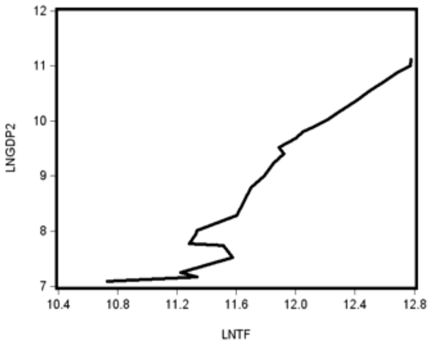

Figure 3. The regression of lngdp2 and lntf

The OLS regression of $lngdp_2$ and *lntrs* is:

$$\ln gdp_2 = 1.09 \ln trs - 9.84 \quad (7)$$
$$(53.86) \quad (-27.82)$$
$$R^2 = 0.99 \quad F = 2900.42 \quad DW = 1.43$$

Fig. 4 reveals good regression of $lngdp_2$ and *lntrs*. By the same method, we can save resid of this pair as e_3, and do further test with e_3.

The OLS regression of $lngdp_3$ and *lnltr* is:

$$\ln gdp_3 = 1.16 \ln ltr - 3.21 \quad (8)$$
$$(7.31) \quad (-1.73)$$
$$R^2 = 0.86 \quad F = 53.42 \quad DW = 1.79$$

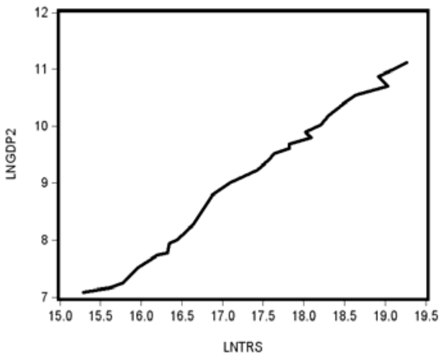

Figure 4. The regression of lngdp2 and lntrs

See the regression of $lngdp_3$ and *lnltr* in Fig. 5, and save resid as e_4.

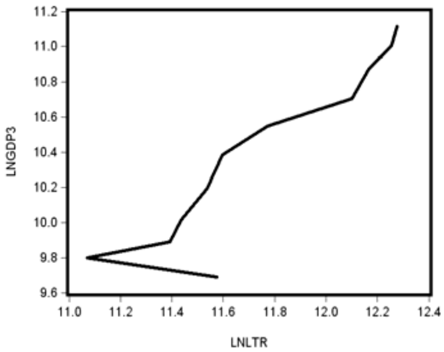

Figure 5. The regression of lngdp3 and lnltr

All the four models have good regressions. The Engle-Granger is a two-step method, so after the first step, we can do the unit root test to each resid. See results in TABLE V. The null hypothesis stands for no co-integration, so residual is a random walk. The results demonstrate that e_1, e_2, e_3, e_4 are all stationary series, thus there exists co-integration in each pair of variables.

TABLE V.
CO-INTEGRATION TEST

Variables	ADF values	(C, T, L)	Test critical values			Results
			1%***	5%**	10%*	
e_1	-5.47	(0, 0, 0)	-3.86	-3.04	-2.66	*** stationary
e_2	-3.55	(0, 0, 0)	-2.66	-1.96	-1.61	* stationary
e_3	-4.39	(0, 0, 0)	-2.66	-1.96	-1.61	*** stationary
e_4	-7.40	(0, 0, 0)	-2.82	-1.98	-1.60	*** stationary

Note: in the form (C, T, K), C refers to intercept, T is trend.

TABLE VI.
GRANGER CAUSALITY TEST

Null Hypothesis	Obs	F-statistic	Prob.	Result
ct does not Granger Cause *gdp*	19	4.56267	0.0235	Reject
gdp does not Granger Cause *ct*		4.19422	0.0300	Reject
tf does not Granger Cause *gdp*	25	0.67347	0.4206	Accept
gdp does not Granger Cause *tf*		9.77010	0.0049	Reject
trs does not Granger Cause *gdp*	25	0.20987	0.6514	Accept
gdp does not Granger Cause *trs*		18.9414	0.0003	Reject
ltr does not Granger Cause *gdp*	10	0.17216	0.6906	Accept
gdp does not Granger Cause *ltr*		63.2761	9.E-05	Reject

Granger Causality Test: After unit root test and Co-integration Test, the data proved to have good stationarity and the next step is to do Granger Causality Test. In the process, it should be judged whether to accept or reject the null hypothesis under the significance level of 5%.

We use the Granger Causality Test in Eviews for each variable pairs, and come to the results as shown in TABLE VI.

Above all, Obs refers to degrees of freedom. The null hypothesis is that the former variable is not a Granger cause of the latter one. In this assumption, F statistics obey F distribution.

E. Analysis of Results and Development Suggestions

For port cargo throughput (*ct*) and GDP in the test, the mutual probabilities are smaller than 0.05 in 5% of the significance level, demonstrating that cargo throughput and GDP granger cause each other. It is visible that port logistics and regional economy promote each other. In the same reason, GDP is the granger cause of total freight *(tf)*, total retail sales of social consumer goods (*trs*), length of transportation routes (*ltr*). On the contrary, the latter three are not the granger cause of GDP.

Some useful conclusions can be drawn from the Granger Causality Test. The result reveals the rapid development of economy in the Yangtze River Delta stimulus social consumption, thus results in prosperity of transportation industry, and promotes the construction of traffic facilities. Regional economy is an important impetus of the development of port logistics. Port logistics and regional economy generally shows a good momentum of mutual promotion. A dynamic system has almost been formed, but there still exists some bottlenecks in the development. Economy pushes port logistics to develop rapidly, but the added value of logistics is insufficient to explain the phenomenon of sustained economic growth. A lot of disordered and unbalanced phenomenon can be explained to the backward growth of logistics, such as the unreasonable investment, disordered layout, unfriendly competition, and so forth.

To break through these obstacles and realize the coordinated linkage development of each factor, eventually improve the international competitiveness of Yangtze River Delta port cities, port logistics should actively explore its way to become the leader of the regional economic development.

Here are some further suggestions given below which may help to solve the problem.

- Expand the functions of ports.

It is essential to have scientific and rational plans of port logistics to coordinate with the rapid speed of economic development. The support of financial and information platform to port logistics cannot be ignored. The significance of modern port logistics is that it can provide basic logistics service and derive value-added service of the whole supply chain system, which can stretch industry chain and improve the value chain. In the process of constantly developing service function, the ports are obliged to not only achieve the basic functions of cargo handling and warehousing, but also attract value-adding process on goods, and optimize configuration. Therefore, they can be transited and upgraded to multi-functional and modernized ports which perfectly integrate transportation organization, loading and unloading, modern logistics, information services, distribution, etc.

- Promote an integrated transport system.

At present, a satisfactory transport system hasn’t been formed between inland channel and coastal port. Therefore, the government should strengthen regional supplies transport hub port construction, promote standardization of inland ship type, encourage professional transportation of container and bulk cargo, so as to improve the volume of main inland channels such as Grand Canal. In addition, the region should emphasize on the construction of linkage transportation network of the sea and land, and promote an overall integrated transport system relying on port logistics.

- Alliance of development.

Ports should active explore their way to be more connected with their counterparts in vicinity. For instance, Ningbo-Zhoushan Port can resort to the dislocation development with Port of Shanghai. Such strategy aims to make full use of its advantage of large throughput. Specific methods can be listed as construction of large tonnage deepwater port, formation of specialized transport systems on delivering coal, ore, oil, containers, grain, and so on. Meanwhile, the Ningbo-Zhoushan Port can realize cooperative relationships with Jiaxing port, Wenzhou port, etc, by exchanging and sharing resource, and achieving mutually beneficial cooperation, and a win-win pattern.

IV. CONCLUSION

Compared to other statistical analysis software, the econometric analysis software Eviews takes the characteristics of time series into account, which is helpful in dynamic analysis of the causality between variables. This paper takes the Yangtze River Delta region in China and its 22 major cities as an example, and a selection of the competitiveness evaluation index system of port city logistics is made according to the Diamond Model. Using the collected data, and by doing the Granger Causality Test with regional economic index GDP, it turns out that nearly all the indexes of port logistics have a causality with regional economy. The results show that by using Eviews, the linkage relationship between the four factors and GDP of the Yangtze River Delta port logistics gets a good fitting and analysis. It proved that Eviews is applicable and effective in causality analysis of port logistics and regional economic variables.

However, the application of Granger Causality Test also has deficient. It lies in that the test result is sometimes very sensitive towards distinct lag lengths. Different lags may lead to completely different test results. The continuous evolution of Yangtze River Delta cities add to the complexity of data gathering. For instance, some small cities merge into one and some cities come into formation lately, thus, some data is blank. What’s more, the Yangtze River Delta is increasing its capacity with time goes by, the collected data is not uniform and is different in time span. Owing to some vacancy in parts of the city data and the difficulty in collecting the early data, the test may have a certain impact on the calculation results. Furthermore, we will complement and perfect our research in future work.

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REFERENCES

[1] Agung, I. Gusti Ngurah Wiley, "Time series data analysis using EViews," Wiley, October 2008.
[2] Agung, I. Gusti Ngurah Wiley, "Cross section and experimental data analysis using EViews", Wiley, March 2011.
[3] Ju Ge, Meimei Du, Chao Zhang, "A study on correlation of wind farms output in the large-scale wind power base", Constatin Brancusi Univeristy of Targu Jiu Annals - Economy Series, Vol. 1, pp. 277-284, May 2009.
[4] Ruize Wang, Yufu Ning, "Test on the economics cobweb model by using Eviews programming", Education Technology and Computer Science, Vol. 1, pp. 785-788, 2010.
[5] Daniel L. Thornton and Dallas S, "In lag-length selection and tests of Granger causality test between money and iIncome", Journal of Money, Credit and Banking, Vol. 17, pp. 164-178, May 1985.
[6] Bernard C. Beaudreau, "On the methodology of energy-GDP Granger causality tests", Original Research Article Energy, Vol. 35, pp. 3535-3539, September 2010.
[7] Peter Rossini, Valerie Kupke, "Granger causality test for the relationship between house and land prices", Eighteenth annual pacific-rim real estate society conference Adelaide, Australia, pp. 15-18, January 2012.
[8] Nan Liu, Yan Li, "Interaction between logistics development and economic growth in China", Journal of Industrial Engineering Management, Vol. 21, pp. 151-154, 2007. (in Chinese)
[9] Kleinberg S, Hripcsak G, "A review of causal inference for biomedical informatics", Journal of biomedical informatics. Vol. 44, pp. 1102-1112, December 2011.
[10] Bingyi Wang, "Port logistic," China Machine Press, January 2011.
[11] Bart W. Wiegmans, Erik Louw, "Changing port–city relations at Amsterdam: A new phase at the interface?" Journal of Transport Geography, Vol. 19, pp. 575-583, 2011.
[12] Jasmine Siu Lee Lam, Wei Yim Yap, "Dynamics of liner shipping network and port connectivity in supply chain systems: analysis on East Asia", Journal of Transport Geography, pp. 1272-1281, 2011.
[13] Giuseppe Carone, "Modeling the U.S. demand for imports through co-integration and error correction", Journal of Policy Modeling, pp. 1-48, 1996.
[14] Gi-Tae Yeo, Michael Roe, John Dinwoodie, "Evaluating the competitiveness of container ports in Korea and China", Transportation Research Part A, pp. 910-921, 2008.
[15] Guojun Ji, Weishou Wang, Wei Feng, "A study on service competence and competitiveness of port logistics", Service Systems and Service Management, 2010 7th International Conference, pp. 1-6, 2010.
[16] Jinshan Chen, Haizhen Lv, "Analytical hierarchy process applied to port logistics efficiency judgment", Informatics in Control, Automation and Robotics (CAR), 2010 2nd International Asia Conference, Vol. 3, pp. 231-234, 2010.
[17] Zengchuo Si, "Research survey of port infrastructure and region economy development— based on the literature in China", Science and Technology of East China University, pp. 48-60, February 2011. (in Chinese)
[18] Bin Zhan, Jun Guo, "Research on the coordinated development between port logistics and regional economy", Business Computing and Global Informatization, 2011 International Conference, pp. 158–161, 2011.
[19] Clive W.J. Granger, "Investigating causal relations by econometric models and cross-spectral methods", Econometrica, Vol. 37, pp. 424-438, 1969.
[20] A. H. Studenmund, "Using econometrics: A practical guide", 5th ed, Inc.: Pearsom Education, 2006.
[21] Dominick Salvatore, Derrick Reagic, Yizhong Du, "Statistics and econometrics", Fudan University Press, August 2008.
[22] Damodar N. Gujarati, Dawn C. Porter, "Essentials of econometrics", China Machine Press, August 2010.
[23] Porter M E, "The Competitive Advantage of Nations", New York: The Free Press, 1990.