2014

ISSN : 0974 - 7435 Volume 10 Issue 21

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(21), 2014 [12853-12858]

Quantitatively analyzing the synergistic effect of the development of regional logistics and economy by applying co-integration theory in econometrics

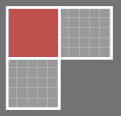
Ronghua Fan
School of Economics and Management, Nanyang Institute of Technology, Nanyang, 473004, (CHINA)

ABSTRACT

In the 21st century, the world economy and the logistics industry are gaining momentum with the constant development of economic globalization. For one thing, the fast development of economy made it possible for the development of the logistics industry. For the other, the robust development of the logistics industry accelerated the regional economic growth. The relationship between the higher level of regional economic development and constant growth of regional logistics industry has been the focus of logistics industry research. The paper aims to survey and dig into the environment of logistics industry and economic development of Anhui province by checking relevant statements, carrying out field study. Integrated with co-integration theory in the econometrics, quantitative analysis is conducted to check relevant data and find out quantitative association between regional logistics and economic development. Thus proposals are made to promote the economic and logistic development in Anhui province. Through series stationarity test, co-integration theory, error correction model and Granger test, the study finds that the relationship between regional logistics and economic development remains mutually promotive. The study shows that the ways to promote regional economic and logistic development mainly include: give full play to the driving effect of economic development on the logistic development, balance regional development in a flexible way, coordinate the efforts of economic and logistic development, and accelerate industrial restructuring.

KEYWORDS

Co-integration theory; Regional logistics; Regional economy; Synergistic effect; Anhui province.



INTRODUCTION

It is generally believed in academic circle that regional logistic development bears a close relationship to regional economic growth. In 2009, logistics was adopted as one of the ten industry revitalization planning. Ever since, it has been raising concerns among business, academic circles and other sectors of the society. Chinese governments at all levels formulate and roll out logistics-related development plan in succession to support the development of regional logistics industry. To answer the call of the Central Committee of the Party, the Twelfth Five-year Plan of Anhui province will incorporate the logistics industry into the provincial "816" program and stress the importance of developing three logistics areas, namely export-oriented modern logistics industrial belt in Wanjiang region, Hefei logistics circle and logistics industrial belt along Huaihe River. It will vigorously develop and build the synthetic logistics center, specialized logistics center and distribution center, accelerate the development of public logistic information platform in a balanced and well-planned way, hence the efficient and fast modern logistics system. Relevant insights have been gained by studying and analyzing the relationship between regional logistics and economic development among scholars and entrepreneurs. However, most researches at home and abroad have ignored the imbalanced economic development among regions. And researches targeting specialized economic and logistic development level are relatively less. Therefore these researches cannot practically guide the development of regional economic and logistics industry development.

Series stationarity test, co-integration theory, error correction model and Granger test and other analysis and measuring methods are applied in this study to survey and study the logistics industry and regional economic development in Anhui province, analyze the synergistic effect between regional logistic and economic development, and make suggestions about promoting the logistics industry and regional economic development, thereby promoting the balanced development of regional logistics and economy.

RESEARCH DESIGN

Index choice

Economic development level index

GDP, GNP and GDP per capita are three most common indexes weighing national and regional economic development level. Among them, GDP which refers to all the ultimate outcome of production activities within a certain period in a country or region is a universally recognized index reflecting regional economic growth. Therefore, in spite of the price, GDP reflects the economic development level in one region in a relative objective way. This study will adopt GDP as the index weighing regional economic growth.

Logistics industry development level

The logistics level in one region is the main index reflecting and measuring regional logistics development level. Regional logistics capability maximizes the ability of the subject to offer the needed logistics service to the demander of logistics service in the region by organizing and applying various resource within the logistic system in an effective and reasonable way. The study will adopt the production value of logistics development as the index weighing regional logistics development level.

Data sources and processing

Data sources

The selected data of this research mainly come from the data of years in the statistical yearbook from 1978 to 2010 in Anhui province. The logistics production value (hereafter referred to as WLCZ) then was showed by the combined value of transportation, postal industry and warehousing among others of the following year. It is remarkable that the income of telecommunication industry of Anhui province couldn't be separated from the production value of logistics in 2004, while it became independent branch with its income separated from logistics production value after 2005. Thus some errors which are inevitable exist in the gross production value of logistics in Anhui province. And GDP is represented by the gross domestic production value of each year in Anhui province.

Data processing

To free the GDP in the data analysis from the effect of price changes, the study deals with GDP as follows:

$$GDP^* = \frac{GDP}{CPI} \times 100$$

As above, GDP* represents the gross domestic product freed from price effects. GDP represents the gross domestic product of the year, while CPI is consumer price index of the year.

In a similar way, to free LIOV from the effect of price changes, the study deals with WLCZ as follows:

$$WLCZ^* = \frac{WLCZ}{CPI} \times 100$$

In this analogy, WLCZ* represents the logistics production value freed from price changes, WLCZ represents the production value of logistics industry of the year and CPI still represents consumer price index of the year.

Figure 1 shows the time series curve graph of LNGDP and INWLCZ according to the above formula. Figure 2 shows the time series scatter diagram of LNGDP and INWLCZ according to the above formula.

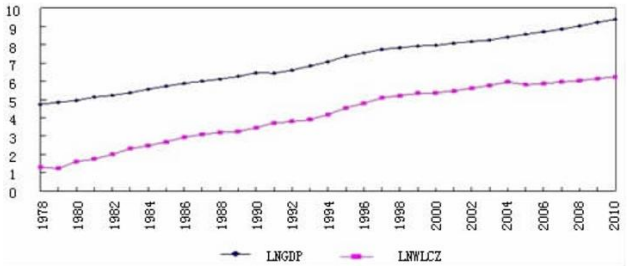


Figure 1 : The time series curve figure of LNGDP and LNWLCZ

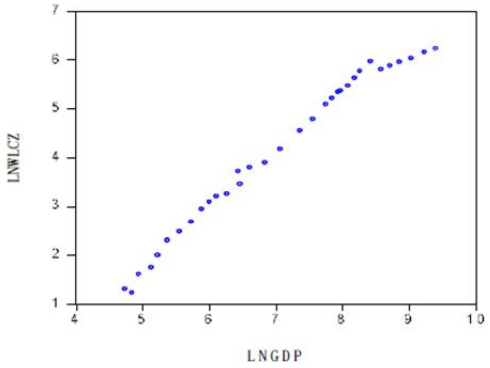


Figure 2 : The time series scatter diagram of LNGDP and LNWLCZ

EMPIRICAL ANALYSIS

Time series stationarity test

In the practical measurement and practice, quite a lot time series show nonstationary features. Spurious Regression which is meaningless as no linear relation exist between two variables while relevant test shows the relation is striking often occurs when we made simple and traditional regression analysis. Therefore, it is necessary to conduct stationarity test or unit root test for time series at first to avoid the Spurious Regression. The unit root test selected by this paper is the common Augmented Dickey Fuller test (ADF test). And according to relevant statistics from statistical yearbook of Anhui province, ADF test is conducted to check the time series of the two variables namely total logistics production value (WLCZ) and gross domestic product of each year in Anhui province. And relevant softwares are applied to process the data. The results are shown in TABLE 1.

TABLE 1 : ADF test results of GDP and total logistics production value of Anhui province

Variables	Test form (c, t, n)	DW value	ADF value	1% critical value	5%critical value	10%critical value	Conclusion
LNGDP	(c, t, 1)	2.23697	-2.36198	-4.28458	-3.56288	-3.21527	nonstationary
LNGDP	(c, 0, 1)	2.04933	-0.14668	-3.66166	-2.96010	-2.61916	nonstationary
DLNGDP	(c, t, 1)	1.92516	-2.89713	-4.29673	-3.56838	-3.21838	nonstationary
D2LNGDP	(c, t, 1)	1.89805	-5.23068	-4.30982	-3.57424	-3.22173	stationary
LNWLCZ	(c, t, 1)	1.69519	-0.72713	-4.28458	-3.56288	-3.21527	nonstationary
LNWLCZ	(c, 0,1)	1.69846	-3.13940	-3.66166	-3.96041	-2.61916	nonstationary
DLNWLCZ	(c, t, 1)	1.82533	-3.38154	-4.29673	-3.56838	-3.21838	nonstationary
D2LNWLCZ	(c, t, 1)	2.00276	-5.58903	-4.30982	-3.57424	-3.22173	stationary

Note: In this table, c represents constant term, t represents trend term, n represents lag coefficient, 0 represents the lack of t, D represents first difference operator, D2 represents second difference operator and critical values under significance level of 1%, 5% and 10% are shown.

TABLE 1 shows that the series of LNGDP, LNWLCZ, DLNGDP and DLNWLCZ are nonstationary through ADF test. While the table shows D2LNGDP and D2LMWLCZ are stationary. Thus the time series of the economic growth and logistics development are two-step stationary series.

Co-integration Theory

The above TABLE 1 shows that the series of LNGDP, LNWLCZ, DLNGDP and DLNWLCZ are nonstationary, so the traditional and relatively simple econometrics theory cannot be applied to build model. As a result, this paper digs into the relationship or co-integration relationship between two variables series namely GDP and WLCZ with co-integration theory. Generally, the ways to check and estimate co-integration relationship are EG (Engle-Grange) two-step method and JJ (Johansen-Jusdius) traces statistics method (or max-Eigen value method). EG two-step method is mainly applied to monadic variables in a simple way. However, it stands a chance of being phased out due to many flaws. Although the test process of JJ trace statistics method is complicated, it works well and it can detect complex co-integration relationship among variables which is significant for testing complicated series and obtaining clear results.

Therefore, the paper will adopt JJ trace statistics method to test the co-integration relationship among variables. The results are shown in TABLE 2.

TABLE 2 : The co-integration test of GDP and total production value of logistics industry

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.#
None*	0.399147	23.343190	12.320900	0.0005
At most 1*	0.216200	7.551628	14.129906	0.0871
Trace test indicates 2 cointegrating eqn(s) at the 0.05level *denotes rejection of the hypothesis at the 0.05 level #MacKinnon-Haug-Michelis (1999)p-values				

According to the TABLE 2, there is only one co-integration relationship below 5 percent significance level, namely the co-integration of vectors (LNGDP, LNWLCZ) being (-1.622313, 1.345811) and standardized co-integration of vectors (logistics production value of Anhui province, GDP of Anhui province, trend C) being (1.000000, -0.821538, 0.229798). Therefore the long-term balanced equation of GDP and logistics production value of Anhui province is LNWLCZ = 0. 821 538LNGDP + 0. 229 798 +εt. And stationarity test is conducted to test the residual series of the equation. As a result, the ADF test statistics is -4.567663 which is less than -4.234735(the critical value calculated when the significance level is 1 percent). At the same time, the residual series is stationary when the value fluctuates around 0.

In conclusion, long-term stationary co-integration relationship exists in GDP and logistics production value of Anhui province. Besides, from 1978 to 2010, GDP of Anhui province developed in a synthetic and balanced way. That is to say, the economic growth significantly promoted the development of logistics.

Error correction model

Based on the above statistics, this paper will adopt Johansen method and apply error correction model to show the short-term fluctuation of economic growth and logistics development:

$$\begin{aligned} D(LNWLCZ)_t &= 0.457063D(LNGDP)_{t-1} + \\ &0.515874D(LNGDP)_{t-2} + \\ &0.121414d(LNWLCZ)_{t-1} + \\ &0.058534D(LNWLCZ)_{t-2} - \\ &0.015469 + \varepsilon_t \quad (2) \end{aligned}$$

Thus it can be seen from the formula that the economy and logistics of Anhui province develop in a certain balanced way in the short term, which means the logistics develops along with the economic growth of Anhui province and vice versa.

Granger test

Granger test is generally applied to test the causal relation among two or more economic variables. Its basic rationale is as follows:

If X brings changes in Y, then X should change before Y does. Based on this rationale, statistics of GDP and logistics development of Anhui province from 1978 to 2010 are analyzed. The results are shown in TABLE 3.

TABLE 3 : Granger test of GDP and total production value of logistics of Anhui province

Null Hypothesis	Obs	F-Statistic	Prob.	Conclusion
LNWLCZ does not Granger Cause LNGDP	31	0.29308	0.7484	Yes
LNGDP does not Granger Cause LNWLCZ	31	2.56400	0.0963	No

TABLE 3 shows that one-way Granger relation exists between GDP and logistics production value of Anhui province from1978 to 2010, which means that economic development of Anhui province drives the fast development of logistics industry.

CONCLUSION AND PROPOSALS

Conclusion

(1) The test of Granger causal relation indicates that the economic development of Anhui province promotes the development of local logistics industry which in turn plays limited role in the regional economic growth. In 2010, the gross industrial output value exceeded 500 billion RMB, retail sales of consumer goods reached 415.15172 billion RMB and the total volume of imports and exports was 24.27677 billion dollars. The fast development of economy in Anhui province contributes to the constant improvement of warehousing and transportation, which solidly guarantees and ensures the development of logistics industry. However, the logistics industry plays a limited role in promoting economic development. In other words, the synergistic effect of the development of the logistics industry and local economy is not obvious and needs improving.

(2) The test of Granger causal relation indicates that the development of logistics cannot contribute to the economic growth in Anhui province. However, the co-integration theory shows that the logistics development plays a limited but positive role in the economic growth in Anhui province. As time goes by, the development of logistics industry will promote the regional economic development in an increasingly evident way, which shows that the faster development of logistics industry is not only of great importance to itself, but a great driving force to the local economic development.

(3) For the moment, the development of logistics industry and regional economy in Anhui province lacks good interactive development mechanism. As a result, the logistics development plays an active role in promoting economic growth which contributes less to the logistic development. This mainly owes to the lack of reliable and evident mechanism in the logistics industry of Anhui province, which needs constant driving efforts from the government and the people. The Synergistic developments of regional logistics and economy is shown as Figure 3.

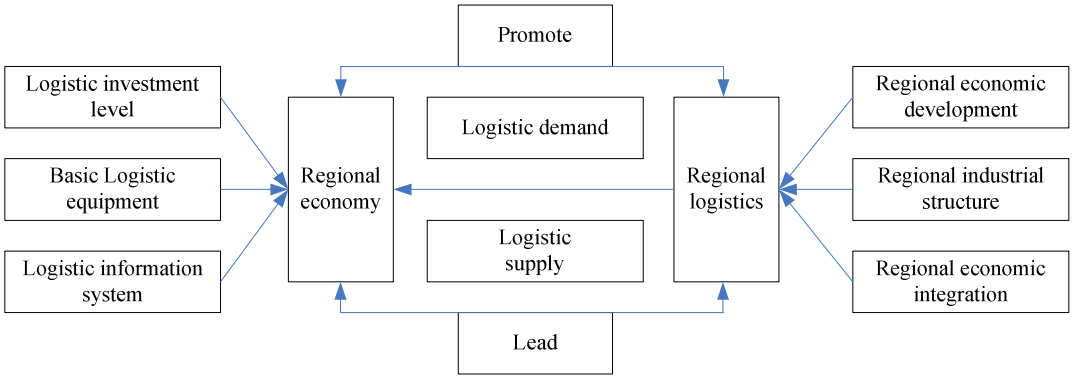


Figure 3 : Synergistic developments of regional logistics and economy

Proposals for the economic and logistic development in anhui province

Firstly, the government of Anhui province must give full play to the driving force that economic development has on the logistics development. As online shopping prevails, the logistics industry with express delivery as the representative can draw a clearer picture of the economic development and other aspects of social life in one country or region. And the synergetic development of regional economy and logistics industry gradually becomes the core impetus of the regional development. While promoting the economic growth, the government of Anhui province should give full play to the leading role the economic development plays in the logistics industry development. It should accelerate the development of the logistics industry, and perfectly combine the logistics industry with the tertiary industry, thus contributing to the sound, fast and steady growth of national economy in Anhui province and the country as a whole.

Secondly, the government of Anhui province must balance the regional development and develop the logistics industry in light with local conditions. Although the logistics industry plays an indelible role in the local economic development, it should be developed in a moderate manner. The logistics industry in different areas of Anhui province should be given priority combined with local features. For those areas with relatively balanced development of interior economy and logistics, priority should be given to improve the balance and sustainable development of economic growth and logistics industry. For those areas with wide gap between the development of interior economy and logistics industry, priority should be given to the development of logistics industry or capital investments, thereby bridging the gap between economic growth and logistics development level and rate, thus laying a firm foundation of balancing economic and logistic development.

Thirdly, the government of Anhui province must improve the logistics industry system, the establishment of which is the basis and precondition of economic and social development and plays a significant role in promoting the overall

development of the region. The logistics industry of Anhui province remains stagnant mainly because of the lack of relevant sound laws and regulations which leads to the failure of reasonable and legal regulations on logistics industry. Thus Anhui province must accelerate the development of sound logistics industry and promote the development of the logistics industry in a sound and orderly manner.

Lastly, the government of Anhui province must accelerate the transformation of industrial structure. It's the sure trend and results of urban development that the primary and secondary industry should transform to the tertiary industry. Therefore, the government of Anhui province must continue to accelerate industrial transfer of Wanjiang urban belt and achieve industrial upgrading successfully, thus providing a reasonable platform for the development of logistics industry, promoting the fast and sound growth of regional economy of Anhui province, and achieving balanced development of economy and logistics industry of Anhui province.

REFERENCE

[1] Xunping Lei, Yanhua Tan, Liang Wang; Research on the co-integration relation of regional logistics and economy in anhui province[J], Journal of Shandong Institute of Business and Technology, **27(2)**, 84-88 **(2013)**.

[2] Xunping Lei, Yanhua Tan, Song Ye; Research on the interactive development of regional logistics and economy in anhui province, Journal of Shanghai Business School, **13(1)**, 17-22 **(2012)**.

[3] Linbang Fan; Relation between logistics development and economic growth—Take typical regions such as northern, middle, and southern suzhou as examples [J], China Business and Market, **18(7)**, 32-37 **(2012)**.

[4] Tai Zhou, Huaizhen Ye; Quantitative model of regional logistics capability based on fuzzy matter element and euclid approach[J], Systems Engineering, **26(6)**, 27-31 **(2008)**.

[5] Zinai Li; Econometric[M], Beijing: Tsinghua University Press, **12(2)**, 15-17 **(2005)**.

[6] Hubin Guo; Econometric research on the synergistic development of logistics and economy in yangtze river delta region [J], Commercial Times, **25(19)**, 33-35 **(2010)**.

[7] Zhongming Shen, Qian Zhang; Empirical study of regional logistics and economy in fujian province[J], Journal of The Central University for Nationalities: Natural Sciences Edition, **21(2)**, 60-64 **(2012)**.

[8] Meiqing Zhang, Ye Zhou, Changlong Zhou; Research on the balanced development of regional economy and logistics based on intergrowth theory, Journal of Beijing Jiaotong University: Social Sciences Edition, **11(1)**, 27 -34 **(2012)**. Guohua Wang; Regional logistics development and economy integration[J], Journal of Modern Logistics, **5(3)**, 11-18 **(2006)**.