Factor Analysis and Empirical Research on Regional Logistics Demand in Shangrao

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ABSTRACT: This article analyses the Shangrao area's economic conditions through the aspects of gross economic value, industry structure, and investment in fixed assets, further explaining the logistics development situation of Shangrao in terms of infrastructure equipment, the status quo of logistics development as well as logistics corporations development. Based on what is mentioned above, Shangrao's 2003-2012 data on gross domestic product, the total output value of primary industry, the secondary industry and the tertiary industry, total Shangrao retail amount, import and export volume, Shangrao fixed asset investment, per capita income, cargo and freight turnover, etc, combined with using multivariate regression model and measurement stepwise regression method to analyse the impact factors of Shangrao regional logistics demand. The study results show that: the total retail sales of social consumer enjoy the most significant impact on logistics needs of Shangrao region. If the total retail sales of social consumer products increase by an additional ten million Yuan, cargo volume would increase 459.9792 million tons, so as the freight turnover would increase by 0.00924 billion ton-km.
KEYWORDS: Shangrao; regional logistics; demand forecast; influencing factors; empirical study

1 INTRODUCTION

Global logistics industry developed a new trend in today's era filled up with e-commerce. Modern logistics is the calling of this era, and has become the third profit source for corporations to keep reducing production consumptions and increase labor productivity, as a new economic growth point of the 21st century, it plays an important role in national economy and social development. In recent years, the worldwide modern logistics industry has shown steady growth, Europe, USA and Japan have become an important global logistics bases.

With respect to the United States where the logistics origins and advanced country-Japan where logistics is fast developing, China's logistics started relatively late and is still in the initial development state. With the rapid and stable development of China's economy, the scale of China's logistics industry will continue to rapidly expand, concentration will be further enhanced, as well as adapting to the adjustment of economic structure and industrial structure.

Shangrao City is located at the junction of Fujian, Zhejiang and Anhui provinces, where the development of the trade and logistics industries enjoys a unique geographical advantage. The rapid rise of the economy has also laid a good foundation for the development of the modern logistics industry in recent years. Scattered round the commercial centre, main roads entrances, port cargo transshipment hub, especially with the development and expansion of Shangrao Economic Development Zone and the development and construction of the new Station Area, Shangrao City has gradually formed a number of regional logistics centres. The city's logistics industry is moving from sporadic and scatter towards intensive and large-scale development, which has realized trade logistics' "large scale, big market and big circulation" target.

2 RESEARCH STATUS AT HOME AND ABROAD

2.1 *Current Situation of Domestic Research*

China has begun to introduce the concept of logistics and large amount of Western theories and achievements on logistics since the 1980s, however, certain targeted research is at a standstill. Among Chinese scholars, Professor Wang Zhitai and Wu Qing have made an outstanding contribution in logistics. They first introduced the concept of "logistics" into China, and have been committed to

the enlightenment and the pioneering works of China's logistics industry. Numerous articles have been published on logistics technology, logistics, facilities planning and design, material handling systems. They also proposed the idea and suggestion of China Pallet System which made a great contribution to the development of modern logistics in China and its integration with the world community. Since then, China's newspapers, magazines, dictionaries and treatises started the discussion of the logistics, a number of influential achievements thus appeared.

2.2 *Current Situation of Foreign Studies*

Forecasting analysis of logistics demand by foreign experts is focused on the transportation demand. In 1996's article "Adopt Multi-criteria Decision-Making Tool for Inventory Forecasting", Jukka Korpela believes that inventory is an important part of the logistics, and the key of inventory management is forecast demand. The use of AHP for logistics demand forecasting improved results[1]. In 1998, S.Y. Yun first applied the artificial intelligence for freight forecasting, learning that the accuracy of linear statistical model is lower[2] than the prediction of neural network model. In 1999, the book "Grain Freight Railway Time Series Forecasting" written by Michael W. Babcock and Xiaohua Lu, introduced the notion of prediction model on multiple linear regression analysis, such as time-series forecasting models and the linear regression forecasting model. They also adopted time series analytical models for grain freight railway transport[3]. In 2001, Bahram Adrangi analysed monthly aviation data in the article "American Air Service Forecast- Chaotic and Nonlinear Investigation", using gray G (3,1), grey G (1,1) model to predict the United States Airlines, reasonably analysed the nonlinear properties of the aviation services industry[4]. The logistics industry started early in developed countries due to their early entering of the industrial age, and they greatly benefited in both theory and practice way as well as successful experience. In terms of logistic statistics, developed countries take management costs, transportation costs, warehousing costs as an indicator to count the logistic costs, and using the proportion of logistics costs engaged in GDP to represent the logistics scale.

3 VARIABLES, DATA AND MODEL

3.1 Variables

When conducting logistics demand analysis and forecasting, the main method is to analyze and predict logistics volume, because it does reflects the logistics demand to a certain extent, and is basically using past logistics volume to predict the future. Logistics volume includes traffic volume, inventory volume, terminal distribution volume, inbound logistics volume, handling volume, etc. Obviously, traffic volume is only one of the major components of logistics volume, however, variations showing on traffic volume can basically reflect the logistics volume, and for its operational ability, traffic volume is generally used to replace logistics volume for the analysis and prediction of logistics demand[5].

This paper selected Shangrao integrated freight volume and cargo turnover as an indicator for measuring the scale of logistics demand. Cargo volume only reflects the quantity of completed transportation goods, and the cargo is is calculated as a cargo ton if it reaches a ton, regardless of the transportation length or goods types. However, different goods result in different displacement, such as their labour intensity. Turnover volume, on the contrary, could reflect labour intensity and transportation results comprehensively, but does not reflect the cargo transportation volume. Therefore, this paper will combine those two to predict for a comprehensive reflection of Shangrao logistics demand conditions.

Economic indicator refers to an indicator that imposes a significant impact on the logistics demand, and would be used on the logistics demand forecast. According to the economic impact analysis made on Shangrao logistics demand in the first section of this chapter, economic indicators of Shangrao logistics demand analysis and forecasting can be set as following aspects. (1) Total economy indicators: Shangrao's Gross Domestic Product (GDP); (2) Industrial structure indicators: the value of Shangrao's first, second, and third industries total output; (3) Trade indicators : Shangrao's total foreign trade, Shangrao's total retail sales; (4) Shangrao's fixed assets investment volume; (5) Consumption level indicators: Shangrao's per capita income.

3.2 *Data*

This paper selected the following variables. Argument: Shangrao gross domestic product (GDP) X1; first industry output X2; the second industry output X3; tertiary industry output X4; Shangrao total retail amount X5; total import and export volume X6; Shangrao fixed assets investment X7; per capita income X8. The dependent variable: traffic volume Y; turnover volume Z.

Table 1: Statistics on main economic indicators of Shangrao City (2003-2012)

Year	Y	Z	X1	X2	X3	X4	X5	X6	X7	X8
2003	3071	18.81	2525.7	620	933.3	974.2	1066.3	80	1126	2383
2004	3102	18.98	3011	647	1235	1128	1238	132	1528	2912
2005	3443	20.91	3881	846.5	1647.1	1387	1358	160	2270	3226
2006	4721	34.73	4513.8	876.5	2006.9	1630.4	1580.1	181	3183.1	3524
2007	6255	46.34	5280.6	983.9	2420.9	1875.8	1869	300	4050	3902
2008	7066	55.34	6283	1200	2979	2100	2315.1	557	4279	4353
2009	11154	175.99	7285	1354	3578	2353	2763.6	644	6123.8	4707
2010	14581	251.14	9010	1517	4593.7	2899.3	3305	1667	8053.5	5317
2011	15230	256.00	11105.8	1765	5989.8	3351	3782.3	2651	8284.6	6134
2012	15992	264.14	12653.9	1928.3	6625.4	4100.2	4269.4	2705	10882.6	7011

Data source: Statistical Yearbook 2013, Shangrao

3.3 *Model*

When the explanatory variable Y is simultaneously influenced by many explanatory variables X_i, and all of X_i(i = 1, 2… n) have a linear relationship with Y, a multivariate non-linear regression model can be established, which can be described as:

$$Y = B_0 + B_1X_1 + B_2X_2 + [illegible] + B_nX_n + U \quad (1)$$

Where Y is the dependant variable, X_i(i = 1, 2… n) are independent variables, B_j(j=0, 1, 2… k) is the regression coefficient, and U is the random error (factors which influence Y other than X).

4 EMPIRICAL ANALYSIS

A least square regression analysis was carried out on the basis of the model, data and variables previously outlined, yielding the results shown in Table 2.

Table 2 Least Square Regression Output of Freight Quantity and Independent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14401.30	5744.502	2.506971	0.2416
X1	267.4119	195.7023	1.366421	0.4022
X2	-270.6165	197.6703	-1.369030	0.4016
X3	-261.0124	193.4357	-1.349350	0.4060
X4	-275.8740	195.4340	-1.411597	0.3924
X5	1.956886	1.989893	0.983412	0.5053
X6	-1.259921	1.242225	-1.014246	0.4955
X7	2.698361	0.595744	4.529394	0.1383
X8	-4.879013	2.706551	-1.802668	0.3224
R-squared	0.999664	Mean dependent var	8461.500	
Adjusted R-squared	0.996974	S.D. dependent var	5280.923	
S.E. of regression	290.5143	Akaike info criterion	13.67860	
Sum squared resid	84398.56	Schwarz criterion	13.95092	
Log likelihood	-59.39299	F-statistic	371.6132	
Durbin-Watson stat	2.905955	Prob(F-statistic)	0.040099	

It can be seen from the table that the corrected value of R was 0.996974, which shows that the model fits well with the samples. The value of F was 371.6132, as is shown across the model. But when A = 0.05, the threshold value of t ranged from 6.314 to 12.706, so none of the independent variables' passed the t-test. Furthermore, the values of X2, X3, X4, X5, X6, and X8 were contrary to expectation, which signifies that there may be a strong multicollinearity between independent variables.

The relationship between explanatory variables is as shown in Table 3:

Table 3: Correlation between Explanatory Variables

	X1	X2	X3	X4	X5	X6	X7	X8
X1	1.000000	0.994752	0.999240	0.997069	0.995781	0.961571	0.988845	0.996664
X2	0.994752	1.000000	0.992818	0.989340	0.995477	0.939268	0.985192	0.992493
X3	0.999240	0.992818	1.000000	0.993892	0.994767	0.969279	0.984451	0.993881
X4	0.997069	0.989340	0.993892	1.000000	0.991124	0.950234	0.992428	0.997145
X5	0.995781	0.995477	0.994767	0.991124	1.000000	0.951169	0.990715	0.991729
X6	0.961571	0.939268	0.969279	0.950234	0.951169	1.000000	0.931002	0.942619
X7	0.988845	0.985192	0.984451	0.992428	0.990715	0.931002	1.000000	0.987979
X8	0.996664	0.992493	0.993881	0.997145	0.991729	0.942619	0.987979	1.000000

It can be seen from the preceding table that there is a high degree of correlation between the explanatory variables, which proves the existence of a strong multicollinearity. This extant correlation exacerbates standard error in the estimate, in turn decreasing the estimate's accuracy, which may lead to sign error. The t-ratio becomes smaller, which may lead to being unable to pass the t-test. So in order to cancel out this collinearity, Eviews software was used to cancel multicollinearity by means of stepwise regression in this study. In the final model, which shows that for every ten million RMB by which consumer goods sales rose in Shangrao, the quantity of goods shipped increased by 459, 979.2 tonnes. For the same reason, the modelled cargo turnover was: $Z = -103.3861 + 0.092422 * X5$, which shows that for every additional ten million RMB by which consumer goods sales rose in Shangrao, cargo turnover increased by 9.24 million tonne-kilometers.

5 CONCLUSION AND POLICY ADVICE

The study's findings show that: total sales of retail consumer goods have the most important effect on logistic demand in the Shangrao region. For every ten million RMB by which consumer goods sales rose in Shangrao, the quantity of goods shipped increased by 459, 979.2 tonnes. For every additional ten million RMB by which consumer goods sales rose in Shangrao, cargo turnover increased by 9.24 million tonne-kilometers.

These findings show total retail sales of consumer goods have great significance in promoting logistics demand, and simultaneously mean that demand within the Shangrao Region has a direct key effect in stimulating logistics demand. Due to this, measures should be taken to increase internal demand and thereby spur the development of logistics demand, which will simultaneously further influence the satisfaction of internal demand.

REFERENCES

[1] Jukka Korpela, Markku Tuominen. Inventory forecasting with multiple criteria Decision tool .International Journal of Production Economics, 1996(45):1-3.

[2] S.Y.Yun, S.Namkoong, J.H.Rho, S.W.Shin and J.U.Choi.A performance evaluation of neural network models in traffic volume forecasting. Mathematical and Computer Modelling, 1998(27):293-310.

[3] Michael W.BabcocK, Xiaohua Lu, Jerry Norton. Time series forecasting of quarterly railroad grain car loadings. Transportation Research Part Eulogistic and Transportation Review, 1999(l):15-28.

[4] Bahram Adrangi, Arjun Chatrath, Kambiz Raffiee. The demand for US air transport service: a chaos and nonlinearity investigation. Transportation Research Part E: Logistics and Transportation Review, 2001(5):337-353.

[5] Di Juan, Analysis and Prediction of Changes in the Transportation Structure of Jiangsu Province, Master's dissertation completed at Southeast University, 2005.