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Analysis of influencing factors of coastal port cargo throughput in China from economic aspect

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ANALYSIS OF INFLUENCING FACTORS OF COASTAL PORT CARGO THROUGHPUT IN CHINA FROM ECONOMIC ASPECT

By

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Contents

Abstract

Coastal ports in China has developed rapidly and obtained great achievements. Port is the national fundamental facilities. With the dual-driven of economic globalization and internationalization of the coastal city, some large ports have been completed from the infrastructural transportation hub to market allocation of resources in world transformation.

Analysis on the Influencing Factors on the Coastal Ports Cargo Throughput in China, taking Major Coastal Port Cargo Throughput as the studying object, adopting qualitative and quantitative methods of analysis to give a comprehensive analysis of the factors affecting container liner freight and constructing multiplying linear regression model to have an empirical study. The purpose of the study mainly solves two problem: one is which factors affect coastal ports cargo throughput and the relationship between coastal ports cargo throughput and national economic; the other is how these main factors influence directly or indirectly the volume of coastal ports cargo throughput.

In terms of qualitative analysis, it is necessary to distinguish between total economy and structural factors, and then we would take in-depth qualitative analysis in order to investigate the composition and evolution of port throughput growth trend. In terms of quantitative analysis, according to the characteristics and related selection factors of the volatility of the coastal ports cargo throughput recent years, in order to make out what factors may have contribution to coastal ports cargo throughput, we consider from two aspects which are scale of economy and structure contribution. Eviews is the main methodology tool.

It indicated what influence the coastal port development using multiple linear regression model. And we consider from two aspects which are macro economy and structure contribution to select factors. Result of the model that there are 4 factors stay including Total Foreign Import-Export Trade, the proportion of primary industry and teriary industry in GDP and volume of rail cargo turnover.

Key words: Coastal port cargo throughput; Multiple linear regression model; Economic aspect; Influencing factors

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1. Introduction

1.1 Research Background

Port is the delivery point of highway, railway, pipeline and water which is the transportation infrastructure and serve for national economy and society. With the rapid growth of China's economy and foreign trade, the function of China's coastal is improved. Coastal ports promoted the development of trade and industrial concentration about macro economic in coastal city. At same time, it promoted the rapid development of the coastal zone economy and radiation throughout the country to promote the development of the national economy. At present, China's coastal ports have a huge scale and advance industrialization of cargo demand have fast growth in long period. From the point of the future development, coastal ports and its hinterland economy will face the development of coastal resources, transportation channel capacity and the environment influence and restriction. The investment of coastal port construction is high, only when the scale of the stable throughput can support and guarantee the smooth development of the coastal port economy, which can promote the healthy and sustainable development of national economy. Both port construction and shoreline resources are not liquidity in the development of port. So rational development and integrated utilization of the port coastline and land area and economic hinterland of good support will become the important influencing factors of port development.

Port has become an important based on the economic development of China coastal areas. Coastal areas in China is the most active domestic economy and foreign trade transportation busiest distribution, economic core city and the most densely populated area. From its development process, for the development of coastal areas and prosperity has created a unique advantage. Reasonable port layout and efficient management is the most considerable to promote regional economic growth and the expansion of the international economic activities. Along with the rapid rising of

dependence of foreign trade in recent years, China's dependence on foreign trade transportation become more and more obvious. According to statistics, the export 90% of foreign trade realizes through port in China. The sum amount regional GDP of 62 regional cities within 200 km coastal accounted for 42% of whole country, and the sum amount GDP of 35 cities along the Yangtze river accounted for 27% of the whole country. Per about 1 million tonnes can create one hundred million yuan and provide about 2000 jobs.

Coastal ports in China has developed rapidly and obtained great achievements. Port is the national fundamental facilities. With the dual-driven of economic globalization and internationalization of the coastal city, some large ports have been completed from the infrastructural transportation hub to market allocation of resources in world transformation. Then port has become an important link in international trade and global value chain. Because the world industrial structure and space layout readjusted that promote the new port construction boom. In the middle of industrialization in China, represents a significant proportion of heavy industry, shipping demand is strong, port facility capacity increase rapidly.

China's economic growth over the years has always been a kind of high input, high consumption of extensive development pattern, makes the national economy in the operation of the various aspects produced different degree of waste and ignore the sustainable development of the national economy in the future. Excess capacity to bring the negative effect of a force for port construction scale, reasonable regulation also indicates the relevant sea freight volume growth will slow. With the adjustment of industrial structure, the future economic development to a certain period of port freight volume growth rate will inevitably slow down or showed a trend of decrease. Although China has entered a period of economic growth to accelerate, the extensive growth mode of our resources, environmental conditions and the conflict between economic growth further.

In a disturbing new report, the European Chamber of Commerce in China lays out the challenge in six sectors: aluminum, where the capacity utilization rate is forecast to be 67 per cent in 2009; wind power, on 70 per cent; steel, on 72 per cent; cement, on 78 per cent; chemicals, on 80 per cent; and refining, on 85 per cent. Yet vast additional capacity is on the way.

The scale of the excess capacity is breathtaking. At the end of 2008, China's steel capacity was 660m tons against demand of 470m tons. This difference is much the same as the European Union's total output. Yet, notes the report, "there are currently 58m tonnes of new capacity under construction in China". To the extent that gross domestic product is driven by such absurd spending is a measure of waste, not of economic welfare.It is a broader problem. China has become hooked on an unbalanced pattern of economic development, in which investment cures this year's excess capacity by increasing next year's.

China's coastal port construction is still in the period of rapid development. Because China is in rapid development stage, urbanization, industrialization and economic globalization cargo throughput and container throughput has maintained rapid growth for many years. After the 2008 financial crisis throughput rate fell below 10%. But the coastal areas of port construction is not cool, many coastal areas still in the active project and expanding scale. It will not only cause huge wharf and facilities in the waste of investment, and intensify regional port of vicious competition, at same time it will increase the difficulty that excess capacity regulation.

1.2 Research Purpose and Methodology:

1.2.1 Research Purpose

Analysis on the Influencing Factors on the Coastal Ports Cargo Throughput in China, taking Major Coastal Port Cargo Throughput as the studying object, adopting qualitative and quantitative methods of analysis to give a comprehensive analysis of

the factors affecting container liner freight and constructing multiplying linear regression model to have an empirical study. The purpose of the study mainly solves two problem: one is which factors affect coastal ports cargo throughput and the relationship between coastal ports cargo throughput and national economic; the other is how these main factors influence directly or indirectly the volume of coastal ports cargo throughput. It can better to determine the port in the current economic development stage of the development of a key, can for the government macro policy orientation and port enterprise management decision provides certain basis and reference, to guide the port industry and national economy coordinated development has the important practical significance. At the same time, to broaden the ports and related theories and methods in the field of national economy system have certain academic significance.

1.2.2 Research Methodology:

According to the characteristics and related factors of the volatility of the coastal ports cargo throughput recent years, in order to make out what factors may have contribution to coastal ports cargo throughput, we consider from two aspects which are scale of economy and structure contribution. Eviews is the main methodology tool.

The thesis applies multivariable linear regression analysis for the selected variables to verify the correctness of the assumptions, using the sample data from 2005 to 2014's financial data. According to the regression results and backward elimination or forward elimination, it summarizes the main factor affecting of the the coastal ports cargo throughput. Then it put forward relevant recommendations on the construction and development of coastal port in China.

In this paper, China's coastal ports throughput for the study using multiple linear regression model.

2. Literature Review

2.1 Recent research of resource allocation in cargo throughput:

Zhu Jian, Siqing Yu (2011) The Vector Auto Regression (VAR) model of foreign trade cargoPartitioning of variance shows; increase of fixed investment system after the financial crisis improves more foreign trade cargo throughput of coastal ports than that before the financial crisis; both fluctuation in the RMB exchange rate and foreign direct investment have littlee influence on foreign trade cargo throughput of coastal ports before and after the financeial crisis; the world enconomy's recovery after the financial crisis dramatically improbes the foreign trade cargo throughput of coastal ports; influence of China's domestic economyc situation on foreign trade cargo throughput of coastal ports reduces greatly after the financial crisis.

Quande Cai , Jie Huang (2011).The results show that: This method makes a true reflection of the industrial structure adjustment and coastal port throughput relationship between mathematical logic and future development trends, the growth of the coastal port throughput by the industrial structure adjustment is slowing down, and it will be stable after crossing knee point.

Ping Zhang, Yixin Yan(2006) put forward a forecast model based on the above mechanisms. The model test results showed that the model can well reflect the actual systematic model and is effective for fitting or the system.

Manyu Xin(2014) A combinational model is presented ,which uses ARIMA forecast method and RBF neural network model to find out the change regulation of costal ports throughput. the results prove that the model for forecasting coastal throughput is effective and feasible ,and it has a good practical value .Jin Hexu (2010) uses statistic software and principle component analysis method to extract the most critical factors

which may affect the port throughput , and analyzes the intrinsic influence mechanism of the port throughout based .

Jian Zhu,Siqing Yu (2011) In short term, RMB appreciation would reduce the cargo throughput of china coast- al ports, and the impact of the RMB appreciation on cargo throughput is weakened after the financial crisis. Before the crisis, there exists the long term equilibrium relationship between the; RMB exchange rate and the cargo throughput of China coastal ports, but this equilibrium relationship no longer exists after the crisis.

2.2 Recent research of resource allocation in other markets

There are a mount of literatures focused on maritime market to analysis their influencing factors. Firstly, in the container market segment ,it is found that there are a lot of literatures focused on which factors effect the index. According to Zhang qi(2007), from the view of the supply and demand of Chinese liner shipping market freight rate of CCFI are analyzed in economics. Articles from the market concentration, the supply and demand theory, game theory and the Angle of the rigid demand curve analysis of container liner shipping market in our country, and from traffic, freight contrast, routes demand imbalance led to freight fluctuation. Wang Shufen(2011) have qualitatively points out that the factors that affect CCFI including 1, shipping market supply and demand; 2, including fuel prices, exchange rates and the transportation cost of Somali pirates factors; 3, including the international container liner freight rate filing system and macro policy factors such as the new export tax rebate policy.

In the research of individual route, another research finding described by Zhang Heng(2008) that's   the strange phenomenon that shipping container liner routes price appear negative rate exported from some ports in China since 2006 on Japanese. He considered from five aspects and gives explanation, 1, the airline capacity and capacity of supply and demand analysis;2, cost pricing strategy analysis;3,

decision-making behavior analysis between liner companies;4, the airline strategic alliance behavior analysis and coordination;5, the government behavior analysis.He analyze from the perspective of qualitative analysis which influencing factors of routes between China and Japan

On the other hand, there are some volatility research. For example, with X-12-ARIMA method, the paper readjusts the seasonal effect in CCFI, while adopting TRAMO/SEATS method to deal with the readjustment issues of holiday effect.And compared with two methods and the original index is decomposed of various factors using the optimized model, finally it has carried on the short-term forecast by Jiang Dina(2005). According to Chen Jinhai and Huang Shunquan(2010), who also analyzed CCFI the index of cyclical fluctuations, found its cycle period is 4 years, is associated with the cycle of the world economy, and along with the rise and fall of trade volume change, on the season is that the feature of high in summer and fall in winter and spring. According to Jiang Dina(2008), the article used two Markov switching model to examine the spot fluctuation of CCFI from Jan.1998 to Dec.2006,it turns out that different states had different transformation probability and each stae persist 2.9 months and 2.65 months respectively.

In the research of individual route, Economic Analysis of the Fluctuations in Freight Rates between Sino-US and Sino-Japanese Routes which is based on Chinese Container Freight Index (CCFI), this thesis longitudinally analysis the freight characteristics on the basis of Sino-US routes and Sino-Japanese route, then has the two freight fluctuations characteristic a horizontal comparison analysis, so it sums up the difference of the fluctuations characteristics. According to the Industrial Economic Theory, the market structure is the basic factor to determine the market price formation, so as to determine the competitive nature of industrial organization. This thesis introduce the market structure theory of Industry Economics which is related to freight fluctuations, and do an in-depth economic analysis to the freight fluctuation from market concentration, products differentiation, and market-access barriers,

market supply and demand as well as freight consultations and supervision. The thesis revealed the different market according to the different freight fluctuation characteristics.

Experts and scholars are mainly from fluctuation mechanism, wave characteristics, volatility risk assessment and risk avoidance strategy four aspects study of dry bulk freight rate fluctuations, this paper made a brief analysis of the mechanism for the freight rate fluctuation leads to freight peak fat-tailed distribution of yield, leverage effect and volatility spillover effect and so on characteristics, belong to the category of wave characteristics of research, the study of freight rate fluctuation characteristic was developed with the development of econometrics model.

3. Qualitative analysis on influencing factors of Coastal Port Cargo Throughput in China

3.1 Profile of coastal ports in China

Port is one of the decisive factors for the development of world economy. Starting in the 1980 s, in the field of shipping container transportation revolution happened, the world economic integration has become a trend. Big cities which located in international shipping lines, qualified several advantages like natural deep-water, wide economic hinterland and comprehensive transportation system become international shipping hub ports, and gradually become a global integrated logistics service base, merchandise goods distribution and financial and trade center. These coastal port to a large extent affect the global resources in the area of concentration, directly determines the region's ability to participate in international competition and a good position. Coastal ports play an important role that shift from traditional transportation hub to national economy which have the dual nature of basic industry and service industry.

So in this context, the construction and development of coastal ports in China, not only affects the development of national economy, but also the important measure of economic integration into the world. In order to better develop plans for the development of the coastal port construction, avoid excessive investment in construction of port facilities idle and waste, and invest in the construction of port become a bottleneck for the further development of social economy. And trend of port throughput is reflect the whole national economy. So it is necessary to understand the basis of the history and current situation of development of port construction, and analyze the influence factors of coastal port throughput and the relationship with the national economy, further in-depth study of China's coastal port throughput's relationship with the development of national economy.

3.1.1 Port construction and development in China

3.1.1.1 The history of the development of port construction in China

When the opium war opened the door of China, a series of unequal treaties signed make lost of control of the port in China. Western powers wreak havoc to plunder the resources and wealth of China who don't care about the development of China's economy, more don't care about the development of China's ports. Until before the founding of new China, our country's port almost paralyzed, the national each berth only have 60, QQCT say only 20000 meters, only more than 500 with throughput of 500 tons, most of the ports in the original state. During this period of Chinese port didn't get any development even some backwards.

After the founding of new China, the country's ports for the freshmen which have made a further development since the founding of new China. The construction of port development in China can be divided into the following five stages.

1) The first stage : in the 1950s to 1970s
   After the founding of new China, Chinese economy is mainly based on the mainland and transportation mainly depended by road and rail. Since there is potential military threats and sea blockade, government didn't invest too much energy and money on the port construction .The government withdraw the port operations, but this stage of the port's development mainly depended on technical reconstruction and recovery utilization.
2) The second stage: in the 1970 s
   During this period, Chinese national economy has obtained certain development and enhanced the communication with the international communication and promoted the development of trade between nations. The volume of foreign trade seaborne has been increasing that highlights the coastal port through capacity of goods is insufficient. Therefore, Premier Zhou issued the "three years transforming Chinese ports", ushered in the first peak of the port construction. Ports recover from the previous paralysis. Exercise during this period has produced a batch of port construction team, for the future of port construction and development has laid a good foundation.
3) The third stage: in the 1980 su

In these ten years, under the tide of global economic integration, the factors of production flow across the globe. Each country is closer together, the development of foreign trade in China to put forward higher requirements on the construction of ports in China. In the "purpose" (1981 ~ 1985), port construction and development as the strategic focus of the national economic development, make China into the second climax of port construction which brings considerable trade income for the country. At this stage, port construction to the national economic development has played an irreplaceable role.

4) The fourth stage: in the 1990 s

Along with the deepening of reform and opening up, China participated in more international competition, the promotion of international trade development that began to deepwater port berths and professional construction. Chinese ten years' development plan and "five-year" plan outline through more clearly the nature of the basic industries, transportation in the port of the construction of the third climax. These 10 years of construction formed the pivotal ports as the backbone. Then regional important port for complement and small ports appropriate the development of port development in the framework.

5) The fifth stage: at the beginning of the 21st century to now

With the economic globalization, trade liberalization, the international transportation integration and the development of modern information network technology, modern port is no longer the simple past of goods delivery. In response to the new requirements, all major ports in the positive research on development strategy of port construction, large amounts of money invested into the construction including port information system, the construction of professional and large deepwater berths. Now a new round of port construction boom continues. Through years of efforts, the level of modernization of our country's ports have greatly improved. The level of the major coastal port has been close to the developed countries advanced ports, some big port is already the world's advanced level.

3.1.1.2 Current situation of the development of coastal ports in China

Since the founding of new China, ports have experienced three times of port construction of obvious orgasm. The port has undergone tremendous changes, and the development of national economy and opening to the outside world played an important role in supporting and promoting . Under the historical background of the reform and opening-up policy, various related workers engaged in port construction and development, they made outstanding contributions to the construction port in China. Chinese port construction under the huge economic technology has formed the development of the observatory.

After 50 years of construction, there are 36 coastal ports whose annual throughput above 10 million tons.At the end of 2012, there are 5715 main coastal port berths and 4811 productive port berths including 1453 ton berth. Especially after the 21st century, the accelerating speed of port construction in our country, the coastal port berths at an annual rate of 78 per head increased. The figure 2.1 shows the growth about the main coastal ports in China. Port berth increased dramatically for port operation of large-scale production has laid a solid foundation.

Number of the major coastal port berths
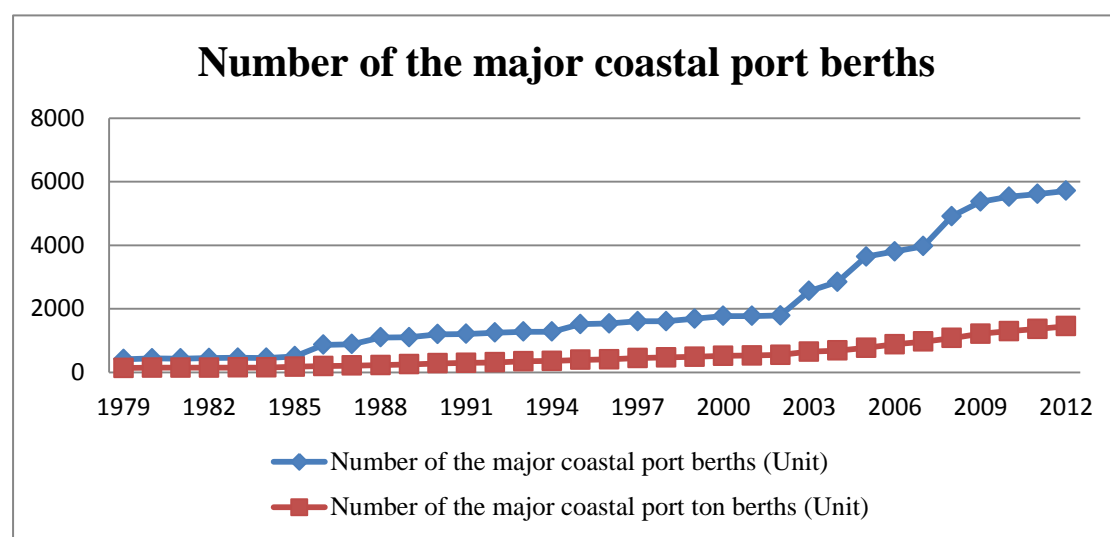
Figure 3.1 Number of the major coastal ports berth
Source: National Bureau of Statistics of China

Since China's reform and opening up, as an emerging market country, China have merged into an integral whole with the global economy, the overall port production increase by a big margin. Port throughput is an important quantitative index of port management production which can reflect the scale of port and ability. At same time it is the most direct embodiment in port role and influence. It is also a reference basis for gauging the progress of the countries and regions. The port throughput can be divided into cargo throughput and passenger throughput.

From the present situation is concerned, container cargo export is still the mainstream of Chinese ports run production what is a major force in the development of the

port. Due to the rapid growth of economy, foreign trade and goods, as well as the adjustment of transportation structure, containerization rate increase jointly promote the three major factors. China's coastal container throughput has been presents the fast growth the tendency. It is the continued growth of around 27%, in 2008 to 116.47 billion TEU.
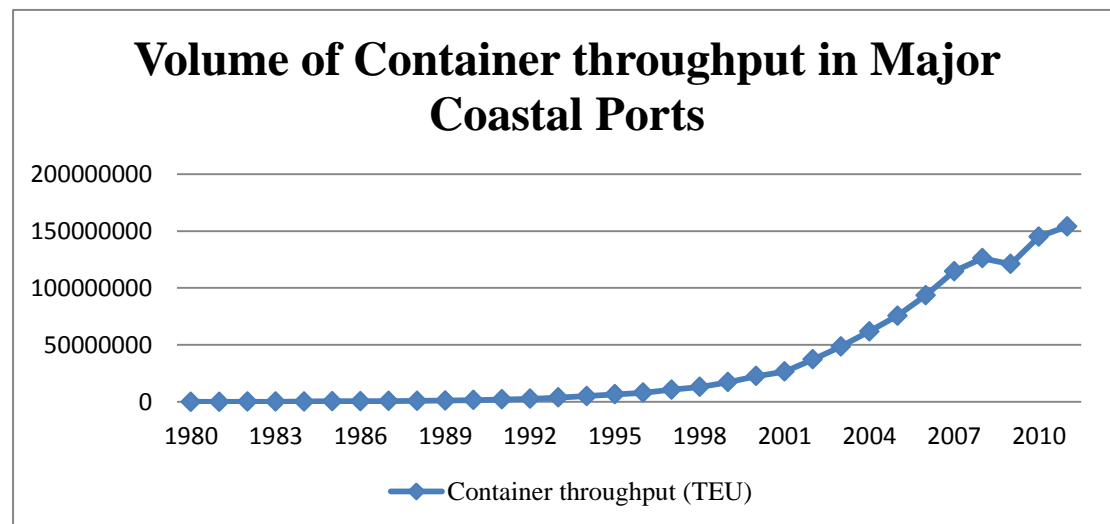
Figure 3.2 Volume of Container Throughput in Major Coastal Ports
Source: National Bureau of Statistics of China

In 2013 the top 10 world container ports seating, Chinese port including Hong Kong port account for seven seats, the rest of the second and the fifth and ninth are the Singapore port and Busan port, the United Arab Emirates Dubai port respectively. In 2013 the world's 10 biggest container port of Shanghai, Singapore, Hong Kong, Shenzhen, Busan port, Ningbo - Zhoushan port, Qingdao port, Guangzhou port, Dubai port and Tianjin port. In 2013 the world's largest container port still for our country in Shanghai port, Shanghai port throughput of 33.617 million TEUs, taming the throne of the world's first four years in a row. Partly explains the Chinese ports occupies very important position in the world, and this is the result of the development of China's coastal port construction comprehensive sharply.

Table 3.1 Top Ten World Container Ports in 2013 and 2012

Rank	Port	Country	Volume 2013	Volume 2012	Growth in the same period
			(Million TEUs)	(Million TEUs)	(%)
1	Shanghai	China	33.62	32.53	3.34
2	Singapore	Singapore	32.60	31.66	2.90
3	Shenzhen	China	23.28	22.94	1.46
4	Hong Kong	China	22.29	23.11	-3.60
5	Busan	South Korea	17.65	17.03	3.70
6	Ningbo-Zhoushan	China	17.33	16.18	7.12
7	Qingdao	China	15.52	14.50	7.00
8	Guangzhou Harbor	China	15.31	14.75	3.83
9	Jebel Ali, Dubai	United Arab Emirates	13.63	13.27	2.71
10	Tianjin	China	13.00	12.30	5.69
11	Rotterdam	Netherlands	11.67	11.87	-1.70

Source: http://www.chinacity.org.cn/csph/csph/150758.html

Coastal areas in China is the most busy and active domestic economy and Marine transportation, and it is the most densely populated part distribution about the city economic core. From the point of its development process, a boom in the coastal area is closely connected with port role in promoting. The country's coastal ports to undertake the task more than 90% of China's foreign trade exports and imports of goods, port throughput and container throughput what are the highest in the world. It has become China's economic "barometer" and strategic resources.

Coastal ports as the important infrastructure of national economic and social development, powerful support for the economy, while they play important role including the improvement of people's living standards, the national comprehensive strength of ascension and the improvement of the comprehensive transport network . Coastal ports as a whole has been initially formed layout is reasonable, clear hierarchy, function clear port layout form and surrounding coal, oil, minerals and four goods class specialized container transport system. In order to meet national energy, raw materials such as bulk material transportation, support the rapid and stable development of national foreign trade and safeguard national participation in international economic cooperation and competition has played an important role. In the demand of transportation, cargo throughput continued rapid growth, especially in foreign trade, container throughput of port construction pace quickened significantly.

3.2 The Classification and Selection of the Influencing Factors

3.2.1 The Classification of the Influencing Factors

Factors affecting the throughput of the port are complex, there are both macroeconomic factors and micro-economic factors. Meanwhile it would be constraints by natural conditions and also affected the social management system. Those factors often mentioned by Existing literature are: natural resources, geographic conditions, the scale of economic development , industrial structure, industry structure , production and distribution , energy development, national economic policy , political conditions , social conditions , and so on.

As we study the relationship between economic development and port throughput here, and therefore, according to our research purposes, this article will influence factors port throughput divided into two categories: one is the national economic system of internal factors ; other is national economic system of external factors. For the first category of factors, which we call the economy (class) factors , and for the second category of factors , we called the (economic) environment (class) factors . In the second category factors, which further divided into two major items : one is hard environmental factors, such factors mainly refers to the relatively stable , easy to change , people will less affected by environmental factors ; Another soft environment factors , such factors mainly refers to the relative instability, changes easier , larger environmental factors will influence by others . In many other factors mentioned above , the scale of economic development , industrial structure , industry structure, production layout , energy, metallurgy , infrastructure etc. of an economic (class) factors ; natural resources , geographical conditions are hard environment (category) factors ; social, political situation , economic policy , etc. are soft environment (class) factors .

The factors affecting the throughput of the port are divided into two categories: economic factors and economic environmental.   It is clear that two different

categories of factors that could lead to a different port cargo transport demand. The problem here is : whether the change in these two categories of factors that will lead to changes in port throughput independently of it? "Independent" here refers to a class of factors change without another factor, which directly impact on the role. On this issue, we get the point here: economic class factors that can affect the action independently , without the need to go through the economic environmental factors ; On the contrary, economic environmental factors are not independently affect the role , it must go through to achieve their economic class factors influence . Naturally, the "through" refers to the relationship between the role of the order, rather than chronological relationships. Terms of time, which may influence occur simultaneously . Meaning of the above problems and views expressed can be understood as following : the economic factor is a direct factors for port throughput, environmental factors, economic factors affecting the throughput of the port is indirect , the indirect factors must be achieved influence through direct factors, direct factors can achieve influence without any other factors. It must be noted that the two types of factors above that effect the order of the relationship , does not mean that changes in economic factors that have no impact on environmental factors. Effect relationship exists between the order of the essence is that these two types of factors port throughput from the socio-economic activities . From this perspective, economic activity , due to the port itself is a freight transportation industry sectors of the national economy , any change in this sector will be reflected in the respective national economy . Therefore, any force causing change in the port cargo transport are understood to act by the national economy . As explained above , we argues : port throughput in a variety of factors , the influence of economic factors in the environment category by economic factors can be realized. With the setting of the role of the relationship , select the variable range would be reduced to a range of economic factors . Just to establish the relationship between economic factors and variables port throughput variables , we can grasp the full impact of factors affecting port throughput . In fact, to the relevant literature's point of view, all the variables are a function of economic class factors , and does not involve environmental class variable

factors . This shows that , although these documents did not mention the above effect relationship directly, the fact is that all these would be treated and dealt with the problem by this relationship .

We can find that from the above, in the economic system, there are still many internal port throughput factors influence the induction of these factors which could be divided into two parts: one is factors belonged to total various economic amount factors, such as economic development scale, industrial scale energy development, metallurgical industrial scale development, infrastructure and scale; the other is from various economic structure factors, such as the industrial structure, industrial structure, energy structure, the structure of the metallurgical industry, transportation structures.

Trend of Port throughput and GDP growth are always in the same path, but there is no regularity between the growth rate, which indicates that economic growth is the dominant factor in the total port throughput growth, but the role of structural effects cannot be ignored since it might cause that the degree of influence does not reveal the total economy regularity. Therefore, it might be inappropriate to analyze economic output alone for the study of the relationship between the national economy and the throughput of the port. In the literature which study on demands. It would choose a few main factors to establish correlation model according to their relationship. It would not consider the economy and structural factors separately.

We believe that the process of economic development is always expressed as the total economic growth and changes in the economic structure, and port throughput are influenced by impact of both economic output and economic structures. Due to various economic effects and economic structure which influence total throughput, it will lead to a different port throughput (ceteris paribus). Therefore, the relationship between economic development and port throughput will become very complicated. Then it's an effective ways to deal with complex systems simple after all. Meantime it is necessary to distinguish between total economy and structural factors, and then we

would take in-depth qualitative analysis in order to investigate the composition and evolution of port throughput growth trend.

Table3.2.1 Representative Indicators

	Groups	Factors
Aggregate economic volume	Scale of economic development	Gross Domestic Product(GDP) Per Capita GDP Total output of primary industry Total output of secondary industry Total output of tertiary industry Gross industrial output value Total output of building industry
	Foreign trade economy	Gross import trade Gross export trade Total volume of import and export trade Foreign direct investment Amount of foreign capital to be utilized in manufacturing industry Exports and imports from foreign capital
	Currency	Exchange Rates China Benchmark one-year deposit
	Fixed assets investment	Fixed assets investment in whole society Investment in coastal ports construction
	Transportation	Volume of cargo turnover Volume of rail cargo turnover Volume of water cargo turnover
	Others	China Manufacturing Purchasing Manager Index
Economic structure	Industry structure	The primary industry, added value (% of GDP) The secondary industry, added value (% of GDP) The tertiary industry, added value (% of GDP) The industrial production, added value(% of GDP)
	Industry structure	Proportion of light and heavy industries in whole industry Proportion of mining industries in

		whole industry
		Proportion of petrochemical industries in whole industry
		Proportion of manufacturing industries in whole industry
	Foreign trade structure	The proportion between manufactured products and primary products

3.2.2 The Selection and Analysis of the Influencing Factors

To make out what factors may have contribution to coastal port cargo throughput, we consider from two main aspects which are aggregate economic volume and economic structure(see Table 3.2.1)

 (l) Gross Domestic Product (GDP)

After the reform and open policy, Chinese government strengthened the relationship with the foreign economic , and carried on the adjustment and upgrading of industrial structure actively. The economic development has made the Chinese proud achievements.

Particularly striking is that China's economy has maintained a rise by above 10% after 2003. From 2004 to 2007, GDP grew by 10.1%, 10.4%, 11.7% and 10.4% respectively .China's GDP broke through the 20 trillion mark in 2006. But due to the United State subprime mortgage crisis caused by the global economic crisis, China's economic growth slowed in 2008, GDP reached 30.067 trillion yuan, 9.0% from a year earlier.

In 2013 Chinese GDP reached 56884.5 billion yuan, calculated at comparable prices up by 7.7% over the previous year. It was a year-on-year increase of nearly 5 trillion yuan which was equivalent to 1994 annual economic output. China nearly twice as much GDP as Japan. Chinese GDP surpassed Japan in 2010 that ranked second in the world next to the United States. Only in the past three years, Chinese GDP reached

Japan twice again. China in recent years gross domestic product (GDP) as shown in figure 3.2.1.

Gross Domestic Product(billion CNY)
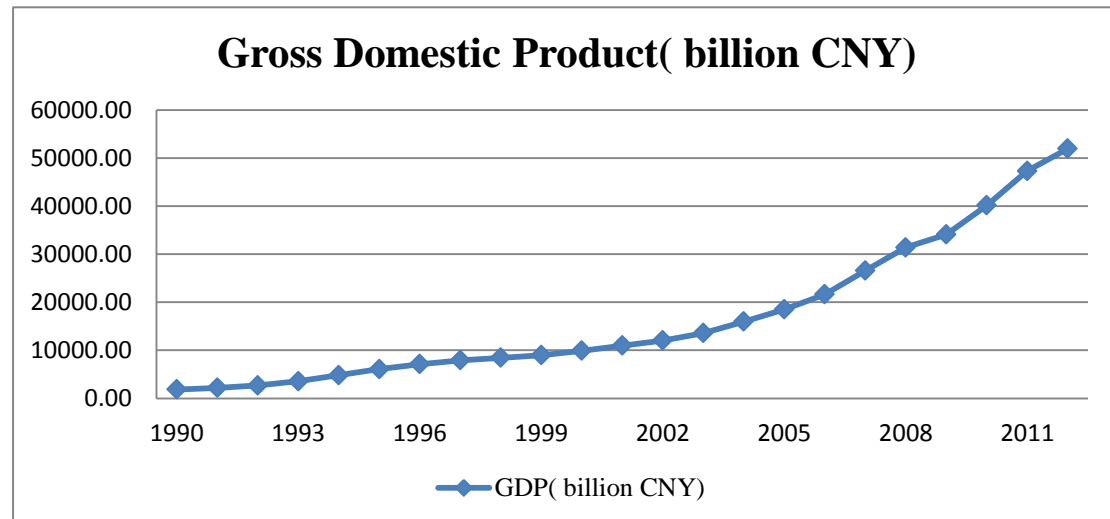
Figure 3.2.1 Gross Domestic Product in China from 1990 to 2013
Source: National Bureau of Statistics of China

Chinese situation is good, not only in total economic growth but also in economic structure which has been optimized. From Table 3.2.2, you can see that from 1990 to 2013, on the premise of keeping steady growth in the primary industry, the development of the secondary and tertiary industry has made great progress. It is effectively maintain the sustainable and healthy development of national economy in our country, and promote the solution of the problem of employment.

Under the background of the rapid economic development , the strong whole demand and government support promoted the rising of the port, the port construction in China present a relatively strong development momentum.

Table 3.2.2 Gross Domestic Product and its structure from 1990 to 2012

Year	GDP(billion CNY)	The primary industry, added value(billion CNY)	The secondary industry, added value(billion CNY)	The tertiary industry, added value(billion CNY)
1990	1866.78	506.20	771.74	588.84

1991	2178.15	534.22	910.22	733.71
1992	2692.35	586.66	1169.95	935.74
1993	3533.39	696.38	1645.44	1191.57
1994	4819.79	957.27	2244.54	1617.98
1995	6079.37	1213.58	2867.95	1997.85
1996	7117.66	1401.54	3383.50	2332.62
1997	7897.30	1444.19	3754.30	2698.82
1998	8440.23	1481.76	3900.42	3058.05
1999	8967.71	1477.00	4103.36	3387.34
2000	9921.46	1494.47	4555.59	3871.40
2001	10965.52	1578.13	4951.23	4436.16
2002	12033.27	1653.70	5389.68	4989.89
2003	13582.28	1738.17	6243.63	5600.47
2004	15987.83	2141.27	7390.43	6456.13
2005	18493.74	2242.00	8759.81	7491.93
2006	21631.44	2404.00	10371.95	8855.49
2007	26581.03	2862.70	12583.14	11135.20
2008	31404.54	3370.20	14900.34	13134.00
2009	34090.28	3522.60	15763.88	14803.80
2010	40151.28	4053.36	18738.32	17359.60
2011	47310.41	4748.62	22041.28	20520.50
2012	51947.01	5237.36	23516.20	23193.45

Source: National Bureau of Statistics

(2)The price level in China

For a long time, the overall level of prices in China has maintained a relatively stable state. From 1998 to 1999, the overall level of prices had a downward trend. But in 2000 was a turning point, prices from falling to stability that the relatively stable situation remained until 2006. From 2000 to 2007, it is the rapid growth of bank loans and foreign exchange reserves that the money in financial markets. A huge sums of money reality invested in the housing market , and then pushing up the price of the real estate market. When the market began to development and prosperity and capital flow into the stock market. In order to make inflating stock market bubble, it left behind potential dangers for inflation. In 2008, in the case of our domestic economy is overheating and has received the world within the scope of energy, raw materials and the impact of higher prices for agricultural products. They made the hybrid inflation

and all kinds of price index value increased dramatically what was the highest levels in recent years.

Because the growth of production factors such as energy, raw materials and labor prices, the production cost of export commodities was raised. To a certain extent on the commodity demand elasticity was larger in the overseas market sales, the direct services in the foreign trade port had brought a certain degree of negative impact. Government had resolutely adopted a tight fiscal policy and the central bank also real-time tightening monetary policy, raising the deposit reserve rate to tighten credit that effectively curb the further spread of inflation and deteriorating.

(3) Foreign Exchange Reserves

There are many advantages to have adequate foreign exchange reserves. Firstly, it maintain China's ability to protect the safety of domestic economy from national and international disaster or emergencies. During the financial crisis starting from 2008, foreign exchange reserves demon started the backing of confidence to domestic and international markets. Secondly, it could provide a level of confidence in the policies for the management of monetary and exchange rate which includes the ability of the government to intervene in order to support the national currency by external assets. It have been a strong solution for the government to maintain the stability of foreign exchange rate which rate which aims at keeping an advance in international competition. Thirdly, it assist the government to meet its foreign exchange reserves need and indicate that China can meet its enteral obligation.. Finally, adequate reserve is one of the most important driving forces of China's economic progress. So adequate foreign exchange reserves shows the high protection and base of development economy. Hence, the higher the reserves, the higher is the capacity of the central bank to smooth the volatility of the Balance of Payments and assure consumption smoothing in the long term. As can be seen from the Figure 2.2.2, foreign exchange reserves rose gradually. In 2012, China's foreign exchange reserves 3.31 trillion dollars. They made a 70 percent increase from 2008 to 2012. At the same time, the

RMB exchange rate had remained steadily rising trend. From 2008 to 2012 the RMB appreciation was near 9%. Although the RMB appreciation lead to several disadvantageous effect in foreign trade and exports caused some adverse effect, it did not interfere with rapid increase of foreign exchange reserves.
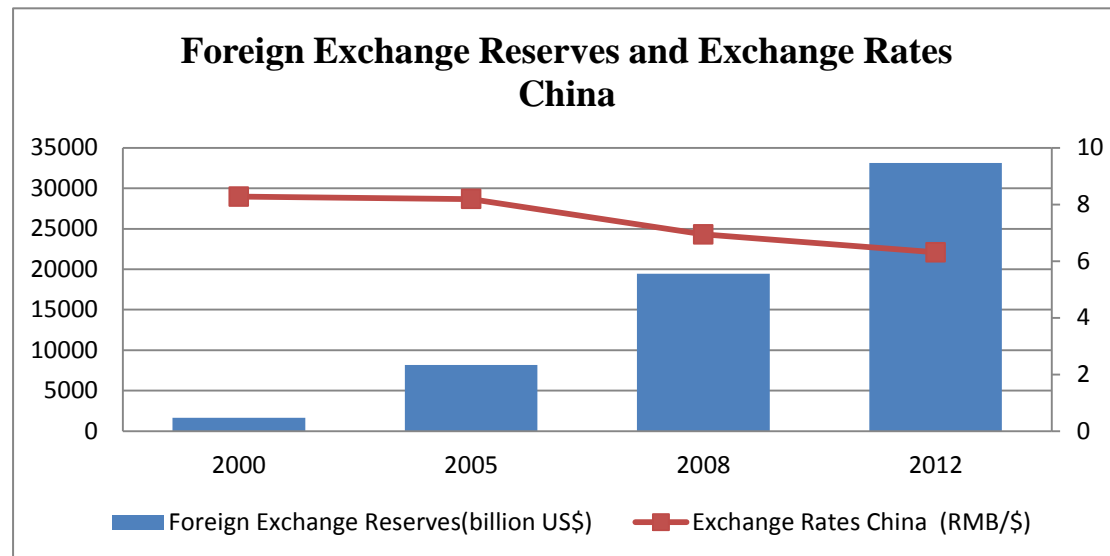
Figure 3.2.2Foreign Exchange Reserves and Exchange Rates China
Source: National Bureau of Statistics of China

（4）Foreign Trade

Port development is closely related to the development of foreign economic trade, prosperity of foreign economic trade directly provide the strong power for port development. After the reform and opening up, China has constantly strengthened linking with the rest of the world, so far has been to most countries and regions of the world has established good trade relations, including the European Union, the United States and Japan, ASEAN is the largest trading partners. Because of the rich resources and cheap labor, this advantage to make Chinese goods have been popular in the world market, who become the main force pulling the national economy fast development. It is clear from the Figure 3.2.3 about the trend of foreign trade.

With the degree of globalization is more and more high, the external environment become the important restriction factor of a country's economic development. In

recent years, as China's international trade position is increasing steadily and export competitiveness enhanced gradually, China suffered trade friction constantly, especially along with the economic crisis to the international trade protectionism. It bring more severe challenges China's foreign trade export. The world economic slowdown and recession will lead to the international trade protection and trade disputes increase is a basic rule. Affected by the economic downturn, the misuse of anti-dumping trade protectionist tendencies are also increasingly apparent. Since 1995, our country for 15 consecutive years to become the world's biggest victim of anti-dumping. And with the outbreak of the financial crisis, China's exports of the vector.
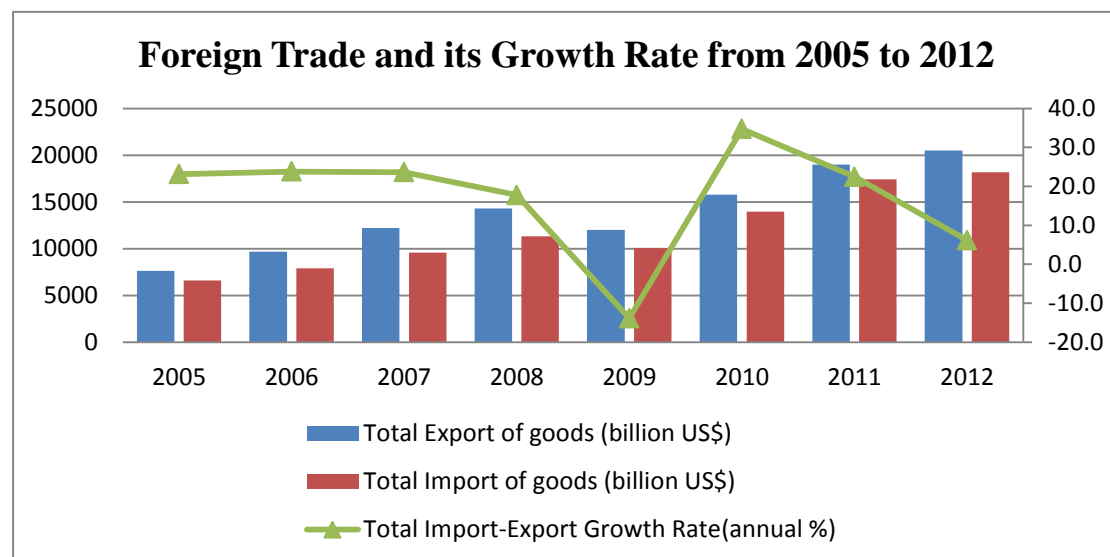
Figure 3.2.3 Foreign Trade and its Growth Rate from 2005 to 2012
Source: National Bureau of Statistics of China

3.3 Analysis on the Relationship among Influencing Factors and Coastal Port Cargo Throughput

To make out what factors may have contribution to coastal port cargo throughput, we consider from two main aspects which are aggregate economic volume and economic structure

3.3.1 Relationship between Scale of Economic Development and Coastal Port Cargo Throughput

Scale of economic development is a main part in influencing factor analysis.As we all know, coastal port cargo throughput reflects the transport market. And the scale of china's economic development can prove the economic situation. There are 7 influence factors be selected.

First, the comprehensive indicators of GDP is to reflect the level of economic development. In order to intuitively reflect the influence degree of the GDP of port throughput, calculated the port throughput of the elasticity of GDP (see Figure 2.3.1).The index can reflect the port throughput proportional relationship between GDP and growth rate of change.

Elasticity can be quantified as the ratio of the percentage changein one variable to the percentage change in another variable, when the latter variable has a causal influence on the former. It is a tool for measuring the responsiveness of a variable, or of the function that determines it, to changes in causative variables in a unitless way. Its formula is:

$$ET=（\Delta T/T）/（\Delta Y/Y）\times 100\%$$

…where: ET=Elasticity value of Cargo throughput and GDP; Δ T= Growth of coastal ports cargo throughput;T= Gross coast ports cargo throughput; Δ Y= Growth of GDP; Y= Gross GDP

According to the calculation, ET = 1 said both throughput and GDP is growth; When the ET > 1, shows that coastal port cargo throughput increases faster than economic growth, and the proportion of coastal port economy to participate in the whole scale of economic distribution has a rising trend; When the ET < 1, which indicates that

although absolute coastal port cargo throughput may increase, but the coastal port cargo throughput growth rate slower than economic growth.

In 1998 as the cut-off point, it is clear from the Figure 3.2 that there was a rapidly rise in China's GDP before 1998 the period of "five-year" ,but it did not bring a high-speed growth in port throughput. the elasticity value of port throughput and GDP during this period is less than 1. From 1998 to 2004, GDP increased steadily and the coastal port throughput increased rapidly. Elasticity value of port throughput and GDP is greater than 1, and its fluctuation is similar with growth rate of port throughput. It showed when enter the new century coastal port throughput became more sensitive to respond to the GDP growth rate, GDP growth could make the port throughput with greater growth. Since 2004,the port throughput still kept growing, but the trend was slowing. It indicated that GDP growth on throughput drive is not unlimited, along with the adjustment of industrial structure and economic development entering a certain stage, there are a slowly increase even decrease in port throughput.
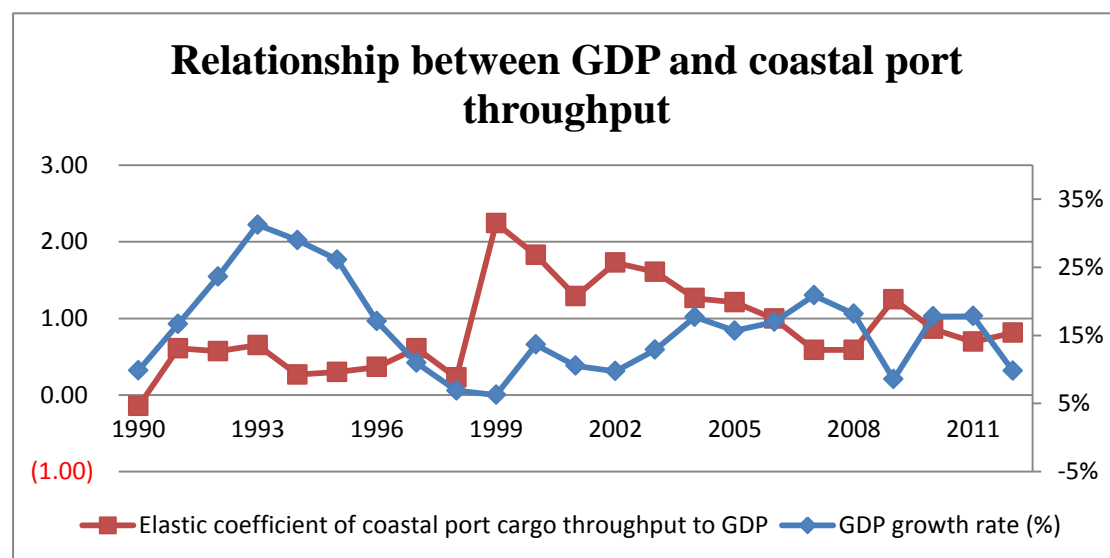
Figure3.3.1 Relationship between GDP and Coastal port throughput

Source: National Bureau of Statistics of China

Relationship between foreign trade economy and coastal port cargo throughput

Foreign trade produce an high effect on coastal port cargo throughput. First, compared with the growth rate change of coastal port throughput, foreign trade cargo throughput and import export trade. As can be seen from the Figure3.3.2, there are almost similar growth curves in foreign trade and coastal port throughput. Except by the financial crisis in 1997 and the influence of the financial crisis in 2008 that the relations appeared larger fluctuation, they are relatively stable for years. Affected by the financial crisis in 2008, foreign trade import and export growth rate fell by about 16% in 2009, but the coastal port throughput of foreign trade was still with 9.3% growth. The main reason why it appeared anti-variations in this year is to boost domestic demand and imports of raw materials is still strong. Nevertheless closely contact with foreign trade import and export of container throughput is reduced by 5.6% over the previous year. So the foreign trade is the judgment of China's coastal port throughput to a leading indicator
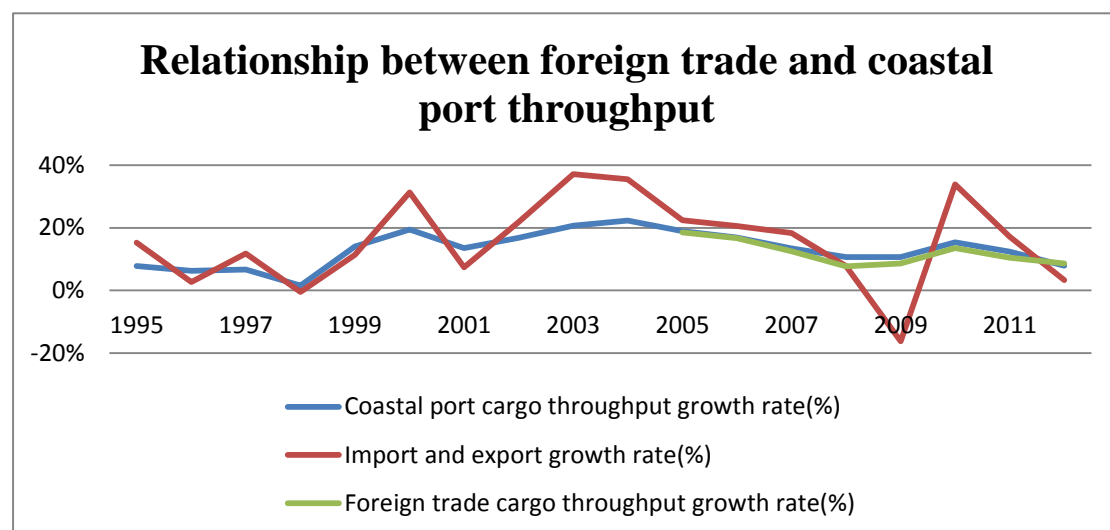
Figure3.3.2 Relation between foreign trade and coastal port throughput

Source: National Bureau of Statistics of China

Relationship between fixed assets investment and coastal port cargo throughput

Rely on expanding demand of investment in fixed assets is still the main source of boosting the economy at the present stage in China. Since China's reform and opening up, the constituents of China's gross domestic product (GDP) is the investment rate

which has been around 35%. Then the investment rate rose since 2001 by 42.6% in 2005 that greatly stimulated the demand for iron and steel and the surge in imports of iron ore and oil what pulling the growth of the coastal port throughput.

Port belong to the transport infrastructure what is often first to ensure the economic development of important support. During the period of "11th five-year plan" of China's port industry by the national key investment, construction investment have a maintain growth and its investment increase year by year in the stage of accelerated expansion. Can be seen from the Figure 3.3.3, the state used in port construction investment growth rate is higher than the fixed asset investment growth in the country. This reflects China's rapid economic growth on the one hand and on the port construction investment is huge. On the other hand it also shows that the growth of port throughput need development of port construction that in order to satisfy the demands of national economic development.

Figure3.3.3 China's economy and port construction investment
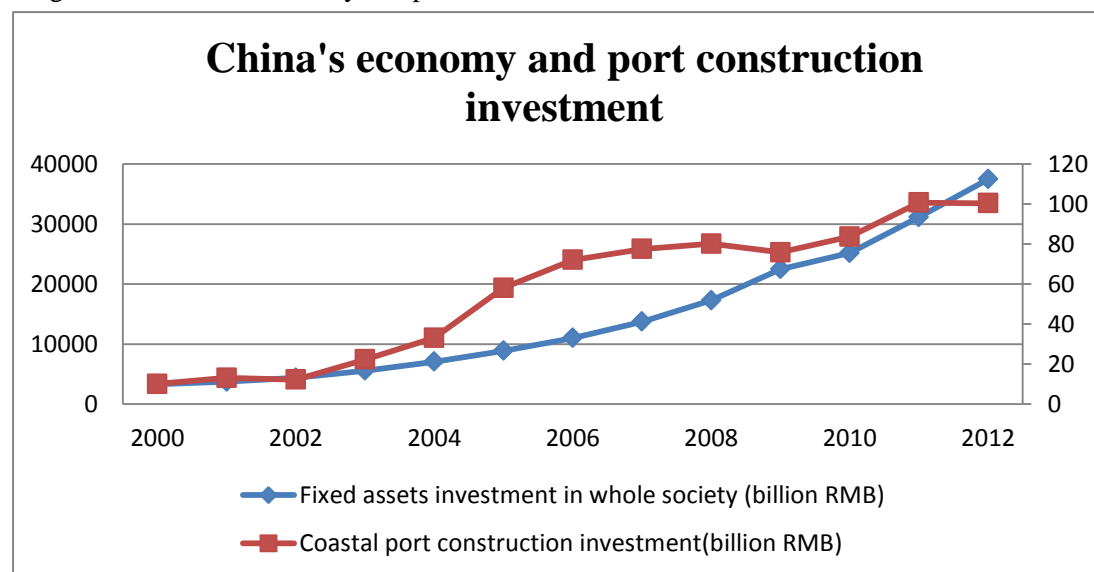
Figure3.3.3 China's economy and port construction investment
Source: National Bureau of Statistics of China

Relationship between exchange rates China and coastal port cargo throughput

First, China's export goods are mainly low value-added labor-intensive products, part of the approximation on the economics of the so-called "Giffen goods". Although the

appreciation of the RMB will lead to this part of the rise in the dollar price of a commodity, but it would not necessarily reduce its demand.

Second, China's export commodities are generally low price, even if exchange rates China have a moderately increase and it measured by absolute dollar price unit rise in commodity prices is limited, what do not reduce foreign consumer demand for Chinese goods.

Third, most of China's export commodity through producers, exporters, entrepot traders, importers, wholesalers, retailers, and many other links to enter the foreign market, which makes the burden on the RMB appreciation is not borne by each level manufacturer rather than a certain level of manufacturer alone. So the appreciation of the RMB burden to each level manufacturers is not large, each type of the manufacturer's profit slightly cut can offset the impact of exchange rate, so the appreciation of the RMB would not necessarily affect the export trade of China.

According to statistics, China's processing trade has more than general trade accounts for over 55% of the total amount of trade what is the main source of China's trade surplus. China's processing trade export proportion is very high, the cost of imports of processing trade is only 20% of export products in the domestic value-added. Below for processing trade and general trade through the model to the reaction degree of different exchange rate adjustments. Their formulas are:

$$C_{pt} = P_f + \frac{W_d + C_d}{r}$$

$$C_{gt} = \frac{P_d}{r} + \frac{W_d + C_d}{r}$$

…where: C_{pt} =Processing trade products cost of foreign exchange; C_{gt} =General trade foreign exchange cost of the products; $P_d =$ Domestic prices of raw materials; $P_f =$ Foreign prices of raw materials; W_d =Domestic workers' wages; C_d =Others' cost; r =Exchange rate.

So when exchange rate is decline, C_{gt} rise than C_{pt}. And when the currency appreciation rises, the processing trade of foreign exchange cost increase amplitude is small, and general trade foreign exchange costs increase amplitude is larger. Further instruction is that the fluctuation of processing trade products price is smaller than general trade product when they sale in foreign countries.

This shows that currency appreciation inhibitory effect of processing trade exports less than general trade exports. And in view of China's processing trade has a characteristics like kind of "big into the big, two head out" which means the two ends of the production and business operation process (raw materials and sale market)sales market in the international market. It determines China's independent import trade is low which makes the impact of the appreciation of the RMB to our country import trade may be limited.

The existence of barriers to trade makes the factors which affect China's foreign trade volume increased a lot of non-market factors. Trade barriers have been influence barriers to world trade liberalization, and this influence is obvious since the financial crisis, trade of China and the United States. For example, trade between United State and China of commodities can be roughly divided into two kinds, one kind is the high value-added capital and technology intensive products, another kind is agricultural products. For the first kind of product, the strict trade restrictions on China, which makes our country to this part of the import trade of goods does not depend on the price factors mainly depends on trade policy, which is the appreciation of the RMB will not increase the import trade in our country on this portion of the goods.
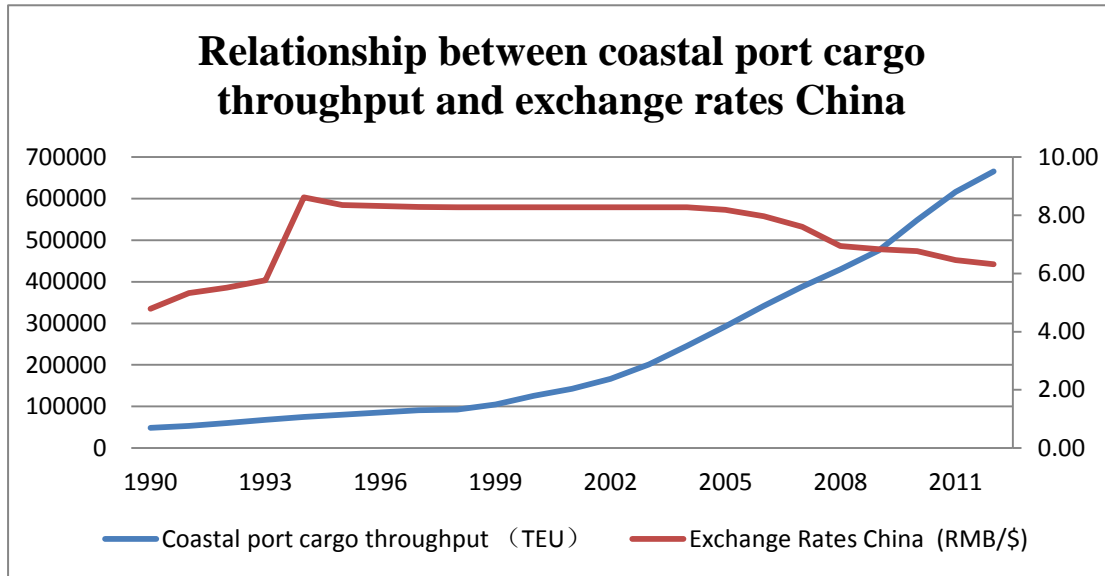
Figure3.3.4 Relation between Exchange rates China and coastal port cargo

Source: National Bureau of Statistics of China

3.3.2 Relationship between Economic Structure and Coastal Port Cargo Throughput

Relationship between Industry Structure and coastal port cargo throughput

In 2005, the level of industrialization in China composite index reached 50, indicating that China has just entered the stage of the second half of the industrialized. In the middle stage of industrialization, the proportion of industry is rising.

Within the industry, the proportion of heavy industry rising, gross industrial output value and the proportion of heavy industry in industrial output in 1990 by about 50% and 30%, respectively, in 2000 rose to 60% and 40% respectively, in 2005 reach 69% and 50% respectively. Entering the 21st century, foreign related industry to transfer to China under the background of globalization, the characteristics of the heavy chemical industry brings out the sharp increase of the domestic market demand to stimulate the import of raw materials and energy, influence the change of coastal port throughput.

In 2008, the size of the above complete dry bulk cargo throughput of 3.975 billion t, accounting for 56.6% of the total throughput. Among them, the mine materials

throughput of 779 million tons, metal ore throughput of 905 million tons and Complete liquid bulk cargo throughput of 658 million tons, accounting for 9.4% of the total throughput. Global iron ore seaborne trade volume in 2008 reached 2008 tons, which China imported iron ore 443 million tons, accounting for 49.83% of the global iron ore seaborne.

So heavy industrialization process the force of the rapid growth of China's port cargo throughput. Historically, the developed countries such as Britain and the United States, and in the process of industrialization, the port industry has appeared in a high-speed growth. According to the national bureau of statistics forecast, "11th five-year plan" period, the proportion of industry will continue to rise, Then is mainly manifested in the rising energy demand. To the "twelfth five-year plan" period, the proportion of industry will gradually come down. If the industry continues to decline, the proportion of the port throughput.

Relationship between International industrial transfer and coastal port cargo throughput

Change the growth of foreign direct investment (FDI) can be used as one of the evaluation metrics of international industry transfer. China is in the 1990 s after the international industrial transfer into the stage of rapid development. In 2001 after China's accession to the WTO, foreign direct investment into the new stage of rapid growth, break through $50 billion a year and reached $90 billion in 2009.Foreign direct investment in China are mainly concentrated in the eastern coastal area of FDI on the coastal area economy stimulated the rapid growth of the coastal port throughput. Over the past few years the export products of enterprises with foreign investment ratio is very high, foreign companies import and export accounts for the proportion of foreign trade import and export more than 50% (see chart 2), changes in growth rate of import and export by foreign-invested enterprises and foreign trade import and export growth rate change synchronization, throughput and promote foreign trade growth.

The world bank statistics shows that technology, knowledge and capital intensive industry into a new round of industrial transfer of the main object. Investment in service industry has become a new hotspot in the international industrial transfer. In 2005 China's manufacturing industry the actual amount is $42.452 billion, for the first time in negative growth, fell 1.3% year on year;$2006 in 40.077 billion, fell 5.6% year on year, a 6.78% drop in share;$2007 in 40.864 billion, a 8.94% drop in proportion .A new round of international industrial transfer to China is mainly the high technology content, high value-added processing industries and services, thus can foresee industrial transfer to China's coastal port throughput contribution rate will drop.

4. Influencing Factors of Coastal Port Cargo Throughput of Data Collection and Selection

4.1 Data Collection and selection

In order to study the influence factors of coastal port throughput in the economic aspect, 29 influencing factors are chosen in the previous chapter what have already done the qualitative analysis of coastal port throughput. There are two main aspects respectively from economic volume and economic structure as a starting point.

In quantitative analysis, the first step should consider the data integrity and accuracy. So the argument needs certain sifting. These 29 variables' data are not consistency，some of them have not the monthly data, most only have a quarterly or yearly data. For example they include GDP, proportion of the primary industry in GDP, proportion of the secondary industry in GDP and proportion of the teriary industry in GDP. And they are significant and necessary factors to analyze coastal port cargo throughput which not throw away. In order to keep these data for later analysis, it can choose only quarterly or monthly data. Many literature often only use the annual data, doing best in multivariate linear regression model, but in this paper I want use quarterly date. Because the higher the frequency of date, the higher the sensitivity and the conclusion more persuasive.

On the other hand, the independent variable of coastal port cargo throughput whose earliest monthly data statistics is in January 2005.Above all, it is chosen from in the first quarter of 2005 as a starting point to the first quarter of 2014 as the end of the data. These data collected from the National Bureau of Statistics of China. There are 37 data samples what are not too many but enough and meet the basic requirements   that   number of samples are more than 30 samples.

Selected 29 variables in the previous chapter should be selected , because they need quarterly data this requirement. But the left data can still part sums up the main analysis .And the meaning of some of the data can also be replaced. In the process of selecting and reference documents. Specifically, the independent variable is mainly divided into total economic scale and economic structure. In terms of economic scale volume, they are selected including GDP, Industrial Production China, Exchange Rates China, China Manufacturing Purchasing Managers Index, Volume of cargo turnover, Volume of rail cargo turnover, Investment in coastal ports construction. They are on behalf of scale of economic development, foreign trade economy, currency, fixed assets investment and transportation respectively. In terms of economic structure, the proportion of GDP in primary, secondary and tertiary respectively (see Table 4.1)

Table 4.1 The sign of selected variables.

Variable	Factors	Sign
y	Major Coastal Port Cargo Throughput	
x_1	Total Foreign Import-Export Trade	+
x_2	Proportion of the primary industry in GDP	-
x_3	Proportion of the secondary industry in GDP	+
x_4	Proportion of the teriary industry in GDP	-
x_5	Industrial Production China	+
x_6	Exchange Rates China (RMB/$)	+
x_7	PMI China Manufacturing Purchasing Managers Index	+
x_8	Volume of cargo turnover	+
x_9	Volume of rail cargo turnover	+
x_{10}	GDP	+
x_{11}	Investment in coastal ports construction	+

4.2 Sign of the selected factors

1) Total Foreign Import-Export Trade，+：Port transportation is a part of import and export trade. And this transportation is main way to import and export. So them have positive relationship.

2) Proportion of the primary industry in GDP，-：The primary industry of GDP can reflect the impact of industrial structure change of coastal port cargo throughput. The primary industry mainly include agriculture, it does not directly affect and coastal port cargo throughput. But from the shape of the developed countries around the world, with the development of economy the proportion of primary industry declined. .In other words, they are negative relationship.

3) Proportion of the secondary industry in GDP，+：The secondary industry includes mining, manufacturing, electric power construction, etc., it accounts for the proportion of GDP growth reflected the country increases the proportion of all kinds of industrial and manufacturing. At the same time, the development of various departments of the influence of water transportation departments each are not identical. Flux of the secondary industry through port in and out of the large amount of raw materials, products, such as iron and steel industry. While China steel industry is mainly used in the current domestic market, as China's advanced steel capacity increasing, after fully meet the demand of the domestic steel market, China's steel exports is bound to rise. So the increase of the second industry, represents the development of industry, increase the demand, will lead to increased imports. On the other hand, the development of the second industry but also for foreign orders demand, this will also lead to increased exports. Most of the in and out after will choose by sea. So it is a positive relationship between them.

4)Proportion of the teriary industry in GDP，- ：The teriary industry refers to the service sector. The primary and secondary industry is the premise and foundation for the development of the third industry. But the proportion of the tertiary industry can't

directly affect the growth, so it is a negative relationship with coastal port cargo throughput.

5)Industrial Production China，+：We know this indicator reflects how well the industrial production in China as its name shows, container is a main part of coastal port cargo throughput and we know container are mainly designed to carry none-bulk cargo, in other words, containers are mainly used to carry manufactured goods. The higher the Industrial Production China, the more product China can produce and more likely to be purchased by overseas' buyers, so the demand of container transport from China will have a large chance to grow, coastal port cargo throughput then will be lifted up, too.

6) Exchange Rates China (RMB/$)，+：Its decline on behalf of the appreciation of the RMB, it will add pressure to producers, at the same time it can reduce the China's price competitiveness in the world. And now China is still mainly low value-added labor-intensive products, while China's export commodities generally low price, even if have more RMB revaluation, measured by absolute dollar price unit rise in commodity prices is limited. It not reduce foreign consumer demand for Chinese goods. Overall, with the increase of it coastal port cargo throughput increases.

7)China Manufacturing Purchasing Managers Index(PMI)，+：It reflects the development of manufacturing industry as a whole, including new orders, production, employees, suppliers, distribution, inventory, price, backlog of orders and new export orders, import business activities such as index. According to the expert analysis, PMI index and GDP are highly correlation, and the turning point is often a few months ahead of the GDP. And manufacturing industry closely related to port throughput is also positive correlation.

8) Volume of cargo turnover，+：The factors including the national railway water and air freight. It is a whole data .Objectively speaking, freight turnover embodies the activity of the whole transportation system.so they are positive correlation.

9) Volume of rail cargo turnover，- : It considers that the high volume of railway freight turnover can indirect evidence inland logistics background system is good. Exclude import and export demand factors, port throughput increase will also have the neck of the bottle, one is the port throughput capacity, the other is in the rear of the port transport capacity. Such as the development of the rail transport increases coastal port throughput.

10) GDP,+: GDP is the best of all economic factors that reflect all aspects of a factor of economic growth, and also is recognized as the best indicators of national economy. There is no doubt that as the growth of the GDP, coastal port cargo throughput will also increase. They are positive correlation.

11) Investment in coastal ports construction，+： Port construction investment can indicate that related people's expectations for future port development, and it can increase the port throughput capacity and related construction service level. So the growth of port construction investment can lead to the better trend of the future port in a certain extent illustrate, the expectations of port throughput will have a rise trend. They have   the interaction relationship.

5. Correlation Research on Influencing Factors of Coastal Port Cargo Throughput

5.1 Methodology of Multiple Linear Regression

5.1.1 Multiple Linear Regression

Linear regression is an approach to model the relationship between a scalar dependent variable and one or more explanatory variables denoted X. The case of one explanatory variable is called simple linear regression. For more than one explanatory variable, it is called multiple linear regression.

Multiple linear regression is a more generalization of linear regression by considering more than one independent variable, and a specific case of general linear models formed by restricting the number of dependent variables to one. The basic model for linear regression is:

$$y_t = \beta_0 + \beta_1 x_{t1} + \beta_2 x_{t2} + \cdots + \beta_p x_{tp} + u_t$$

In the formula above we consider n observations of one dependent variable and p observations of independent variables. Thus, y_t is the tth observation of the dependent variable, Xij is ith observation of the jth independent variable, j = 1, 2, ..., p. The values of βj represent parameters to be estimated, and ut is the ith independent identically distributed normal error.

The aim of linear regression is to figure out the reliability coefficient (β0···βj) of different determinants in the trade. The more significant the coefficient is, the more related the determinants are to the trade. In this chapter, the determinants which are both easy to be quantified and available are chosen as the suitable statistics for analyzing in the EViews. Coastal port cargo throughput is chosen as the dependent

variable y in the analysis. The independent variables defined as x1, x2,···, x15. All the variables have a time series of quarterly statistics from Q1/2005 to Q1/2014, because the data specific to the year are not sufficient than the quarterly data and as sample data, only the quarterly data could meet the requirements of the sample size. At same time, because of several important date is absence, quarterly data could be selected rather than monthly data. The data are all collected from Clackson Shipping Intelligence Network (2013) and National Bureau of Statistics of China.1 Table 5.1.1 presents the one-to-one correspondence of each variables and its definition.

Table 5.1.1 The variables and definitions

Variable	Definition	Unit
y	Major Coastal Port Cargo Throughput	,000 TEU
x_1	Total Foreign Import-Export Trade	current ,000$
x_2	The primary industry, added value	% of GDP
x_3	The secondary industry, added value	% of GDP
x_4	The tertiary industry, added value	% of GDP
x_5	Industrial Production China	% Yr/Yr
x_6	Exchange Rates China	RMB/$
x_7	PMI China Manufacturing Purchasing Managers Index	Index
x_8	Volume of cargo turnover	current billion ton km
x_9	Volume of rail cargo turnover	current billion ton km
x_{10}	GDP	current billlion RMB
x_{11}	Investment in coastal ports construction	Billion RMB

5.2 Data Pre-process

Thus, the suitable data have been already selected for the linear regression model. However, before we do the multiple linear regression, two things should be ensure. The first one is to test the stationarity of data. The second one is to test the correlation of the independent and dependent variables.

5.2.1 Stationarity

In mathematics, a stationary process is a stochastic process whose joint probability distribution does not change when shifted in time or space. Consequently, parameters such as the mean and variance, if they are present, also do not change over time or position. As a result, the mean and the variance of the process do not follow trends. Stationarity is used as a tool for time series analysis, where the raw data are often transformed to become stationary. In this research, the stationarity of the data need to be tested before we do the linear regression.

First the ADF (Augmented Dickey-Fuller) Unit Root Test is used to test the stationarity. So we put these data into the Eviews and test the stationarity of each variable. It is a very serious mistake in the multiple linear regression if the variables are not stationary. It may lead to spurious regression. From the test, we can figure out that all of the variables comply with the stationary requirements. The Prob. value turned out to be less than 0.05. Table 5.2.1 shows the result of ADF test.

According results, as can be seen from Table 5.2.1 that almost them are not pass. So it should be used 1st difference（see Table4.2.2）. The Prob. Value of X3 X6 X8 X11 is high than 0.05, so we delete these variables. Then we change others with 1st difference and rename them like Z=Y= Major Coastal Port Cargo Throughput; W1=X1=Total Foreign Import-Export Trade   and so on.

Table 5.2.1 ADF Fisher Unit Root Test (1st)
Null Hypothesis: Unit root (individual unit root process)

Series: Y, X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11

Sample: 2005Q1 2014Q1

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 6

Total number of observations: 400

Cross-sections included: 12

Method	Statistic	Prob.**
ADF - Fisher Chi-square	36.3274	0.0510
ADF - Choi Z-stat	0.98247	0.8371

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results START

Series	Prob.	Lag	Max Lag	Obs
Y	0.9841	2	8	34
X1	0.9913	6	8	30
X2	0.0003	3	8	33
X3	0.9858	5	8	31
X4	0.9886	5	8	31
X5	0.0324	1	8	35
X6	0.3110	1	8	35
X7	0.0504	0	8	36
X8	0.9543	4	8	32
X9	0.3039	0	8	36
X10	0.4133	0	8	36
X11	0.8137	5	8	31

Table 5.2.2 ADF Fisher Unit Root Test (2nd)

Null Hypothesis: Unit root (individual unit root process)

Series: Y, X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11

Sample: 2005Q1 2014Q1

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 5

Total number of observations: 395

Cross-sections included: 12

Method	Statistic	Prob.**
ADF - Fisher Chi-square	179.176	0.0000
ADF - Choi Z-stat	-10.2942	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(START)

Series	Prob.	Lag	Max Lag	Obs
D(Y)	0.0000	1	8	34
D(X1)	0.0331	5	8	30
D(X2)	0.0001	2	8	33
D(X3)	0.0822	4	8	31
D(X4)	0.0226	4	8	31
D(X5)	0.0005	1	8	34
D(X6)	0.0566	0	8	35
D(X7)	0.0000	0	8	35
D(X8)	0.0687	3	8	32
D(X9)	0.0000	0	8	35
D(X10)	0.0000	1	8	34
D(X11)	0.0533	4	8	31

Table 5.2.3 ADF Fisher Unit Root Test (change)

Null Hypothesis: Unit root (individual unit root process)

Series: Z, W1, W2, W4, W5, W7, W9, W10

Date: 06/02/14   Time: 14:41

Sample: 2005Q1 2014Q1

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 4

Total number of observations: 259

Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	145.483	0.0000
ADF - Choi Z-stat	-9.82514	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(D36811)

Series	Prob.	Lag	Max Lag	Obs
D(Z)	0.0000	1	8	33
D(W1)	0.0451	4	8	30
D(W2)	0.0001	2	8	32

D(W4)	0.0160	4	8	30
D(W5)	0.0006	1	8	33
D(W7)	0.0000	0	8	34
D(W9)	0.0000	0	8	34
D(W10)	0.0002	1	8	33

5.2.2 Multicollinearity

This problem happens when there are high correlations existed between independent variables. The regression model will be very sensitive to changes of explanatory variables. The easiest way to measure multicollinearity is to check the correlations table of variables. Table 5.2.4 presents the results of correlation test. If the value of correlation coefficient more than 0.8, their correlation coefficient is too high. The results show there is correlations among W_1, W_2, W_9, W_{10} and among W_2, W_7, W_{10} and between W_9, W_{10}. W_{10} should be deleted. W_1, W_9 still keep the variables in our model. There are three reasons for this. One is if we delete any one of them the model will have significant influence on statistics properties of the model. Second reason is that this two factors is important in this analysis, and the volume of data sample is not enough quantity. In details, the reason why choose Total Foreign Import-Export Trade rather than GDP because foreign import and export trade is main and direct factor to influence coastal port throughput in China. Third reason is the model is still statistical valid when there is muticollinearity in the model. So W_1, W_9 should become a association in order to stay them and then ran the regression again to make the correlation coefficient less than 0.8(see table 5.2.5)

Table 5.2.4 Results of Correlation(1st)

	W1	W2	W4	W5	W7	W9	W10
W1	1.000000	0.088474	0.552441	-0.524903	-0.453209	0.913736	0.904212
W2	0.088474	1.000000	-0.398409	0.066472	-0.091753	-0.058633	0.099734
W4	0.552441	-0.398409	1.000000	-0.445110	-0.336470	0.470705	0.433359
W5	-0.524903	0.066472	-0.445110	1.000000	0.764340	-0.389012	-0.464954
W7	-0.453209	-0.091753	-0.336470	0.764340	1.000000	-0.343787	-0.411463
W9	0.913736	-0.058633	0.470705	-0.389012	-0.343787	1.000000	0.891633
W10	0.904212	0.099734	0.433359	-0.464954	-0.411463	0.891633	1.000000

Table 5.2.5 Results of Correlation(2nd)

	W1/W9	W2	W4	W5	W7
W1/W9	1	0.13911	0.556215	-0.56486	-0.49804
W2	0.13911	1	-0.39841	0.066472	-0.09175
W4	0.556215	-0.39841	1	-0.44511	-0.33647
W5	-0.56486	0.066472	-0.44511	1	0.76434
W7	-0.49804	-0.09175	-0.33647	0.76434	1

5.3 Data Process, Analysis and Results

After the pre-process of the data, the data is qualified to apply to the multiple linear regression. The equation of the linear regression in this research is assumed as:

$$Z_t = \beta_0 + \frac{\beta_1 W_1}{W_9} + \beta_2 W_2 + \beta_3 W_4 + \beta_4 W_5 + \beta_5 W_7 + u_t$$

Constant C is β_0 and β_1 to β_5 is the coefficient of each independent variable from W_1 to W_7. The result of the linear regression is shown in Table 5.3.1.

Table 5.3.1 First Result of Multiple Linear Regression
Dependent Variable: Z
Method: Least Squares
Sample (adjusted): 2005Q2 2014Q1
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
W1/W9	93783.10	10110.14	9.276146	0.0000
W2	-4283697.	1261791.	-3.394934	0.0019
W4	-2514168.	1468792.	-1.711725	0.0473
W5	-4916.870	12430.59	-0.395546	0.6952
W7	6692.932	15187.72	0.440680	0.6626
C	1173466.	1007395.	1.164852	0.2533

R-squared	0.838736	Mean dependent var		1233046.
Adjusted R-squared	0.811859	S.D. dependent var		363132.0
S.E. of regression	157509.4	Akaike info criterion		26.92337
Sum squared resid	7.44E+11	Schwarz criterion		27.18729
Log likelihood	-478.6207	Hannan-Quinn criter.		27.01549

F-statistic	31.20609	Durbin-Watson stat	2.336621
Prob(F-statistic)	0.000000		

5.3.1 T-Test

From Table 5.3.1, the F-statistics is 31.20609 and the Prob. value is 0.0000 which pass the F-statistics test. The Adjusted R-squared is 0.838736 which presents the model is highly fitted. But Table 4.3.2 also shows only the Prob. values of $\frac{W_1}{W_9}, W_2, W_4$ are less than confidence level of 0.05[2] in the t-test which means the other variables need to be tested by wald-test.

5.3.2 F-Test

Thus, we applied wald-test for the other two variables. If the test results show null-hypothesis is not rejected then we can safely remove such variables from the model. Wald-test result presents in Table 5.3.2. We use Wald test in E-views to apply F-test. According to the F-test formular, we find the F-test statistic is 0.105 which is smaller than the critical value of 1.08. Meanwhile, the P-value at 0.9004 and 0.9001 respectively are larger than 0.05. Then we do not reject H0 which means that we can safely remove all the other variables including W_5, W_7 in our regression model. This time, the result is shown in Table4.3.3

It is clear from the Table5.3.3 that the Prob. value is 0.0000 and F-statistics is 55.01 which pass the F-statistics test. The Adjusted R-squared is 0.822380 which presents the model is highly fitted. The Prob. values of all variables are less than critical value of 0.05 that means all coefficients have passed the T-test and can be used in our model.

Table5.3.2 Result of F-test

F-test

---

[2] We assume confidence level in t-test is 5% because data have high volatility.

H$_0$	β1=0,β2=0...	H$_1$	β1≠0,β2≠0...
Test statistic	F-statistic	Critical Value	F(m,T-k)
	0.105267	<	1.08

Test Statistic	Value	df	Probability
F-statistic	0.105267	(2, 30)	0.9004
Chi-square	0.210533	2	0.9001

Null Hypothesis: C(4)=C(5)=0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(4)	-4916.870	12430.59
C(5)	6692.932	15187.72

Restrictions are linear in coefficients.

Table 5.3.3 Second Result of Multiple Linear Regression

Dependent Variable: Z

Method: Least Squares

Sample (adjusted): 2005Q2 2014Q1

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
W1/W9	94173.09	8931.464	10.54397	0.0000
W2	-4408207.	1196981.	-3.682772	0.0008
W4	-2532949.	1415851.	-1.788994	0.0831
C	1473986.	609019.2	2.420261	0.0214

R-squared	0.837604	Mean dependent var	1233046.
Adjusted R-squared	0.822380	S.D. dependent var	363132.0
S.E. of regression	153042.0	Akaike info criterion	26.81925
Sum squared resid	7.49E+11	Schwarz criterion	26.99520
Log likelihood	-478.7465	Hannan-Quinn criter.	26.88066
F-statistic	55.01655	Durbin-Watson stat	2.332215
Prob(F-statistic)	0.000000		

5.3.3 Five Assumptions of CLRM

So far, our model has passed T-test and F-test. But we still not get a BLUE model. In order to get unbiased estimator of coefficients for the model, we must be specific

about how the μ_t are generated. Usually, the following set of assumption about the μ_t are used to test model:

$$1. E(\mu_t) = 0 \ (t = 1, 2, \cdots, n)$$

$$2. Cov(\mu_t, \mu_j) = E(\mu_t, \mu_j) = 0 \ (t \neq j, t, j = 1, 2, \cdots, n)$$

$$3. Var(\mu_t) = E(\mu_t^2) = \delta^2 (t = 1, 2, \cdots n)$$

$$4. Cov(X_{jt}, \mu_t) = 0 \ (j = 1, 2, \cdots k, t = 1, 2, \cdots, n)$$

$$5. \mu_t \sim N(0, \delta^2)$$

In this chapter, it should test assumptions one by one except assumption 4 because if our variables are carefully selected and significant in T-test our model will satisfy the assumption 4. So there is no need to test it.

Assumption 1:$E(u_t) = 0$

This assumption is the mean of the disturbances is zero. So the easiest way is to perform the test of residuals. If the mean of residuals is approach to zero the model will be assumed to pass the test. The statistics detail of residuals of the model presents in Graph 5.1. From that, we can see that mean value is near 0 which shows the residuals of the model not satisfy the assumption 1. So assumption 1 is pass.

Graph5.1 Statistic detail of Residual Value

	RESID
Mean	-2.90e-10
Median	-30785.1
Maximum	91465.0
Minimum	-84169.0
Std. Dev.	43221.2
Skewness	-0.085003
Kurtosis	2.151887
Jarque-Bera	1.122296

Probability		0.570554
Observations		36

Assumption 2: Autocorrelation

We would like to see that there is no pattern in our residuals. That is to say, no correlation is what we need in our test. Autocorrelation is next period return is correlated with this period of a variable. If there are patterns in residual from a model, we say that they are autocorrelated. So Breusch-Godfrey Serial Correlation LM Test should be tested where or not the residuals are auto-correlated. As we can seen from Table5.3.4,this is the first result that Prob. Chi-Square by 0.000 which is lower than the critical value at 0.05.

Table5.3.4 First Result of Breusch-Godfrey Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	19.68539	Prob. F(4,28)	0.0000
Obs*R-squared	26.55663	Prob. Chi-Square(4)	0.0000

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Sample: 2005Q2 2014Q1

Included observations: 36

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
W1/W9	12022.49	9049.892	1.328468	0.1948
W2	-1054512.	976011.8	-1.080429	0.2892
W4	-1181124.	1288403.	-0.916735	0.3671
C	458811.1	535575.6	0.856669	0.3989
RESID(-1)	-0.152359	0.174893	-0.871153	0.3911
RESID(-2)	0.022340	0.167185	0.133627	0.8947
RESID(-3)	-0.186899	0.173480	-1.077352	0.2905
RESID(-4)	0.885243	0.121171	7.305710	0.0000

R-squared	0.737684	Mean dependent var	-2.90E-10
Adjusted R-squared	0.672105	S.D. dependent var	146336.2
S.E. of regression	83795.17	Akaike info criterion	25.70327
Sum squared resid	1.97E+11	Schwarz criterion	26.05516

Log likelihood	-454.6588	Hannan-Quinn criter.	25.82609
F-statistic	11.24879	Durbin-Watson stat	1.312978
Prob(F-statistic)	0.000001		

Therefore, we say that residuals of the model have autocorrelation. In order to solve the problem, we add ARMA(1,1) into our regression model. Then our regression model will be:

$$Z_t = \beta_0 + \frac{\beta_1 W_1}{W_9} + \beta_2 W_2 + \beta_3 W_4 + \beta_4 W_5 + \beta_5 W_7 + \beta_6 Z_{t-1} + \beta_7 u_{t-1} + u_t$$

Then using Breusch-Godfrey test for the model again, the result presents in Table5.3.5. The test statistic 8.6726 is smaller than the critical value 23.337Then we do not reject the null hypothesis and it leads to the no correlation and no memory hidden in the past. The P-value at 0.0698 is larger than 0.05 can also prove the result.

Table5.3.5 Second Result of Breusch-Godfrey Test

Breusch-Godfrey test			
$u_t = p_1 u_{t-1} + p_2 u_{t-2} + p_3 u_{t-3}... + p_r u_{t-r} + v_t, \quad v_t \sim N(0, \sigma^2)$			
H_0	$p_1=0, p_2=0,..., p_r=0$	H_1	$p_1 \neq 0, p_2 \neq 0,..., p_r \neq 0$
Test statistic	$(T-r)R^2$	Critical Value	$X^2(r)$
	8.6726	<	23.337

F-statistic	2.059903	Prob. F(4,25)	0.1165
Obs*R-squared	8.672660	Prob. Chi-Square(4)	0.0698
Dependent Variable: RESID		Method: Least Squares	
Sample: 2005Q3 2014Q1		Included observations: 35	
Presample missing value lagged residuals set to zero.			
W1/W9	1375.457	6819.793	0.201686	0.8418
W2	-157523.8	661907.7	-0.237985	0.8138
W4	-36705.55	1047097.	-0.035055	0.9723
C	15041.65	420193.0	0.035797	0.9717
AR(1)	0.004355	0.008241	0.528471	0.6018
MA(1)	0.000526	0.000751	0.699619	0.4906
RESID(-1)	0.335313	0.202735	1.653946	0.1106
RESID(-2)	-0.392374	0.210051	-1.867990	0.0735
RESID(-3)	0.251923	0.209594	1.201959	0.2406

RESID(-4)	0.118849	0.220744	0.538402	0.5951
R-squared	0.247790	Mean dependent var		865.3722
Adjusted R-squared	-0.023005	S.D. dependent var		78096.41
S.E. of regression	78989.62	Akaike info criterion		25.62698
Sum squared resid	1.56E+11	Schwarz criterion		26.07136
Log likelihood	-438.4721	Hannan-Quinn criter.		25.78038
F-statistic	0.915046	Durbin-Watson stat		1.934321
Prob(F-statistic)	0.528184			

Assumption 3: $Var(u_t) = \delta^2$

If the variance of errors is constant we call it homoscedasticity that is our assumption 2. If the errors do not have a constant variance, we call it is heteroscedastic that is we do not want to see in our model. In this paper, we use White General Test for heteroscedasticity. The results of White Test shows in table 5.3.6. As result shows, Prob. value is 0.4863 >0.05 and it shows the test statistic 20.11901 is smaller than the critical value 32.17 and this refers to that we should not reject the null hypothesis. So it means the variance of errors is homoscedastic.

Table5.3.6 Results of White Test

White test			
H_0	$Var(\mu_t)=\sigma^2$	H_1	$Var(\mu_t)\neq\sigma^2$
Test statistic	TR^2	Critical Value	$X^2(m)$
	20.11901	<	32.17

|			
F-statistic	0.848895	Prob. F(25,9)	0.6494
Obs*R-squared	24.57726	Prob. Chi-Square(25)	<mark>0.4863</mark>
Scaled explained SS	20.11901	Prob. Chi-Square(25)	0.7406
Dependent Variable: RESID^2		Method: Least Squares	
Sample: 2005Q3 2014Q1		Included observations: 35	

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.26E+13	1.77E+13	-0.713613	0.4936
GRADF_01	7.67E+11	9.13E+11	0.840429	0.4224
GRADF_01^2	-1.33E+09	2.12E+09	-0.627685	0.5458
GRADF_01*GRADF_02	-1.91E+11	3.14E+11	-0.606439	0.5592
GRADF_01*GRADF_03	1.75E+11	3.86E+11	0.452407	0.6617
GRADF_01*GRADF_04	-7.53E+11	9.67E+11	-0.778212	0.4564

GRADF_01*GRADF_05	3263.240	3798.323	0.859127	0.4126
GRADF_01*GRADF_06	-12484.65	15257.79	-0.818248	0.4343
GRADF_02	3.35E+13	8.60E+13	0.389340	0.7061
GRADF_02^2	2.68E+13	1.68E+13	1.592708	0.1457
GRADF_02*GRADF_03	1.64E+13	3.36E+13	0.488354	0.6370
GRADF_02*GRADF_04	-4.45E+13	8.79E+13	-0.506185	0.6249
GRADF_02*GRADF_05	-513156.4	328513.8	-1.562054	0.1527
GRADF_02*GRADF_06	-644241.2	1460507.	-0.441108	0.6695
GRADF_03	-1.05E+13	4.45E+13	-0.236534	0.8183
GRADF_03^2	1.54E+13	2.67E+13	0.575012	0.5794
GRADF_03*GRADF_04	-6.27E+12	5.71E+13	-0.109831	0.9150
GRADF_03*GRADF_05	-201649.2	445077.1	-0.453066	0.6612
GRADF_03*GRADF_06	230957.1	722728.1	0.319563	0.7566
GRADF_04	1.00E+13	6.77E+13	0.147648	0.8859
GRADF_04^2	5.62E+12	2.84E+13	0.198098	0.8474
GRADF_04*GRADF_05	3246655.	2397781.	1.354025	0.2087
GRADF_05	-3214351.	2426890.	-1.324473	0.2180
GRADF_05^2	-0.005444	0.011848	-0.459499	0.6568
GRADF_05*GRADF_06	0.051924	0.039660	1.309252	0.2229
GRADF_06	210555.8	273633.0	0.769482	0.4613

R-squared	0.702207	Mean dependent var	5.9E+09
Adjusted R-squared	-0.124994	S.D. dependent var	9.2E+09
S.E. of regression	9.85E+09	Akaike info criterion	48.98
Sum squared resid	8.73E+20	Schwarz criterion	50.14
Log likelihood	-831.2621	Hannan-Quinn criter.	49.38
F-statistic	0.848895	Durbin-Watson stat	1.768
Prob(F-statistic)	0.649445		

Assumption 5: $\mu_t \sim N(0, \delta^2)$

Bera Jarque test is used to test residuals for normality by testing whether the coefficient of skewness and the coefficient of excess kurtosis are jointly zero. The Prob. value is 0.57which is higher than 0.05 that means the distribution of residuals is normal distribution.

Graph 5.2 Result of Jarque-Bera Test
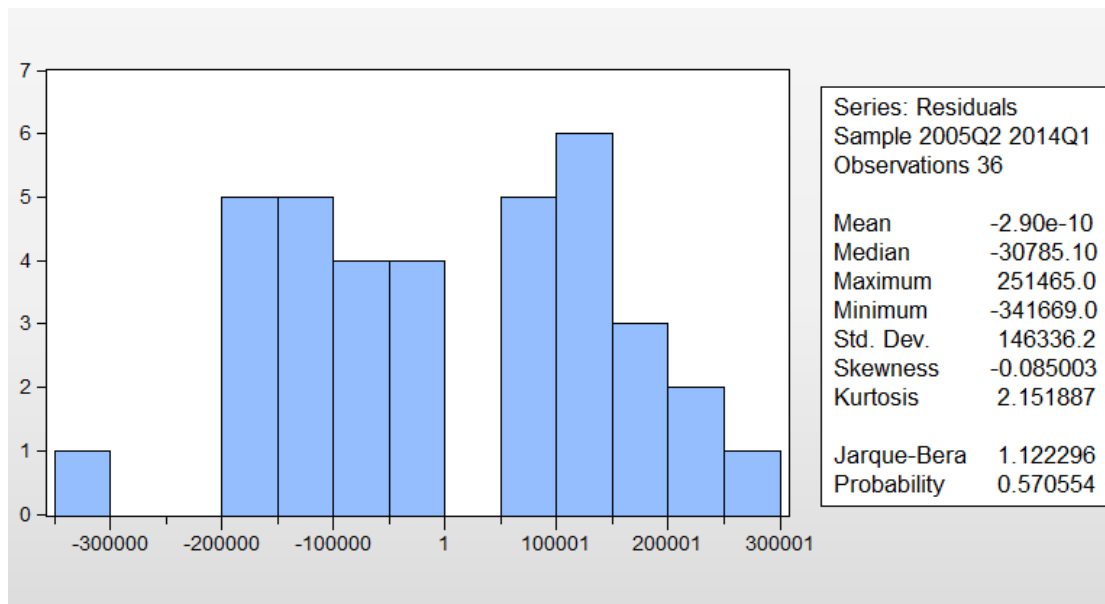
5.3.4 Result of Model

So far we have estimated regressions as following:

$$Z = \frac{1475.457W_1}{W_9} - -157523.8W_2 - 36705.55W_4 + 0.004355Z_{t-1}$$
$$+ 0.00053U_{t-1}15041.65$$

Table 5.3.7 The variables and definitions

Ranking	Factor	Sign	Sign pre-model	Sign post-model
W1	Total Foreign Import-Export Trade(current ,000$)		+	+
W2	The primary industry, added value(% of GDP)		-	-
W4	The teriary industry, added value(% of GDP)		-	-
W9	Volume of Rail cargo turnover(current billion ton km)		-	+

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It indicated what influence the coastal port development using multiple linear regression model. And we consider from two aspects which are macro economy and structure contribution to select factors. Result of the model that there are 4 factors stay including Total Foreign Import-Export Trade, the proportion of primary industry and teriary industry in GDP and volume of rail cargo turnover. Although there are several important factors excluded.

First Total Foreign Import-Export Trade is main positive factor to coastal port cargo throughput. Another factor is rail cargo turnover which is a negative factor. It shows coastal port cargo throughput is not related with foreign trade. It also affected by inland transport. On the other hand, not only scale of economic volume but also economic structure have significant role in coastal port cargo throughput. The result the decline of presentation of primary industry and teriary industry in GDP can increase coastal port cargo throughput. It can mean that another proportion of secondary industry in GDP which increase can make coastal port throughput growth.

Conclusion

1. In different stages of economic development, industrial structure is not the same as the factors influencing the port transportation. Before reform and opening up, China's economic development level is low, the industry is not developed, with low levels of processing agricultural and mineral raw materials, and other products for a large proportion, the structure factors influence on growth of the number of ports. Since reform and opening-up, our country gradually entered the early stage of industrialization, the industrial proportion in national economy increase rapidly, the raw product such as agricultural products in China, the proportion of processed products increases, the demand of national economy of port traffic is relatively reduced. Since 2000 especially in recent years, the coastal areas of reverse adjustment of industrial structure in our country, the proportion of heavy rise, through the port's surge in industrial raw materials, the influence of structure factors on port throughput to strengthen.

2. Development of coastal ports in China and the national economic system and the economic situation at home and abroad with strong correlation. With the rapid development of economy in our country, all sectors of the economy to expand rapidly in scale and generate huge cargo demand. Coastal ports is integrated transport channel nodes at the same time, is an important hub of international communication, the development of China's foreign trade to promote the growth of foreign trade container throughput. Port is a basic industry of national economy, its development promotes the economic development, at the same time, the development of other industries also needs the support of the port, investment in fixed assets can reflect the status of construction and operation of the port industry. But our country's stage of economic development, the pattern of economic development, as well as international industry transfer and foreign trade relations from deeper influence and determine factors such as China's coastal port throughput.

3. In chapter4 and 5, it indicated what influence the coastal port development using multiple linear regression model. And we consider from two aspects which are macro economy and structure contribution to select factors. Result of the model that there are 4 factors stay including Total Foreign Import-Export Trade, the proportion of primary industry and teriary industry in GDP and volume of rail cargo turnover. Although there are several important factors excluded. First Total Foreign Import-Export Trade is main positive factor to coastal port cargo throughput. Another factor is rail cargo turnover which is a negative factor. It shows coastal port cargo throughput is not related with foreign trade. It also affected by inland transport. On the other hand, not only scale of economic volume but also economic structure have significant role in coastal port cargo throughput. The result the decline of presentation of primary industry and teriary industry in GDP can increase coastal port cargo throughput. It can mean that another proportion of secondary industry in GDP which increase can make coastal port throughput growth.

4.Though the financial crisis impact on the navigation industry, the effect of China's policy of stimulating domestic demand is beginning to show. As to increase the traffic infrastructure construction of the implementation of the policy of stimulating domestic demand, port infrastructure construction boom has sustained. But the port throughput is closely connected with economic development, along with our country gradually at later stage of industrialization, the proportion of heavy industry will gradually decline, and change the way of economic development, at present a large number of exports of primary products to high-tech content, high value-added products, I will change, can foresee the port throughput will no longer maintain existing high-speed growth momentum. And therefore should be scientific estimate port demand, control the rhythm of port construction, scientific investment. Government departments should pay close attention to by the trade development situation at home and abroad, to predict and timely release of market demand changes and there may be a risk investment, guide the local government and port enterprises

actively adjust supply scale, the development of port construction from the pace to reasonable grasp the rhythm.

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