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Research on the planning strategy of Fangcheng Port within southwest coastal ports

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DECLARATION

I hereby certify that all the material in this dissertation that is not my own work have all been identified, and that no material is included for which a degree has previously been conferred on me.
The contents of this dissertation reflect my own personal views, and not necessarily endorsed by the University.

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ABSTRACT

Title of dissertation: **Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports**

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In a highly competitive environment, every economic player in the market economy hopes he can become invincible and achieve maximum benefits. But the uncertainty of the economic environment and the existence of transaction costs, the asymmetry information and opportunistic behavior and other reasons constrained the realization of the main goals of the market. At the same time these restricted conditions has provided a broad space for the use of the main strategy for the market.

The port is the combination of various modes of transport. The modern harbor is the core of water transport, rail transport, road transport, pipeline transport and air transport. In the whole transport system, the port becomes more and more important. China's coastal ports is facing even more incentive competition, as China's "Port Law" and "the nation's coastal port layout planning" are introduced，and the southwest coast port cluster，as one of the five coastal ports group，is composed of ports within western Guangdong, Guangxi and Hainan. As the Ring North Bay ports have the similar natural environment, commodity logistics and markets, their competition is increasingly apparent to that the co-opetition will be the inevitable trend of the port development.

This article divides into three parts. The first part of this article will analyze the status of domestic and foreign ports competition and cooperation within the ports cluster both in China and other countries. The second part of this article will analyze the main

factors which affecting the development of Fangcheng port. The third part of this article will focus on the forecasting of cargo capacity and container throughput of Fangcheng port by using regression analysis prediction method, grey method and exponential smoothing methods. And finally produce the planning strategy of Fangcheng port.

KEYWORDS: Strategy Planning; Forecast; Fangcheng Port

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LIST OF ABBREVIATIONS

ASEAN	The Association of Southeast Asian Nations
GCT	Guangzhou Container Terminal Company Limited
WTO	World Trade Organization
GDP	Gross Domestic Product
CAFTA	China and ASEAN Free Trade Area
DWT	Deadweight Ton
TUE	Twenty-foot Equivalent Unit

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Chapter 1 Introduction

1.1 Research Background

Economic globalization and regional economic integration process has accelerated that promotes the global industrial transfer and the globalization of the means of production configuration. China's development of economic and foreign trade and the establishment of the status of the world's factory have prompted the growth of number and size of the coastal and river ports. The existing coastal ports in China are more than one hundred and fifty. The coastal ports as an important infrastructure in national economic and social development effectively supported the economic, social and trade development and at the same time improve people's living standards. And also play an important role in enhancing national strength and improving the transport network. In the past twenty years, the coastal ports have basically formed a reasonable layout and a cargo transportation system around the coal, oil, ore and container. This system plays an important role in international economic cooperation and competition.

August 16, 2006, the State Council considered and adopted *the nation's coastal port layout planning*; the nation's coastal ports have been divided into five port clusters including around Bohai bay, Yangtze River Delta port cluster, southeast coast port cluster, the Pearl River Delta port cluster and southwest coast port cluster. This means that China's coastal port construction and development has entered a new stage of development.

Due to the similar geographic location and a common hinterland, there is a natural competition between terminals within one port cluster. Limited competition between ports can reduce logistics costs, improve logistics efficiency and improve service levels. What's more, it can promote trade and development of integrated logistics.

Also it will be beneficial to the port project development and operational management level. It can be said that competition is the driving force behind the port development. However, once the competition between ports is too much, the harm would be very serious. First, port as the foundation industry plays an important role in the development of national economy. The investment amount is large and the payback period is very long, once form repeated investment, the loss will be very serious.

Second, resources in coastal ports are non-renewable, excessive competition will result in inappropriate use of resources. Meanwhile, the vicious competition between operators is not conductive to promoting the professionalization of the port, information and technological progress, is not conductive to the logistics distribution system optimization, and is not conductive to the cooperation between port operators. Previous studies focused to a particular port's competitiveness, but from an economic point of view, local optimum does not mean global optimum. Thus the center of competition should not exist in the interior, but the integration of all the terminals in the region to play the whole advantage, to attract more shipping companies and shipping line to call at the ports in the region.

As the one of the five port clusters in our country, Southwest Coastal Port Cluster is the joint of China and ASEAN (the Association of Southeast Asian Nations).It is also the important way for Southwest area to enforce the communicate with ASEAN and global market. The location advantageous is obviously and the stratagem state is outstanding. The pots have rich resource, wide hinterland and the potential of exploration. Accelerating the benign development speed can not only promote the development of local economy, but also keep up with the trend of economy globalization and integration of regional economy. Answer for to the demand of national development strategy. It is the strategic step to fully carry out scientific developing view and accelerate to carry out the "the eleventh five-year" plan. It has magnificent meaning in flourish local economy, promote exploring west, and push the common prosperity and development of both China and ASEAN. Accelerating the building of southwest port can help fertilize and enrich the content of cooperation

between China and ASEAN. It is good for sharing the resource in the area, help transferring dividing the industry reasonable. It is good for countries to exert there comparative vantage, mutually complementary and beneficial, get together to rise the integrate competition of the local area. It is beneficial to absorb and reasonable use international capital and out resource. And help to international cooperation on economy and trade on higher level and more deeply. On the end, a new zone of economic increasing will be formed in South Pacific and it will help to build harmony Asia and harmony world.

1.2 Literature Review

The construction of one port includes large investment and long construction period, and the port management is involved in many departments. Many researchers from engineering, economics, management, planning and other aspects studied the ports. In the aspect of economy, Jojansson and Qshneerson apply modern economic theory to analyze the port economy especially the congestion price. Zhu Xiaochun applied principles of production function and methods to analyze and evaluate the contribution of the input factors to output and production economies of scale.

The study on the ports competition is mainly from two aspects. One is from the policy impact to ports competition, the other one is from the ports competition strategy. Most of the research on port competition had focused on pricing strategies. While with the integration of world transport system and the emergence of multimodal approach, port rate is no longer the main component of transport costs of goods. From that, the port began to pay more attention to the improvement of the quality of service during the formulation of pricing strategy. In this context, many ports competitive model began to consider the combined effect of a variety of competitive strategy. Since there were

many difficulties exist in the quantitative description of a number of factors, many models are descriptive.

In terms of competition and cooperation between terminals, Yuan Bing agreed that the strategy of integrate terminal resources and implement the ports' lengthways incorporating strategy and the transverse incorporating strategy is an effective way to solve the problem in the process of the development of port industry. Yuan Bing also pointed out that the goal of the integration of terminal resources is to enhance the core competitiveness of port group and individual port. On this basis, the author indicated that the integration of terminal resources includes three aspects. First, integrate the internal resources among various subsystems of a port. Second, integrate the resources between upriver and downriver enterprises. Third, integrate the resource between ports in the same port cluster. These three aspects can be sum up as the ports' lengthways incorporating strategy and the transverse incorporating strategy.

When mention the implementation methods of co-opetition, Wang Yunxia(2003) gave some new suggestions. The emphasis of this thesis is the introduction of the new concept of co-opetition among port enterprises, and the tentative study on the implementation methods of co-opetition. Some suggestions provided in this thesis to Chinese main port enterprises are valuable.

R. Midoro, E. Musso and F. Parola(2005) pointed out that in the transportation and logistics industry, however, cooperation is becoming even more critical than competition in determining firm's efficiency. In the process of co-coordination the interests between the global carriers and global terminal operators, for the terminal operators who affected by economic, technical and managerial capacity constraints, and cooperation can reduce costs, integrated supply chain management as a business strategy. When compared with competition, cooperation is more critical in determining the terminal business efficiency.

Terminal is a professional special port, the operation is homogeneous and therefore there are more articles about the analysis of competition. Chen Jingna(2002) take Guangzhou Container Terminal Company Limited(GCT) for example analyzed the environment that GCT faced with. The author also analyzed the main factors that may affect the international container transportation development in the port of Guangzhou systematically. She point out a strategy to help GCT to penetrate into offshore lines marker run by small ships and try to increase the market share and finally become the regional transship hub. This article is a typical example in the study of the container terminal as an individual.

Li Zisheng(2004) broke through the idea of individual terminal study, and the method of this research is based on the Cooperation and Competition Theory, Game Theory, Modern Logistics Theory, taking the problems appeared in the development of ports and the wrong conception as the cut-in point. The discussion separated by two clues including lengthways synergy and landscape orientation collaboration. After that the author gave same advices to the coming down difficulties of the strategy.

James J. Wang and Brian Slack (2004) analyzed the case of Shanghai and Ningbo ports in Yangtze River Delta (YRD). Based on the case, the author analysis how can the domestic ports develop into an important world-class hub in the context of China's accession to WTO and global economic integration. In the process, analyzed how to deal with the conflicts between pier developers, shipping companies, other terminals and government, and how to deal with the competition and cooperation between these parts.

Dong Won Yi, Soung Hie Kim, Hyung Rim Choi, Nam-Kyu Park and Tae-Woo Lee (2000) did some preliminary experiments and research in the possibility of sharing the container terminal facilities. The research took Busan for example suggested a conceptual model for sharing container terminal resources. Container terminal equipment had been divided into cargo container terminal operations equipment,

anchorage tools, fixtures and human resources. These four major categories classified according to different standards for sharing.

Kong Xianlei and Xu Changxin (2004) first proposed the concept of the port cluster system. They expounds on the development process of port group system from port regional combination to port transportation system, relationship among port regional combinations which is characterized by competition and cooperation. As a result establish the evaluation indices concerning integrated development of port group system. The authors take the cooperation between ports as the fundamental condition for the establishment of the port system.

Chapter 2 Development of Major Port Cluster in China and other Countries

In the world economic development, the harbor gradual grows its scale long with the social economy development. As the foundational facility of the social economy, harbor first services the urban economy or center regional economies. Generally speaking each harbor gradually has formed the respective relative stabilization in its own developing process direct or the indirect economic hinterland, establishes the harbor industry scale which adapts with its economic development, has formed the basic balanced pattern of regional international harbor group. From the mid and late stage of last century, the transformation of the sea transportation way had broken the existing harbor's balanced pattern. Both the economic globalization of production and large transport mode of shipping prompt the new boom of port construction, and aggravate the competition between the regional international ports. This chapter introduces the developing experience of foreign main harbor groups and domestic main harbors' cooperation experience, and at the same time analyzes the situation of ports within Beibu Gulf.

Port group refers to the ports that have the similar geographic location and a common hinterland, part of a function or functions can be mutually instead of individual port system composed of large groups of port. The combination of ports between each port to form a network within which each port planning well and the function is clear. Due to the similar geographic location and a common hinterland, there is a natural competition between terminals within one port cluster. This requests various ports to carry on the resources conformity, and carry on the reasonably strategic plan.

2.1 The Developing Experience of Foreign Main Harbor Groups

There is no lack of successful examples of building coordinating and communicating mechanism of neighbor harbors in the world. Some harbors are combined together and set up a committee; for some harbors, they are supervised by Harbor Office. However, they all find the best ways to solve problems in both tax and common benefit. The functions of government reflect from common service. For example, New York-New Jersey harbor is the biggest container harbor in the east coast of U.S.A. The harbor group is made up with harbors belongs to New York and New Jersey respectively. It is managed by harbor committee made up of 14 people.7 people comes from New York, and others are from New Jersey. They are appointed by their Governors separately. This kind of combine comes from market competition in 1940s.This committee only works on the problem of harbor operating, constructing and management. The key problem of the harbor will be solved by state government. The harbor of U.S.A and Europe has significant effect on local economy. Los Angles and Long Beach transfer more than $ 200 billion goods every year for west U.S.A and U.S.A's trade partner in Latin America and Asia. New York harbor and New Jersey harbor; German Bremerhaven harbor and Hamburg harbor, among those harbors they all set up coordinating mechanism, which bring about misplaced development and complementary advantages.

Holland's Rotterdam Port and Belgium's Antwerp's port claimed that they have 800 kilometers economic hinterland. Actually these two ports are quite close to each other. The containers in Rotterdam develop well. In response, Antwerp firstly development assembly parts which cannot be used for containers in Luxemburg. When the transportation need grows, some containers products are will to be sending by Antwerp shipping line. Those harbors work together and gain what they want.

In order to enhance competitive power, the six ports on Tokyo bay operating superlatively. But they will combine together when they facing outer competition.

The six ports are announced to be container harbor. During the process of growing; the central government is always play an important role to integrate them together. The practices of foreign harbors prove that allocating harbor resource resonablely could the ability of city's economics assembling and industry derive. Turn the city allocation from passive productive force into active productive force, and from over relying on inland resource into comprehensive utilization of home and broad resource. Create new point of economy growth and industry chain.

2.2 Cooperation Experience of Domestic Main Harbors

Assembler harbors across area in Yangtze River Delta. Zhejiang Province's harbors group mainly made up with Ningbo and Beilun harbors, Jiangsu Province's Yangtze River harbors group include Taicang, those groups integrate with Shanghai harbors into assembling harbors. Shanghai harbor became one of the important national harbors for it has large service hinterland, supported by branch ports, feeding ports, has many shipping lines and container resource. However, 200 to 300 thousand ton ships which transport oil, iron ore and dry bulk cargo cannot arrive at Shanghai Harbor for it is not deep enough. Niongbo and Taicang have reasonable depth of navigable channel. Those ships could reach Niongbo or Zhoushan to load down the cargo, regarding these ports as Transshipment port and then transport those cargos to other ports to serve the whole hinterland. The Yangshan Deep Water Port in Shanghai makes up the deficit of Shanghai Ports whose navigable channel depth is not deep enough. This could raise the international competitive power of Shanghai International Shipping Center. This Shanghai assemble ports pattern of Yangtze River Delta area make main hub port joint tightly with branch ports and feeding ports. Those ports could develop their own advantage, share the benefit, and promote the Yangtze River Delta economic grows.

Assembler ports in Xiamen Bay. The reposition work of Xiamen Bay Harbors' function has been completed and endorsed by the provincial government. According to a new location, Dongdu port, Haicang port, Songyu port focus on the development of ocean container trunk route transport. Zhaoyin port focuses on the development of the ocean and coastal transport, at the same time, transport the passengers. Build the Xiamen Bay port, making the entire production factors together, promoting the construction speed of Xiamen bay and improves the overall advantage in Xiamen Bay, the port is able to effectively coordinated services to regional economic development, and make a contribution to the development of cross-strait economic.

2.3 The main situation of ports within North Bay

2.3.1 Fangcheng Port

Fangcheng Port is located in south of Guangxi Province, the north side of the Beibu Gulf. It's the combinated place of Big Southwest Economic Circle and the economical Southeast Economics Circile. Also, this port is the hub of Southeast and Southeast Asia. It's near Yun, Gui, Chuan,Yue, Qiong, Hongkong, Macao, Vietnam and Beibu Gulf. The port condition is very good-wide water depth, shelter, water and landside; long water front; short waterway but less silt. More than 100,000DWT ships could navigate through the port safely. It's an excellent port in south China, one of the nineteenth hubs, and the biggest Port in Guangxi Province.

Fangcheng Port is based in Subtropics, neither too cold in winter, nor too hot in summer. The weather is very convenient to the port working process. The average annual temperature is 22.5 Degree. The typhoon is less than once per year, normally in August and September, but for the nurture protection of the port, the typhoon can't have too much affection to the port. The average annual fog days is 22.2 days, the

biggest tide range is 5.39 meters. The tide range day, which is more than 3 meters, is 315 days per year.

Fangcheng port is one of the twenty main hubs in China's coastal ports, it is the largest harbor in Guangxi, and it is also the first class foreign trade port. Now there are more than 70 countries in the world do business with this port. It is the main portal and most convenient overland crossing in Southwest. The Fangcheng Port is the farthest hub port on the southwest coast of China. As one of the 12 hub ports in China, the total berth line is 2751m long. During the Eighth Five-Year Plan period, the berth line was increased by 1265m and 13 new berths were built, out of which 10 berths are for vessels of 1000-5000 dwt and one berth is for vessels of 30,000 dwt. The main structural of the quay wall is the gravity-type large diameter cylinders with reinforced concrete thin wall.

Judging from the sea, Fangcheng port is the most convenient port that connects the mainland of China to Southeast Asia and Western Europe. 151 sea miles away from the Vietnam's Hai Phong port and 849 sea miles away from Manila port in Philippines, and 1,345 sea miles away from Singapore, and 1,343 sea miles away from Bangkok, Thailand. Fangcheng port now do business and navigation with more than 70 countries and regions, more than 220 ports. Opening a container route to Hong Kong, Hai Phong, Vietnam, Singapore, Malaysia Tanjung Paz, Busan, South Korea and other international liner and to Shenzhen, East China, Northeast China region's internal trade port liner, and has opened up in Southeast Asia, America West, U.S. East, Europe, Middle East, Australia and other international routes and major ports of the internal trade routes, route operating companies, including COSCO, Maersk, China Shipping, APL, MSC, CNC, etc..

Bulk cargo is indeed the main backbone source routes that are located throughout the world: East Asia, Korea, Japan, Taiwan, Singapore, Vietnam, Indonesia and other countries; the Netherlands Rotterdam in Europe; the United States of America.

Fangcheng Custom’s clearance management system was upgraded in mid-January 2004 to HZ000 version, to further improve the efficiency of customs clearance inspection. Fangcheng port give full play to advantages of the port leading role, by developing port, limb and resource-based work industry, port construction and port industries to achieve joint development, the port-specific location advantages, resource advantage into competitive advantage. At the same time, the port focus on the introduction of a port as the backing of large iron and steel, grain and oil, chemical and electricity industries.

But there are still many problems in the Fangcheng port. First, port construction is lagging behind, berths are too small, through capacity is not good enough, and the lack of large spaces and specialized terminals, and the depth of water is not too deep, terminal capacity and professionalism to meet the urgent need to improve shipping large scale professional development requirements. Second, collecting and distributing system imperfections. Railway transportation capacity is limited, the railway transport capacity adjustment imbalance, local railway tariffs are high. Third, funds of public infrastructure are insufficient, and there is only a single channel. National investment in port infrastructure is limited; now rely primarily on their own funds and bank loans to be adequate for the rapid development of port construction needs. Fourth, the overall strength of the port and service levels need to be further improved the overall strength of the port and the port on the service level is an important port's overall competitiveness. Fifth, harbor industries developed slowly.

2.3.2 Beihai Port

Beihai port has associated with the national railway network, direct access to the port warehouse, 8 field special railway line terminal. Port with the road network extending in all directions, a vast depth of the pier hinterland, harbor land area is 1.3897 million square meters; there is broad space for development. North Sea port of transportation facilities improved.

2.3.3 Qinzhou Port

Qinzhou to start construction in 1992, and in 1994, a project put into production, then a series of port infrastructure facilities are put into use, the port have been expanding to form a port transportation and port development, industrial interaction situation, the port development of an integrated environment has become more and more perfect.

Qinzhou port located at the top of the South Sea of China, and in the central position of the Beibu Gulf. Along with the harbor of port infrastructure and constantly improve, port industry also obtained rapid development, many large petrochemicals, metallurgy, energy, paper, etc in Qinzhou. China's accession to the WTO, the building of China-ASEAN free trade area, and the imply of the country western development strategy and our pan-Pearl River Delta region of promoting economic cooperation, would greatly facilitate Qinzhou port construction and development of the port industry, Qinzhou will span into the billion-ton world Harbor ranks, and form a large port, large industries, logistics, tourism benign, interactive development patterns, which in turn developed into industry, ecology, tourism, human settlement coordinated and harmonious development of the modern integrated port.

2.3.4 Zhanjiang Port

Zhanjiang port located in the southernmost in the Leizhou Peninsula of Guangdong Province in the East China Sea, Zhanjiang harbor is famous for its natural deepwater, and it is the port that is the shortest port from mainland China to Southeast Asia, Africa, and Europe. It is also the main channel of the goods transportation of Southwest and South Sea of China. It is one of the main hub ports along the coast in the country. Now it does business with more than 100 countries and regions. Zhanjiang Harbor is the first modern port that China design and construct it by ourselves.

Chapter 3 Analysis of the Main Factors Affecting the Development of Fangcheng Port

3.1 Analysis of the Hinterland and Commodity Supply of Fangcheng Port

The harbor and the hinterland are depend on each other and promoted each other; their development is also linked with each other. The harbor can not exist and develop without the hinterland, and the hinterland also can not exist and develop without the harbor. Take the Rotterdam Port for example, thanks to the vigorous development of the Western Europe center; the Rotterdam Port can be so prosperous. According to the present status function and the development condition of Fangcheng Port, considered that the neighbor harbor's function and the development, and combined with the status quo and development planning of comprehensive transport network hinterland, the Fangcheng Port's direct economic hinterland is the mid-west area of Guangxi autonomous region, western area of Guizhou Province and Yunnan Province. The indirect hinterland of Fangcheng Port includes eastern area of Guangxi and Guizhou province and certain regions of Sichuan, Chongqing, Hunan and Hubei. But actually the scope of the hinterland is not irrevocable. I think if a port can attract goods from a region, this region can be called the hinterland of this port. Following introduces the economic development condition of the hinterland.

Guangxi:

Guangxi province has rich mineral resources, now has found 102 kinds of minerals, up until the year of 1997, 85 kinds of minerals had been ascertained. Nonferrous metal, nonmetal as well as ferrous metal are very rich; these metals hold very important position in our country.

In 2009 the total out put value of Guangxi province has become more than 770 billion RMB[1]. The total export-import value of 2009 is 14.21 billion dollars, when compared with 2008, it has increased 7.3%. Among which the export value is 8.37 billion dollars, the growth is 13.9% when compared with 2008's export value. The growth of the value of export-import and export were more than the national average. In the year of 2008, the transportation industry developed steadily. The total turnover of freight traffic of this year was 207.9 billion ton kilometers[2].

Guizhou:

Guizhou province has found 110 kinds of minerals, 74 kinds of minerals had been ascertained. Coal, bauxite, hydrargyrum, manganese, phosphorus and etc. are not only superiority minerals in Guizhou, but also important minerals in China. In 2008 the total output value of Guizhou province has become more than 333.34 billion RMB. The total turnover of freight traffic of this year was 80.53 billion ton kilometers.

Sichuan:

Sichuan province is one of the provinces that have rich mineral resources and the kinds of the resources are variety. Until now, many kinds of mineral resources have been proven and 1327 places have proven reserves of mineral resources which accounts for about 6% of our whole country.

Chongqing:

Chongqing province also has rich mineral resources and the kinds of the resources are very variety. It plays an important role in our country. 75 kinds of mineral resources have been found. Its coal reserves is 20 billion tons, it is an important base in southern coal production; natural gas reserves is up to 320 billion cubic meters.

[1] Source: National Bureau of Statistics of China. http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm
[2] Source: National Bureau of Statistics of China. http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm

Table 3.1 shows the commodity throughput of Fangcheng port from 2001 to 2008. We can find that both of the total throughput and container throughput have increased. Although in 2006 the container throughput reduced, the overall trend is increasing.

Table 3. 1 Commodity throughput of Fangchang Port from 2001 to 2008(million tons)

Year	2001	2002	2003	2004	2005	2006	2007	2008
Total throughput	10.032	11.162	13.196	16.084	20.0634	33.82	51.5292	56.2586
Compare with last year	8.74%	11.26%	18%	22.3%	24.7%	68.57%	52.36%	9.18%
Container throughput	20123	46079	52000	80168	105000	54065	85390	102000
Compare with last year	26.39%	129%	12%	57.17%	30.97%	-48.51%	57.94%	19.7%

Source: Drawn by author: ©Copyright Yu Yiyi, WMU-ITL Shanghai, (2010) by Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports.

3.2 Main Factors Affecting the Development of Fangcheng Port

3.2.1 Impact of Gross Domestic Product and Foreign Trade Development on the Development of Fangcheng Port

Gross Domestic Product (GDP) is an aggregative indicator that reflects national economy; it is also an indispensable indicator of economic statistics for many countries. GDP represent the total situation about social production and ports are the transportation sector served for social production. The social production state

determines the source of goods of ports, assume the port can meet the requirements for social production, and then the port throughput is the total amount of goods of port, so there a certain functional relation between GDP and port throughput. What this kind of functional relation showed is social economy to the relation of aggregate demands of port, knowing the facility scale of necessary port of the society as to us has very great help. At different economic stage social production characteristics differ widely, the requirements for communications and transportation will be different too, so at each stage of economic development, there is a very great difference to the port demand in the total supply and demand. While analyzing the relation between GDP and port throughput, we should estimate the relation between every economic stage's GDP and quantitative and the port throughputs.

The main factor that influences the development of port development is the ample resources needed in economic construction of the scale, transportation of the large raw materials and increase of foreign volume of trade. The economic construction and development of external trade derive the demand for appearing to transporting; derive the requirements for construction of port out too. At certain stage of economic development, must require the corresponding service for it of transportation system; require the corresponding handling capacity of port to correspond to it. Whether the handling capacity of the port meets the transportation demand, the impact on national economy and foreign trade development is very direct. Port national barometer of economical operation, it is national economic base industry for port not to transport, the development speed of national economy is closely linked with growth of production of port. Through analysis of data in recent years, China's national economic development and transportation have a strong correlation. Port will be for a long period of time to maintain a good development prospects. Our country is in the process of industrialization in the country, the country's economic development will continue in a period of rapid growth, according to well-off society in China's construction of the goal and the "Eleventh Five-Year Plan", the next few years will carry our economy the past few years momentum and continue to maintain steady

growth, but the speed will be slow down, and the overall economic performance will shift the normal state of partial heat. National economic growth rate will directly affect the port business expectations.

The rapid growth of total foreign trade in China in recent years promoted the rapid development of the marine industry. From global economic integration trends, China is becoming world manufacturing center, China's economy will further integration into the world economy, China as the world's major trading countries and further strengthens the position. China shipping industry will face significant opportunities for development; the rapid development of foreign trade will have significant transportation needs. The reduction of tariff and non-trade barriers for the total abolition of the import and export, the country would continue to grow rapidly, as China's port transport provides broad space for development. China’s import and export of goods for about 90% transported by sea. In 2009 China's total foreign trade value is about 2207.27 billion dollars. China's accession to the WTO shows the formation of large economic pattern. Import and export drive rapid growth in port throughput. I looked at this year's fast growth in the import and export was mainly due to strong economic growth remains in the world. Although many organizations believe that growth of this year will be moderated, you will still be higher than the last year’s level. Fast growth of external economic promotes China's export growth. But how long the situation of the rapid growth in the import and export can last? The fast growth resulted in China's trade surplus increased, and the appreciation of the RMB will face pressure. So the export growth rate easing trend is inevitable.

Western development strategy speed up the development of the western area of China, it is the major decision of the new century that made by Chinese government. Western development strategy in the past 5 years, have made significant progress and significant results. Through 2004, Western region’s GDP annual growth is around 10% improving the basic infrastructure and the investment environment, and improving social development pace. More than 60 major projects about transportation, energy,

water, ecological and other projects have started in the Western region; the total size reached 850 billion. At the same time, when the western region develop its economic that will promote the transport demand and the development of foreign trade. Fangcheng port as a convenient Southwest corridor, will receive many opportunities, how to better planning of port in order to better meet the transport needs of the West, and self-development, deserves our careful consideration.

3.2.2 Impact of National Policies on the Development of Fangcheng Port

3.2.2.1Establishment of Association of China and ASEAN Free Trade Area (CAFTA)

ASEAN consists of Indonesia, Malaysia, the Philippines, Singapore and Thailand in 1967. The aim is to promote political and economic cooperation and regional stability. The chairman of the ASEAN is taken charge of countries in alphabetical order each year by rotation. As soon as Brunei got independence from British rule in 1984, it joined the ASEAN. Vietnam in 1995 became the seventh member of ASEAN. Laos and Myanmar in July 1997 was officially accepted as members of the ASEAN at that time coincide with the celebration of the 30th anniversary of the birth. Cambodia in 1999 became the tenth member of ASEAN. The impact of this organization to the Asia-Pacific regional trade, political and security issues is much greater than its individual members'. ASEAN adopted the consultation, consensus and cooperation is a major factor in its success. 9 out of 10 of the ASEAN countries are coastal countries, marine links outside with these countries. The importance of ocean to the ASEAN economic and trade development, foreign relations and other aspects of the importance of China in building a strategy for the ASEAN Free Trade Area value has become more and more significant. Which point of view from the regional conditions, in the Beibu Gulf has become the center of "ASEAN in the sea." The Beibu Gulf region is in an advantageous location, it ranged between East Asia and Southeast Asia and is an important maritime hub. Its own geographical economics is called "day

area", that means it only needs one day to travel between two ports whose distance is the longest. This creates an opportunity to promote closer economic ties between the development of international economic and technological cooperation and creation of favorable conditions. Gulf Area geopolitical location conditions for the economic development advantages become more apparent.

With the building of an ASEAN Free Trade Area, in particular, a Chinese-ASEAN Expo permanent location in Nanning, Gulf region attracted the world's attention. This region, face the South-East Asia, back to the southwest and near the Greater Pearl River Delta, and in the center of CAFTA. The Beibu Gulf region is the most convenient major thoroughfare in interior of China to Southeast Asia, it is the association of the Greater Pearl River Delta Economic Circle, Southwest China Economic Circle and the Southeast Asian Nations Department of Economic Circle. Therefore, as a CAFTA, the region's access will become more apparent. With the development of internationalization and domestic economic regionalization and the collectivization, this geographical advantage becomes a remarkable location advantage. After the establishment of an ASEAN Free Trade Area, a lot of money, personnel, logistics of the ASEAN countries and the world countries go into China's southwest region, in the Beibu Gulf region is undoubtedly the best location out of the inland areas and even to seize the cooperation with Southeast Asia into opportunities in Southeast Asia, we must take full advantage of the region. This good geographical advantage in the Beibu Gulf region strengthens the economic cooperation and the formation of powerful alliances, and creates the conditions for complementary advantages.

In 2001, Guangxi province’s foreign trade and export with ASEAN countries increased, Vietnam became the biggest export market of Guangxi instead of Hong Kong. Pingxiang, Qinzhou, fangcheng and other port cities have become China's most important land and amphibious transport channel and gateway to Vietnam, and South-East Asia's. According to statistics, in the first 8 months of 2008, the trade

volume of Guangxi to ASEAN is more than 2 billion dollars. ASEAN has been the largest trading partner of Guangxi.

The total amount of the import and export of Guangxi Province in Viet Nam has substantially increased, 2005 reached 0.98 billion dollars, accounting for three-quarters of the ASEAN trade for Guangxi Province, and Viet Nam has continuous become the largest trading partner for Guangxi for seven years. Fangchen port is the largest export port in Guangxi. As the rapid progress of CAFTA construction, Fangcheng port's strategic position and role is becoming more and more important.

With establishment of CAFTA, the trade between Fangcheng port and Vietnam, Thailand and other ASEAN Countries had increased, and the volume of foreign export trade was rising. Last year, the total import and export value of Fangcheng port was 2.1 billion dollars.

3.2.2.2 National monetary and fiscal policy

The country carry out tight fiscal policy, and the potential of RMB appreciation will definitely affect the import and export trade, in particular, slowing down the speed of the export trade, which inevitably led to reduce port throughput. During the eleventh five-year period, the export growth rate of non-metallic ores and coal, phosphate rock, barite, talc and steel, cement in Fangcheng port will slow down when compared with the previous year, while the import of metal ores, petrochemicals, fertilizers and other products will rise slightly.

3.2.2.3 The impact of national energy policy on the development of Fangcheng port

"Eleventh Five-Year" Plan not only explicitly set the goal of building a resource-saving society, but also proposes to reduce the unit GDP energy

consumption by 20 % for the first time. The central economic work meeting that held at the end of 2006 listed the conservation of energy resources as one of the eight key tasks. It is expected that during the Eleventh Five period the transportation of coal, petroleum and other products in Fangcheng port will be affected and the proportion of the cargo throughput will decrease.

3.2.3 Impact of Hinterland's Economic Development on the Development of Fangcheng Port

Hinterland is the origin and destination of ports. The larger development of the economic, the greater the level of regional transportation needs. The level of economic development within the hinterland, the distribution of natural resources, the productive forces, resources development and utilization, is the most direct factor that affect the port throughput. So if do the prediction of throughput, the analysis of hinterland must be carried out, that means analysis the relationship between the hinterland and the port, in other words, the proportion and number of imports and exports by using the ports. In general, the hinterland cargo import and export trade and the class structure is relatively stable, but as the hinterland economy development, production layout and industrial structure adjustment related factors are also gradually changing, which deserves special attention. Generally, the hinterland analysis on provinces and regions will be respectively. Through the analysis of the quantity, variety, the volume and throughput proportion of its total trade volume and throughput to identify the main goods categories, provinces and areas that have a major impact on the enterprise. In recent years, due to the acceleration of port construction and the increase of port capacity, the situation that some ports possess the same hinterland is also increasing. Hinterland of the cross-supply market research should pay particular attention to analysis the hinterland of the utilization of different ports individually. Port is divided into several types like hinterland-port and transit port, without exception, the economic strength of these ports' hinterland is very strong, because of the strong economic strength of the hinterland, the number of import and

export goods will be rich, thus the route of the port is intensive, and the collection and distribution is very good, and because of Matthew, this port will attract more transit cargo, to further improve the throughput of the port. World renowned port, the numbers of transit goods occupy a larger share in total throughput and the operating profit of transit goods is very large. The economic characteristics of ports' hinterland determine the nature of the port.

Fangcheng port indeed belongs to the hinterland-port, Fangcheng port's direct economic hinterland is Guangxi, Guizhou and Yunnan province; indirect economic hinterland includes Sichuan, Chongqing, Hunan and other provinces. Chapter III analyses the economic development of the hinterland and the gravity of the import and export goods of the hinterland. Port throughput forecast results should consider the above analysis of the situation.

3.3 SWOT Analysis on Fangcheng port

3.3.1 Specific steps of SWOT analysis

SWOT stands for strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors. Opportunities and threats are external factors. So it is also can be called as internal and external environmental analysis. In the process of analysis, the most critical step is the assessment index. Using various research methods to analysis the environmental factors of the enterprise, that includes external environmental factors and internal environmental factors. The external environment factor including the opportunity factor and the threat factor, they are the direct influential advantageous and the disadvantage factor to enterprise's development. It belongs to the objective factor; generally divide into different category like economical, political, social, the population, the product, and the service, technical, the market and competition.

Internal environmental factors include the strength and weakness factors, they are exist in the enterprise's development, and it is an active factor. It divided into management, organization, and business, financial, sales, human resources and etc. in the investigation of these factors, not only taking into account the history and present situation of enterprises, but also to consider the future development of enterprises.

In the process of structuring the SWOT matrix, the development of those enterprises have a direct, important, large, immediate, long out of the impact of prioritization factors, while those indirect, secondary, small, and short Factors ranked in the back. After completing the environmental factor analysis and the SWOT matrix structure, carries on the SWOT generalized analysis in order to work out the corresponding strategic plan. Use the overlapping combination analysis, through the different combination, in line with holds the opportunity, avoids threatening, displays the strong point fully, overcomes own insufficient principle to formulate the SO strategy, the ST strategy, the WO strategy and the WT strategy separately, and in these four strategy's foundation, compares enterprise's existing management key and the management strategy carries on the adjustment, finally find out a series of measures for the enterprises to develop in the future, and achieve the final goal of environmental analysis.

Table 3. 2 SWOT strategic combination

	Strengths (S)	Weakness (W)
Opportunity (O)	SO strategy Using the internal superiority to hold the opportunity.	WO strategy Using the exterior opportunity and overcome the internal insufficiency.
Threats (T)	ST strategy Using the internal superiority to overcome	WT strategy Avoid the external threats and reduce the internal

	the exterior threat.	insufficiency.

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We can find that WT strategy is the most pessimistic policy, this policy will only be taken in the most difficult circumstances. WO strategy and ST strategy is a kind of bittersweet, the policy will be taken in general situation. SO strategy is an ideal response, it will be taken in a best situation.

3.3.2 SWOT analysis on Fangcheng port

Strategic planning's basic mentality is to take advantage of superiority factor, overcome weakness factor, consider the past things, foothold current, and focus the future. SWOT is this kind of way which both can analyze enterprise's superiority, and can analyze where the enterprise’s opportunity and threatens are. I will use SWOT to analyze the development environment of Fangcheng port.

3.3.2.1 Opportunity analysis

After the establishment of an ASEAN Free Trade Area, a lot of money, personnel, logistics of the ASEAN countries and the world countries go into China's southwest region. This good geographical advantage in the Beibu Gulf region strengthens the economic cooperation and the formation of powerful alliances, and creates the conditions for complementary advantages. With establishment of CAFTA, the trade between Fangcheng port and Vietnam, Thailand and other ASEAN Countries had increased, and the volume of foreign export trade was rising.

The rapid growth of total foreign trade in China in recent years promoted the rapid development of the marine industry. Western development strategy speed up the

development of the western area of China, it is the major decision of the new century that made by Chinese government.

3.3.2.2 Threat analysis

The country carry out tight fiscal policy, and the potential of RMB appreciation will definitely affect the import and export trade, in particular, slowing down the speed of the export trade, which inevitably led to reduce port throughput.

Since 2008 the financial crisis influences China's harbor industry strongly. On the one hand the financial crisis causes the foreign capital swarm into our country, the harbor is compelled to choose the absolute sincerity cooperation, otherwise all will be defeated by outside. On the other hand there exists keen competition between ports that attracted by the maximize benefit. Although the Fangcheng port still maintains developing in the financial crisis, the speed-up already started to postpone. The financial crisis has not seen the bottom, and we must pay more attention to that.

3.3.2.3 Strength analysis

The condition of Fangcheng port is very good-wide water depth, shelter, water and landside; long water front; short waterway but less silt. More than 100,000DWT ships could navigate through the port safely. It is the largest harbor in Guangxi, and it is also the first class foreign trade port. Now there are more than 70 countries in the world do business with this port. It is the main portal and most convenient overland crossing in Southwest. Fangcheng port is the most convenient port that connects the mainland of China to Southeast Asia and Western Europe. 151 sea miles away from the Vietnam's Hai Phong port and 849 sea miles away from Manila port in Philippines, and 1,345 sea miles away from Singapore, and 1,343 sea miles away from Bangkok, Thailand.

3.3.2.4 Weakness analysis

port construction is lagging behind, berths are too small, through capacity is not good enough, and the lack of large spaces and specialized terminals, and the depth of water is not too deep, terminal capacity and professionalism to meet the urgent need to improve shipping large scale professional development requirements.

Collecting and distributing system imperfections. Railway transportation capacity is limited, the railway transport capacity adjustment imbalance, local railway tariffs are high. Funds of public infrastructure are insufficient, and there is only a single channel. National investment in port infrastructure is limited; now rely primarily on their own funds and bank loans to be adequate for the rapid development of port construction needs. And the overall strength of the port and service levels need to be further improved the overall strength of the port and the port on the service level is an important port's overall competitiveness. Fifth, harbor industries developed slowly.

Chapter 4 Cargo Capacity and Container Throughput Forecast of Fangcheng Port

Port throughput is the basic production indicators of the port, an important measure of the port development, and also an important condition for port organization of production, the preparation of port development planning and for port construction. Meanwhile, the size of the port throughput will reflect the scope of the port city and its hinterland's economic situation and level of development. Throughput classification can be reflected the industrial structure and economic structure of a city and its hinterland. Throughput can reflect the economic and trade relations between ports, cities, regions and foreign trade ports. It can be seen in the evaluation of port development and preparation the port development plan, the throughput is the first thing to consider.

In development planning, we should first predict its throughput, grasp the trend rule, analysis the relevant factors in order to provide reliable and accurate basis for the development plan of port. This article will combine the characteristics of the development of Fangcheng port, by analyzing its economic development level and development of throughput, and then choose the right forecasting method for throughput prediction. To order to improve the accuracy of the forecasts, this article using three forecasting methods: regression analysis prediction method, gray method and exponential smoothing method.

4.1 Regression Analysis Prediction Method

In real life, there are all kinds of links between two objective economic phenomena, the existence and development of one economic change must be associated with the phenomenon of existence and development of another constraints and the impact of changes. Regression analysis is the prediction of economic phenomena from the relationship between the departures through the objects associated with the phenomenon of forecast changes in the trend analysis, projections predict the future state of the object of a number of performance.

4.1.1 Unary Linear Regression Model

Suppose x is an independent variable, y is the dependent variable; there is a linear relationship between y and x, so the unary linear regression model is as follows:

$$Y_i=a+bX_i+\varepsilon_i \qquad i=1, 2, \ldots, n$$

X represents the impact factor, we tend to believe that it can be controlled or given in advance, so it is called the independent variable. ε represents the sum of influence that various random factors on y, according to the Central limit theorem, it can be considered subject to the normal distribution, that is $\varepsilon \sim N(0, \sigma 2)$. y as the dependent variable is our forecast target, due to the influence of various random factors, it is a regression line on the center of the corresponding value of normal random variables, that is $y \sim N(a+bX, \sigma 2)$. So the forecast model is:

$$\hat{y}_i=a + bX_i$$

a and b are the regression coefficients, usually we use Ordinary Least Square(OLS) method to evaluate the regression coefficients of the model. It can be known that the regression coefficients are about:

$$\hat{b}=\frac{n\sum x_{iy_i}-\sum x_i \sum y_i}{n\sum x_i^2-(\sum x_i)^2}$$

$$\hat{a}=\frac{\sum y_i}{n}-\hat{b}\frac{\sum x_i}{n}$$

Is the establishment of unitary regression model consistent with the objective laws between variables? Do the two variables have significant linear correlation? That

requires Significance Check Method for the test of regression model. The most common significance test in a linear regression model is coefficient of correlation test. The correlation coefficient is the index for measure the correlation of the two variables in the unary linear regression model. Generally speaking, the large correlation coefficient shows the more closely related relationship of the two variables. The following describes the coefficient of determination R^2 and correlation coefficient R:

$$R^2=\frac{\sum(\hat{y}_i--\bar{y})^2}{\sum(y_i-\bar{y})^2}$$

$$R=\frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum(x_i-\bar{x})^2}\sqrt{\sum(y_i-\bar{y})^2}}$$

$\bar{y}$ is the mean of observations, according to the σ that given by the regression model's degree of freedom (n-2), we can find out from the critical value table that the critical value is $R_\sigma(n-2)$. If $|R|\geqslant R_\sigma(n-2)$, which indicates that a significantly correlation linear relationship between two variables, this regression model can be used to forecast. If $|R|\leqslant R_\sigma(n-2)$, which indicates that a insignificantly correlation linear relationship between two variables, this regression model cannot be used to forecast, we should analyze the reason and handle the regression model again.

The following is the statistic of throughput of Fangcheng port.

Table 4. 1 Cargo throughput and container throughput of Fangcheng port from 1995 to 2009

Year	Cargo Throughput(million tons)	Compare with last year (%)	Container throughput (TEU)	Compare with last year (%)
1995	4.636	0.24	4966	-15.2
1996	5.085	9.69	4240	-14.6
1997	6.508	27.98	2859	-32.5

1998	7.065	8.56	3442	20.39
1999	8.08	14.37	4859	41.2
2000	9.226	14.18	15921	227.7
2001	10.032	8.74	20123	26.39
2002	11.162	11.26	46079	129
2003	13.19	18.17	52000	12
2004	16.08	21.91	80168	57.17
2005	20.06	24.75	105000	30.97
2006	33.82	68.59	54065	-48.51
2007	51.5292	52.36	85390	57.94
2008	56.2586	9.18	102000	19.7
2009	45	-20.01	143033	40.23

Source: Drawn by author: ©Copyright Yu Yiyi, WMU-ITL Shanghai, (2010) by Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports.

Use EXCEL to make the scatter diagram of Fangcheng port's throughput:

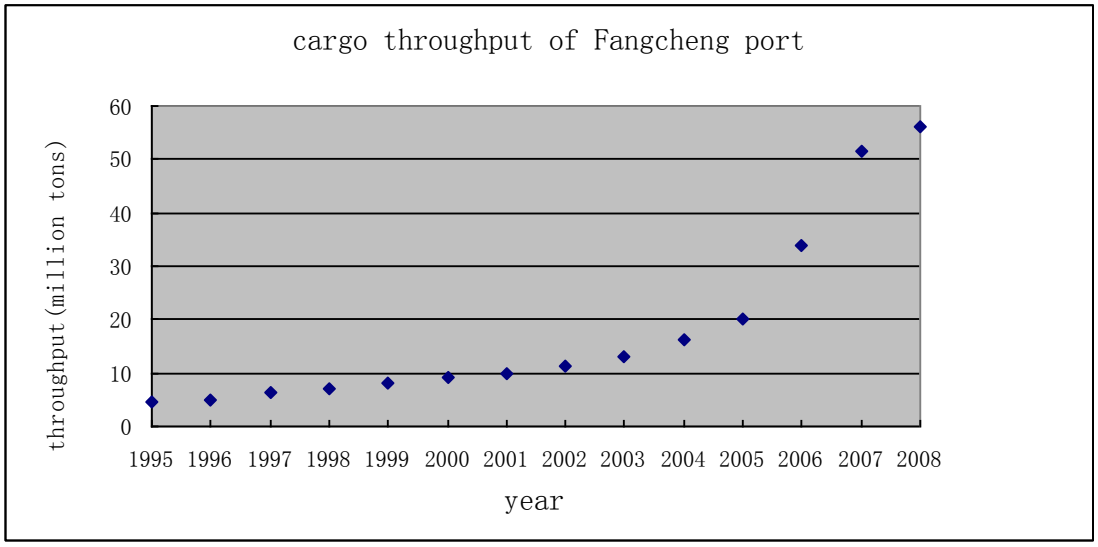

Figure 4. 1 The scatter diagram of Fangcheng port's throughput

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Obviously the time series is not a linear relationship. From the last 14 years throughput of Fangcheng port, their time series is a linear relationship, so we use EXCEL for fitting.

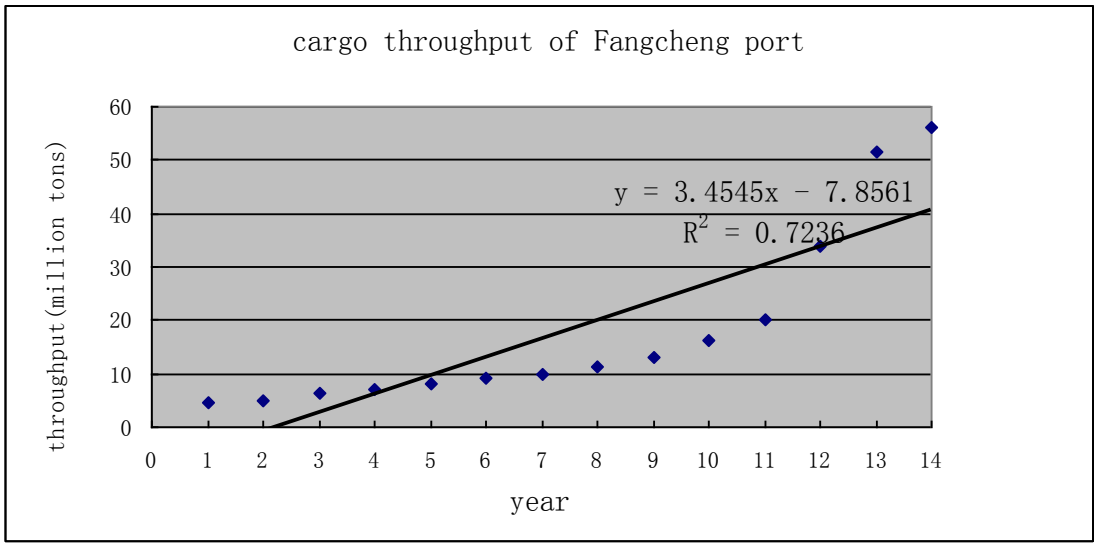

Figure 4. 2 Linear relationships between cargo throughput and year of Fangcheng port

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Also by EXCEL we can get the following relations:

y=3.4545x-7.8561

R^2=0.7236

So R=0.8506, when α =0.05, n=14, we can find from the critical value of the correlation coefficient table that $R_{0.05}(12)$ =0.5324, because R=0.8506>0.5324, that indicates that a significantly correlation linear relationship between two variables, this regression model can be used to forecast.

We use this relation to forecast the year 2010 to 2014's throughput.

Table 4. 2 Forecast of cargo throughput for Fangcheng port from 2010 to 2014 by the use of unary linear regression model (Million tons)

Year	2010	2011	2012	2013	2014

Throughput	47.4159	50.8704	54.3249	57.7794	61.2339

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When compare the forecast of Fangcheng port's throughput by linear regression method with the real value, there is some bias, but as a kind of forecast methods, their prediction methods and inspection methods on the dissertation is very useful for this article.

4.1.2 Nonlinear regression method

Due to the complicated socio-economic phenomenon, the advantage of the relationship between the various factors does not always linear, and that may exist in a non-linear relationship, we must establish a nonlinear model. Fangcheng port's throughput and year is not a linear relationship. The following I will establish quadratic curve model.

We use EXCEL for fitting:

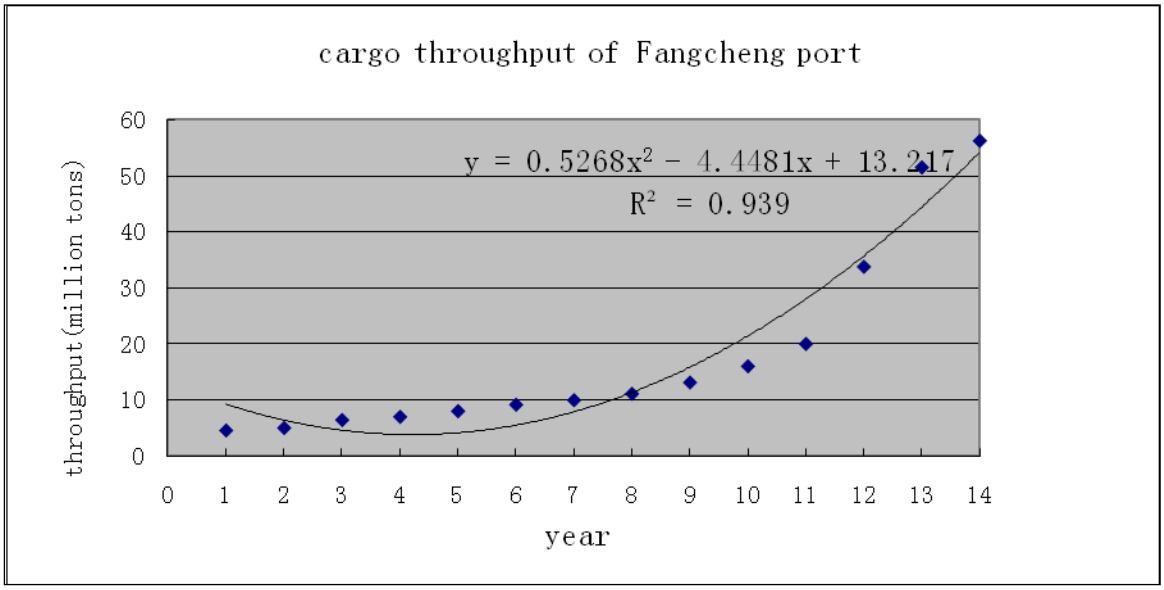

Figure 4. 3 Quadratic curve relationships between cargo throughput and year of Fangcheng port

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The relation is:

$$y=0.5268x^2 - 4.4481x + 13.217$$

$$R^2 = 0.939$$

We use this relation to forecast the year 2010 to 2014's throughput.

Table 4. 3 Forecast of cargo throughput for Fangcheng port from 2010 to 2014 by the use of nonlinear regression model (Million tons)

Year	2010	2011	2012	2013	2014
Throughput	76.9082	89.8445	103.8344	118.8779	134.975

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We also use EXCEL to fitting the container throughput of Fangcheng port:

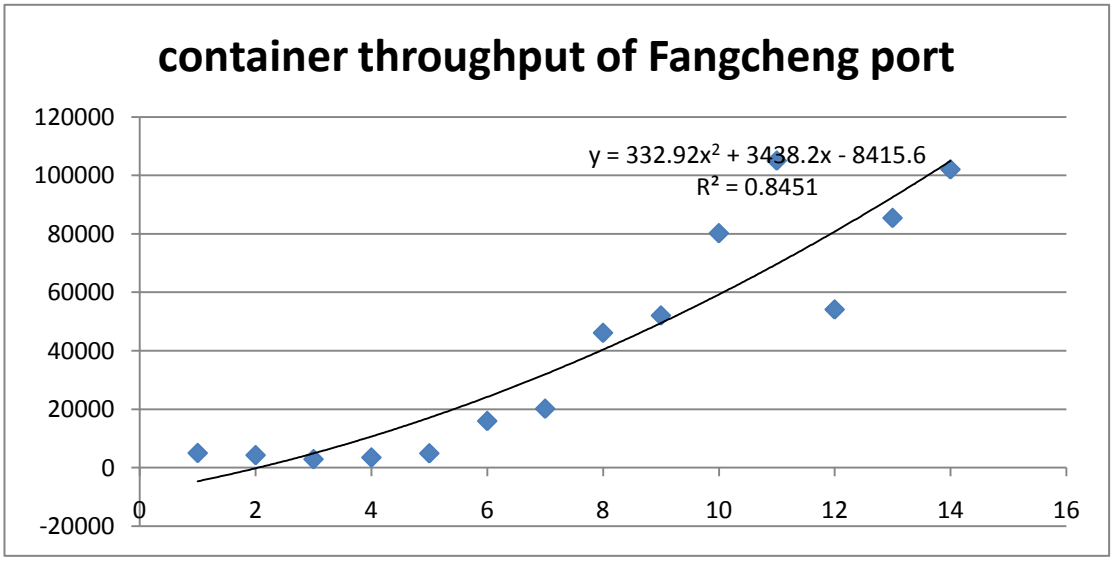

Figure 4. 4 Quadratic curve relationships between container throughput and year of Fangcheng port

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The relation is: $y=332.92x^2 + 3438.2x - 8415.6$

$$R^2 = 0.8451$$

We use this relation to forecast the year 2010 to 2014's container throughput.

Table 4. 4 Forecast of container throughput for Fangcheng port from 2010 to 2014 by the use of nonlinear regression model (TEU)

Year	2010	2011	2012	2013	2014
Container Throughput	131823	146248	161338	177094	193516

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4.2 The Grey Prediction Method

Grey system contains both known or unknown or uncertain information, it is first proposed by Professor Deng Julong in our country in 1982. This theory attracted many domestic and foreign scholars and scientists' attention. Grey system provides poor information in case of new ways to solve system problems. Characterization of chaos and gray system behavior observation data, by generating principle of treatment, the gray system model can be established, when to seek less than the probability characteristics of the system, the gray model to show the outstanding advantages.

Grey prediction model is called as GM (Grey Model). GM (1, n) is a differential prediction model that contains first order and n variables. I will introduce GM (1, 1) model as follows, and take this as a container throughput prediction model.

Suppose the original progression is $x^{(0)}(t) = \{x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n)\}$ and do a cumulative for $x^{(0)}(t)$. Generate progression $x^{(1)}(k) = \{x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n)\}$ based on $x^{(1)}(k) = \sum_{t=1}^{n} x^{(0)}(t)$. So the differential equation for $x^{(1)}(k)$'s GM (1, 1) model is $\frac{dx^{(1)}}{dt} + ax^{(1)} = u$, $\hat{a} = (a, u)^T$. If we use least square method, $\hat{a} = (B^T B)^{-1} B^T Yn$, so we can get the following relation:

$$B = \begin{pmatrix} -0.5\left(x^{(1)}(1) + x^{(1)}(2)\right) & 1 \\ -0.5\left(x^{(1)}(2) + x^{(1)}(3)\right) & 1 \\ \cdots & \\ -0.5\left(x^{(1)}(n-1) + x^{(1)}(n)\right) & 1 \end{pmatrix}$$

$$Yn = \left(x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n)\right)^T$$

And

$$\hat{X}^{(1)}(k+1) = \left(X^{(0)}(1) - \frac{u}{a}\right) e^{-ak} + u/a$$

$$\hat{X}^{(0)}(k) = \hat{X}^{(1)}(k+1) - \hat{X}^{(1)}(k)$$

We can use this relation to get the prediction value of year k+1. But we still need to test the accuracy of the prediction model. The calculation formula is$C = S_2/S_1$, $P = \left\{\left|q^{(0)}(t) - \bar{q}^{(0)}\right| < 0.6745 S_2\right\} = \frac{n}{n}$, because

$$S_1 = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}\left[x^{(0)}(t) - \frac{1}{n}\sum_{t=1}^{n} x^{(0)}(t)\right]^2}$$

$$S_2 = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}[q^{(0)}(t) - \bar{q}^{(0)}]^2}$$

$$q^{(0)}(t) = x^{(0)}(t) - \hat{x}^{(0)}(t)$$

$$\bar{q}^{(0)} = \frac{1}{n}\sum_{t=1}^{n} q^{(0)}(t)$$

the precision class of P and C is judged by the following table, take the big one for the model precision class.

Table 4. 5 The precision class of model

C	<0.35	<0.5	<0.65	>=0.65
P	>0.95	>0.8	>0.7	=<0.7
precision class	First class	Second class	Third class	Forth class

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Use the statistics that given by table 4.1, we can get the grey prediction value of Fangcheng port's cargo throughput.

Table 4. 6 The prediction value of Fangcheng port's cargo throughput (million tons)

Number of dimension	P	C	Prediction value of year 2010	Prediction value of year 2011	Prediction value of year 2012	Prediction value of year 2013	Prediction value of year 2014
13	1	0.203	71.281	75.8993	85.673	93.3812	114.167
12	1	0.196	71.8776	76.433	86.9201	96.432	116.9105
11	1	0.202	72.972	77.1926	87.573	98.3557	118.4369
10	1	0.213	73.031	79.932	89.0164	99.2473	122.597
9	1	0.205	73.2278	81.722	92.381	102.7281	125.3812
8	1	0.203	74.9210	83.1704	94.0196	105.138	129.9669
7	1	0.136	75.260	86.735	97.8114	109.322	132.1087
6	1	0.132	77.8105	89.1572	103.541	112.6824	133.957
5	1	0.066	78.1332	91.3817	106.729	118.9248	135.713

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We can get the cargo throughput of Fangcheng port in 2010 is 78.1332 million tons. And we can also get the grey prediction value of Fangcheng port's container throughput.

Table 4. 7 The prediction value of Fangcheng port's container throughput (TEU)

Number of dimension	P	C	Prediction value of year 2010	Prediction value of year 2011	Prediction value of year 2012	Prediction value of year 2013	Prediction value of year 2014
8	1	0.2638	14636	18250	23366	27515	34745
7	1	0.2047	12154	16217	22307	25433	32612
6	1	0.2240	11149	15208	20291	23407	30569
5	1	0.1602	15732	19303	27493	37783	54929

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When c=0.1602 the precision is the best, so we get the container throughput of Fangcheng port in 2010 will be 15732 TEUs.

4.3 Exponential Smoothing Method

Exponential smoothing, known as the exponential smoothing, is an important time series prediction method. This method can eliminate the incidental changes of time series, and improve the importance of the data in the prediction. It is based on the process of the original data, the data is called smoothness index, then calculate on the basic of the smoothness index to form a forecast model, so we can forecast the value in the future. Exponential smoothing method not only does not require a lot of historical data, but also consider the importance of each data, and use all the historical data. It is the improvement and development of moving average method, and applied more widely. Exponential smoothing method is essentially a weighted average of historical data for forecasting results for future time. The weighting factor is expanding exponentially decaying, the early time's weight will be greater, and the sum of weighting is equal to 1, because the weighting factor meets the index rules, and also has exponential smoothing feature, it is known as the exponential smoothing. It has many advantages like simple calculation, less sample, strong adaptability, more

stable, etc. Not only can be used for short-term predictions, but also can be used for the long-term prediction and the result can be even better.

4.3.1 Single-index moving method

Set time series as $y_1, y_2, \ldots y_t$ ...; the formula of single-index moving method is

$$S_t^{(1)} = \sigma\ y_t + (1-\sigma\ ) S_{t-1}$$

$S_t^{(1)}$ in the above formula is the single-index moving value, σ is the weighting coefficient, and $0<\sigma\ <1$. The forecast model is $\hat{y}_{t+1} = S_t^{(1)}$, that is

$$\hat{y}_{t+1} = \sigma\ y_t + (1 - \sigma\ )y_t$$

We take the exponential smoothing values of the time of t as the predictive value of the period t+1.

4.3.2 Secondary exponential smoothing method

When linear trend changes occur in time series, the use of single-index moving method will find error. We must amend it. The correction of a method is to do secondary exponential smoothing, use lag deviation of law to establish a linear trend model. This is the secondary exponential smoothing method. The formula is

$$S_t^{(1)} = \sigma\ y_t + (1-\sigma\ ) S_{t-1}^{(1)}$$

$$S_t^{(2)} = \sigma\ S_t^{(1)} + (1-\sigma\ ) S_{t-1}^{(2)}$$

In the above formula, $S_t^{(1)}$ is the single-index moving value, and $S_t^{(2)}$ is the secondary exponential smoothing value. When the time series $\{y_t\}$ become linear trend, it can be forecasted with linear trend model. The formula is

$$\hat{y}_{t+1} = a_t + b_t T \qquad T=1,2, \ldots$$

$$a_t = 2S_t^{(1)} - S_t^{(2)}$$

$$b_t=\frac{a}{1-a}(S_t^{(1)}-S_t^{(2)})$$

4.3.3 Cubic exponential smoothing method

When the movements of time series exhibit quadratic curve trend, we need to use cubic exponential smoothing method. Cubic exponential smoothing method is based on the secondary exponential smoothing method. The formula is

$$S_t^{(1)}=ay_t+(1-a)S_{t-1}^{(1)}$$

$$S_t^{(2)}=aS_t^{(1)}+(1-a)S_{t-1}^{(2)}$$

$$S_t^{(3)}=aS_t^{(2)}+(1-a)S_{t-1}^{(3)}$$

$S_t^{(3)}$ is the cubic exponential smoothing value. The forecast model of cubic exponential smoothing is

$$\hat{y}_{t+1}=a_t+b_tT+c_tT^2$$

In the formula

$$a_t=3S_t^{(1)}-3S_t^{(2)}+S_t^{(3)}$$

$$b_t=\frac{a}{2(1-a)^2}[(6-5a)S_t^{(1)}-2(5-4a)S_t^{(2)}+(4-3a)S_t^{(3)}]$$

$$c_t=\frac{a^2}{2(1-a)^2}[S_t^{(1)}-2S_t^{(2)}+S_t^{(3)}]$$

We use cubic exponential smoothing method to forecast the throughput of Fangcheng port 2010 to 2014.

Table 4. 8 Forecast of Fangcheng port's throughput from 2010 to 2014 by the use of Cubic exponential smoothing method (million ton)

Year	Throughput (million tons)	Single-index moving value	Secondary exponential smoothing value	Cubic exponential smoothing value	Forecast value

		6.219333	6.219333	6.219333	
1996	5.085	5.584107	5.863606	6.020126	
1997	6.508	6.101487	5.996819	6.007074	
1998	7.065	6.641054	6.357591	6.203364	
1999	8.08	7.446864	6.967584	6.631327	
2000	9.226	8.44318	7.793918	7.282378	
2001	10.032	9.332919	8.655759	8.051471	
2002	11.162	10.3572	9.608568	8.923445	
2003	13.19	11.94357	10.91617	10.03937	
2004	16.08	14.25997	12.7887	11.57899	
2005	20.06	17.50799	15.4315	13.7364	
2006	33.82	32.40109	28.12777	24.74352	
2007	51.5292	49.61639	43.1698	37.64192	
2008	56.2586	55.59438	51.86701	49.3619	
2009	45	43.05944	43.6818	41.2381	
2010					78.2819
2011					90.4775
2012					105.5435
2013					119.2371
2014					136.8324

Source: Drawn by author: ©Copyright Yu Yiyi, WMU-ITL Shanghai, (2010) by Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports.

We use cubic exponential smoothing method to forecast the container throughput of Fangcheng port.

Table 4. 9 Forecast of Fangcheng port's container throughput from 2010 to 2014 by the use of Cubic exponential smoothing method (TEU)

Year	Throughput	Single-index moving value	Secondary exponential smoothing value	Cubic exponential smoothing value	Forecast value
		3514	3514	3514	
1996	4240	3833	3654	3576	
1997	2859	3405	3544	3562	
1998	3442	3421	3490	3530	
1999	4859	4054	3738	3622	
2000	15921	9275	6174	4745	
2001	20123	14047	9638	6898	
2002	46079	28141	17779	11686	
2003	52000	38639	26958	18406	
2004	80168	56908	40136	27967	
2005	105000	78069	56826	40665	
2006	54065	47681	42665	37563	
2007	85390	70421	62095	54735	
2008	102000	94626	84867	75827	
2009	143033	66233	71823	73024	
2010					147124
2011					166339
2012					187125
2013					200934
2014					223157

Source: Drawn by author: ©Copyright Yu Yiyi, WMU-ITL Shanghai, (2010) by Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports.

4.4 Forecast Conclusions

Because the characteristic of port construction investment including large investment, high risk and long cycle. It is so necessary to forecast the throughput of Fangcheng port, as the throughput is the basis of port planning and construction. The above two methods forecast the throughput and container throughput of Fangcheng port. The result is showed in the above Table 4.10. Different methods of predictive value discrepancies, when analysis the above forecast results, and combine with the influence of GDP in the previous chapter, industry structure, etc. on the Fangcheng port, and refer to the expert advice, we recommend Fangcheng port's throughput in 2010 will be 76.9082 million tons, with container throughput 131823 TUE; the throughput in 2014 will be 134.975 million tons, with container throughput 193516 TEU.

Table 4. 10 The conclusion of cargo throughput and container throughput of Fangcheng port

Year	2010	2014
Unary Linear Regression of cargo throughput	76.9082	134.975
Grey prediction of cargo throughput	78.1332	135.713
Exponential Smoothing of cargo throughput	78.2819	136.8324
Unary Linear Regression of container throughput	131823	193516
Grey prediction of container throughput	15732	54929
Exponential Smoothing of container throughput	147124	223157

Source: Drawn by author: ©Copyright Yu Yiyi, WMU-ITL Shanghai, (2010) by Research on the Planning Strategy of Fangcheng Port within Southwest Coastal Ports.

Chapter 5 Planning Strategy of Fangcheng Port Development

August 16, 2006, the State Council passed the "coastal port layout planning." September 15th, Ministry of Communications held a "national coastal port layout planning" press conference. Coastal port layouts are: according to different regional conditions and the characteristics of economic development, regional ports' situation and major cargo transportation. Divided the coastal ports into Bohai Sea ports cluster, Yangtze River Delta ports cluster, the southeast coast ports cluster, the Pearl River Delta ports cluster and the southwestern coast ports cluster, form 8 transportation systems as coal, oil, iron ore, container, food, goods vehicles, land Island, ro-ro and passenger transportation.

The law on the southwest coast ports is defined as follows: the Southwest coastal port group consists of ports in the west of Guangdong province, Guangxi costal ports and the ports in Hainan Province. The layout of the port will pay attention to the development of Zhanjiang, Fangcheng and Haikou port, and at the same time develop the Beihai, Qinzhou, Yangpu, Basuo and Sanya ports, in order to service the West. The layout of container transport system is that Zhanjiang port, Fangcheng port; Haikou port, Beihai port; Qinzhou port, Yangpu port and Sanya port act as feeder ports. Zhanjiang port, Haikou port, Yangpu port, Guangxi coastal port used to import petroleum, transit natural gas. Import and export of ore transit transport system consists of Zhanjiang port, fangcheng port, and Basuo port. Zhanjiang port and Fangcheng port constitute the system of cereal product transportation and storage.

5.1 Fangcheng port's strategic development planning

Guangxi Autonomous Region will seize the opportunity to speed up the industry structure and layout adjustment, focus on the important things, improve the

environment, and focus on development of coastal areas like the Beibu Gulf, the border area and the southern region, as a new investment at home and abroad. Meanwhile, take the advantages of seaports to develop the industrial, change the Beibu Gulf Coast area into the portal to the world.

Yunan province, Guizhou province and Sichuan province's industry mainly located along the Guikun, Chuanqian, Chengkun, Baocheng, and Chengyu railway or along the Yangtze River, as the open of Nankun railway, coal, phosphorus, chemicals and raw materials for industry and the building materials industry along the Yunnan and Guizhou province will heavily developed.

5.1.1 Vessel Planning

According to forecasts on the level of cargo throughput and flow of goods, and also analysis various types of ships' develop trends, combined with the possibility of expansion the channel and demonstrate the ship transportation routes on to the domestic coastal and near-ocean, ocean-going, suggest the main planning of transport ship in Fangcheng Port as follows:

(1) Metal ore: recently based on 50 to 100 thousand tons bulk carrier, in the future will based on 150 to 200 thousand tons bulk carrier

(2) Non-metallic ore: based on 30 to 50 thousand tons handysize bulk carrier

(3) Coal: 30 to 50 thousand tons bulk carrier

(4) Oil: recently based on 10 thousand tons tanker, in the future will based on 50 thousand tons tanker

(5) Bulk Cement: 10 thousand tons bulk carrier

(6) Break bulk: coastal and near-ocean cargos are transported by 5 to 10 thousand tons break-bulk carrier, and ocean transportation use 15 thousand tons multi-purpose Ships

(7) Container: use 25 thousand tons container ships recently, the loading volume is about 901 to 1800 TEU. In the future will use 40 thousand tons container ship, the loading volume is about 2101 to 3000 TEU.

5.1.2 Port and Waterway Planning

In order t to meet the situation that vessels are becoming bigger and more professional. Fangcheng port need to speed up the construction of deep-water berths, channel, and the pace of building specialized terminals, while accelerating the development of port industry, during the "Eleventh Five-Year" period it will focus on building 20-ton dock. During the "Eleventh Five-Year Plan" period, it will add 15 berths for about 10 thousand tons ships, additional handling capacity of 3.08 million tons. It is said that at the end of 2010, the city's berth will up to 29 that for 10 thousand tons vessel, and the capacity will reach 4.438 million tons.

5.2 The Main Strategic Measures of Fangcheng port

5.2.1 Strengthening the links between the port and its hinterland

The relationship between port and its hinterland is interdependence and mutual promotion. Their movement is coordinated and jointly promote each other. Port and hinterland cannot exist in isolation without each other. So, how to coordinate Fangcheng port with its southwest hinterland? How to consolidate the sources of the goods? Hinterland is the foundation for port to survive and develop. The relationship between port and its hinterland have a direct impact to the port city’s prosperity. Therefore, I believe that Fangcheng port should do the follow things. First of all, strengthen the links between hinterland and port. Only to build an office in the hinterland or hold an annual coordination meeting is not enough. The port city leaders need to visit the enterprise whose cargo throughput is very large and also have to

invest the hinterland, communicate with the hinterland about talent, technology, capital and other production flows. At the same time open railway passenger transport and road passenger transport to the hinterland. Secondly, change the attitudes and improve service quality. Fangcheng port should take service in the hinterland for the economic development as its important projects. In addition, attract enterprise in the hinterland to invest in Fangcheng Port, and develop its economy. Indeed not only to attract resources from hinterland to import or export cargos from the Fangcheng port, but also to attract businesses from Fangchang port's hinterland to invest in the port, by using the resources of the enterprise, enhanced the economic and technical contact of Fangcheng port and its hinterland.

5.2.2 Develop container transportation

Container throughput is an important indicator to evaluate the status and function of the port. Through geographical location, transportation network, or from the economic hinterland of the appropriate box supply situation, Fangcheng port has significant advantages to carry out container transport. According to statistics in 2004 Fangcheng Port Authority statistics showed that nearly two years, Fangcheng port container throughput from the past several thousand TEUs per year to the rapid growth of more than 60,000 TEUs. Recently, there are eight groups do container shipping business in Fangcheng port, of which four the world is's top ten container shipping.

Fangcheng port now forms a better railway and highway transportation network to link the hinterland with the port. The Nanfang Railway Line connects with Nankun, Xianggui, Qiangui, Lizhan, Liqin and Zhiliu railway. The southwest import and export goods transported from Fangcheng port out by the Nankun railway. This transportation distance is 230 to 600 kilometres shorter than that transported by transit

from other ports. In addition, the rail and road transportation network, formed to carry out a fast track for Fangcheng port to do railway transport and container door to door transportation.

According to a Fangcheng port survey, southwest area adds 5 million TEUs of container every year, and an annual growth rate is 20%. In order to meet the growing container transport business, Fangcheng port is building a platform including logistics, business flow and capital flow to open up container transport market, building a culture of container hub port and a logistics centre.

Indeed the port authority also construct the inland container freight station in Nanning, and the logistics and distribution place established in Guizhou has also been put into operation, so that the Fangcheng port's container service concentrate to the southwest of the hinterland.

5.2.3 Develop port industry

The modern port city in addition to undertake the feature of foreign trade, but also other features, such as the development of the coastal industry, marine industries, aquaculture and marine high-tech industries. If Fangcheng city want to become a integrative marine industry city, it had to develop aquaculture, port marine transportation industry, marine high-tech industry, coastal tourism, marine industries and a variety of industries. It is important because these industries have great relevance. Therefore, coordination problem of the port city inter-industrial is critical. Harbor industrial development and port development is enabling.

5.2.4 Speed up the construction of port infrastructure

5.2.4.1 Development of berths, channel and specialized wharf

Fangcheng port position itself as a bulk transport hub port, it is no wonder that it need to develop berths, channel and specialization codes. I think that the port should develop the deepwater pier and strength port terminals, and pay attention to quality improvement. The ports own structural adjustment needs the development space of the port and strength the modern port functionality. It is accomplished in two ways: one is the extension of the terminal building for quantity expansion; the second is the connotation, which means to rehabilitate old port area to ensure that total throughput for high rise. Through the integration, the rational use of resources, optimize configuration coastline especially deep water shoreline resources, further mining channel resources is focus on set delivery resource integration, particularly in the railway transport ability. Our goal is to realize different transportation ways can well connected with logistics, storage, processing, distribution and other features in the port.

5.2.4.2 Develop Container Collection and Distribution System

Railway and highway is our major container collection and distribution system, but the peninsula which Fangcheng port located in is only 1 kilometre wide and 12 kilometres long. It is suggested that the planning of Fangcheng should handle the traffic problem. Ensure that access to the channel will be properly arranged, and the city's main thoroughfares, and peripheral cohesion highway overpass, should be adopted in order to form a smooth and quick access to traffic.

5.2.5 Enhance the competition and cooperation between ports within North Bay

Fangcheng port is one of China's coastal hub ports and an important hub of an integrated transport system. It is the basis for the development of export-oriented economy and promotes the industrialization process of Fangcheng city, it speeds up economic and social development of Yunnan, and it is an important condition for the

implement of western development strategy and connects the international market, it is also an important channel of southwest to the sea.

Because of the high overlap in the hinterland, there is fiercely competitive between the Fangcheng port and other ports within the Beibu gulf rim. Overlap of hinterland has two levels: one is the way through a variety of set delivery and inland port to contact area - mainly southwest regional economy; one is a port by route contacted the port and the area involved - mainly to Southeast Asia and other countries or regions. Thus fangcheng port must be coordinated with other port in order to facilitate the growth of the port. (1) Realize that the port coordination is very important to the development of Fangcheng port. Although the development of port city mainly depends on the economic development of the hinterland, it is also depends on the relationship with the surrounding ports. Coordination with other ports around Fangcheng port may avoid vicious competition between ports, to develop their cooperation in the competition. (2) Fangcheng port coordinates with other port cities from different angles. From the low level of co-ordination is the coordination of cost of port services and port source. In the principle of healthy competition, co-ordinate the cost of port services and co-ordinate the supply. From a higher level of co-ordination is to develop strategies, industrial development, and the transfer hinterland relations.

5.2.6 Enhance the development of intangible infrastructure

Hardware is the basis for port development and intangible infrastructure is critical, we should pay great attention to the construction of the port, the main things including the following three areas: 1) to enhance port management service levels, enhance service awareness, absorbing domestic port reform of successful experiences and achievements, and the service in customs, inspection and quarantine department, banking, insurance and port management should connect with international practice. 2)

Establish a port-centric information network, implementing EDI systems engineering, and realize network interconnection with port tube department and other relevant departments, therefore the information exchange can improve the overall efficiency of port operations. 3) Improve the quality of personnel; attract various talents, especially senior management personnel training talents. That may make the port become more scientific and modern.

5.2.7 Promote the development of port logistics

The port is the junction of international logistics and domestic logistics. Along with the scope of port overlap become larger, the focus that ports attracting hinterland cargo expand from the geographic location, the container collection and distribution conditions, traditional handling and storage services to offer value-added services. Port takes modern logistics as a link to strengthen links with the hinterland can promote the development of integrated transport to enhance modern logistics network and stations of construction. Promote land transport and the development of the Eurasian land bridge transport, which in turn promote modern logistics in a broader range and more high-level development. Encourage warehouse logistics enterprises to establish a logistics centre in the port area, pay attention to the construction of Fangcheng logistics campus. Construct distribution centres for ore and steel, sugar and cereals, and attract more cargo through the port. Speed up the construction of linhai industrial campus to improve the port throughput.

Chapter 6 Conclusion

The main purpose of this paper is try to provide strategic decision support for Fangcheng port, and make accurate positioning for Fangcheng port in Beibu gulf. The main efforts reflected in the following areas:

First, the dissertation analyzed the hinterland and commodity supply of Fangcheng port, suggested it to become a regional bulk port. Second, the dissertation use regression analysis prediction method and exponential smoothing methods to forecast the throughput and container throughput of Fangcheng port.

If Fangcheng port can seize the development opportunity and make suitable strategy, in the future, Fangchenggang has the potential to become a modern, comprehensive medium-sized area of the harbor.

In view of the author's knowledge and information is limited, this dissertation is only a rough study on the strategic development of Fangcheng port, some of which still need to take an in-depth study and develop.

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