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The strategic reposition of Chongqing port : the development under the "Yangtze River strategy"

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THE STRATEGIC REPOSITION OF CHONGQING PORT

——the development under the "Yangtze River strategy"

By

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DECLARATION

I certify that all the material in this dissertation that is not my own work has 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 are not necessarily endorsed by the University.

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ABSTRACT

Title of Dissertation: **The Strategic Reposition of Chongqing Port**
——The development under the "Yangtze River Strategy"

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Chongqing port, placed at the upper stream of Yangtze River, is the biggest river port in the southwest of China. After the accomplishment of Three-Gorge Project and the application of Yangtze River Strategy, Chongqing port now is facing brand-new develop opportunities as well as challenges.

This paper is discussing the developing issues of Chongqing port, especially the new development under "Yangtze River Strategy". Those issues include both internal and external factors to development as well as existing problems. This dissertation also introduces the "Yangtze River Strategy" in detail and analyzes the impact that "Yangtze River Strategy" brings to Chongqing port.

The throughput of a port is the starting point for a port's activities. This dissertation uses GM (Grey models) forecasting models, which is one of the most frequently used forecasting models, to forecast the throughput of Chongqing port. And it compares the existing capacity of throughput with the forecasting results. With all the analysis results, paper table some recommendations to Chongqing port's future development at end part of this dissertation.

KEYWORDS: Chongqing port, Containerization Yangtze River Strategy, Grey Model (GM), Throughput forecasting,

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LIST OF ABBREVIATION

AGO Accumulated Generating Operation

DWT Deadweight tonnes

FDI Foreign direct investment

GDP Gross domestic production

GM Grey Model

GPS Global Position System

Km Kilometer

KWH Kilowatt-hour

PRC People's Republic of China

TEU Twenty foot equivalent unit

RMB RenMinBi

Ro-Ro Roll in and roll out

USD US dollar

WTO World Trade Organization

CHAPTER 1
INTRODUCTION

1.1 RESEARCH QUESTIONS

Chongqing port, placed at the upper stream of Yangtze River, is the biggest river port in the southwest of China. Chongqing port is also the multitransport and economic center of this part of China. This paper is discussing the developing issues of Chongqing port, especially the new development under “Yangtze River Strategy”. On the waves of Containerization and affecting by the three-gorge project and the national developing strategy——“Yangtze River Strategy”, Chongqing port is facing the challenges from new ports and other transport modes. What are the advantages and disadvantages of Chongqing port in this new situation? Whether the position of Chongqing port is appropriate? What’s the impact of “Yangtze River Strategy” to Chongqing port? How can Chongqing port survive from the competitions and develop for the future? This paper is to discuss these questions and based on the analysis of those questions, the paper try to make some suggestions to Chongqing port’s development.

1.2 THE SIGNIFICANCE OF THE RESEARCH

Chongqing is the largest inland port city on the upper reaches of The Yangtse River. The Yangtse River, Jialing River and their distributaries forms the water carriage network Chongqing. After the central government set Chongqing as the fourth

municipality in China, Chongqing's economy and infrastructures develops rapidly. However, the development of Chongqing port didn't take up the speed of the city, especially the development container transport is far lagged behind the economic requirement. The rise of new ports and other transport modes threads Chongqing port's No.1 place gradually. It's a must for Chongqing port to face the problems existing and carefully plan for its future.

"Chongqing marine centre developing plan" was published by 2003 and rather old to the current situation. Especially, the plan mentions little about the container developing strategy, while the container transport is the fastest growing business of Chongqing port in the last five years. "The strategic development plan for 2005-2007 of Chongqing port Co. Ltd" is rather a bureaucratic issue, which talks nothing about the drawbacks existing in Chongqing port. The existing academic papers about Chongqing port more concentrate on the internal factors, which don' t introduce the concept of competitions.

So it's quite necessary to do a research on the situation of Chongqing port and make an appropriate evaluation of existing plans and their affections. Furthermore, this paper is aim to make some recommendations for Chongqing port's development, especially for the recent years.

1.3 STRUCTURES AND METHODOLOGIES

Beside the first chapter "introduction", this paper is made up by "Circumstance analysis", "Yangtze River Strategy and its impact", "The throughput forecasting" and late chapter " recommendations and conclusions".

The second chapter, which is "Circumstance analysis", is the analysis of influential factors to Chongqing port. This method of analysis is similar to SWTO analysis, but only it divides the circumstance analysis into two categories: external circumstance analysis and internal circumstance analysis. The reason for this classification is some

factors are both opportunities and threads. For example, it's hard to separate "the development of railway transport" into opportunities or threads. Because it's like a two-edged sword, it has both positive and negative factors.

The third chapter introduces the "Yangtze River Strategy" and its impact to Chongqing port. "Yangtze River Strategy" is the very crucial strategy for Yangtze River as well as the waterway transport. So I set an independent chapter to illustrate this strategy. The first part of this chapter describes the whole concept of "Yangtze River Strategy", the second part is the analysis the impact to Chongqing port.

The fourth chapter of this paper is the forecasting the throughput of Chongqing port, traditional cargo and containers. For the forecasting model, I chose Grey Model (1,1). The throughput of Chongqing port is rapidly growing year by year, and doesn't appear S curve or in the saturation stage. That is suitable to use the GM (1,1) model to do calculations[①]. In addition, the history of Chongqing port's containerization is less than 10 years. It's not accurate to use regression to do forecasting. While the GM (1,1) model has the features of veracity and small sample data, satisfy all the requirements. To make sure the accuracy of the forecasting results, all the results must go through accuracy check.

The last chapter of main body is the recommendations part. In this chapter, the paper concludes the analysis, forecasting results and the impact of "Yangtze River Strategy", and makes some recommendations to the future development of Chongqing port.

1.4 LITERATURE REVIEW

Chongqing Marine Center Developing Plan (Chongqing Communications College and Bureau of Chongqing Port and River Management, 2003, pp.7-9) shows that

① The limit of this model is it's imperfect when the forecasting object increases in the curve with S type or the increment of the object is in the saturation stage.

Chongqing is planning to be the marine center of southwest of China. The report tells the water transport situation of Chongqing: by end of the year 2002, Chongqing, including yangze river, jialin river and wu river three main rivers, has 1020 km 5 grades above capacity to be open to navigation, 38 ports and 1351berths in all. There are 9 throughput between 1 million tons to 3million tons. The whole Chongqing city has 2,927registered cargo ships, the total DWT 846,800 tons and 4,400TEU container ships and 1918-car capacity. According to this plan, Chongqing will be the transport center where can radiate the range Sichuan, Guizhou, Yunnan , Hubei, Hunan province. There are some recommendations in this report: Cuntan container port construction and jiulongpo second project. In terms of detail data and present situation of Chongqing port, this report shows very detail information of Chongqing's water transport. However, due to the time factor and this is a bureaucratic file and plan, this report didn't tell the problems of Chongqing port and the very practical solution.

Some scholars point out that there are three advantages of Chongqing port: 1) the transport price. Water transport has the cutting edge compares with other transport modes. Transport a 20 feet container from Shanghai to Chongqing port will cost 4,500 RMB, but the water transport only takes about 1700 RMB. After the 2nd and 3rd stages of three-gorge project finishing, the water transport will go down 20-30%. In terms of transport time, because of Chongqing customs' application of "green light to customs", the containers go through the waterway original from Chongqing or destination to Chongqing can serve direct access. As the result the fastest time of transport containers from Shanghai to Chongqing can be reduced to 5 days. 2) The position advantage of Chongqing port: Chongqing places at the southwest of China, is the 1st grade hub port of China. The export and import cargo from Sichuan, Guizhou, Qinghai province mainly transport by waterway. 3) Chongqing has the resource advantage. Chongqing is the traditional heave industry base since 1949; many manufacture company located in Chongqing, especially the motorbike and automobile manufacture, electronic, medicine, tobacco and nature gas industry. So

Chongqing gathers sufficient cargo resource for water transport. This essay also mentions some disadvantages of Chongqing port: the insufficiency of port throughput capacity, especially the container throughput capacity. Being lacking of advanced management. (DeShen Yang, 2004, pp. 24-25)

Another scholar tells that Chongqing port should take 4 advantages in strategy: the geographic advantage, the economic scale and ability advantage, infrastructure advantage and person with ability advantage. (YunDong Chen, 2000, pp.6)

Containerization is the trend of whole maritime. Chongqing port will not make the exceptions. To be a big hub port, Chongqing port makes containerization strategy several years ago. In the beginning of year 1993, Minsheng Shipping Co., Ltd invested and built up 14 container ships to start container business in Chongqing. At the same time, Chongqing Jiulongpu port bought 2 container cranes from Shanghai and together with Chongqing government and costumes to set up the first container port in Chongqing. Through 13-year development, Jiulongpu port has the capacity of 70 thousand TEU/year. (YuJian Li, 2003, pp.1) Jiulongpu port is the largest container port in Chongqing. And the Jiulongpu port is now under the construction of 2nd project, which will be finished by 2006. This project will increase the capacity of Jiulongpu port to 200,000 TEU/year as well as the heavyweight cargo and super heavyweight cargo capacity. But now the jiulongpu port is facing some essential problems to solve: 1) the challenge from other newly-built ports. The three-gorge project is a good opportunity to Chongqing port as well as other competitor ports. Many container ports are under construction to get into the profitable container market. Chongqing port is now facing the challenge of ports from other province. 2) Chongqing container ports have got the serious insufficient container capacity. 2003 the container throughput of Chongqing port was about 100,000TEU, it overstocks 5,529TEU in March 2004. The throughput will be 180,000 TEU in 2005 just through planning capacity 70,000TEU/year container ports. 3) The management is greatly lagging behind the container throughput. Though the throughput of Chongqing

container port increases year by year, the management of the port is still the traditional general and bulk port management. Besides the low efficiency and productivity, the biggest problem is finding container. This problem already becomes the bottleneck of the Chongqing container port development (DeKun Yang, 2004, pp.2-3).

The developing strategy report of Chongqing Container Company of China Changjiang Shipping (CSC) Co.Ltd mentions that: railway container transport is the main competitor of waterway transport. Ministry of Railways take container transport as a develop strategy. The Ministry of Railways has several years' railway container transport experience and the railway network spread all over China. In recent two years, Chengdu bureau of railway started 2 new container lines: "Chongqing—Shanghai, Chongqing—Qingdao". The railway projects along the Yangtze River are under discussion by The Ministry of Railways. If the railway along side of the Yangtze River will be built up, it must be the biggest competitor to the waterway container transport.

From the latest news shows that, national railway container chongqing distribution center project was launched in shapingba district in chongqing, which is one of 18 railway container distribution centers in China. According to the plan, the first stage project will bring 4 million tons capacity and the final stage will reach 9.1million tons in 2015, which is 1.3miltion TEU.It's said that this project takes 1 billion RMB and 5 square km land ground; this center has functions of organizing trains into groups, preparing, information management and other functions of customs and quarantine. This center will connect railways, such as chengdu—chongqing, xiangfan—chongqing, chongqing—huaihua, and super highways, such as chongqing—chengdu, chongqing—fulin, chongqing—sui'an, together, makes the integrated communication system.

For the forecasting methods, the Grey method (GM) was introduced by Chinese prof.

Deng (JuLong Deng, (2005), pp.1-13), one of the most frequently used forecasting models. The advantages of this model are veracity, small sample data (at least 5 samples), short prepared time and forecast value checkable. But it is imperfect when the forecasting object increases in the curve with S type or the increment of the object is in the saturation stage. (ZiJian Guo, XiangQun Song & Jian Ye, (2005), pp.890). If increases in the curve with S type or the increment of the object is in the saturation stage, the modified GM model, which is called Grey Verhulst Model, can be used. The accuracy checking of Grey method forecasting is necessary. Residual value checking and relative error checking are used to GM forecasting model accuracy checking. (Ning Sun,(2005),pp. 34-35)

CHAPTER 2
CIRCUMSTANCE ANALYSIS OF CHONGQING PORT

2.1 EXTERNAL CIRCUMSTANCE ANALYSIS

2.1.1 Macro -economy and policy to Chongqing port

The wave of globalization with main content of liberalization of the trade, liberalization of the economy and process integration influences countries all over the world. As the recovery of North America's economy, the rise of EU's economy and the steadily economy growth of Asia-Pacific region, the world's economy grows in the mass. This is quite a push power to the world trade. After the entry into WTO, China is gradually getting into the system of globalization. As we know, China keeps a remarkable economy growth rate since Reform and Opening strategy and becomes "the world factory", so the international trade in China will not slow its pace. The cargo transport, especially marine transport, is quite closely related to the international trade, so it makes us more confident to the development of shipping industry.

In the view of national economy and policy, to promote the strategy of "developing the country's west", the central government is making "Act of promotion the strategy of developing the country ' s west ". This act will provide legal protection to the west area of China from structure organization, capital, technology, talent, facilities and information aspects. Chongqing is biggest city in the west of China and big industrial and commercial city and will surely benefit a lot from this act.

2.1.2 The economy of Chongqing Municipality

Right after the forming of municipality, Chongqing government has been fully carrying on new opening strategies to build a new industrialized city. Chongqing has maintained significant economic growth: the GDP in 2005 reached RMB 306.91 billion, increased by 11.5% over the previous year. The GDP per capita (according to resident population) reached RMB 10978, which exceeded of USD 1,000. Total investment in fixed assets reached a record high at RMB 160.5 billion, increased by 26.4%. Investment in key construction projects reached RMB 42 billion. (National Bureau of Statistics of China, 2006,data of Chongqing)

The international trade in Chongqing also develops rapidly. The export and import value in 2005 increased 11.3% to 4.293 billion USD: the import amount value is 2.51 billion USD, 0.3% increasing; while the electronic products exported 1.566 billion USD, which is 62.1% of entire export, increasing 3.5% over year 2004. The Figure 2-1 shows the export and import situation of Chongqing in last 5 years, which tells Chongqing's international trade, is growing quite well recently. As we know, the export and import value of an area is closely related to a port's container throughput. So the export and import situation is quite favorable to Chongqing port.

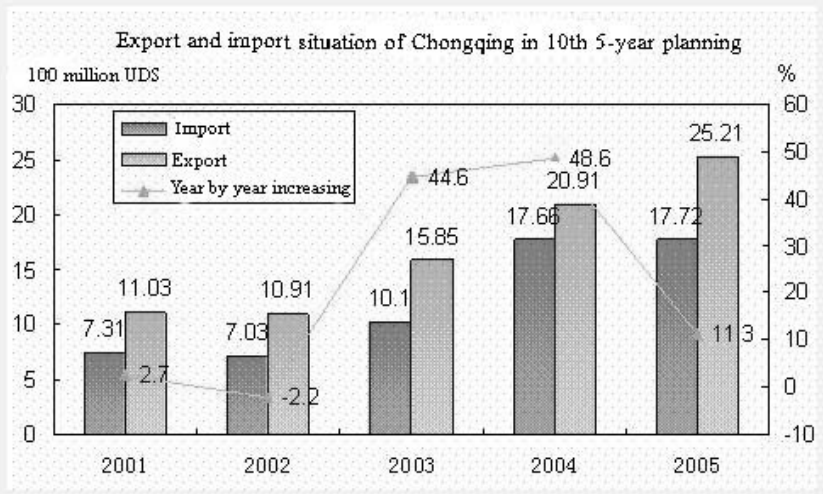

Figure 2-1 The Export And Import Situation Of Chongqing in 10th 5-year Planning

Source: National Bureau of Statistics of China, (2006) *data of Chongqing*

FDI in Chongqing remains fast growth rate recent year, the year 2005 contractual foreign direct investment rose 22.9% to 0.819 billion USD, while the actual used FDI 0.516 billion USD, which is 27.3% higher than last year. The Figure 2-2 tells actual used FDI of Chongqing in last 5 years. The Figure shows Chongqing' FDI value stably increasing with 2 digits increasing rate in recent 4 years. Considering the FDI value is the very sensitive indicator of a city's develop potential, though the amount value is small compares advanced districts, Chongqing's economy is quite suite for the development of Chongqing port.

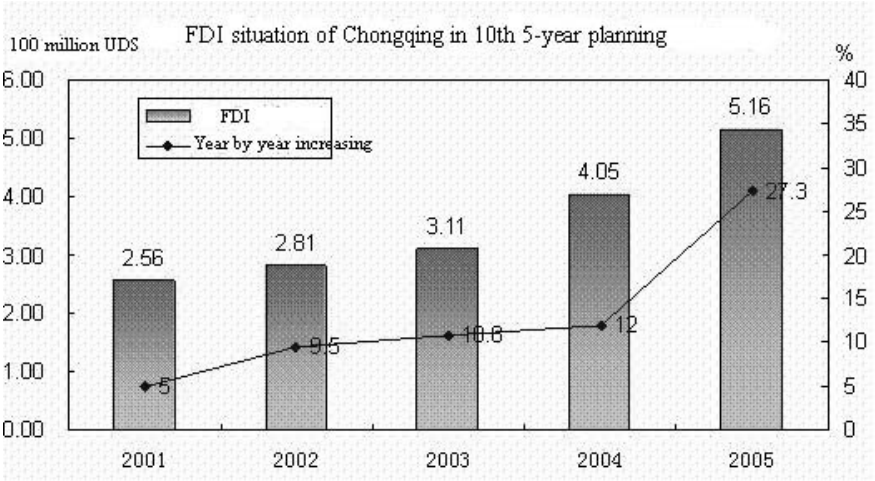

Figure 2-2 The FDI Situation Of Chongqing in 10th 5- year Planning

Source: National Bureau of Statistics of China, (2006) *data of Chongqing*

In addition, in order to fulfill the goal of increasing 1.5 times industry value of 2000 by the end of year 2007, government makes adjust to industry zones: to cultivate two national economy developing zone; municipal Changsou chemical zone, downtown economic center, west Chongqing economy passage, three-gorge ecosystem economic zone, etc. There are 30 various functional zones under planning. So those industry zones and factories will provide a lot of regularly logistics resource need to be transported.

2.1.2 Influence of three-gorge project

The three-gorge project has great influence to Chongqing's shipping industry in

terms of navigable waterway. The three-gorge project will sluice water 156m depth in 2007 and keep as deep as 175m in 2009. After the finish of 2010, the new added navigable waterways will be 68; estimated navigable waterway milage will be above 6000 km as well as the increasing of navigable waterway grades. Presently, the maximum size vessels calling at Chongqing are no more than 10,000 dwt but 5,000 dwt in the dry season, with the typical container vessels being 87m long and carrying 144 TEUs. This is expected to increase to 105 m vessels with a 330 TEU capacity by June of 2006. With the completion of the Three River Gorge dam expected in 2009, the water level will rise and remain more consistent throughout the year. At the mean time, the projects " Jianglin River Hechuan Caojie hub project", "Lizhe hub port project" and "Wu River Pengshui hub project" will go into application, the navigable waterway of Jialin River and Wu River will be surely improved. As the result, the grades of Chongqing navigable waterway will be changed totally: taking the existing 30 navigable rivers for example, the three-gorge project will keep depth as the level of 175m, which means by the year 2010, the navigable waterway milage above grade 6 will reach 1726km, 57.43% in total: grade 1 navigable waterway will be 527km, which is 17.5% in all; grade 3 navigable waterway will be 290km, which is 9.7%; grade 4 will be 421km, which is14.0%; grade 5 will be 250.7km, which is 8.4%; grade 6 will be 237.3km, which is7.9%. (Chongqing Communications College & Bureau of Chongqing Port and River Management, 2003, p. 12-13) The Table2-1and Figure 2-3 shows the detail data of the changes before and after three-gorge project.

Table2-1 Changes of Navigable Rivers and Waterway after Three-Gorge Project

Time	Sluice depth (m)	Navigable river	Navigable waterway mileage (km)
2000	N/G	30	3004
2010	175	98	6000

Grades		1	2	3	4	5	6	Other
2000	Milage(km)	0	0	680	95	247	86	1896

	%	0	0	22.6	3.2	8.2	2.9	63.1
2010	Milage(km)	527	0	290	421	250.7	237.3	1278
	%	17.5	0	9.7	14.0	8.4	7.9	42.5

Source: Chongqing Communications College & Bureau of Chongqing Port and River Management, (2003). *Chongqing Marine Center Developing Plan*, Chongqing: Author.

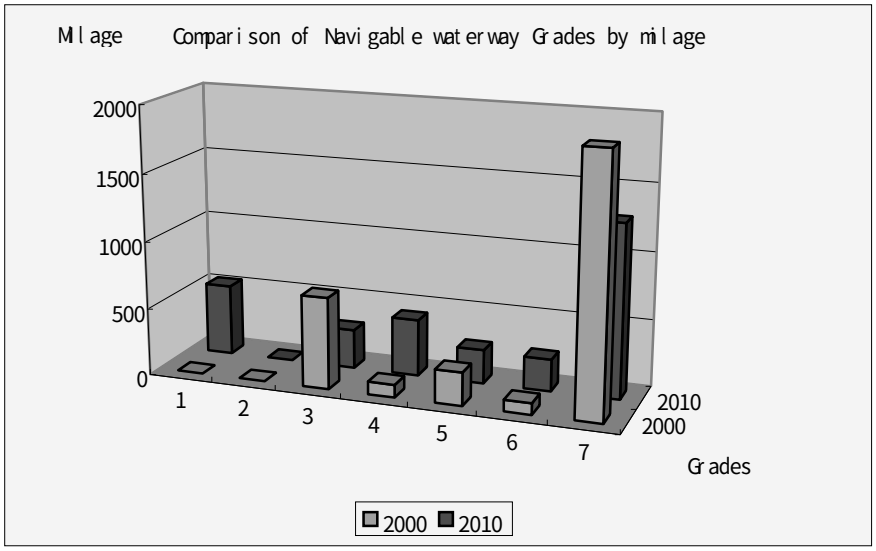

Figure 2-3 Comparison Of Navigable Waterway Grades By Mileage

Additionally, The restrictions on vessel size are due to both air draft of bridges crossing the river, and the water depths in the middle section of the Yangtze. Currently, the maximum draft of a vessel that can navigate the river is 3.2 to 3.5 m. However, there are plans to dredge this section to 3.8 m. The 2,000km journey from Chongqing to Shanghai take 8 days in the past, but it will be completed in only 5 days. (DeShen Yang & YongJu Yu, 2004, p.45)

2.1.3 The economy situation of the areas around Chongqing

Figure 2-4 Map of Southwest of China

Source: Retrieved from the World Wide Web: www.chinaodysseytours.com/ maps/china_south.jpg

Figure 2-4 is the map of southwest of China, which shows the location of Chongqing and surrounding area. Obviously, Chongqing located in the center of transport, especially for the water transport. The export products and cargo, especially cargo in scale and super heave cargo, come from Sichuan,Yunnan and Guizhou province will go via Chongqing port and take the advantage of water transport.

Yunnan province: the GDP of Yunnan grows fast in recent years, the GDP value in 2004 reached 295.948 billion RMB, 11.5% higher than the year before. The main energy products and raw materials rise significantly: coal production 53.15 million tons, steel production 3.505 million tons, colored metals 1.29 million tons and cement 22.96 million tons. The export and import value in 2004 is 3.75 billion USD, which increased 40.4% by the year before. And the FDI value is 318million USD.

And the export and import value of Guizhou 2004 is 1.514 billion USD, which is 53.8% higher than 2003. (National Bureau of Statistics of China, 2005, data of Yunan and Guizhou)

Sichuang is a big economy province in southwest of China, the export and import value of 2005 is 7.9 billion USD, the main industries are electronic products and agricultural products. However, Sichuan province is building container terminal for its own in Luzhou[①], so how much Sichuan cargo will transport through Chongqing port is still uncertain.

The area around Chongqing, with fasting growing economy and support of the central government, will provide large quantities of water transport resource as well as the opportunity of multiptransport, because most of places can't access navigable river directly, the multitransport is a good solution. The economy and international trade condition of those areas are important to the cargo provide to Chongqing.

2.1.4 Analysis of changes on transport modes

China is building up an integrated transport network: railway transport, road transport, air transport, waterway transport and pipeline transport develop and compete with each other. Changes of one transport mode will more or less affect other transport modes. So it's necessary to analysis the changes on other transport modes

1) Waterway transport

Luzhou port is a newly fast growing port in Sichuan province. Luzhou is located at the connection Sichuan province, Guizhou province and Chongqing. Sichuan province is planning to build a 50,000 TEU/year capacity container port in Luzhou, which is aim to chanllenge Chongqing port's position. A important thing is that a

① Though Luzhou port has its own natural limits and the next section will mention it.

container from Chengdu[①] goes through Luzhou port is 300 RMB cheaper than going through Chongqing port because of the high cost of road transport, though there are 238km more waterway. But there is a fatal problem in Luzhou port: containers from Luzhou port must ship through 180km adlittoral river channel. Only 1000T or below ships can go through this channel during the swelling season. But these small ships can't reach the economic of scale, the cost of transport remains very high. (Sichuang will build Luzhou port to share the market of Chongqing port, 2004. pp.43) Minsheng Shipping Co., Ltd, biggest container shipping company of southwest China, tried to transport containers from Luzhou, though they can save 40% of port operation cost, because of economy of scale and ships from Luzhou port can't navigate during the night, their total revenue reduce 30%. Finally, Minsheng gave up this trial. In this sense, Luzhou port hardly challenge the position of Chongqing port in a short time.

2) Railway transport

Railway transport is biggest competitor to the water transport of all the other four modes, especially for containers and large, heavy cargo transport. There are six railway lines connected with Yangtze River: Jing-Hu line, Jing-Guang line, Jiaozhi—Zhiliu line, Baocheng-Chengchang line, Chengyu-Chuanqian-Qianzhi line and Huannan-Yingxia line. The plans of the ministry of railway shows that the railway along side the Yangtze River will be built step by step from Shanghai to Chongqing, which goes through the city Nanjing, Wuhu, Tonglin, Jiujiang, Wuhan, Wanzhou and Fulin. The areas this railway line covers is exact the same as the Yangtze River does. (Chongqing Container Company of China Changjiang Shipping (CSC) Co.Ltd, 2004, p .9)

To the Chongqing railway, National railway container Chongqing distribution center project is under construction in shapingba district in Chongqing, which is one of 18 railway container distribution centers in China. According to the plan, the first stage

[①] Chendu is the capital city of Sichuang province.

project will bring 4 million tons capacity and the final stage will reach 9.1million tons in 2015, which is 1.3miltion TEU. This center has function of organizing trains into groups, preparing, information management and other functions of customs and quarantine. This center will connect railways, such as chengdu—chongqing, xiangfan—chongqing, chongqing—huaihua, and super highways, such as chongqing—chengdu, chongqing—fulin, chongqing—sui'an, together, makes the integrated communication system.

Of course, the development of railway transport is the two-edges sword: on one hand, the fulfillment of those developing plans, which are aim to directly compete with water transport in Yangtze River, will definitely take the share of waterway transport. The railway transport has the advantages: speedy, punctual and safe that waterway transport does not have. We can foresee that the containers transport market will be the most competitive market between railway transport and waterway transport in the near future. On the other hand, those projects also bring opportunity to waterway transport. Because the capacity for cargo of railway transport in China presently is insufficient, the price remains in a high level. The distributary of cargo will be limited. On the other hand, those projects pave the way of co-operations between waterway and railway transport. Because of the limits and strengths of waterway and railway transport, multitransport is the a good solution: waterway transport can take its advantage to lower the transport cost and railway transport can take its strength to cover more areas than waterway does. So the pattern of future will be both Cooperative Game and non-Cooperative Game between rail transport and waterway transport.

3) Road transport

Chongqing now is carrying on "two rounds and eight lines" [①] project, this project will make an integrated highway network for road transport. The newly built super highways, which connect Chongqing to Guizhou, Yunnan province, will shorten the

[①] There will be two round roads in main city and eight highways connect near areas.

road transport time and turn over time. (Chongqing Container Company of China Changjiang Shipping (CSC) Co.Ltd, 2004, p .11) For this reason, Chongqing's road transport develops faster than any other time. The fast development of road transport will not threaten waterway transport for its high transport cost. In fact, it's a good opportunity for cooperation of two transport modes in terms of multitransport. The modern logistics requires logistics service providers to supply door to door with tolerable cost and time consumption. For road transport and waterway transport each alone, they can't overcome their limits. Multitransport can take the flexibility and door-to-door service of road transport as well as the low transport cost, big capacity and long distance transport of waterway transport. The advanced highway system is the precondition of multitransport. The fact that Chongqing port attracts more cargo, especially the containers, from Guizhou province right after the accomplishment of YuQian super highway is good evidence.

4) Air transport and pipeline transport

Air transport and pipeline do not affect waterway transport directly, so this paper does not discuss those points. But one thing should be mentioned: the petroleum pipeline from Lanzhou--Chengdu--Chongqing will be finished this year. By then, the petroleum transport from Yichang—Chongqing will reduce greatly.

2.1.5 Market analysis

The development of any a port can't live without the market. Market is one of the most diverse things in the world. There is a saying among breakers: " If you occasionally leave the market for three days, you've already left behind the market." So market is so important factor that we can't omit.

There is three main types source markets for Chongqing port: break bulk cargo, containers and automobiles. Each market has its own features.

1) Break bulk cargo market:

Coal mine

Development of metallurgy and construction industry, especially the firepower industry, in east part of China stimulates the increasing needs of coal. In 2003, along the coast and Yangtze River, there were new power stations projects accumulated over 10 million KWH, the added needs of coal over 30 million tons/year. Because of the insufficient capacity of railway, waterway transport coal volume in total increased from 21.2% to 25%. Pessimistically estimated, waterway coal transport will remain two or three year's peak time. Meanwhile, the price of energy resource keeps rising, the freight will not drop. The year of 2005 Chongqing port transported 10.6714 million tons coalmine, increased 40.9% compares with 2004, and coalmine is still the main cargo of Chongqing port.

Steel and ore

China is the largest steel-making country. The demand of iron ore increases year by year. Chongqing Steel Co. and Daxian Steel Co. are the biggest iron ore consumers in this area. And the proportion of imported iron ore takes larger share in recent years. Last year Chongqing port transport 4.073million tons iron ore and 1.55 million tons steel products, increased 70.66% and 35.33% over the same period of 2004 separately.

Fertilizer and chemical products

There are annually 2.5 million tons Sodium Sulfate in west Suchuan province needed to be transported to east China and export. Water transport is the first choice because of the low price. And the volume of Sodium Sulfate is increasing; Yunnan, Guizhou, Chengdu province and Chongqing are the areas lack of sulfur. Annually one million tons of sulfur becomes stable and long term cargo source. Additionally, chemical zones and industry zones in Chongqing, such as Changsou industry zone, Fulin chemical zone and Yuzu industry city, which produced over 10 billion RMB value last year, will provide large quantities of cargo source.

2) Container transport

The container throughput in Chongqing port increases average 50% year by year since 2000. The good situation of Chongqing's international trade makes us more optimistic to the future of container transport. As the import and export cargo rising, the national trade containers also make contribute to the throughput. There are more and more transfer trade containers come from Suchuan, Yunnan and Guizhou province. In the year 2005, Chongqing container throughput reached 219800TEU, increasing 38% over 2004.

Containerization is the trend of world marine transport. Containers transport will definitely be the most significant part of Chongqing port's development now and the future.

3) Automobiles

Chongqing Ro-Ro transport market is one of the four Ro-Ro transport markets in China[①]. Chongqing is a large automobiles manufacture base. The famous car manufacturer Chang'an Suzuki Ford Group is located in Chongqing, which along with heaven auto manufacturer Chongqing Automobile Group and another automaker Chongqing Isuzu Group take 11% of national market share. According to the 11th five-year planning of Chongqing, 58 billion RMB will be invested into the automobile industry as well as over 9 automobiles and auto parts industry zones project will be launched. It's reported that Chongqing will produce one million cars in 2007 with the total industry value over 100 billion RMB. By the year 2010, production capacity will increase to 1.5 million.(Guang Yang, 2005, pp.73)

Besides the sufficient market resource's support, Chongqing's Ro-Ro transport has special advantages of its own, which breathe the vitality into this market: firstly, the low cost of transport and more important is the saving of intangible cost (illegal fee on the national highway:the cost of Road maintenance fee, Overload fee and so on);

① The others are Qiongzhou channel market, Zhoushan archipelago market and Bo sea gulf market

secondly, Ro-Ro transport is a rest of both drivers and automobiles. Ro-Ro transport can reduce the consumption of machines, length the life spend time of cars; Thirdly, Ro-Ro transport is safer than road transport. The No.318 national highway between Suchuan--Chongqing and Wuhan is one of most complex roads, drivers usually aren't willing to drive this part of road unless locate drivers who are quite familiar with roads condition.

Ro-Ro transport is another rapidly increasing market for Chongqing port with remarkable return. In 2005, Ro-Ro transport finished 312200 automobiles, increasing 33.7% over the year before. So Ro-Ro transport of Chongqing port is another potential market besides container transport.

2.1.5 Conclusions Remarks of external circumstance analysis

According to external circumstance analysis, Chongqing port has the following external features:

1) Chongqing port is under a good macro economy situation, and Chongqing municipality itself has a good economy to support waterway transport.
2) Good economy situation of the areas around Chongqing will enlarge the demand of waterway transport in port.
3) The three-gorge project will change the sea-route situation of Chongqing dramatically. It benefits Chongqing port a lot.
4) Luzhou port will affect a little part of container throughput of Chongqing port, but because of the vital natural drawback in sea-route, Luzhou port can hardly compete with Chongqing port.
5) The development of railway transport will create the opportunity of multitransport as well as threaten the container transport of Chongqing port. Fast growing road transport is good new to Chongqing port for the water-road transport.
6) The coalmine, petroleum products, chemical products and fertilizers are the main bulk cargo categories for Chongqing port. While the container and Ro-Ro

transport are the fast growing and potential niche markets.

2.2 INTERNAL CIRCUMSTANCE ANALYSIS

2.2.1 History of Chongqing port

Chongqing port is the largest inland port on the upper reaches of The Yangtze River. There are tens of ports and wharfs along the Yangtze River in Wanzhou, Fuling and other districts.

Before 1949, Chongqing port was a lagging and beat-up port, which was suffered a lot from the war. After the foundation of PRC, Chongqing port has gone through 3 developing stages.

1) 50's newly built period: At the beginning of 1950's, there are only 45 simple piers in Chongqing port, over 95% of the cargo loaded and unloaded by manpower. There is not a single warehouse in the port. During the 1st and 2nd "five year planning", Chongqing port rebuild some piers including No.3 mechanized pier and No.1 coalmine pier as well as a grain warehouse. The throughput of 1960 was 16 times of 1950's.

2) 60—70's rebuilding and expansion period: Chongqing port got into the fully construction and expansion period during these 20 years. 1960, bureau of Communications and Chongqing port invested over 5 million RMB to build the 1st 180T mechansied large and heavy cargo pier of upper stream of Yangtze River and a 50T bulk cargo. After that, Chongqing set up two new ports at the outskirts of Chongqing city, which are called Lanjiatuo and Mao'er'tuo port respectively. Lanjiatuo port, which is connected with ChengYu railway and Gujiatuo railway station, is a complex port with a steel pier, a multiple pier and a beark bulk pier. It's a multitransport port in Chongqing. Mao'er'tuo port is mainly designed for the transportation of phosphorite, coalmine and fertilizer. By the end of the 70's,

Chongqing had developed to main port of upper stream of Yangtze River with Lanjiatuo, Mao'er'tuo, Jiulongpo,Chaotianmen and Jiangbei 5 main passenger and cargo port areas.

3) The fast developing period after the reforming and opening strategy: This is the most important period of Chongqing port, because the modernization of Chongqing port started. Chongqing Jiulongpo port technical upgrading 1st and 2nd project made Jiulongpo port to be a container port, it was that time Chongqing port started its containerization. These two projects ended at 1998 enabled the Jiulongpo port 50,000 TEU/year capacities and a 300,000-tons/year break-bulk cargo capacity. Mao'er'tuo port also expanded its capacity to 1.8 million ton/year. (Yundong Chen, 2003, pp.14-15)

Now Chongqing port is one of the main ports along Yangtze River and the most influential port upper stream, facing greatly changes.

2.2.2 The situation of Chongqing water transport and shipping industry

1) General situation of Chongqing port and shipping industry

Looking back to the history, Chongqing was a city originally built by the side rivers, the development of upper stream of Yangtze River Economic Area and Grand Southwest Cooperation Zone is greatly relied on water transport and shipping industry. Today, the water transport still makes irreplaceable contribution, especially to the large and cheap cargo.

By the end of year 2001, there are 30 rivers open to navigation, Yangtze River, Jialin River, Wu River are the representatives. the total navigation mileage is 3004 km, including 7 rivers that over 100km navigation mileage and 1020 km five grades navigation river mileage[①]. There are totally 38 ports, 1351 berths in Chongqing, in

[①] According to "National Freshwater Sea-Route Standard" GBJ 139—90, sea-route Grade 5: depth 2.0-2.5m width:40-75m

which are 15 main ports and 1072 berths: 7 ports in the size between 0.5-1 million tons and 9 ports in the size between 1—3 million tons. Passenger ships: 1275 (not including ferries), passenger capacity 164300 person including 369 passenger ships and 110200 capacity in branches of Yangtze River; Cargo ships: 2927(not including man-power ships) with total capacity 846800tons, 4400TEU, 1918 car capacity.

The Yangtze River goes through Chongqing city, the main branches of Yangtze River Jianglin River and Wu River go into the Yangtze River at ChaoTianMen and Fulin in Chongqing separately, navigable waterway and facilities make a natural water transport system which can reach the branches as well as the sea through river-sea multitransport.

2) Sea-route conditions of Chongqing

Chongqing city navigable waterway mileage shows as Table 2-2 and Figure 2-5The navigable waterway mileage conditions of Chongqing are not as good as downstream or middlestream ports. Over half of the waterway mileages are out of grades, which means can be hardly used as waterway transport. Even in grades waterway mileages, less than 50% mileage are in Yangtze River.

Talbe 2-2: Navigable waterway mileage

Mileage Unit: kilometer

Grades	Total	In grades	Out of grades	Yangtze River
Mileage	3004	1448	1556	680
%	100	48.2	51.8	22.6

Source:Chongqing Communications College & Bureau of Chongqing Port and River Management, (2003). *Chongqing Marine Center Developing Plan*, Chongqing: Author.

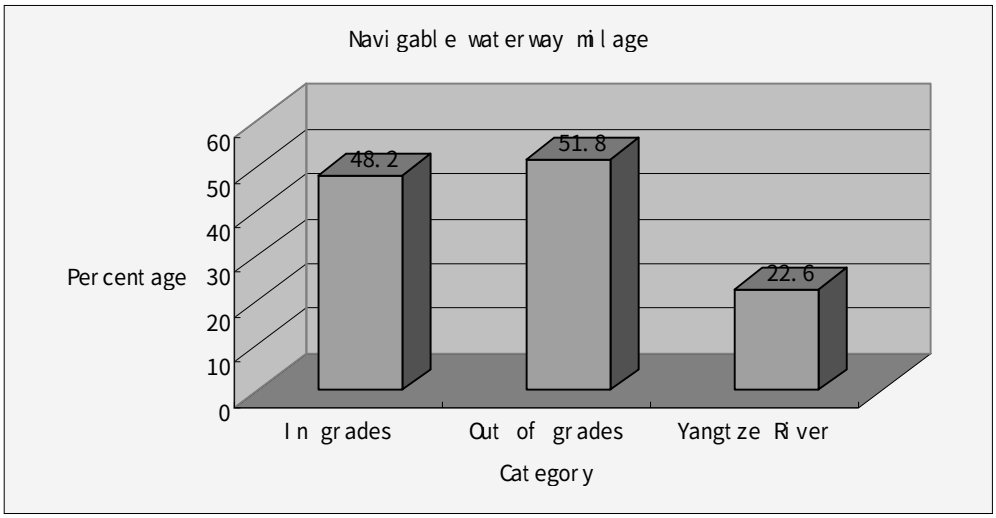

Figure 2-5: Navigable Waterway Mileage

The navigable waterway mileage by grades shows more clearly that Chongqing port's natural sea-route conditions are not so good. There are no grade 1 or 2 sea-route, which can go through the 3000T, 2000T grade ships separately. The navigable waterway mileage by grades shows in Table 2-3 and Figure 2-6. However, the sea-route conditions will be improved quite a lot after the accomplishment of three-gorge project as discussed in 2.1.2.

Table 2-3 Chongqing navigable waterway mileages by grades

Unit: km

Grades	Grade1	Grade2	Grade3	Grade4	Grade5	Grade6	Grade7	Out of grades
Mileage	0	0	680	95	247	86	340	1556
%	0	0	22.6	3.2	8.2	2.9	11.3	51.8

Source:Chongqing Communications College & Bureau of Chongqing Port and River Management, (2003). *Chongqing Marine Center Developing Plan*, Chongqing: Author.

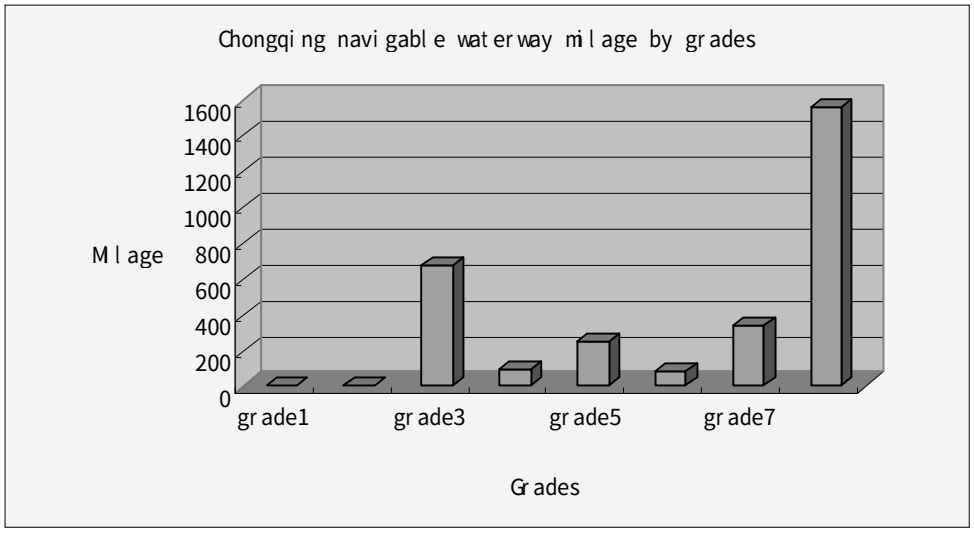

Figure 2-6 Chongqing Navigable Waterway Mileages By Grades

The main ports of Chongqing mostly distribute along Yangtze River, over 80% ports are Yangtze River mainstream ports. According to the data of year 2000, there are totally 15 main ports and 1072 berths, where 283 berths reach 1000T or above. The main cargo categories are coalmine, petroleum products, chemical products and fertilizers. The detail situation of Chongqing main ports appears in Table2-4 Generally speaking, the foundation of Chongqing port is relative good in terms of amount; the natural sea-route condition is comparatively poor before the Three-Gorge Project; the scale of Chongqing port is not favorable.

Table 2-4 situations of Chongqing main ports

Unit: 10,000tons, 10,000 people

Port Name	River Located	No. Of Berth	1000 Tons Grade Berth	Main Function	Capacity		Throughput Of 2000		Remark
					Cargo	Passenger	Cargo	Passenger	
Main City Port	Yangtze River	189	84	Break-Bulk, General Cargo, Containers,RO-RO,Passenger	1033	900	1063	702	

Wan Zhou Port	Yangtze River	216	35	Coal Mine, Construction Material,Fertilizer,Passenger	917	2767	464.9	603	A little container capacity, inundated
Fulin Port	Yangtze River	143	40	Passengers,Coal Mine, Steel Products	681	1335	387.2	347	A little container capacity, inundated
Wushan Port	Yangtze River	77	8	Passengers,Coal Mine, Steel Products	197	844	12.4	77.5	Inundated
Fengjie Port	Yangtze River	29	15	Passengers, Coal Mine, Fertilizers	301	341	151.1	111	Inundated
Yunyang Port	Yangtze River	37	25	Passengers, Coal Mine, Steel Products	117	274	34	160.1	Inundated
Zhongxian Port	Yangtze River	48	14	Passengers, Coal Mine, Construction Material	124	147	119.2	59	Inundated
Xituo Port	Yangtze River	15	13	Passengers, Coal Mine, Construction Material	81	18	10.1	25	Influenced
Fengdu Port	Yangtze River	33	9	Coal Mine, Construction Material	182	340	20.4	151.5	
Changsou Port	Yangtze River	61	10	Steel Products, Construction Material	133	81	49.1	36.6	
Jiangji Port	Yangtze River	100	30	Cement, Fertilizer	661	48	309	42	
Yongchuang Port	Yangtze River	15		Steel Products, Construction Material	79	16	17.6	58	
Hechuang Port	Jianglin River	76		Steel Products, Fertilizer	178	24	121	69	
Pengshui Port	Wu River	20		Coal Mine, Construction Material	82	60	40.5	20	
Wulong Port	Wu River	13		Steel Products, Construction Material	86		9.2	3	
Total		1072	283		4852	7195	2808.7	2464.7	

PS: the main city port refers to original Chongqing port; "Inundated"(Influenced) means this port will be inundated (Influenced) after finish of Three-Gorge project.

Source:Chongqing Communications College & Bureau of Chongqing Port and River

Management, (2003). *Chongqing Marine Center Developing Plan*, Chongqing: Author.

2.2.3 Chongqing Port Expansion Plans:

Chongqing port is now in the booming period; many expansion projects are under construction or under planning. Following projects listed here are the main projects, which are important to Chongqing port's development.

1) Cuntan port project

A new container port is being built at Cuntan, the 1st stage will be able to handle 250,000 TEU and when fully completed will have a capacity of 700,000 TEU. Cuntan port is also a large Ro-Ro terminal in Chongqing. The container part will discuss more detail about Cuntan port.

2) Jiulongpo port renovation project

Jiulongpo port is the first and largest container terminal existing in Chongqing, which has been built over 10 years. To solve the problem of low efficiency and insufficient capacity, Jiulongpo port now is doing the facility upgrading and technology renovation. The Jiulongpo Container Berth Company[①] has beening constructed a 50,000 sq meter container yard, renovated 2 old berths, constructed 5 container operations lanes, and has purchased new container handling equipment and 40-ton handling crane.

3) Changsou new port area project

Changsou new port area project is another important project after Cuntan port. This port will be located to Changsou chemical industry zone with the multiple capacity of 8 million ton. There will be a liquid chemical pier, a multiple chemical pier, a break bulk cargo pier and a multipurpose pier. Changsou port will serve for the dangerous cargo and break bulk cargo of the industry zone.

[①] It's a part of Chongqing port (group) CO., LTD

4) Wanzhou container terminal

Wanzhou places at the three-gorge reservoir; it is a communication hub of water, rail and road transport. The first stage project is under construction, invested 550 million RMB to build a 200,000 TEU/year container terminal with 2 3000-ton berths and the bank line 550 m. Wanzhou container terminal will be the biggest port at reservoir area, it will connect surrounding area to the upper stream and down stream.

5) Lanjiatuo port tech-upgrading project

Lanjiatuo port is multi-function break-bulk cargo, a new imported ore work pipelining and the stacking yard leveling up are under construction, the electricity facility is also being renovated. By the end of this year, Lanjiatuo port will have capacity of break bulk cargo over 2 million tons.

6) Mao'ertuo port technology upgrading

Mao'ertuo port is planning to rebuild the road access to port and enlarge the land scale of port to set up a 10,000-ton throughput simple port.

2.2.4 The Container ports of Chongqing

Containerization does not just a trend or fashion that everybody follows, more important is it can bring the profit to shipping companies that do container business. The newest release financial statement of Chongqing port (group) CO., LTD, which is Management Company of all ports in Chongqing main city including Jiulongpo port, Cuntan port, Lanjiatuo port, Changsou port and Etc. Containers business is fastest growing business and contributes 53% of total income, which shows in Table 2-5 and Table 2-6.

Table 2-5 The main business and revenue condition

Unit RMB

Business	Revenues	Cost of revenues	Profit (%)

Loading & Unloading Business	159,714,644.74	64,427,443.89	53.69
Passenger Transport Business	26,976,243.37	23,258,383.19	12.40
Product Sales Business	68,062,832.94	66,857,517.40	1.59
Other Business	11,741,200.34	11,362,514.50	2.90

Source: Chongqing Port (Group) CO., LTD,(2006) *Financial Statement of Chongqing Port (Group) CO., LTD 2005*,Chongqing:Author

Table 2-6 The main business and increasing rate

Project	Throughput	Increasing/Decreasing Over The Last Year (%)
Throughput (ton)	6408000	+25
Loading & Unloading(ton)	4469000	+19.2
Passenger Throughput (person/time)	685000	-19.4
Container Throughput (TEU)	181552	+31.24

Source: Chongqing Port (Group) CO., LTD,(2006) *Financial Statement of Chongqing Port (Group) CO., LTD 2005*,Chongqing:Author

1) Cuntan container terminal

Cuntan Port is being constructed on the northern bank of the Yangtze River, 6km from downtown Chongqing, berths are being constructed using the same method as is used in sea port construction. It's planned to be built the largest integration container terminal on the upper stream of Yangtze River. The land scale of Cuntan Port is 2 km^2 [①], available bank line 1.5 km. Cuntan port is also easy to access to highway, railway and airport. The port will consist of 5 3000-ton berths each 110 m

① The port facilities will take 1 km^2 and the logistics center will take the rest 1 km^2

wide by 36 m deep, after completion of the Three- Gorges dam project the quay top will be 23.5mts above water. The container stacking areas will be built at 3 different levels, as there is a 55 m difference in height between the quay and the access to the port. Each stacking area is designed to hold 2,100 TEU stacked five high and there will be a 15 – 18 meter height difference between each stacking area with the roads having a slope of 6 degrees. There will be a computerized container park management system. The Central government has classed the port as a Class 1 Port, which is open to foreign-flagged vessels. The port will consist of 2 Ro-Ro terminals and 5 container terminals, each berth will have 2 container cranes. The whole project will be finished by 2008, and then the capacity of Cuntan port will reach 700,000 TEU and 300,000 autos/year.(Introduction of Chongqing Cuntan Terminal Project, 2004, pp.101)

Now Cuntan port just finished the first stage project with 2 container berths and 1 Ro-Ro terminal, port already gone over the original container terminal Jiulongpo port to be the first container terminal in Chongqing. Undoubtedly, Cuntan port will stimulate the container and Ro-Ro transport in Chongqing with its existing capacity 280,000 TEU and 150,000 autos/year.

2) Jiulongpo container port

Jiulongpo container port was built in 1993, the specialized container terminal in Chongqing with the capacity of 100,000TEU. Jiulongpo container port is the existing main container port of Chongqing, which contributes 90% of the container throughput of Chongqing. There are a full set of container facilities: 1.5 km^2 land scale with 350,000 m^2 container yard and 8000 m^2 FCL center; 2 upgraded container berths with 2 sets of container working lines. However, present passing capability and matching equipments of Jiulongpo container port are far from meeting the requirement of the economic development and the capacity becomes quite insufficient to the demand. Congestion is the biggest problem in Jiulongpo port. Now the second stage renovation and expansion project has been launched, which will

enlarge Jiulongpo container port's capacity to 200,000TEU.

But the land scale limits the further development of the port; Cuntan container terminal will take over the biggest container port in Chongqing.

3) Wanzhou Jiangnan container terminal

Wanzhou District, situated in the center of Three Gorges reservoir area and located in the combination part of the economies of Southwestern China and the Yangtze River basin. With open traffic: Dazhou-Wanzhou Railway, Wuqiao Airport, Wanzhou-Chongqing express highway, the railway special line of Hongxigou Port and Wanzhou-Yichang Railway, Wanzhou is building a container terminal including two 3,000 ton container special berths and their matching facilities in 400,000sq.m, land scale with an annual handling capacity of 200,000 TEU. The terminal will serve the area of northern and western Sichuan, southern Shanxi and northwestern Hubei. In addition, Wanzhou Port is the fine deepwater port on the upper reach of the Yangtze River. Considering the port scale and the geographic advantage, Wanzhou Jiangnan container port will be one of key ports of Chongqing.

4) Fulin Huangqi container terminal

Locating in Fulin district, Fulin Huangqi container terminal, which has the functions of container transport, Ro-Ro transport and logistics distribution center, is one of three main planning container terminals of Chongqing municipality. Terminal will has annual 200,000 TEU and 180,000 autos capaticty with two 3000-ton grades container berths after accomplishment in 2008.

5) Container terminal of Da Du Kou Logistics Zone

The Da Du Kou Logistics Zone (GDP RMB 6 billion in 2004) also has a plan to develop two new ports. These ports are still in the planning stage and conceptual designs have not been started for the new port facility. The anticipated capacity of this new port facility is 150,000 TEU with a mixed use of break bulk, container and

automobile shipping.

2.2.5 Conclusions Remarks of Internal Circumstance Analysis

According to internal circumstance analysis, Chongqing port has the following inside features:

1) Chongqing port is an old port that has gone through many years with a good foundation of traditional waterway transport.
2) Chongqing port will totally have 1,500,000 TEU capacity and 480,000 autos throughput capacity by the year 2010 according to the expansion plans.
3) The existing container throughput capacity of Chongqing port can't meet the requirement of market. So the expansion plans mainly concentrate on container transport and Ro-Ro transport.
4) The biggest problem of the existing container terminal of Chongqing port is lagging behind in management and technology compares with big container terminals.

CHAPTER 3
YANGTZE RIVER STRATEGY AND ITS INFLUENCE TO CHONGQING PORT

3.1 INTRODUCTION OF YANGTZE RIVER STRATEGY

Yangtze River, the biggest river in China and third biggest river in the world, is not only the main artery goes through east part and west part of China, but also is the " Golden belt" connects economy of its valley. Recent year, the price of petroleum rocketing and railway and road transport are caught in the problems of "bottleneck", "petrol crisis" and "capacity crisis", the cutting edges of waterway transport as "low power consumption, large transport capacity, low transport cost and low pollution" becomes more remarkable. Thus people pay more attention to this "Golden Channel" again.

According to ministry of communications' "National Freshwater Transport Developing Strategy"(2002), Yangtze River administration of navigable affairs, which is a direct Yangtze River management agency of the ministry of communications, carried out "Yangtze River Strategy". The aim of "Yangtze River Strategy" can be describes as: to perform and act follow the concept of "the whole Yangtze River, the whole waterway transport", to develop the productivity of shipping industry, to speed up the reform of enterprises' structure, to start from serving the economy of Yangtze River valley, to set up a safe, straightway, effective and harmonious Golden Channel with joint effort, ultimately actualize the Yangtze

River transport modernization. (Yangtze River Administration of Navigable Affairs, (2006), pp.1-3)

“Two channels, Two types management and one window” are the contents for Yangtze River Strategy: according to Yangtze River Strategy, waterway transport channel of Yangtze River and information channel make up “Two channels”; Yangtze River administration of navigable affairs will strengthen management of operational ships and security management; a demonstration windows of safe navigable sea-route and scientific management is also the content of the strategy. (Yangtze River Administration of Navigable Affairs, (2006), pp.5)

The key work of Yangtze River Strategy is renovating water-route: dredging up the water-route of Yangtze Delta Area. Improve the water-route between Nanjing and Shanghai to12.5m in depth, which has the navigable capacity of 10000-ton; dredging up water-route of middle-stream, from Chenlinji to Wuhan, which will have 5000-ton all year and 8000-ton seasonal capacity and the water-route of uppersream, from Shuifu to Chongqing will be improved as well. Though this is a long term plan and it’s the beginning of the Yangtze River Strategy, this strategy will improve the whole waterway transport.

In addition, the most distinct feature of Yangtze River Strategy is this strategy will bring the ports, shipping companies and logistics related industry with industry structure and resource allocation aspects. In the past, no matter big port or small port along side the Yangtze River managed and competed with each other just from their own aspects: everybody wanted to be a big port of Yangtze River regardless the restriction of geographic, capital and technology; the low level repetitive constructions could be seen everywhere, the result was low efficiency, large quantities of resource were wasted. However, in this is brand new concept of the waterway transport, ports would cooperate, coordinate to consolidate with each other, corporately do some of logistics services. For example, some assets of ports will be

reallocated, and cross-industry projects can be applied as well. Now Shanghai port is cooperating with Chongqing, Wuhan, Nanjing, Jiangyin and An'qing port. Chongqing and Shanghai textile industry is planning to apply large-scale ownership reallocation and structure integration. The biggest contribution of Yangtze River Strategy is trying this way to overcome irrational competitions among ports.

Definitely, the application of Yangtze River Strategy will bring tremendous impact on the ports of Yangtze River.

3.2 YANGTZE RIVER STRATEGY'S IMPACT TO CHONGQING PORT

3.2.1 Yangtze River Strategy improves the waterway transport conditions

In the following five year, the ministry of communications will improve the sluice through capacity of Three-Gorge dam as well as the Ge'zhou dam, which is an existing dam on the Yangtze River. This will solve part of the insufficient capacity of the Dams. In addition, the ministry of communications will fully standardize operation ships on Yangtze River. In this way, the congestion of Three-Gorge dam will be improved a lot.

The safety issue will be upgraded according to Yangtze River Strategy. 69.6 million RMB will be invested to upgrade the information system and safety monitoring system, which includes emergency reaction system, GPS navigation system.

Yangtze River Strategy also low down the transport cost. After the water-route improvement and the three-gorge project accomplishment, the navigable capacity will increase dramaticly: Chongqing's average water-route will rise from present2.4m to 3.5m, as the result transport cost will reduce 35%-37% [①];The navigable capacity will be five time of present level, and the transport time will save 50%.

① Now the cost is about 0.03-0.04RMB /km.ton

3.2.2 Yangtze River Strategy brings new capital, technology, and advanced management.

Recent year, Chongqing port and Shanghai port did many trials on waterway transport and logistics. The July of last year, Chongqing Port Group and Shanghai Port Group made a deep discussion on operation management, capital management, reform of structure, development of the enterprises, port facility construction and logistics planning. More important is the two ports decided to cooperation plan: Chongqing port and Shanghai port invested totally 1.55 billion RMB, which is consisted of 50% each, for the first and second phrase project of Cuntan container terminal. Chongqing port and Shanghai port will have 50% of stocks of Cuntan terminal. After accomplishment of Cuntan terminal, Chongqing port and Shanghai port will set up a new joint corporation for operate and manage it together. In addition, it's reported that other main ports of Chongqing, such as Jiulongpo terminal, Wanzhou port and Fulin port, are going to cooperate with Shanghai port and the plans are similar to Cuntan terminal, which is each port holds 50% of the stocks. In the strategic cooperative plan, Chongqing port and Shanghai port will enhance the service and cooperative area with waterway transport, containers and logistics, based on the piers cooperation, set up advanced port service system.

This is a win-win cooperation. For the Shanghai port aspect, investing Yangtze River ports can promote the waterway transport of Yangtze River as well as the form of Yangtze River market. Furthermore, Shanghai port will gain more containers resource from Yangtze River. It's said that Shanghai will gain 1.5million TEU per year from Yangtze River in recent 5 years. For Chongqing port, firstly, the cooperation lessens pressure of finance. Cuntan port will cost 1.55 billion RMB; Shanghai port shares half of it. Secondly, Chongqing port can take the advance container terminal technology and management. Shanghai is one of the biggest container terminals in the world with advanced technology and experience of managing terminal; Chongqing port is lack of the experience of managing container

terminal. For a long time in the past years, Jiulongpo terminal, the only conainer terminal in Chongqing, was managed like a break bulk port with extremely low effieciency. This is what Chongqing port need badly. The cooperation will benefit to the container transport from both cities. There will be green channels for containers, where cargoes can receive the reduction of tariffs, the time of processing and parking tariffs.

3.2.3 Yangtze River Strategy brings opportunities to other industries in Chongqing.

Yangtze River Strategy dose not just affect in waterway transport, but also in other fields. Shanghai sanmao textile Group consolidated Chongqing Textile Holding Group. The textile factory will switch to Chongqing. This is another big state-owned resource reallocation. Shanghai Sanmao textile Group is one of the top-ten textile companies in this industry and Chongqing Textile Holding Group is an old textile state-owned company. Through this consolidation, Chongqing can get the new technology and equipment of textile and take the advantage of the low labor cost in Chongqing; Textile industry is not the supported industry in Shanghai's planning. So Shanghai can restructure the industry by this opportunity. This is also good news to water transport in Chongqing: Chongqing Textile Holding Group will have a huge production capacity of textile. In terms of the large quantity and textile products are not time sensitive cargos, textile will be the potential cargo for waterway transport.

Chang'an Ford Motors also benefit from Yangtze River Strategy. Chang'an Ford Motors regards Yangtze River as a resource, consolidated Jiangling Motors in Jiangxi province and launched a new manufacture factory in Nanjing. Based on Yangtze River, Chang'an Ford Motors makes a high integrated manufacture system with the three main factories in the upper, middle and downstream separately. Chang'an Ford Motors created the manufacture system along the Yangtze River is aimed to take the advantage of waterway to transport mobile parts and whole automobiles. Chang'an Ford Motors has the production capacity of 200,000 automobiles in Chongqing and

160,000 in Nanjing. So their strategy will stimulate Ro-Ro transport market. And for Chongqing port, the Ro-Ro transport last year reached 312,200 automobiles. The estimated throughput of Ro-Ro transport is very favorable. It's the potential market in the near future.

No matter Yangtze River Strategy improves textile companies or motor companies, the growing up of shippers is definitely good news to Chongqing port's future plan. Since Chongqing port already carried on so many large projects, sufficient cargo to be transport will be the guarantee of the profits of Chongqing port.

3.2.4 Yangtze River Strategy strengthen the competitions to Chongqing port

There is no absolutely good thing in this world. Yangtze River Strategy is not the exception either. As it brings capital, technology, and advanced management to Chongqing port, it brings competitions either. In the past, the regional protectionism is an effective support to ports development. Local ships have a favorite tariffs, process time and other privileges. In this sense, the regional protectionism ensures local ships would choose local port as first choice, but it prevents the ecdemic ships to access to the port. However, this situation is going to be changed soon. As the application of Yangtze River Strategy, the co-operations between Yangtze River ports will be enhanced. Effect of the regional protectionism will become smaller and smaller. Every Yangtze River ports will try every possibility to attract more cargo and ships both local and ecdemic. So the competitions among ports are unavoidable. Chongqing port will face the challenges of other ports.

Another problem the Yangtze River Strategy takes in is that it may cause the imbalance development of Chongqing port. As we know, Shanghai port is going to build a world-class container terminal. So the cooperations between Chongqing port and Shanghai port are on the container. All of the capital was invested into container transport. The general cargo and break-bulk cargo are being neglected. In fact, Chongqing port finished 51.5 million tons traditional cargo in 2005 and the

increasing rate of recent 5 years is 17%. For the west part of China, where is teem with mineral resources and energy resources, the traditional cargo still takes large part of the market. For Chongqing port, the Yangtze River Strategy doesn't bring the capital, technology, and advanced management to traditional cargo. Chongqing port has to develop it by itself or gives the traditional business up gradually.

3.3 CONCLUSIONS REMARKS OF YANGTZE RIVER STRATEGY

1) Yangtze River Strategy is carried out by Yangtze River Administration of Navigable Affairs and aim to set up a safe, straightway, effective and harmonious Golden Channel. The key work of it is renovating water-route; Yangtze River Strategy has the feature of promoting co-operations between Yangtze River ports.
2) Yangtze River Strategy improves the waterway transport conditions, which will low down the transport cost and improve the safety issues of Chongqing port.
3) Through the co-operations with other ports, Chongqing port gains capital, technology, and advanced management as well as the opportunities to access into other valley.
4) Other industries in Chongqing, as Chang'an Ford Motors and Chongqing Textile Holding Group, are also benefit from Yangtze River Strategy. They will provide more cargo and ultimately benefit to Chongqing port.
5) Yangtze River Strategy enhances the competitions to Chongqing port and it will small the effect of the regional protectionism in Chongqing and other areas. Yangtze River Strategy may also cause the imbalance development of Chongqing port, for the co-operations are on the container transport.

CHAPTER 4
THROUGHPUT FORECAST OF CHONGQING PORT

Throughput of a port is a very important guideline to the development of the port. An appropriate forecast of throughput is significant to the port's facility investment, the layout of the port, management strategy and development of integrated logistics. The throughput of a port is the starting point for a port's activities. All the task of a port is also assigned by throughput. In terms of regional economy, throughput of a port can show something about the economy situation of this region. This chapter will forecast on the throughput of Chongqing port.

4.1 THROUGHPUT FORECASTING MODELS

The Grey method (GM) has numerous applications, as any issue of the Journal of Grey System will testify. This method was introduced by Chinese prof. Deng in his famous book "Grey System Fundamental Method" of 1982. Today extensive research has been done to attempt to explain the phenomenon of geography, geology, agriculture and earthquakes, financial operating performance, stock markets, supply and demand for electronic power, management decisions and Etc by using GM.

The GM (1,1) is one of the most frequently used grey forecasting model. Here (1,1) represents "simple differential equation". The GM (1,1) model has the features of veracity, small sample data, short prepared time and forecast value checkable. The GM (1,1) model is relatively applicable to describe the monotonous variety process.

However, GM (1,1) model also has the limits. It is imperfect when the forecasting object increases in the curve with S type or the increment of the object is in the saturation stage. (ZiJian Guo, XiangQun Song & Jian Ye, (2005), pp.890) Considering the throughput of Chongqing port keeps increasing and definitely not reach the limit. The GM (1,1) model will be a good forecasting model for my research.

This model is a time series forecasting model, encompassing a group of differential equations adapted for parameter variance, rather than a first order differential equation. Its difference equations have structures that vary with time rather than being general difference equations. Although it is not necessary to employ all the data from the original series to construct the GM(1,1), the potency of the series must be more than four. In addition, the data must be taken at equal intervals and in consecutive order without bypassing any data (JuLong Deng, (2005), pp.11-13). The GM (1,1) model constructing process is described below:
Denote the original data sequence by

$$x^{(0)}=(x^{(0)}(1),x^{(0)}(2),x^{(0)}(3),...,x^{(0)}(n)), \quad (1)$$

Where n is the number of years observed.

The AGO (Accumulated Generating Operation) formation of x (0) is defined as

$$x^{(1)}=(x^{(1)}(1),x^{(1)}(2),x^{(1)}(3),...,x^{(1)}(n)), \quad (2)$$

Where $x^{(1)}(1)=x^{(0)}(1)$ and $x^{(1)}(k)=\sum_{m=1}^{k} x^{(0)}(m), k=2,3,...,n$ (3)

The GM(1,1) model can be constructed by establishing a first order differential equation $x^{(1)}(k)$ for as

$$dx^{(1)}(k)/dk + ax^{(1)}(k) = b \quad (4)$$

Therefore, the solution of Eq. (4) can be obtained by using the least square method. That is

$$X^{(1)}(k) = (x^{(0)}(1) - \frac{b}{a})e^{-a(k-1)} + \frac{b}{a} \quad (5)$$

Where

$$[a,b]^T = (B^T B)^{-1} B^T Y \quad (6)$$

And

$$B = \begin{bmatrix} -0.5(x^{(1)}(1) + x^{(1)}(2)) & 1 \\ -0.5(x^{(1)}(2) + x^{(1)}(3)) & 1 \\ -0.5(x^{(1)}(2) + x^{(1)}(3)) & 1 \\ \\ -0.5(x^{(1)}(n-1) + x^{(1)}(n)) & 1 \end{bmatrix} \quad (7)$$

$$Y_n = [x^{(0)}(2), x^{(0)}(3), x^{(0)}(4), ..., x^{(0)}(n),]^T \quad (8)$$

We obtained X(1)from Eq. (5). Let X(0) be the fitted and predicted series,

$$X^{(0)} = (x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), ..., x^{(0)}(n), ...) \quad (9)$$

where $X^{(0)} = x^{(0)}(1)$

We applying the inverse AGO, then we've got

k= 2,3,… $$X^{(0)}(k) = (x^{(0)}(1) - \frac{b}{a})(1 - e^{a})e^{-a(k-1)} \quad (10)$$

Where

$X^{(0)}(1)$, $X^{(0)}(2)$, $X^{(0)}(3)$,…, $X^{(0)}(n)$ are called the GM(1,1) fitted sequence,

while $X^{(0)}(n+1)$, $X^{(0)}(n+2)$,…are called the GM(1,1) forecast values

4.2 FORECASTING OF CARGO THROUGHPUT IN CHONGQING (EXCLUDING CONTAINERS)

4.2.1Original data

Here is the statistic data of throughput of Chongqing port of last 9 years, the data comes from the website of National Bureau of Statistics of China as shows in Table 4-1.

Table 4-1 Throughput of Chongqing port between years 1996—2005

Unit: million tons

No.	1	2	3	4	5	6	7	8	9
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Throughput	25.487	24.77	25.998	24.48	28.4	30.04	32.43	45.39	52.51

Source: Retrieved from the World Wide Web of National Bureau of Statistics of China

4.2.2 GM (1,1) model forecasting

The GM (1,1) model can be described as

Differential equation: $dx^{(1)}(k)/dk + ax^{(1)}(k) = b$

Data dealing

Getting the AGO value of time series $X^{(1)}=\{ k| k=1,2,3,4,5,6,7,8,9\}$ assembly

$X^{(1)}=(x^{(1)}(1), x^{(1)}(2), x^{(1)}(3),..., x^{(1)}(9))$

$X^{(1)}$	$x^{(1)}(1)$	$x^{(1)}(2)$	$x^{(1)}(3)$	$x^{(1)}(2)$	$x^{(1)}(2)$	$x^{(1)}(2)$	$x^{(1)}(7)$	$x^{(1)}(8)$	$x^{(1)}(9)$

AGO value	25.487	50.26	76.258	100.738	129.138	159.178	191.608	236.998	289.508

Then do the forecasting

$$B=\begin{bmatrix} -0.5(x^{(1)}(1)+x^{(1)}(2)) & 1 \\ -0.5(x^{(1)}(2)+x^{(1)}(3)) & 1 \\ -0.5(x^{(1)}(3)+x^{(1)}(4)) & 1 \\ -0.5(x^{(1)}(4)+x^{(1)}(5)) & 1 \\ -0.5(x^{(1)}(5)+x^{(1)}(6)) & 1 \\ -0.5(x^{(1)}(6)+x^{(1)}(7)) & 1 \\ -0.5(x^{(1)}(7)+x^{(1)}(8)) & 1 \\ -0.5(x^{(1)}(8)+x^{(1)}(9)) & 1 \end{bmatrix}=\begin{bmatrix} -37.87 & 1 \\ -63.26 & 1 \\ -88.5 & 1 \\ -114.9 & 1 \\ -144.2 & 1 \\ -175.4 & 1 \\ -214.3 & 1 \\ -263.3 & 1 \end{bmatrix}$$

$Y=\{24.773,25.998,24.48,28.4,30.04,32.43,45.39,52.51\}^{\mathrm{T}}$

$a=[a,b]^{T}=(B^{T}B)^{-1}B^{T}Y$

Then calculating out $a=[a,b]^{T}=\{-0.12577,15.68289\}$

All the calculations are done through Excel (See Appendix A: Calculation Pic1)

Taking $a=[a,b]^{T}=\{-0.12577,15.68289\}$ into

$$X^{(0)}(k)=(x^{(0)}(1)-\frac{b}{a})(1-e^{a})e^{-a(k-1)}$$

Then we get

$$X^{(0)}(k)=(25.478-(15.68289)/(-0.1257))\times(1-2.71828182845904^{(-0.12577)})\times 2.71828182845904^{(-0.12577)(k-1)} \quad (11)$$

We get the calculated $X^{(0)}(k)$, k=2,3,...,9 while $X^{(0)}(1) = x^{(0)}(1)$

K	2	3	4	5	6	7	8	9
$X^{(0)}(k)$	20.126	22.823	25.882	29.351	33.285	37.746	42.804	48.541

4.2.2 Accuracy Checking

Denote the residual value $e^{(0)}(k)$ and Relative error $r^{(0)}(k)$,

While $e^{(0)}(k)=X^{(0)}(k) - x^{(0)}(k)$ and $r^{(0)}(k)=e^{(0)}(k)/X^{(0)}(k)$

Then we get the data as follows

k	$X^{(0)}(k)$	$x^{(0)}(k+1)$	$e^{(0)}(k)$	$r^{(0)}(k)$
1	20.12638253	24.773	-4.64662	-18.76%
2	22.82374676	25.998	-3.17425	-12.21%
3	25.88261527	24.48	1.402615	5.73%
4	29.35143737	28.4	0.951437	3.35%
5	33.28515555	30.04	3.245156	10.80%
6	37.74607581	32.43	5.316076	16.39%
7	42.80485447	45.39	-2.58515	-5.70%
8	48.54161728	52.51	-3.96838	-7.56%

The residual variation $S_2^2 = 1/9\sum_{k=1}^{n}(e(k)-\bar{e})^2$ = 11.80409

The original data variation $S_1^2 = 1/9\sum_{k=1}^{n}(x^{(0)}(k)-\overline{x^{(0)}})^2$ = 100.48864

So the Power of a test C, which presents the dispersion of error in forecasting, (the smaller, the better) is

``

$C=S_2 / S_1 = 0.3427$

And the accuracy p (the bigger, the better) $p=P\{\left|e^{(0)}(k)-\bar{e}\right| \prec 0.6745S_1\} = 100\%$

Table 4-2 Checking the C value and the P value with accuracy checking grades

Grades	*p*	C
Very good	$0.95 \leq p$	$C \leq 0.35$
Good	$0.80 \leq p < 0.95$	$0.35 < C \leq 0.5$
Ok	$0.70 \leq p < 0.80$	$0.5 < C \leq 0.65$
Fail	$p < 0.70$	$0.65 < C$

Source: Ning Sun,(2005,Mar)*The Research on Development Strategy Planning of Taizhou Port,* HoHai University, Nanjing:Author

So we can find both the p and C value are in the grade “very good”. We can use this model to forecast the future throughput of Chongqing port.

4.2.4 Forecasting the throughput of Chongqing port in the year 2006-2015

Taking k=11,12,…,20 into the equation (11), we can get following forecasting results:

Unit: million tons

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Throughput	62.42	70.79	80.28	91.04	103.23	117.08	132.77	150.56	170.74	193.62

4.3 FORECASTING OF CONTAINER THROUGHPUT IN CHONGQING

4.3.1 Original data of container throughput

Because of the container throughput of Chongqing was quite small before the year 1999 (less than 10,000 TEU), so the data only from 1999 to last year. Here is the

container throughput

data of Chongqing port , the data comes from the website of National Bureau of Statistics shows as Table 4-3

Table 4-3 Container throughput of Chongqing port between years 1999—2005

Unit: 10,000TEU

No.	1	2	3	4	5	6	7
Year	1999	2000	2001	2002	2003	2004	2005
Throughput	1.64	3.02	4.2	6.5	9.9	15.94	21.98

Source: Retrieved from the World Wide Web of National Bureau of Statistics of China

4.3.2 GM (1,1) model forecasting

The GM (1,1) model can be described as

Differential equation: $dx^{(1)}(k)/dk + ax^{(1)}(k) = b$

Data dealing

Getting the AGO value of time series $X^{(1)}=\{k|\ k=1,2,3,4,5,6,7\}$ assembly

$X^{(1)}=(x^{(1)}(1), x^{(1)}(2), x^{(1)}(3),..., x^{(1)}(7))$

$X^{(1)}$	$x^{(1)}(1)$	$x^{(1)}(2)$	$x^{(1)}(3)$	$x^{(1)}(4)$	$x^{(1)}(5)$	$x^{(1)}(6)$	$x^{(1)}(7)$
AGO value	1.64	4.66	8.86	15.36	25.26	41.2	63.18

Then do the forecasting

$$B=\begin{bmatrix} -0.5(x^{(1)}(1)+x^{(1)}(2)) & 1 \\ -0.5(x^{(1)}(2)+x^{(1)}(3)) & 1 \\ -0.5(x^{(1)}(3)+x^{(1)}(4)) & 1 \\ -0.5(x^{(1)}(4)+x^{(1)}(5)) & 1 \\ -0.5(x^{(1)}(5)+x^{(1)}(6)) & 1 \\ -0.5(x^{(1)}(6)+x^{(1)}(7)) & 1 \end{bmatrix}=\begin{bmatrix} -3.15 & 1 \\ -6.76 & 1 \\ -12.11 & 1 \\ -20.31 & 1 \\ -33.23 & 1 \\ -52.19 & 1 \end{bmatrix}$$

$Y = \{3.02, 4.2, 6.5, 9.9, 15.94, 21.98\}^{\mathrm{T}}$

$a = [a,b]^T = (B^T B)^{-1} B^T Y$

Then calculating $a = [a,b]^T = \{-0.39716, 1.800466\}$ out

All the calculations are done through Excel. (See Appendix A: Calculation Pic2)

Taking
$a = [a,b]^T = \{-0.39716, 1.800466\}$ into $X^{(0)}(k) = (x^{(0)}(1) - \frac{b}{a})(1 - e^a)e^{-a(k-1)}$

Then we get

$$X^{(0)}(k) = (25.478 - (1.800466)/(-0.39716)) \times (1 - 2.71828182845904^{(-0.39716)}) \times 2.71828182845904^{(-0.39716)(k-1)} \quad (12)$$

We get the calculated $X^{(0)}(k)$, k=2,3,…,7 while $X^{(0)}(1) = x^{(0)}(1)$

K	2	3	4	5	6	7
$X^{(0)}(k)$	3.010089	4.477791	6.661135	9.909065	14.74067	21.92813

4.3.3 Accuracy Checking

Denote the residual value $\mathrm{e}^{(0)}(k)$ and Relative error $r^{(0)}(k)$,

while $\mathrm{e}^{(0)}(k) = X^{(0)}(k) - x^{(0)}(k)$ and $r^{(0)}(k) = \mathrm{e}^{(0)}(k) / X^{(0)}(k)$

$$S_2^2 = 1/9 \sum_{k=1}^{n} (\mathrm{e}(k) - \bar{\mathrm{e}})^2$$

The residual variation = 54.606

The original data variation $S_1^2 = 1/9\sum_{k=1}^{n}(x^{(0)}(k) - \overline{x^{(0)}})^2$ = 0.2868

So the Power of a test C, which presents the dispersion of error in forecasting, (the smaller, the better) is

$C=S_2 / S_1 = 0.0724$

and the accuracy p(the bigger, the better) $p=P\{\left|e^{(0)}(k)-\bar{e}\right| < 0.6745S_1\} = 100\%$

Checking the C value and the P value with accuracy checking grades table

Grades	p	C
Very good	$0.95 \le p$	$C \le 0.35$
Good	$0.80 \le p < 0.95$	$0.35 < C \le 0.5$
Ok	$0.70 \le p < 0.80$	$0.5 < C \le 0.65$
Fail	$p < 0.70$	$0.65 < C$

So we can find both the p and C value are in the grade “very good”. We can use this model to forecast the future container throughput of Chongqing port.

4.3.4 Forecasting the container throughput of Chongqing port

Taking k =8,9,…,12 into the equation (12), we can get following forecasting results:

Unit: 10,000 TEU

Year	2006	2007	2008	2009	2010
Throughput	32.62016	48.52555	72.18632	107.3839	159.7437

4.4 CONCLUSIONS REMARKS OF THROUGHPUT FORECASTING

1) Traditional cargo throughput forecasting

Unit: million tons

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Throughput	62.42	70.79	80.28	91.04	103.23	117.08	132.77	150.56	170.74	193.62

Using GM (1,1) forecasting model, I make a forecast of cargo throughput and container throughput of Chongqing port. From the result of cargo throughput, IN 2010,Chongqing port's cargo throughput will reach 103.23 million tons, it's almost twice of cargo throughput last year and it's 1/4 volume of Shanghai port did last year. And by the year 2015, this figure will rise to nearly 200million tons, which is half volume that Shanghai port did port last year. Considering the general cargo and break bulk cargo operation experience and existing handling capacity of Chongqing port, as the biggest port of upperstream of Yangtze River, Chongqing port do have the ability to realize this cargo throughput volume with necessary facility and capacity improvement. For the cargo aspect, Chongqing's own fast-growing economy will support part of cargo. More important, Chongqing's cutting edges in geography will help Chongqing port achieve the throughput. Yunnan and Guizhou province are the resource advantage provinces. Coal mine, chemical products, metal and nonmetal ore cargo are the large quantity cargo for the waterway transport.

The traditional cargo for Chongqing port has reached stably increasing period, and the average forecasting increasing rate is about 13%, which is a reasonable increasing rate. So the forecasting results are relatively dependable.

2) Container throughput forecasting

Unit: 10,000 TEU

Year	2006	2007	2008	2009	2010
Throughput	32.62016	48.52555	72.18632	107.3839	159.7437

Taking the GM (1,1) forecasting model can solve the problem of small statistic sample number, but this limit of this model, which is it is imperfect when the forecasting object increases in the curve with S type or the increment of the object is in the saturation stage, may affect the accuracy of the forecasting. According to the total planning container throughput capacity of Chongqing, Chongqing port will not have container-handling capacity 1.5 million TEU by the year 2010. So when the container throughput is close to 1.5 million TEU, the increasing condition will be in the saturation stage. Then using this GM (1,1) model will not be accurate. At this situation, the modified GM model, which is called Grey Verhulst Model, can be used. Thus, to play the safe side, the forecasting of container throughput is valid till 2009, which doesn't reach the saturation stage.

Containers are comparatively new business to Chongqing port. Now container transport in Chongqing is at the booming period. And the average increasing rate is over 40% from the statistic years. But the real practice tells us, any a port can't remain the increasing rate of booming period forever. When port gets into the maturity time, the increasing rate will slow down. According to the Chongqing government's planning, the container throughput will reach 1,000,000 TEU by 2010,which is much small than the forecasting figures. Considering the governments are comparatively conservative, the real container throughput in 2010 will be around 1.1 million TEU, which is little higher than the official planning and lower than the GM forecasting.

CHAPTER 5
REPOSITION AND SEGMENTATION OF CHONGQING PORT

5.1 RECOMMENDATIONS TO CHONGQING PORT'S FUTURE DEVELOPMENT

5.1.1 Reposition

During the 10th five-year plan period, Chongqing government and port authority positioned Chongqing port as the marine center of the upper stream of Yangtze River. Through the recent five-year development, Chongqing port has already make huge progress in various aspects: The cargo throughput increased 13.6% and containers throughput grew annually 47.2%; the infrastructure investment and construction of Chongqing port were also remarkable; the port set up the EDI system for operation; port signed up a strategic cooperation agreement with Shanghai port… however, the situation of Chongqing port is far from the requirement of modern logistics and it can hardly rest easy. The previous parts of this paper discuss more detail about the existing problems and challenges to Chongqing port.

The unclear poison of Chongqing port is the biggest problem need to be dealed with. The concept of shipping center is developing as the time. Generally speaking, a shipping center has several features: an advanced shipping market, strong support hinterland, advanced modern container logistics, very good port natural condition

and facilities, mature logistic system and so on. (LiJun Zhuang,(2005),pp.49-53) However, in the "*Chongqing Marine Center Developing Plan"*(Chongqing Communications College & Bureau of Chongqing Port and River Management, (2003), pp.19), there is no clear definition of this "Freshwater Marine Center", but some productive goals: Such as 3000-ton ship navigable sea-route, 700,000 TEU container throughput capacities. Chongqing port may match some of requirements by the fine development, but can't overcome some geographic and natural features. The port natural condition may still not good as a shipping center and there are not enough feeder ports in the nearer area, because the layout of Yangtze River. The logistic system of Chongqing is far from maturity. More important, the features of waterway transport, which are the transport time and capacity, decide water transport can't dominate other transport modes in Chongqing. There is either enough shipping related industry. Setting Chongqing port as the shipping center is more vain meaning than the real significance. So this "Marine Center" plan is more vain meaning than the real significance.

In fact, Chongqing can't overcome some geographic and natural features as a real marine center and there are not enough feeder ports in the nearer area, because the layout of Yangtze River. The logistic system of Chongqing is far from maturity. More important, some features of waterway transport, which are the transport time and capacity, decide water transport can't dominate other transport modes in Chongqing. There is either enough shipping related industry. Personally, for Chongqing port, setting an advanced hub port and logistics center as the developing goal is a cleverer choice. The port authority should emphasize on the integrated planning of all ports in Chongqing. Chongqing port is better to be based on main city ports and Wanzhou port; other ports support the two ports. Setting up a reasonable allocated and horizontally and vertically integrated ports group is the goal of Chongqing port. Furthermore, the development of Chongqing port can't go without railway transport and road transport. The logistics center also requires an integration logistics system, which includes both integration of the process of waterway transport and integration

of cross-transport modes. Presently, there is nearly no the integration of cross-transport modes in Chongqing: there is no big road transport company, which can cooperate with water transport effectively; there is little no water-railway transport. Considering the situation of Chongqing port and logistics development, Chongqing port should set an advanced hub port and logistics center as long term strategy.

5.1.2 Segmentation and Brand Strategy

1) Segmentation

The coverage of Chongqing port should be enlarged. The two ports group will cover different regions separately. The main city port will cover Sichuang Guizhou, Qinghai province and north part of Yunnan province; Wanzhou port will cover Sanxi, Gansu, the west part of Hu'nan and the west part of Hubei province. Other ports of Chongqing will correspond the two ports groups to the waterway transpor, which shows as Figure 5-1. The market coverage of Chongqing port should be organized as the picture shows. With this organization Chongqing port can get rid of the out-of-order competitions inside the municipality. There are only 327km between Wanzhou city and Chongqing main city, it merely takes 3 hours can get each city by super highway. And they are the biggest two port groups of Chongqing municipality. If the two ports compete with each other in the same market, it will be definitely internecine results to Chongqing port. Fortunately, Chongqing port can take the geographic advantages of ports to segment market in fine order. The potential market of Chongqing port lies in surrounding areas. Alos, the development of railway transport and road transport network will help Chongqing port attract more cargo from other provinces. Also, the improvement of Chongqing municipality's communication system will contribute waterway transport.

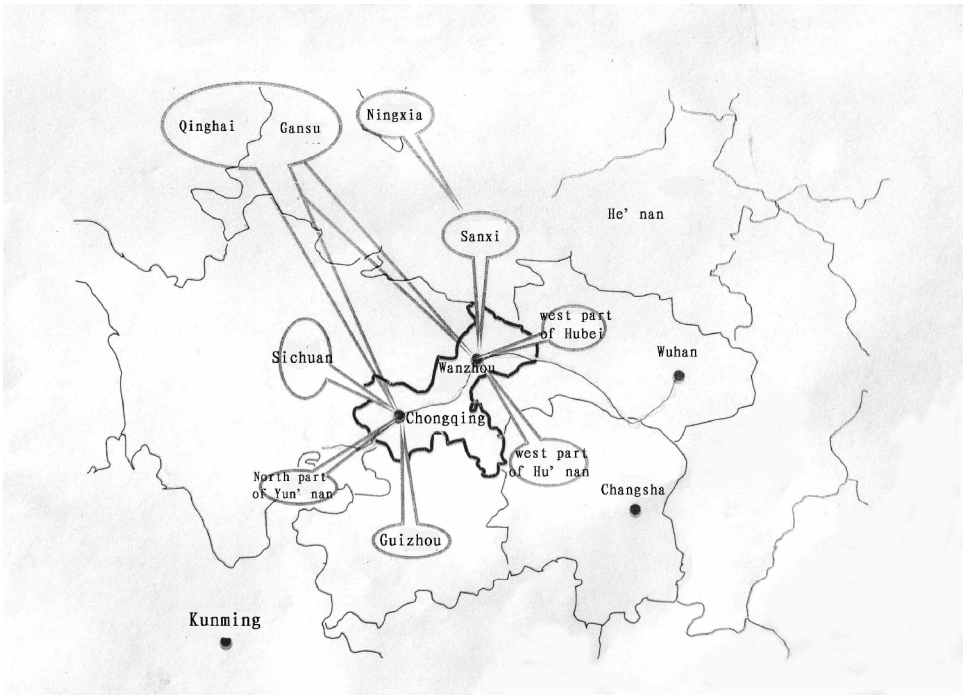

Figure 5-1 Segmentations Of Chongqing Port

2) Brand strategy

"A strong brand is invaluable as the battle for customers intensifies day by day. It's important to spend time investing in researching, defining, and building your brand." [①] For port authorities and operators, the brand of a port is a quite important intangible asset and it's also a significant competitiveness. There are three important existing or potential brands for Chongqing port: container transport, Ro-Ro transport and super size and heavy cargo transport.

[①] Developing Your Brand Strategy,(2006) *Marketing.About.Com* Retrieved from the World Wide Web: http://marketing.about.com/cs/brandmktg/l/aa072003a.htm

Container transport is the most important service for Chongqing port as well as the most profitable. The container throughput of Chongqing port annual increased 47.2% during last five years. Chongqing government and port authority take container transport as the first strategy of Chongqing port, several projects are built to serve the container transport. Under the plan, the container throughput capacity of Chongqing will increase dramatically; according to the throughput forecasting last chapter, container transport will take over traditional cargo and be the core business of Chongqing port within recent 5 years. With appropriate management, the old Chongqing port will indubitably turn to the biggest container terminal on upper stream of Yangtze River.

As one of four Ro-Ro transport markets in China, the annual Ro-Ro transport throughput of Chongqing exceeded 400,000 automobiles and the increasing over 4%. According to the plan and under construction projects, the total Ro-Ro transport capacity will increase to 500,000 autos in 2010. And Chongqing's auto manafacture industry will also provide more autos for Ro-Ro transport market. So Chongqing's Ro-Ro transport is the relatively large and promising market. Chongqing port, of course, will give up this niche market.

Chongqing port's super size and heavy cargo transport is the unique and advantage service. Because of the large paid-in capital and relatively small demand, there is no other competitor of this service. Chongqing port has already built full set of super size and heavy cargo transport facilities and service plans. Though the small demand, super size and heavy cargo transport creates remarkable profit every year. Last year, this service brought 10 million RMB net profits to Chongqing port with over 20% annually increasing rate. The development of Chongqing municipality and other west areas will enlarge the demand super size and heavy cargo transport. This is the profitable potential market for Chongqing port.

5.1.3 Infrastructure Constructions and Investment

The development of Chongqing port can't go without large infrastructure constructions and huge capital investment, especially during containerization time. The concept of containerization is affecting the whole Chongiqng municipality. It's quite a good thing. But a serious problem comes out: almost all the ports in Chongqing want to turn into container terminals over night; some small ports are planning to build their container terminals, which have the capacity greatly exceeds the demand of areas. It's another kind of waste of resource. So it's better to put main container infrastructure constructions into main city and Wanzhou city, which are economical and communications advanced cities.

Southwest of China is the district that teems with mineral resources and energy resources. The general cargo and break-bulk cargo are still increasing annually 13.7% and the mineral cargo and energy cargo will rise as the economy goes on, So the traditional cargo will remain large throughput. The experience of the Mississippi River port may tell something: Two-thirds of U.S. corn exports and three-quarters of U.S. soybean exports are shipped from Mississippi ports on the Gulf of Mexico. St. Louis is the US's second largest inland port with barge connections to 29 U.S. metropolitan centers and the world via the Mississippi River and the Gulf of Mexico. The metropolitan area, which St. Louis can fetch, is near the geographic center of the United States and closer than any other metropolitan area to the population center. The Port Authority of St. Louis leases to Beelman River Terminal the largest general cargo dock in the area, the City of St. Louis Municipal Dock, as a public terminal. The facility features 27 acres with two warehouses, rail and truck access, and two large docks for barge off/on loading. The main cargos that St. Louis ports serve are corn and soybeans, because corn and soybeans account for nearly half of all downbound commodities on the Mississippi River. St. Louis places at the upper valley of Mississippi River and is the metropolitan center of U.S. There are certainly some similarities between Chongqing and St. Louis. St. Louis' experience reminds the authorities of Chongqing port: Containerization is not the only way to

achieve success. Appropriate development strategy is the key.

Above all, though the general cargo and break-bulk cargo transport aren't the key strategy of Chongqing port, the big volume would remind the authorities not to give up this "cash cow". So the traditional cargo is still an important market for Chongqing port presently. Chongqing port is still need infrastructure and capital support for traditional cargo capacity improvement.

5.1.4 Management and Software Update

Comparing with the improvement of infrastructures and facilities, the management level of Chongqing port is dramatically lagged behind. Though Chongqing Jiulongpo container terminal has set up the EDI system inside of port, this system can merely be accessed by port, rather than logistics companies, customs or relative government agencies. The affection of this E-system is tiny. "Operating container terminal with the methods of bulk cargo port", " being lack of integrated logistics planning and allocation" and " low mechanized and automation equipment" are the real situation of present Chongqing port. So to improve the management level and software, to some extend, is more urgent than infrastructure constructions.

Chongqing port should develop on the basis of "Chongqing—Shanghai port strategic cooperation frame agreement", speed up the infrastructure constructions as well as the learning of advanced container terminal management and experience. Besides, to polish existing information system and invest new information system appropriately is also crucial to Chongqing port's authority, especially avoiding the case of "EDI".

5.1.5 Enhance Multitransport

The co-operations between Chongqing port and Shanghai port provided a good example to multitransport. Each side owns 50% stocks of the joint companies and invests into the both interested fields. Take Chongqing port and Chongqing railway

transport for example: they can set up a joint container transport company to multitransport. This multitransport can take waterway transport's advantage to lower the transport cost as well as railway transport's strength to cover more areas. Though this is the most practical blue of print cross-transport mode co-operations for Chongqing port, the co-operations need the support from Ministry of Communications and Ministry of Railways. Hopefully, the two ministries will soon realize multitransport is the win-win solution for both sides.

5.2 CONCLUSIONS REMARKS

This chapter lists several recommendations to Chongqing port from 5 aspects:

1) It's better for Chongqing port get rid of the vain meaning "Marine Center" plan and reposition as an advanced hub port and logistics center for the future.
2) Chongqing main port and Wanzhou port should segment the market to avoid the unnecessary internal competition; Container, Ro-Ro and super size (weight) cargo transport are the three key brands for Chongqing port.
3) It's better to put main container infrastructure constructions into main city and Wanzhou city; Chongqing port is still need infrastructure and capital support for traditional cargo.
4) Enhance multitransport will benefit a lot to Chongqing port, but need the support from Ministry of Communications and Ministry of Railways
5) To improve the management level and software is crucial to Chongqing port's development.

CHAPTER 6
SUMMARY AND CONCLUSIONS

Port is a confluent point of various transport modes. As an independent productive department, it provides the actualization of the connection of various modes, transfer and distribution of the cargo, provisional storages for cargo and the related services. (LiJun Zhuang,(2005),pp.43-44) And the modern port requires the integration of processes and services along with advanced technologies and management. To this sense, Chongqing port is far from the modernization.

This dissertation discuss about the development of Chongqing port, which is on the way of its modernization. Chongqing port is now experiencing the very special period. It's on the wave of containerization and facing brand new developing opportunities: Chongqing port is under a good macro economy situation and the greatly support from Chongqing municipality; The Three-gorge project has huge impact on it; Yangtze River Strategy not only improves the waterway transport conditions, but also brings the co-operations with other ports… However, Chongqing port is also facing some challenges that it never had: Chongqing port will compete with both other ports and railway transport; Chongqing port may suffer from negative Yangtze River Strategy causes. This paper analysis those factors that can affect to Chongqing port's future.

In dissertation, I use GM (1,1) forecasting model to forecast the traditional cargo and containers throughput of Chongqing port. And the aim is the check whether the expansion plans of Chongqing port can satisfy the development. Choosing this model

is because the specific situation of Chongqing port. The results of forecasting remind me that container transport will be the most influential business of Chongqing port with marvelous increasing rate; the general cargo and bulk cargo will remains large quantity in volume. And the results are directly related to the recommendations to Chongqing port's development.

This academic work lists out several recommendations to Chongqing port's future development. Those recommendations don't cover everything in detail, but just lists from the aspects that Chongqing port need to do urgently or the key issues that should not to be neglected in future: It's better for Chongqing port to reposition as an advanced hub port and logistics center; Container, Ro-Ro and super size (weight) cargo transport are the three core business for Chongqing port, but there is no reason to give up traditional cargo for its large volume. If possible, the enhanced co-operation of the cross-transport mode will fill Chongqing port with new developing power.

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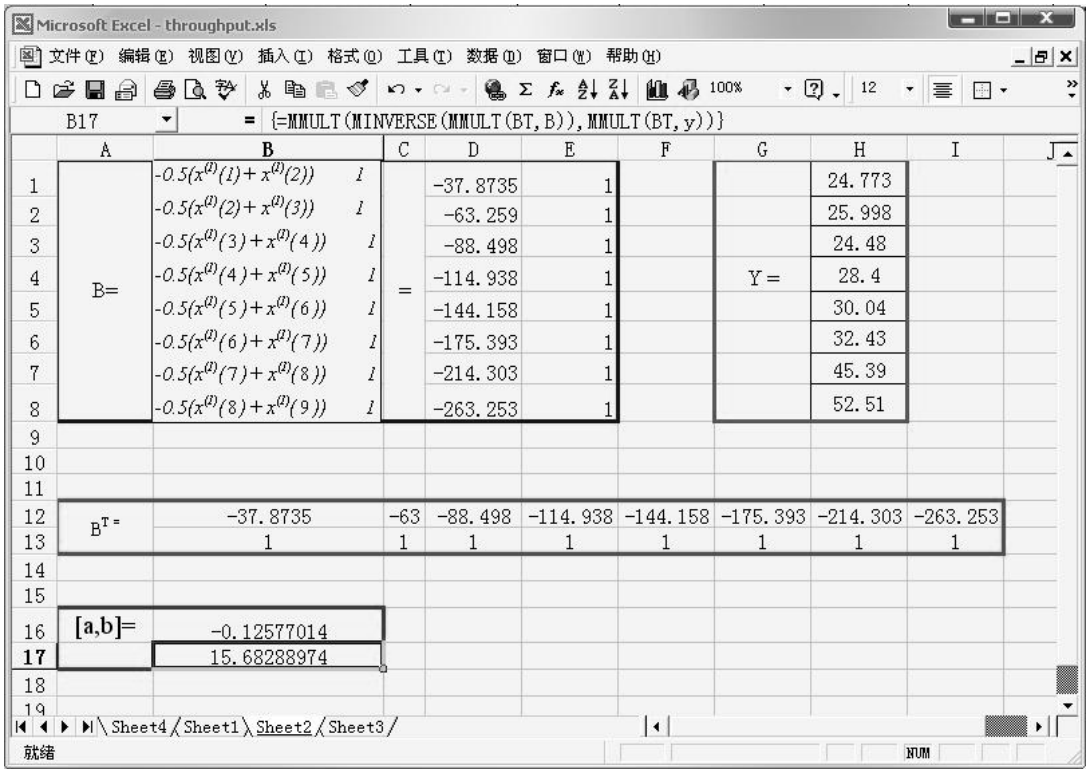
APPENDIX

Appendix A

Calculation Pic1



Calculation Pic2