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Ship financing mode selection for COSCO's general cargo vessel

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Ship Financing Mode Selection for COSCO's General Cargo Vessel

By

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Declaration

I certify that all the material in this research paper 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 research paper reflect my own personal views, and are not necessarily endorsed by the University.

Rong ZiWen

2010-6-14

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Abstract

Title of research paper: **Ship Financing Mode Selection for COSCO's General Cargo Vessel**

Degree: **MSC**

Since September 2008, the financial crisis has lasted nearly one year and a half all over the world. During this period, the global financial market liquidity was retrenched in a large scale. The ship financing business was also suffered from the sharp decline of global financial market. But considered "global economy recovery" and "shipping market recovery", some experts in International shipping industry proclaimed that International shipping market will resuscitate gradually in 2 or 3 years. Ship financing market will recover step by step. And considered "relatively large age structure of COSCO's general cargo vessel fleet", COSCO Group decided to seize the current opportunity (the drop of vessels' price caused by financial crisis), accelerating the pace of the ship updates, eliminating old vessels, achieving structural adjustment, and establish a modern, energy saving and environmental-friendly fleet. Now, the problem faced by COSCO is choosing which ship financing mode to purchase the vessel.

There are five typical ship financing modes: (1) Retained earnings (2) Commercial bank loan (3) Ship financing leasing (4) Issuing Eurobond (5) Issuing new shares.

The author applied AHP methodology and established a new ship financing mode selection evaluation indicators system in this dissertation. In this system, "the convenience of implementation"; "financial economic effect"; "the control of the enterprise" and "subsequent influence" be considered as four main criterions. With this system, the author evaluated five typical ship financing modes for COSCO and drew the conclusion that: "ship financing leasing" should be the best ship financing mode for COSCO.

KEYWORDS: COSCO Group; General Cargo Vessel; AHP methodology; Financing Mode Selection

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LIST OF ABBREVIATIONS

AHP	Analytic Hierarchy Process
COSCO	China Ocean Shipping (Group) Company
IMF	International Monetary Fund
DWT	Dead Weight Tonnage
VLCC	Very large Crude Carrier
AIP	Aggregation of Individual Priorities
AIJ	Aggregation of Individual Judgments
ICBC	Industrial and Commercial Bank of China
CI	Consistency Index
CR	Consistency Ratio
RI	Random Index

Chapter 1 Introduction

1.1 Research background and meanings

Research background

Since September 2008, the financial crisis has lasted nearly one year and a half all over the world. During this period, the global financial market liquidity was retrenched in a large scale. The ship financing business was also suffered from the sharp decline of global financial market. However, the International Monetary Fund (IMF) released a report declared that with the powerful intervention of all the governments, the international financial markets are gradually revealing a trace of the dawn of recovery. Unfortunately, in the process of global financial markets' stabilization, the shipping financial industry can't recover simultaneously. It is very difficult for the ship financing market to resuscitate in a short term. Old banks bogged down in the quagmire while the total amount of loans declined continuously. First half of 2009, further deterioration occurred in ship financing market. The global ship financing bank loaned 17.5 billion U.S. dollars with 50 businesses. Compared with 43.1 billion U.S. dollars with 165 businesses in the same period in 2008, it collapsed sharply and broke the lowest record since 2005.

However, on the World Economic Forum in Davos 2010, a number of leaders announced that the global economy will recover slowly. A lot of senior experts in International shipping industry also proclaimed that International shipping market will resuscitate gradually in 2 or 3 years. The value of the vessels will be stabilized. Ship financing market will recover step by step.

At this time, China Ocean Shipping (Group) Company (COSCO), as China's largest and the world's leading Group specializing in global shipping, modern logistics and

ship building, has seriously constrained by the age structure of its own fleet. The engineer equipments of its old vessels are obsolete. Their fuel consumption is huge and need frequent maintenance. It not only increased the vessels' operating costs, but also caused great harm to the environment. Therefore, COSCO decided to seize the current opportunity (the drop of vessels' price caused by financial crisis), accelerating the pace of the ship updates, eliminating old vessels, achieving structural adjustment, and establish a modern, energy saving and environmental-friendly fleet.
Now, the problem faced by COSCO is choosing which ship financing mode to purchase the vessel.

Research meanings

In March 25, 2009, on the State Council Executive Meeting, Chinese leaders formally adopted such a decision: till 2020, Shanghai will basically be built as an International Financial Center which is in accordance with Chinese economic strength and RMB's international status and Shanghai will be built as an International Shipping Center which has the capacity of allocating global shipping resource.

And the shipping financial industry is an important link between the International Shipping Center and the International Financial Center. It plays an important role in promoting the completion of these two Centers.

Nowadays, as for some other International Financial Centers or Shipping Centers, they all attach great importance to the development of shipping financial industry. And their shipping financial service industries are all well-developed. For example, London's shipping financial service not only has a wide coverage, but also holds the absolute advantage in most areas. Other Shipping Centers also have its own unique features in shipping financial industry.

In recent years, Shanghai made remarkable achievements in building an International

Shipping Center. And Shanghai also developed its shipping information service. But compared with some internationally recognized Shipping Center cities, such as London, Singapore and Hong Kong, Shanghai's shipping financial industry is still in its infancy and the gap between them is huge. Take the ship financing business as an example, currently, the scope of global ship loan is approximately 300 billion U.S. dollars, the scale of global ship chartering business is approximately 70 billion U.S. dollars, the scope of ship stock and bond financing business is approximately 15 billion U.S. dollars. However, the global ship loans, financing businesses are almost under the control of three internationally recognized ship financing business centers, namely, London, Hamburg and New York. In contrast, Shanghai, whose market share is less than 1%, is seldom involved in related fields.

From the analysis above, we can draw the conclusion that in the next 5 to 10 years, how to promote the development of shipping financial industry will play an important role in the completion of Shanghai's two Centers. And ship financing business, as the main business of shipping financial industry, will doubtless have a significant impact on the completion of Shanghai's two Centers.

Therefore, how to compare the existing ship financing modes, and then find the most suitable mode to our shipping company under the background of the recovery of shipping market, will play an important role in the development of Chinese shipping financial industry.

1.2 Main research contents and methods

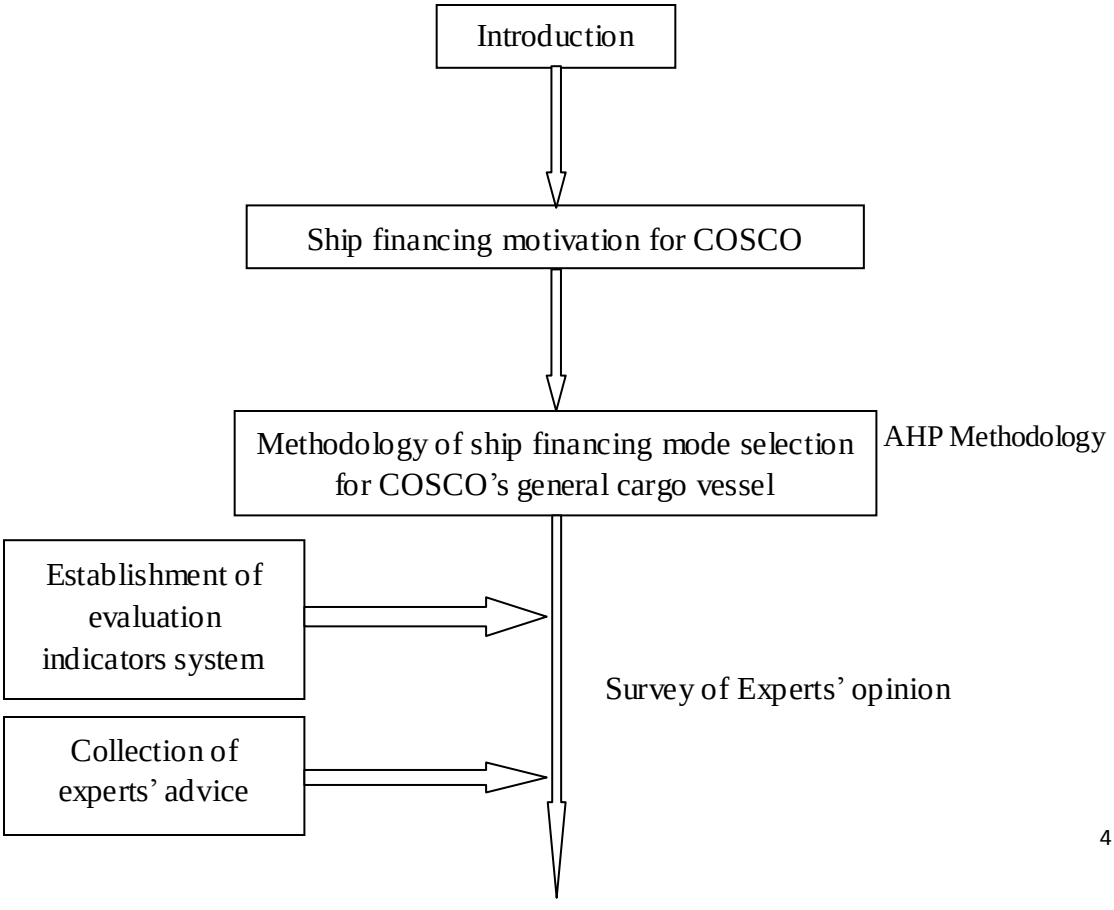
The main research contents of this dissertation are: the most suitable ship financing mode of COSCO's general cargo vessel in the current shipping market conditions.

Based on the deep understanding of COSCO Group and some domestic and foreign financing institutions, as well as the actuality of Chinese ship financing industry, refer

to the views and suggestions of many experts and scholars in International shipping industry, the author finished the final draft of this dissertation.

The first Chapter is "Introduction", mainly explain the research background and meanings of this dissertation. The second Chapter is "Literature Review", mainly introduced four typical ship financing modes and actuality analysis of Chinese ship financing industry. The third Chapter introduced the COSCO Group and analyzed the ship financing motivation for COSCO Group. In the fourth Chapter, the author applied AHP methodology and established a "ship financing mode selection evaluation indicators system", and through experts' opinion surveys and consistency index inspection to determine the weight of each indicator. In the fifth Chapter, the author used weighted arithmetic mean method to deal with the views of the experts and through the calculation of each indicator to select the most suitable ship financing mode of COSCO's general cargo vessel in the current shipping market conditions.

The research framework of this dissertation shown in Figure 1-1



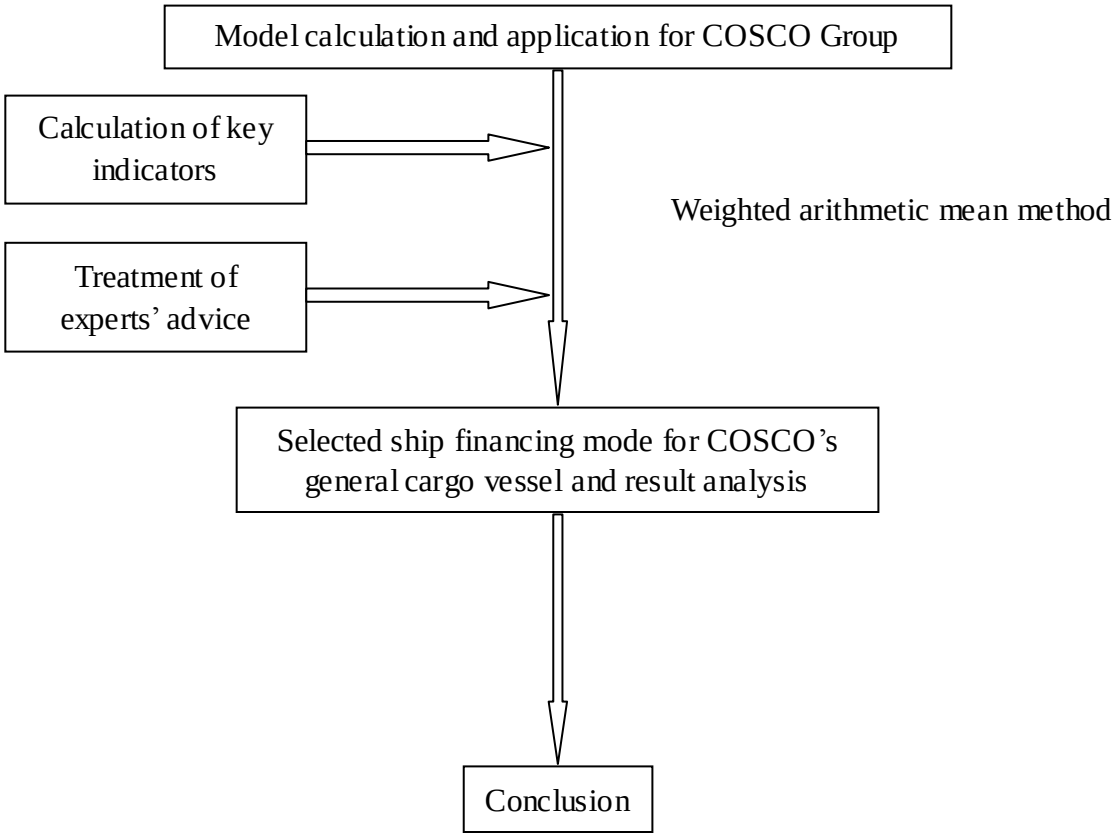


Figure 1-1 the research framework of this dissertation

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

Chapter 2 Literature Review

2.1 AHP (Analytic Hierarchy Process) model

My dissertation will use AHP (Analytic Hierarchy Process) to evaluate and show the criteria used for ship financing mode selection.

Professor Thomas L. Saaty was the first person who developed the AHP technique as a multiple criteria decision-making methodology to deal with complex decision-making problem in 1977.

It gives us a reasonable and comprehensive framework to analysis a decision-making problem, disassembling overall goals to several sub-problems, setting several criteria with different weight, and use them to evaluate alternative solutions.

In AHP method, the first step is to decompose the overall goals into several more easily and comprehended hierarchies in order to analyze them independently. In the second step, the decision maker should judge the importance of each element by comparing them systematically. After that, the decision makers will convert their evaluation or judgment to numerical values, setting a priority or weight to the elements of each hierarchy to compare them in a reasonable and systematical way. In the final step, the decision maker will calculate the numerical values for alternative solutions. The solution which holds the highest numerical values should be selected by the decision maker.

AHP methodology has two main characteristics. The first one is: AHP offers the possibilities in group decision-making. According to Saaty (1980), "AHP has two approaches: the aggregation of individual priorities (AIP) and the aggregation of individual judgments (AIJ)." [1]The second one is: AHP offers an analytical measure to analyze the illogicality of decision makers' judgments. AHP has a consistency index. As per Saaty (2000), "this index tests the transitivity of decision makers' judgment and preference. For instance, if a decision maker prefer A to B, and B to C, then does he or she prefer A to C in consistent? This AHP consistency index gives us a useful way to check."[2]

As a decision-making tool, the merits of the "Analytic Hierarchy Process" have been reviewed extensively. As per Saaty (2001), the AHP has at least 10 merits:"Unity; Complexity; Interdependence; Hierarchy Structure; Measurement; Consistency;

[1] Saaty, T.L., (1980). The Analytical Hierarchy Process. McGraw-Hill, New York.
[2] Saaty, T.L., (2000): *Fundamentals of decision making and priority theory.* RWS Publications: Pittsburgh, PA.

Synthesis; Tradeoffs; Judgment and Consensus; and Process Repetition." [3]

According to Rangone (1996), "AHP as a flexible methodology can be used to solve any hierarchy of decision-making problems." [4] In another article" A combined AHP-GP model for quality control systems", Badri (2001) mentioned that," with the help of AHP, we can combine evaluation on tangible quantitative criteria and intangible qualitative criteria." [5] Ananda and Herath (2003) observed that" the process of the AHP methodology is transparent, any particular pairwise comparison and priority have a readily apparent influence on the final decision. In using AHP methodology, we can enhance credibility and minimize ambiguity." [6] Theresa Mau-Crimmins and J.E. de Steiguer (2003) listed 5 advantages of the AHP as a decision-making tool:" (1) AHP is a well-organized quantitative process and decision-making process which can be easily understood, replicated and documented. (2) AHP methodology utilizes both quantitative and qualitative data. (3) AHP methodology is applicable to decision-making situations involving multi-hierarchies, multi-criteria and subjective evaluation. (4) AHP methodology provides the possibilities in group decision-making. (5) AHP methodology offers a consistency index to measure the consistency of preference and the illogicality of decision makers' judgments."[7]

Furthermore, Forgionne et al (2002) argued that" as a decision-making system, AHP can accommodate the simulations and modifications of the model through sensitivity analysis without difficulty."[8]

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[3] Saaty, T.L., (2001): *Decision making for leader, new edition.* RWS Publications: Pittsburgh, PA.

[4] Rangone, A. (1996): An analytical hierarchy process framework for comparing the overall performance of manufacturing departments. *International Journal of Operations & Production Management* 16: 104-119

[5] Badri, M. A. (2001). A combined AHP-GP model for quality control systems. *International Journal of Production Economics*, 72, 27 – 40.

[6] Ananda, J., Herath, G., (2003). The use of Analytic Hierarchy Process to incorporate stakeholder preferences into regional forest planning. Forest Policy and Economics 5, 13– 26.

[7] Theresa Mau-Crimmins and J.E. de Steiguer (2003). AHP as a means for improving public participation: a pre–post experiment with university students. *Forest Policy and Economics* 7: 501-514

[8] Forgionne, GA, Kohlib, R and Jennings, D. (2002): An AHP analysis of quality in AI and DSS Journals. *Omega* 30: 171-183

Therefore, the AHP methodology is widely used in decision-making situations in a wide variety of fields such as business, industry, government, education and healthcare all over the world.

For example, Kangas (1994) employed the AHP methodology to evaluate the strategy of woods planning in his country. In this article, Kangas (1994) observed that" people's capability to employ the AHP methodology to express his or her own opinions mainly lie on how well the decision-making problem was decomposed as pairwise comparisons. And the process of AHP methodology can help people to understand the whole decision-making problem better."[9]

In International Transportation and Logistics field, a lot of scholars also utilize AHP to solve decision-making problems. For example, Shrestha and Yedla (2003) [10]used AHP methodology to choose the most environment-friendly transportation mode in their country; Lirn et al (2003) [11]and Tzeng and Wang (1994) [12]utilized AHP methodology to research and analyze Taiwan airline industry's job attractiveness. Liang and Chou (2001) [13]utilized AHP methodology to evaluate and analyze shipping companies' performance.

The success of the AHP in researching and solving International Transportation and Logistics decision-making problems let me made the decision to use AHP methodology to evaluate and show the criteria used for ship financing mode selection in this dissertation.

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[9] Kangas, J., (1994). An approach to public participation in strategic forest management planning. Forest Ecology Management 70, 75– 88.

[10] Yedla, S and Shrestha, RM. (2003): Multi-criteria approach for the selection of alternative options for environmentally sustainable transport system in Delhi. *Transportation Research Part A: Policy and Practice* 37: 717-729

[11] Lirn, TC. (2003): The job attractiveness of airlines to students in Taiwan: An AHP approach. *Journal of the Eastern Asia Society for Transportation Studies* 5:556-571

[12] Tzeng, GH and Wang RT. (1994): Application of AHP and Fuzzy MADM to the evaluation of a bus system's performance in Taipei City. Third International Symposium on the Analytical Hierarchy Process, George Washington University, Washington, DC, 11-13 July 1994.

[13] Chou, TY and Liang, GS. (2001): Application of a fuzzy multi-criteria decision-making model for shipping company performance evaluation. *Maritime Policy and Management* 28: 375-392.

2.2 Actuality analysis of Chinese ship financing industry

I) Analysis of Chinese ship financing channels

Chinese Shipbuilding financing industry mainly depends on the loan, which can be divided into two patterns: seller financing (shipbuilding corporation loan) and buyer financing (shipowner loan). But as the market economy structural reform intensified, ship financing industry's development has been diversified gradually. At present, the domestic ship financing modes are as follows:

i) Government loan

Chinese government provides favourable policy (such as interest subsidies, accelerated depreciation, credit guarantees and deferred payment), using the forms of buyer credit or seller credit to encourage the policy-oriented banks to offer the shipowners a long-term concessional loans with below-market interest rates.

ii) Commercial bank loan

This is currently the most common way in Chinese ship financing industry. Industrial and Commercial Bank of China (ICBC) is Chinese largest commercial banks in ship financing industry. In 2004 and 2005 alone, ICBC arranged accumulatively 83 vessels, more than 13 billion Yuan of various types of ship financing business, involving in mortgage loans, financing leases and other modes which cover the main types of the vessels. ICBC's head office uniformly accepts and carries out its ship financing project, the business mainly included shipbuilding, purchasing, leasing, maintenance services and the various types of support documents such as guarantees, letters of credit. Nowadays, ICBC has formed six major product systems, namely, common

loan, financing lease, lease guarantees, financing and guarantees of shipbuilding, export credit institution supporting financing and financial services, and more than 20 business types.

iii) Other ship financing approach

Other domestic ship financing approaches include securities financing, shipyards credit, private financing and joint venture financing.

II) The challenge of Chinese ship financing system

The Government's policy orientation and the characteristics of ship financing industry, such as capital-intensive, highly technical, long return period and high risk, result in the difficulties of Chinese ship financing industry which are reflected in three aspects:

i) Through the Chinese shipbuilding industry's capital structure, we can see that it is relatively easier for the state-supported large shipping companies to obtain loans than other enterprises. But it also leaded to two outstanding problems: single source of funding for shipbuilding enterprises and financing modes limited.

ii) Financial institutions in China are not professional enough and they don't closely cooperate with relevant ship professional institutions. So, it is difficult for them to prevent the technical risks, marketing risks and finance risks in ship financing project. Chinese financial institutions are currently low level of professionalism and they seldom collaborate with ship brokers, classification societies and other professional institutions. Therefore, when carrying out financing operation, they can only evaluate it based on general business rules instead of taking the characteristics of shipbuilding industry into consideration for their credit assessment process.

iii) Lack of capital-abundant ship financing leasing company as the main body

funding for the shipbuilding industry to absorb a lot of capital. At present, Chinese tax system restricts the development of domestic ship financing leasing company. Therefore, the capital-abundant economic entity which specializes in ship financing leasing business can't be formed in China currently.

Domestic financing channels are limited; the amount of loans is relatively small. Domestic shipping companies were forced to finance and purchase vessels abroad, which results in the cruel fact that China exports and imports a large number of vessels simultaneously.

From the analysis above, we can draw the conclusion that currently, Chinese shipping industry, a majority of which are state-owned corporation, are mainly financing through the channels of commercial banks and policy-oriented banks. The blemishes of this financing system are as follows: the using of the funds is still under the intervention and control of Chinese government; single source of funding for shipbuilding enterprises; financing modes limited; low solvency; unprofessional financial institutions; unable to prevent the technical risks, marketing risks and finance risks in ship financing project; lack of capital- abundant ship financing leasing company.

2.3 Typical ship financing mode

2.3.1 Commercial bank loan

In the new ship construction, many shipowners prefer this financing mode. From the history, we can find that there are two criteria for the commercial banks loan to the shipping companies:

(I) Asset value

Using this criterion, the bank will sell the asset by the end of investment period, to ensure the disinvestment of principal and interest. For example, investing in a ship, the bank doesn't care its business status. They only hope to sell the vessel after the expiry of its service period, compensating for the principal and interest by the residual value of the vessel. The commercial loans in shipping industry in 1970s just reflected this consideration of the banks. However, after 1980s, with the sharp fall in asset values in the ship and the inflation, the residual value of the vessel can't compensate for bank's capital cost. Therefore, the commercial loans with "asset value" standard are considered as speculative activities.

(II) Cash flow

Whether the shipowner can make profit or not will be a criterion in bank's decision-making. If ship owner's business status is in good condition, cash flow is positive, the bank can recover the principal and interest. Cash flow standard pay more attention to shipping companies' operating income and management performance, eliminating speculative investment. Therefore, it is more practical and safer for the banks to take cash flow for the first considerations in their decision-making.

Generally speaking, before the banks provide credit to the shipowner, they must gain a certain degree of sponsion. In most cases, the sponsion is a ship mortgage. If this ship has already been rent out by time charter, the bank will ask the shipping company to transfer the time charter contract to him. In this case, the bank will receive the assurances that the ship's operating income will firstly be used to repay the loan. Furthermore, the bank will generally ask the shipping company to transfer the ship insurance to him in order to get the appropriate compensation as the assignee of the insurance when this vessel suffer from a total loss or partial loss. In addition, ship owner's parent company or partner can also provide guarantees.

2.3.2 Ship financing leasing

The lessee selects the ship and the seller, or selects the shipyard and ship construction technology standards. The lessor (leasing companies) will sign a financing leasing contract with the lessee and a ship purchase contract with the seller or shipyard respectively. The lessor leases the vessel to the lessee. The lessee pays the hire and obtains the ownership of the vessel ultimately. Its main purpose is to help the shipping companies to solve the problems of the urgent need for ship capacity and lack of funds. This financing mode separates the ownership and the usufruct of the vessel in a long term. The ownership of the vessel belongs to the lessor while the usufruct of the vessel belongs to the lessee.

The traditional mode of ship financing is" purchase ship by loan and repay the loan by operating income". Ship financing leasing is a breakthrough of this single and traditional mode of ship financing and is widely used abroad. It is also a useful way to spread the risk of the shipping industry.

In recent years, the "UK Tax Lease" and the "German KG" (the abbreviation of German word" Kornmanditgesellschaft") are two popular modes of ship financing leasing.

The operating procedures of these two ship financing leasing modes are as follows:

(I) UK Tax Lease

"UK Tax Lease" utilizes the tax relief provisions in UK Tax Law to reduce the financing costs, whose operating procedures are as follows:

The lessor (must be a British company) purchases the vessel and leases it to the lessee (also must be a British company). The lessee pays the hire to the lessor. According to the UK Tax Law, the vessel could be depreciated as per 25% of the book value in

previous year. In the early years, the hire must be lower than the depreciation. The loss on the lessors' accounts can offset part of their profits to reduce taxes. The lessors return this part of income to the lessees, which can also reduce the cost of financing for the latter. Compared with the Tax Lease in other countries, the "UK Tax Lease" enjoys the largest income (deduct other costs, the net profit could reach 6% to 8% of the price of the vessel after 25 years). But it also holds a demanding, complex, costly feature.

(II) German KG mode

Since 1969, Germany began to implement KG ship financing mode. This is a tax-favourable measure which encourages the investors, especially individual investors, to invest in shipbuilding industry.

This German financing mode allows the shipping company to develop their business with 100% financing proportion without any effect on the balance sheet. It runs the vessel by time charter to meet the shipping companies' requirements on the lease, the choice of the year and even the final purchase option of the vessel. The flow chart below shows the operating procedures of German KG mode:

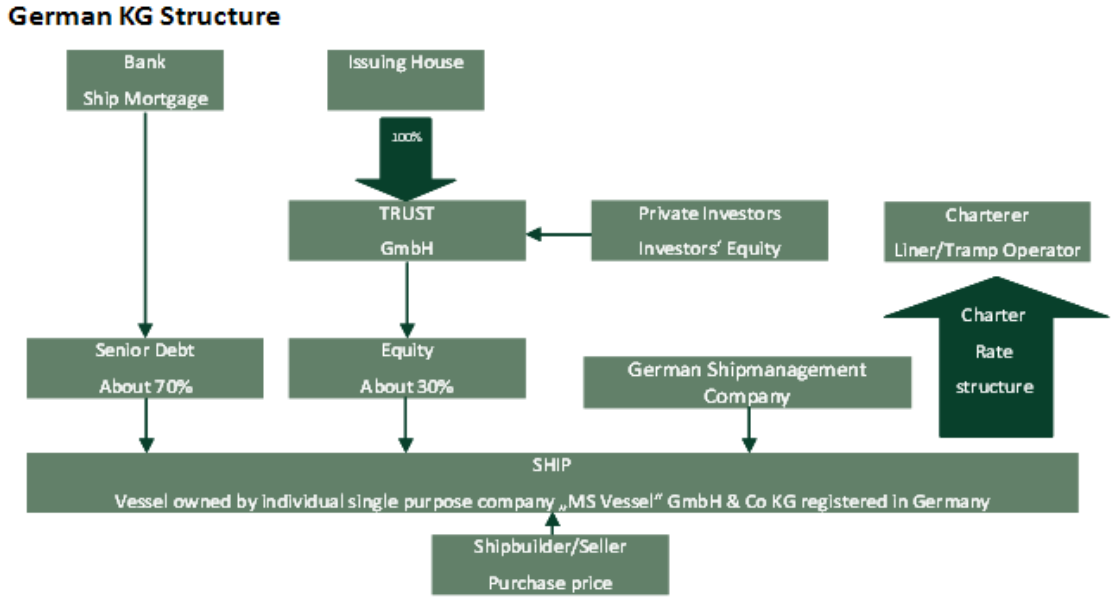

Figure 2-1 the operating procedures of German KG mode

Source: HCI Capital, Marine Money

KG is a private limited partnership, a kind of community organizations. Individuals (typically high-income individuals such as managers, entrepreneurs, lawyers) join in it voluntarily. They share part of the funds (at least 15,000 Euros) without recovery obligations. In addition, everyone has a partner. This partner is a limited liability company (equivalent to a general partner).

KG Company uses collected net assets to buy the ships. The net assets provided by the investors normally account for 35%-50% of the total contract value. The balance of funds maintained by a bank loan, which usually rely on the company's credit standing.

After acquires the vessel successfully, KG Company will rent out the vessel to the lessee by time charter (usually the lessee and the seller are the same company). The lessee will pay the hire to the KG Company. The period of the time charter party varies according to ship type. For example, the term of a container ship is generally no more than five years while the term of a large LNG vessel is sometimes more than

10 years. The operation and management of the vessel generally entrusted to the ship management company.

The precondition of carrying out KG financing mode is that the management of shipping company (technical management and business administration) must be based in Germany. But foreign companies can run KG financing mode with a certain range of subcontract. And the vessel should be rent out by time charter instead of bareboat charter. With the specific term, the KG vessel's long-term lessee can hold a certain range of priority (for example, a priority of crew the time charter vessel).

Under the KG financing mode, the benefits obtained by the seller (namely previous shipowner) are as follows:

(1) Obtain 100% financing
(2) Fix the interest by time charter party
(3) No need to adjust the capital cost according to the fluctuation of the market price of the vessel.
(4) Except the time charter party, no other additional terms
(5) No risk of residual value
(6) Enhance the liquidity of the assets
(7) Reduce the bank debt (to enhance debt capacity) and invest in the areas of higher potential income.

2.3.3 Issue bond

Bonds are similar to loans. But the bond interest rate is higher than the deposit interest rate. And the risks of bonds in the portfolio are small. So it is often accepted by the investors easily. The existing international bonds can be broadly divided into foreign bonds and Eurobonds. Issuing foreign bonds shall be subject to not only the approval of the host Government but also the jurisdiction of the financial laws in that country. At present, foreign bonds are mainly issued in the United States and Japan while

Eurobonds are generally issued in two or more countries' overseas market simultaneously. And Eurobonds aren't subject to the jurisdiction of the financial laws in each country. Compared with other types of bonds, a bond called "convertible bond" is the most attractive one. This bond can be converted into company stock after expiration.

2.3.4 Issue stock

In the early 1980s, the shipping companies seldom raised money in the stock market. However, since the mid-1980s, more and more shipping companies raised money in the stock market in the United States, Norway, Singapore and Hong Kong. For example, the shipping companies in the United States raised 100 million U.S. dollars in the American Stock Exchange in 1987. As Chinese economic system reform and the establishment of the stock market, the domestic shipping companies have one more place for raising capital. Apart from raising funds abroad, the domestic shipping companies can also raise RMB funds in the domestic stock market.

Generally speaking, it is very difficult for the shipping companies to raise funds in the open stock market. The shipping industry is less attractive to the investors in the open stock market since its characteristics of high risky, strong cyclical and long payback period.

Chapter 3 Ship financing motivation for COSCO

3.1 Introduction

Previous chapter, "Literature Review", mainly introduced four typical ship financing modes and actuality analysis of Chinese ship financing industry.

This chapter will introduce the COSCO Group and analyze the ship financing motivation for COSCO Group.

3.2 COSCO Group Introduction

"As one of the major multinational enterprises in the world, China Ocean Shipping (Group) Company (COSCO) is China's largest and the world's leading Group specializing in global shipping, modern logistics and ship building and repairing.

COSCO owns or operates a fleet of more than 800 modern merchant vessels with a total capacity of over 50 million DWT and an annual shipping volume of over 400 million tons, covering over 1,500 ports in 160 countries and territories across the globe, ranking China's first and world's second in general. In specific, the containers fleet ranks No.1 in China and No.6 in the world; the dry bulk fleet ranks the top in the world. The general cargo and specialized fleet such as heavy lifts is among the top ones in the world; the oil tanker fleet boasts some 300,000-dwt VLCCs and ranks the first in China. Hundreds of Group members home and abroad have been networking globally in ocean shipping businesses and logistics services, with its headquarters in Beijing while radiating towards Hong Kong, Japan, Singapore, the US, Europe, Australia, Korea, South Africa and the West Asian regions, holding more than 1000 business entities in over 50 countries and territories around the world.

Since 2004, the COSCO has created an annual return of over 10 billion RMB, being one of the 10 most profitable central companies in China. With its US$ 15.4135 billion (122.8825 billion RMB) in annual revenue, COSCO was successfully listed as the 488th of Fortune Global 500 in 2006; in 2007, COSCO secured the 405th of the list with its US$ 20.84 billion (158.5135 billion RMB)"[14].

Since COSCO already have such a large fleet and very good operating income, why will they still choose ship financing at the moment?

[14] COSCO's official website Retrieved June 15, 2010 from http://www.cosco.com/en/about/index.jsp?leftnav=/1/1

As far as I'm concerned, there are three motivations:

3.3 Global economy recovery

In the Qingdao International Shipping (China) annual meeting (2009), the experts in International shipping industry generally believed that the recovery of the shipping industry mainly depends on the recovery in world economy and trade.

The International Monetary Fund (IMF) claimed on April 21, 2010 that the pace of world economic recovery faster than expected, economic activity rebounded with different degree all over the world. The recovery processes in developed countries are more moderate, but in most emerging markets and developing countries, the recovery process is progressing steadily. Meanwhile, in the IMF recently issued "World Economic Outlook report", the organization raised its global economic forecast from 3.9% in January to 4.2%. Furthermore, on the World Economic Forum in Davos 2010, a number of leaders announced that the global economy will recover slowly. A lot of senior experts in International shipping industry also proclaimed that International shipping market will resuscitate gradually in 2 or 3 years. The value of the vessels will be stabilized. Capacity requirements will be increased to some extent which will undoubtedly accelerate the pace of recovery in the international shipping market and become one of the motivations for COSCO to choose ship financing at the moment.

3.4 Shipping Market recovery

As per Rodricks Wong, a famous financial analyst, the shipping market cycle can be described as the flow chart below:

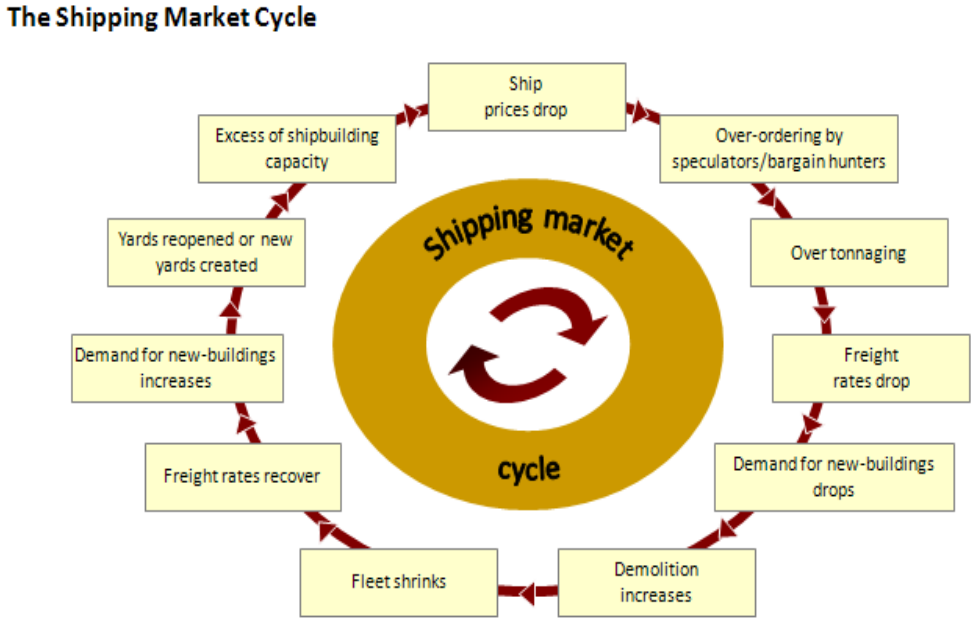

Figure 3-1 Shipping Market Cycle

Source: DVB

As the freight rates dropped, the demand for new-building ships also declined while the demolition of the old vessels increased, which result in the shrink of the fleet. With the lack of shipping capacity, the freight rates recovered.

Once the freight rates recovered, the demand for new-building ships increased. And then, a lot of ship-yards reopened or some new ship-yards created, which leads to the excess of shipbuilding capacity. At last, Ship prices dropped inevitably.

Another famous expert, Martin Stopford, analyzed the length of shipping cycles over the period 1869-1995. According to his research[15], "there were twelve cycles during that period, averaging 7.2 years each. Four cycles lasted only 5-6 years from peak to peak, two lasted 8 years, and six lasted 9 years or more. Each cycle developed within a framework of supply and demand, so common features such as business cycles and over-ordering of ships crop up again and again. As a rule supply has no difficulty keeping up with demand, so the big freight "booms" are often the result of unexpected

[15]Martin Stopford. (1997): Maritime Economics. Publications: Abingdon, RN.

events, such as the closing of the Suez Canal, stockpiling or congestion. Recessions tend to be driven by economic shocks which cause an unexpected decline in trade (as in 1930, 1958, 1973, 1982 and 2008)."

As we all known, the latest booming in International shipping market began from the second half of 2002. According to Martin Stopford's "shipping cycle theory", shipping market is expected to begin to recover within 1 or 2 years. At that time, Capacity requirements will be increased to some extent and become one of the motivations for COSCO to choose ship financing at the moment.

3.5 Relatively large age structure of COSCO's general cargo vessel fleet

As far as I'm concerned, the third motivation for COSCO to choose ship financing at the moment is: relatively large age structure of COSCO's general cargo vessel fleet.

Take COSCO's General Cargo Vessel as example:

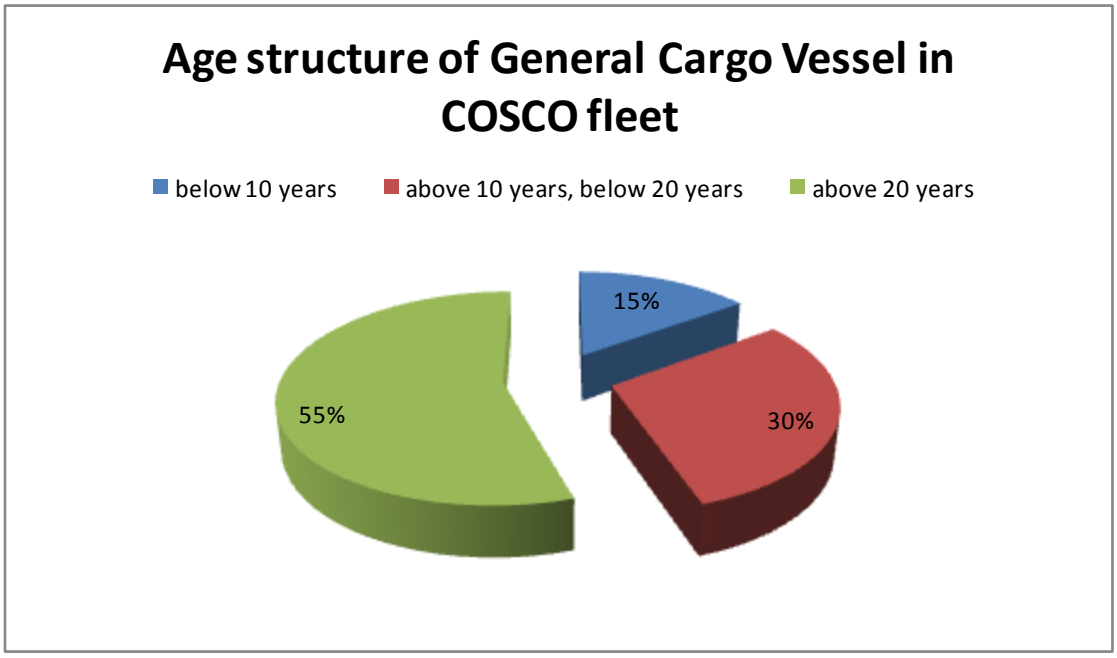

Figure 3-2 Age structure of General Cargo Vessel in COSCO fleet
Source: http://www.cosco.com/en/fleet/BoatList.jsp?parCatName=General%20Cargo

From COSCO's official website, we can learn that COSCO has 80 general cargo vessels currently. Thereinto, 68 ships' ages are more than 10 years, accounting for 85% of the total general cargo vessel fleet in COSCO. In other words, less than one-fifth of the general cargo vessels in COSCO fleet are new vessels whose ages are less than 10 years old. Furthermore, 44 ships' ages are more than 20 years, accounting for 55% of the total general cargo vessel fleet in COSCO.

From the analysis above, we can learn that in COSCO's general cargo vessel fleet, more than half of the vessels are old ships whose ages are more than 20 years. The engineer equipments of these old vessels are obsolete. Their fuel consumption is huge and need frequent maintenance. It not only increased the vessels' operating costs, but also caused great harm to the environment.

Therefore, the age structure of COSCO fleet is relatively large. COSCO should seize the current opportunity (the drop of vessels' price caused by financial crisis), accelerating the pace of the ship updates, eliminating old vessels, achieving structural adjustment, and establish a modern, energy saving and environmental-friendly fleet. At the same time, COSCO should actively respond to international carbon emissions reduction activity and develop their "green shipping".

Summary

From the introduction of COSCO Group, we can learn that "COSCO is China's largest and the world's leading Group specializing in global shipping, modern logistics and ship building and repairing. COSCO owns or operates a fleet of more than 800 modern merchant vessels with a total capacity of over 50 million DWT and an annual shipping volume of over 400 million tons, covering over 1,500 ports in 160 countries and territories across the globe, ranking China's first and world's second in general.

With its US$ 15.4135 billion (122.8825 billion RMB) in annual revenue, COSCO was successfully listed as the 488th of Fortune Global 500 in 2006; in 2007, COSCO secured the 405th of the list with its US$ 20.84 billion (158.5135 billion RMB).”
Although COSCO already have such a large fleet and very good operating income, considered global economy recovery; Shipping Market recovery and relatively large age structure of COSCO’s general cargo vessel fleet, COSCO should seize the current opportunity (the drop of vessels’ price caused by financial crisis), accelerating the pace of the ship updates, eliminating old vessels, achieving structural adjustment, and establish a modern, energy saving and environmental-friendly fleet. At the same time, COSCO should actively respond to international carbon emissions reduction activity and develop their "green shipping”.

Chapter 4 Methodology of ship financing mode selection for COSCO’s general cargo vessel

4.1 Introduction

The previous Chapter mainly introduced the COSCO Group and analyzed three ship financing motivations for COSCO Group: (1) Global economy recovery; (2) Shipping Market recovery; (3) Relatively large age structure of COSCO’s general cargo vessel fleet.
In this Chapter, the author will apply AHP methodology and establish a “ship financing mode selection evaluation indicators system”, and will through experts’ opinion surveys and consistency index inspection to determine the weight of each indicator.

4.2 Model applicability of AHP in ship financing mode selection

My dissertation will use AHP (Analytic Hierarchy Process) to evaluate and show the

criteria used for ship financing mode selection.

Professor Thomas L. Saaty was the first person who developed the AHP technique as a multiple criteria decision-making methodology to deal with complex decision-making problem in 1977. "With the help of AHP, we can incorporate evaluation and judgments on tangible quantitative criteria alongside intangible qualitative criteria. Badri (2001)[5] The characteristic of this method is to carve up the various factors of the complex problems into orderly and businesslike hierarchy. According to the subjective judgments (mainly a pairwise comparison), the decision-maker will combine the experts' opinion and analysts' objective assessment. After quantitative describing the importance of the pairwise comparison of factors in each hierarchy, the decision-maker will make use of mathematical method to calculate and reflect the relative importance of the factors in each hierarchy and sort the relative weights of all the elements."

Applicable scope of AHP:

According to Rangone (1996)[4], "AHP as a flexible methodology can be used to solve any hierarchy of decision-making problems." When the decision-making problem is influenced by several factors which can be decomposed into some more easily and comprehended hierarchies or can be classified into several different categories, and at the same time, the influence degree of each indicator to the final evaluation can't be quantitatively calculated by sufficient data, we may choose AHP methodology.

Precondition of applying AHP methodology:

When applying AHP methodology, it has to satisfy a few preconditions as follows:

(1) The factors of each hierarchy must be already known, and their logical structure should be clear.

(2) The relationship of the factors in the same hierarchy is equal, mutually independent and no significant relativity among them.
(3) The indicators in the bottom of the hierarchy can be quantitative and be measured by some way.
(4) The relationship between the factors in different hierarchy needed to be clear.

I decided to use AHP methodology to evaluate and show the criteria used for ship financing mode selection in this dissertation for two reasons:

(1) The success of the AHP in researching and solving International Transportation and Logistics decision-making problems
(2) The ship financing mode selection problem in this dissertation meet all the requirements of AHP methodology and all the preconditions above.

The detailed calculation procedure of AHP:

(1) "In the first step, the decision-making problem should be decomposed into several more easily and comprehended hierarchies in order to analyze them independently. The decision maker should arrange the objective, criteria and alternatives in a hierarchical structure just like a family tree. This hierarchical structure should has four levels: overall objective of the problem at the top; the criteria; the sub-criteria and the alternatives at the bottom."(Albayrak & Erensal, 2004)[16]

(2) The second step is pairwise comparison of the criteria; sub-criteria and the alternatives.

"Once the decision-making problem is decomposed into several hierarchies, prioritization procedure should be implemented to compare the relative importance of the each criteria and sub-criteria. This procedure starts from the second level of the

[16] Albayrak, E., & Erensal, Y. C. (2004). Using analytic hierarchy process (AHP) to improve human performance. An application of multiple criteria decision making problem. *Journal of Intelligent Manufacturing*, 15, 491 – 503.

hierarchy (criteria) to the lowest level (decision alternatives)"(Albayrak & Erensal, 2004)[16]

Saaty set down a five rank scale with numerical values of 1(Equally important), 3(Moderately more important), 5(Strongly more important), 7(Very strongly more important), 9(Extremely more important), while 2,4,6,8, as intermediary even values, are sometimes used to refine the pairwise comparison.

Let $U= \{U_i | i=1,2,\ldots, n\}$ be the set of criteria. Pairwise comparison's result on the n criteria can be summarized in an (n x n) evaluation matrix. Each element a_{ij} (i,j =1,2,…, n) in this evaluation matrix is the quotient of the weights of the criteria. And $a_{ii}=1, a_{ji}=1/a_{ij}$

In the third step, we will use mathematical process to unitary normalization and decide the relative weight for each range-pairwise comparison matrix. In this step, we will calculate the right eigenvector (ω) and the largest eigenvalue (λ_{max}) of the matrix. The relative weights are decided by ω corresponding to $\lambda_{max,}$ as

$$A_\omega=\lambda_{max}\omega \qquad (4\text{-}1)$$

The last step is consistency index inspection. As per Saaty (2000)[2], "this index tests the transitivity of decision makers' judgment and preference. For instance, if a decision maker prefer A to B, and B to C, then does he or she prefer A to C in consistent? This AHP consistency index gives us a useful way to check."

"If the pairwise comparisons are completely consistent, the matrix A has rank 1 and λ_{max}= n. Under this situation, we can normalize the columns or the rows of the matrix to obtain the relative weights." (Wang and Yang, 2007)[17].

The consistency of the pairwise comparison judgments plays an important role in the

[17] Wang, J. J., & Yang, D. L. (2007). Using a hybrid multi-criteria decision aid method for information systems outsourcing. *Computers & Operation Research*, 34, 3691 – 3700.

quality of the output of AHP methodology. The consistency index is defined by the relationship between the entries of the range-pairwise comparison matrix

The consistency index (CI) is: $CI = \frac{\lambda max - n}{n-1}$ (4-2)

The final consistency ratio (CR) is calculated as the consistency index (CI) divided by the random index (RI): $CR = CI/RI$ (4-3)

The numerical values of the random index (RI) are as follows:

N	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

This step can not only be used to assess the consistency of the decision-makers but also the consistency of the whole hierarchy.

"If the consistency ratio (CR) is less than 0.1, the consistency of the evaluation procedure is acceptable. But if CR is larger than 0.1, we should adjust and repeat the whole procedure to improve the consistency." (Wang and Yang, 2007)[17]

4.3 Establish evaluation indicators system

As mentioned previously, the shipping industry is a capital-intensive and risky service industry. The investment of the vessel is the first and the most important activity of all the shipping company. The financing decision-making will directly affect their operating efficiency. Faced to various financing alternatives, we should establish a reasonable evaluation indicators system:

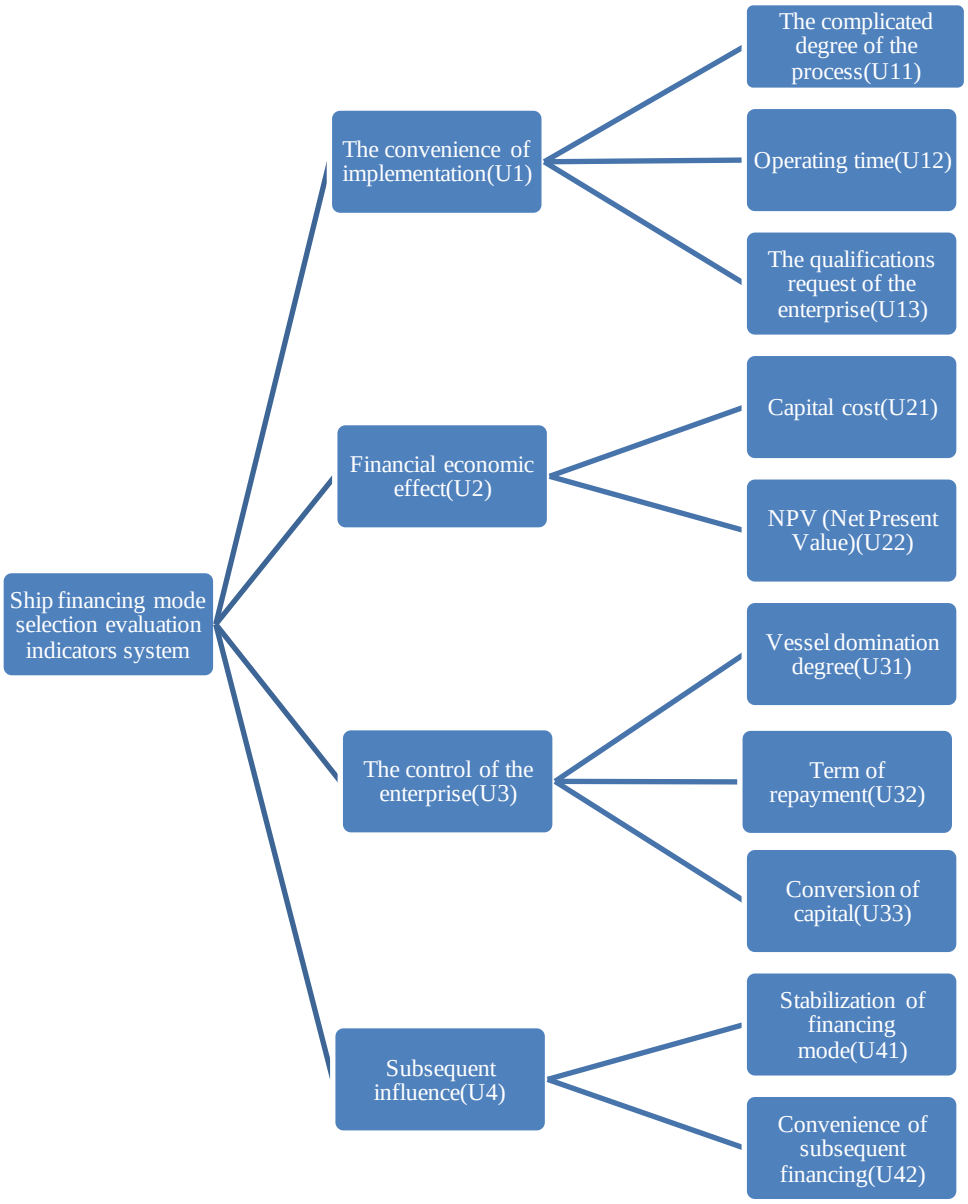

Figure 4-1 Figure of Ship financing mode selection evaluation indicators system

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

The figure above is my established ship financing mode selection evaluation indicators system.

Explanation as follows:

The first level is the final ship financing mode selection evaluation indicators. The bigger the numerical value, the better ship financing mode it is.

This evaluation indicator consists of four criterions in the second level, namely, the convenience of implementation; financial economic effect; the control of the enterprise; subsequent influence. And they have their sub-criterions in the third level respectively.

4.4 Choose evaluation indicators

The convenience of implementation

Whether it is easy or difficult for the shipping company to implement the financing activity under the selected mode? The bigger the numerical value of this indicator, the easier for the shipping company to implement the ship financing operation procedure. Three sub-criterions are explained as follows:

(1) The complicated degree of the process

The different ship financing mode has different operating procedure. Some operating procedure may need the government's approbation and approval.

(2) Operating time

Operating time means runtime of the financing activity which include the readiness time and the time needed for implement the whole financing process.

(3) The qualifications request of the enterprise

The different ship financing mode has different qualifications request of the shipping company. For example, the domestic enterprises have to meet the corresponding qualifications before they start to establish joint-stock company to issue stock. The enterprises who want to issue bond also have to meet the corresponding rating system.

Financial economic effect

The economic indicators for each ship financing mode. The bigger the numerical value of this indicator, the better economic effect the financing mode will bring. It has two sub-criterions: capital cost and NPV (Net Present Value), both of which can be expressed by detailed numerical value.

Two sub-criterions are explained as follows:

(1) Capital cost

The capital cost of the financing activity, including financing costs, interest, dividend, etc. In practice, choosing different ship financing mode will result in different capital cost.

(2) NPV (Net Present Value)

The net cash flows arising over time cannot be summed to calculate the return an investment will earn. This is because money has a time value.

A sum of money held now usually worth more than an equal and certain sum to be paid in the future date because there is an opportunity to invest the money and obtain a return at the same time.

The Net Present Value (NPV) of an investment is the sum of all net cash flows discounted by a specified discount rate. The bigger the numerical value of NPV, the better the investment it is.

The control of the enterprise

After ship financing activity, whether the shipping companies can wholly control the vessels and the funds they raised. This indicator is the bigger the better. Sub-criterions

include:

(1) Vessel domination degree: Whether the shipping company can dominate the vessel freely. The numerical value is the bigger the better.

(2) Term of repayment: The longer the better.

(3) Conversion of capital: For example, Stock can be traded on the secondary market. The numerical value of this sub-criterion is the bigger the better.

Subsequent influence

To the shipping companies, ship financing is not a one-off activity, with the development of the enterprises, this activity will be repeated for several times. Therefore, it should be considered that whether the ship financing mode be selected this time will have some impact on next time.

This indicator is the bigger the better. Sub-criterions include:

(1) Stabilization of financing mode:
Whether the ship financing mode be selected this time matches former financing consuetude. What is the relationship between the ship financing mode be selected this time and former financial structure of the company.

(2) Convenience of subsequent financing:
Whether the ship financing mode be selected this time will have some impact on subsequent financial administrative operation?

4.5 The weights of the indicators and consistency index inspection

In my evaluation indicators system, it is obviously that the importance of each indicator to the final evaluation result is different. So we should use Saaty's five rank scales to fix the weights of the indicators first.

So I invited four experts to pairwise compare the criteria and sub-criteria in my evaluation indicators system to obtain the range-pairwise comparison matrix. And then, I will use mathematical process to unitary normalize the matrix and obtain the right eigenvector (ω) and the largest eigenvalue(λ_{max}) of the matrix. After consistency index inspection, I fixed the weight of each indicator:

The details of the process above are as follows:

(I) Fix the range-pairwise comparison matrix

I invited four experts in the shipping and financial industry to pairwise compare the criteria and sub-criteria of my evaluation indicators system and obtain the range-pairwise comparison matrix as follows (Original experts' consultation sheets and their grading record are in the appendix):

$$\begin{bmatrix} A & U1 & U2 & U3 & U4 \\ U1 & 1 & 1/5 & 3 & 5 \\ U2 & 5 & 1 & 6 & 8 \\ U3 & 1/3 & 1/6 & 1 & 3 \\ U4 & 1/5 & 1/8 & 1/3 & 1 \end{bmatrix}$$

(II) Fix the weights of the criteria

Since the limitation of the length, I will only introduce the calculation process of the weights of four criteria. The process of the weights of ten sub-criteria will be omitted.

(i) Unitary normalize the range-pairwise comparison matrix and obtain the matrix below:

$$\begin{bmatrix} 0.1531 & 0.1341 & 0.2903 & 0.2941 \\ 0.7653 & 0.6704 & 0.5806 & 0.4706 \\ 0.0510 & 0.1117 & 0.0968 & 0.1765 \\ 0.0306 & 0.0838 & 0.0323 & 0.0588 \end{bmatrix}$$

(ii) Sum the matrix above by rows and obtain the column vector: $\begin{bmatrix} 0.8716 \\ 2.4869 \\ 0.4360 \\ 0.2055 \end{bmatrix}$

(iii) Unitary normalize the column vector in (ii) and obtain the column vector: $\begin{bmatrix} 0.2179 \\ 0.6217 \\ 0.1090 \\ 0.0514 \end{bmatrix}$

(III) Consistency index inspection:

$$\begin{bmatrix} 1 & 1/5 & 3 & 5 \\ 5 & 1 & 6 & 8 \\ 1/3 & 1/6 & 1 & 3 \\ 1/5 & 1/8 & 1/3 & 1 \end{bmatrix} \begin{bmatrix} 0.2179 \\ 0.6217 \\ 0.1090 \\ 0.0514 \end{bmatrix} = \begin{bmatrix} 0.9262 \\ 2.7764 \\ 0.4395 \\ 0.2090 \end{bmatrix}$$

$\lambda_{max}=\frac{1}{4}(\frac{0.9262}{0.2179}+\frac{2.7764}{0.6217}+\frac{0.4395}{0.1090}+\frac{0.2090}{0.0514})=4.2037$

CI= $\frac{\lambda max-n}{n-1}=\frac{4.2037-4}{4-1}$=0.0679

CR=$\frac{CI}{RI}=\frac{0.0679}{0.90}=0.0754<0.10$

The consistency ratio (CR) is less than 0.1, so the consistency of the evaluation procedure is acceptable.

Therefore, A=$[0.2179 \quad 0.6217 \quad 0.1090 \quad 0.0514]$;

Repeat the calculation procedure above for sub-criteria, we can obtain that:

$A_1=[1/3 \quad 1/3 \quad 1/3]$
$A_2=[1/2 \quad 1/2]$
$A_3=[0.0623 \quad 0.7013 \quad 0.2364]$
$A_4=[1/9 \quad 8/9]$

Summary

In this Chapter, the author firstly analyzed model applicability of AHP in ship

financing mode selection. And then, the author applied AHP methodology and established a “ship financing mode selection evaluation indicators system”. This system consists of four criterions in the second level, namely, the convenience of implementation; financial economic effect; the control of the enterprise; subsequent influence. And they have their sub-criterions in the third level respectively. At last, through experts’ opinion surveys and consistency index inspection, the author determined the weight of each indicator.

Chapter 5 Selected ship financing mode for COSCO’s general cargo vessel

5.1 Introduction

In previous Chapter, the author analyzed model applicability of AHP in ship financing mode selection and applied AHP methodology and established a “ship financing mode selection evaluation indicators system”. At last, through experts’ opinion surveys and consistency index inspection, the author determined the weight of each indicator.
In this Chapter, the author will use weighted arithmetic mean method to deal with the views of the experts and through the calculation of each indicator to select the most suitable ship financing mode of COSCO’s general cargo vessel in the current shipping market conditions.

5.2 Model calculation and application for COSCO Group

Considered three ship financing motivations, COSCO decided to seize the current opportunity (the drop of vessels’ price caused by financial crisis) to buy some new general cargo vessels. Now, the problem faced by COSCO is to choose which ship financing mode to purchase the vessels.
After a preliminary filtration, a few alternatives are as follows:

A. Using retained earnings to buy the vessel
B. Applying Commercial bank loan to buy the vessel
C. Ship financing leasing
D. Issuing Eurobond through an Investment bank
E. Issuing new ordinary shares through its joint-stock company

COSCO decided to invite 5 experts who are familiar with ship financing in relevant universities and corporations to apply above "ship financing mode selection evaluation indicators system" to help the company to select the most suitable ship financing mode.

5.2.1 Calculation of key indicators

The following details are about the specific calculation of key indicators and background information:

(I) Financial economic effect

The economic indicators for each ship financing mode. The bigger the numerical value of this indicator, the better economic effect the financing mode will bring. It has two sub-criterions: capital cost and NPV (Net Present Value), both of which can be expressed by detailed numerical value.

(i) The detailed calculation method of capital cost

(a) The calculation of debt financing costs

The alternatives which belong to debt financing are: B. Applying Commercial bank loan to buy the vessel & D. Issuing Eurobond through an Investment bank. Through

this kind of financing mode to obtain capital, we can calculate its financing costs by the formula below:

$$Kc=\frac{I(1-T)}{Pc\,(1-fc)} \qquad (5\text{-}1)$$

Where:

Kc Debt financing costs

I Actual annual interest

T Corporate income tax rate

Pc Funding amount

fc Financing expenditure ratio, namely financing expenditure divided by funding amount. If the company applies commercial bank loan directly, there is no financing expenditure.

In this case, COSCO applies long-term commercial bank loans 1 million Yuan. Annual interest is 10 percent. Loan term is 10 years. COSCO will pay the interest once a year, and repay the principal after expiration day. Corporate income tax rate is 33 percent. No financing expenditure. Then the financing costs are:

$$Kc=\frac{1000000\ x10\%(1-33\%)}{1000000\ (1-0)}=6.7\%$$

If COSCO doesn't apply commercial bank loans, but issued 1 million Yuan Eurobond instead. Bond carries a coupon interest rate of 12% with 2% financing expenditure. Other conditions are the same. Then the financing costs are:

$$Kc=\frac{1000000\ x12\%(1-33\%)}{1000000\ （1-2\%）}=8.2\%$$

(b) The calculation of equity financing costs

For stock companies, equity financing costs are the costs of financing through the issuance of shares. For non-stock companies, equity financing costs are the costs of obtaining paid-up capital. Since COSCO is a stock company, we take stock company as example to explain the calculation of equity financing costs. Stock can be divided into two forms, namely preferred stock and common stock (ordinary shares).

The calculation of the cost of preferred stock:

Issuing preferred stock, the stock companies also need financing expenditure, and shall pay the dividend. The dividend is paid to preferred shareholders after tax. Therefore, unlike debt financing, there is no tax-free effect in equity financing. So the calculation of equity financing costs is far different from that of debt financing. We can calculate its financing costs by the formula below:

$$Ks=\frac{Ds}{Ps\,(1-fs)} \tag{5-2}$$

Where:

Ks The cost of preferred stock

Ds Annual profit of preferred stock

Ps The amount of issued preferred stock

fs Financing expenditure ratio of preferred stock

For example, COSCO issued preferred stock 1 million Yuan, financing expenditure ratio is 3%. Fixed dividend paid to preferred shareholders is 13% each year. Then the financing costs are:

$$Ks=\frac{1000000\ x13}{1000000\ x\,(1-3\%)}=13.4\%$$

The calculation of the cost of common stock:

Just like preferred stock, the dividend of common stock is paid to shareholders after tax. So there is no tax-free effect either.

We can calculate its financing costs by the formula below:

$$Ks=\frac{Ds}{P0\,(1-fs)}+g \tag{5-3}$$

Where:

Ks The financing costs of common stock

Ds Annual payments of dividends

P0 The current market price of common stock

g Expected dividend growth rate (g<Ks)

fs Financing expenditure ratio

This formula also applies to already issued common stock cost calculation and the calculation of the cost of capital accumulation. But its financing expenditure is zero.

In this case, COSCO intends to raise capital through the issuance of common stock. Expected issue price is 23 Yuan. Financing expenditure ratio is 5%. Expected annual cash dividend is 1.8 Yuan. Dividend growth rate is 7%. Then the financing costs are:

$$Ks=\frac{1.8}{23x\,(1-5\%)}+7\%=15.2\%$$

From the analysis above, we can draw the conclusion that: (1) debt financing costs are lower than equity financing costs since debt financing costs enjoy tax-free effect. (2) Loan financing cost is lower than the cost of bond financing. The reason is that bond's risk is relatively higher. (3) Preferred stock financing cost is lower than common stock financing cost. The reason is that common stock's risk is relatively higher.

For a combination of a variety of financing mode, integrative cost of capital formula is as follow:

$$K=\sum_{i=1}^{n} WjKj \qquad (5\text{-}4)$$

Where:

K Integrative average cost of capital

Wj Financing mode j accounted for the proportion of the total amount of funding

Kj Individual capital cost of financing mode j

(ii) NPV (Net Present Value)

The bigger the numerical value of NPV, the better the investment it is. We can calculate the numerical value of NPV by the formula below:

$$NPV=\sum_{i=1}^{n}\frac{Ai}{(1+r)^{i}}-C \qquad (5\text{-}5)$$

Where:

n Project life

Ai Net cash flows at the end of year i

r Discount rate

C Initial capital expenditure

(II) The convenience of implementation

Whether it is easy or difficult for the shipping company to implement the financing activity under the selected mode? It includes the ripe degree of financing conditions, the length of financing preparation time, the length of financing implementation time, etc. The bigger the numerical value of this indicator, the easier for the shipping company to implement the ship financing operation procedure.

(i) The complicated degree of the process

The different ship financing mode has different operating procedure. Some operating procedure may need the government's approbation and approval.

(ii) Operating time

Operating time means runtime of the financing activity which include the readiness time and the time needed for implement the whole financing process.

(iii) The qualifications request of the enterprise

The different ship financing mode has different qualifications request of the shipping company. For example, before the domestic enterprises start to establish joint-stock company to issue stock, they have to meet the corresponding qualifications as follows: At the end of the previous year, the company's net assets in the proportion of the total

assets should be no less than 30%; Intangible assets in the proportion of net assets should be no more than 20%; Consecutively make profit in the past three years, etc. The enterprises who want to issue bond also have to meet the corresponding rating system.

(III) The control of the enterprise

After ship financing activity, whether the shipping companies can wholly control the vessels and the funds they raised. This indicator is the bigger the better. Sub-criterions include:

(i) Vessel domination degree: Whether the shipping company can dominate the vessel freely. The numerical value is the bigger the better.
(ii) Term of repayment: The longer the better.
(iii) Conversion of capital: For example, Stock can be traded on the secondary market. The numerical value of this sub-criterion is the bigger the better.

(IV) Subsequent influence

To the shipping companies, ship financing is not a one-off activity, with the development of the enterprises, this activity will be repeated for several times. Therefore, it should be considered that whether the ship financing mode be selected this time will have some impact on next time.
This indicator is the bigger the better. Sub-criterions include:

(i) Stabilization of financing mode:

Whether the ship financing mode be selected this time matches former financing consuetude. What is the relationship between the ship financing mode be selected this time and former financial structure of the company.

(ii) Convenience of subsequent financing:

Whether the ship financing mode be selected this time will have some impact on subsequent financial administrative operation?

5.2.2 Collection and treatment of experts' advice

Weights of experts' evaluation

The experts play an important role in the application of this model. Therefore, the selection of the experts should be very careful. (Be sure to select the experts and scholars who are familiar with ship financing and the operation of the vessels or the top manager in the shipping companies.)

However, each expert has different experience, different individuality and different understanding level. In order to reflect this difference, the weights should be given to each expert's evaluation based on his breadth of knowledge and his familiarity with the different indicators.

The table below shows the weights of each expert's evaluation:

Table 5-1 weight table of experts' evaluation

	Expert1	Expert2	Expert3	Expert4	Expert5
The complicated degree of the process	0.2	0.2	0.3	0.1	0.2
Operating time	0.2	0.2	0.3	0.1	0.2
The qualifications request of the enterprise	0.2	0.3	0.3	0.1	0.1
Capital cost	0.1	0.3	0.2	0.2	0.2
NPV (Net Present Value)	0.1	0.3	0.2	0.2	0.2
Vessel domination degree	0.2	0.2	0.2	0.3	0.1
Term of repayment	0.2	0.2	0.2	0.3	0.1
Conversion of capital	0.1	0.3	0.2	0.3	0.1
Stabilization of financing mode	0.3	0.1	0.1	0.2	0.3
Convenience of subsequent financing	0.3	0.1	0.1	0.2	0.3

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

The following formula was weighted arithmetic mean formula:

$$y=\frac{\sum(Xi*Wi)}{\sum Wi} \quad (5\text{-}6)$$

Where:

y Weighted arithmetic mean

Xi Scoring value of each expert

Wi Weight value of each expert's evaluation

The following are the results of the experts who applied above "ship financing mode selection evaluation indicators system" to score the five alternatives. (The original forms of experts' advice and scoring records refer to the Appendix of this article):

Table 5-2 Evaluation Form of alternative A (retained earnings)

	The convenience of implementation（U1）			Financial economic effect（U2）		The control of the enterprise（U3）			Subsequent influence（U4）	
	（U11）	（U12）	（U13）	（U21）	（U22）	（U31）	（U32）	（U33）	（U41）	（U42）
Expert1	10	10	10	1	5	10	10	1	1	10
Expert2	10	9	10	1	5	10	10	1	3	8
Expert3	10	9	10	1	5	10	10	1	2	9
Expert4	10	10	10	1	5	10	10	1	1	10
Expert5	10	10	10	1	5	10	10	1	2	9
Weighted arithmetic mean	10	9.5	10	1	5	10	10	1	1.6	9.4
The weights of the second level (sub-criterion)	1/3	1/3	1/3	0.5	0.5	0.0623	0.7013	0.2364	1/9	8/9
Evaluation scores for the	9.833333333			3		7.8724			8.533333333	

second level (sub-criterion)				
The weights of the first level (criterion)	0.2179	0.6217	0.109	0.0514
Total score	5.304488267			

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Table 5-3 Evaluation Form of alternative B (commercial bank loan)

	The convenience of implementation（U1）			Financial economic effect（U2）		The control of the enterprise（U3）			Subsequent influence（U4）	
	(U11)	(U12)	(U13)	(U21)	(U22)	(U31)	(U32)	(U33)	(U41)	(U42)
Expert1	6	7	7	6	5	9	3	1	7	2
Expert2	8	8	7	7	5	10	2	1	6	3
Expert3	7	6	6	6	5	8	4	1	7	4
Expert4	7	8	8	7	5	9	5	1	8	3
Expert5	8	7	7	7	5	10	4	1	8	3
Weighted arithmetic mean	7.2	7	6.8	6.7	5	9.1	3.7	1	7.4	2.8
The weights of the second level (sub-criterion)	1/3	1/3	1/3	0.5	0.5	0.0623	0.7013	0.2364	1/9	8/9
Evaluation scores for the second level (sub-criterion)	7			5.85		3.39814			3.311111111	
The weights of the first	0.2179			0.6217		0.109			0.0514	

level (criterion)				
Total score	5. 702833371			

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Table 5-4 Evaluation Form of alternative C (Ship financing leasing)

	The convenience of implementation（U1）			Financial economic effect （U2）		The control of the enterprise （U3）			Subsequent influence （U4）	
	(U11)	(U12)	(U13)	(U21)	(U22)	(U31)	(U32)	(U33)	(U41)	(U42)
Expert1	6	7	8	7	5	4	6	1	4	8
Expert2	7	6	6	8	5	7	7	2	6	7
Expert3	7	4	6	8	5	6	8	1	5	9
Expert4	6	6	7	10	5	5	7	1	7	7
Expert5	7	5	8	8	5	7	8	1	6	8
Weighted arithmetic mean	6. 7	5. 4	6. 7	8. 3	5	5. 6	7. 1	1. 3	5. 5	7. 8
The weights of the second level (sub-criterion)	1/3	1/3	1/3	0. 5	0. 5	0. 0623	0. 7013	0. 2364	1/9	8/9
Evaluation scores for the second level (sub-criterion)	6. 266666667			6. 65		5. 63543			7. 544444444	
The weights of the first level (criterion)	0. 2179			0. 6217		0. 109			0. 0514	
Total score	6. 501857981									

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Table 5-5 Evaluation Form of alternative D (Issuing Eurobond)

	The convenience of implementation（U1）			Financial economic effect（U2）		The control of the enterprise（U3）			Subsequent influence（U4）	
	(U11)	(U12)	(U13)	(U21)	(U22)	(U31)	(U32)	(U33)	(U41)	(U42)
Expert1	4	5	5	6	5	10	4	6	4	2
Expert2	5	5	4	7	5	9	3	6	3	3
Expert3	5	4	5	7	5	10	6	7	4	4
Expert4	4	5	5	8	5	10	4	6	2	3
Expert5	5	4	4	6	5	9	5	7	3	4
Weighted arithmetic mean	4.7	4.5	4.6	6.9	5	9.7	4.3	6.3	3.2	3.1
The weights of the second level (sub-criterion)	1/3	1/3	1/3	0.5	0.5	0.0623	0.7013	0.2364	1/9	8/9
Evaluation scores for the second level (sub-criterion)	4.6			5.95		5.10922			3.111111111	
The weights of the first level (criterion)	0.2179			0.6217		0.109			0.0514	
Total score	5.418271091									

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Table 5-6 Evaluation Form of alternative E (Issuing new ordinary shares)

	The convenience of implementation（U1）			Financial economic effect（U2）		The control of the enterprise（U3）			Subsequent influence（U4）	
	(U11)	(U12)	(U13)	(U21)	(U22)	(U31)	(U32)	(U33)	(U41)	(U42)

Expert1	6	5	2	7	5	10	2	10	4	3
Expert2	7	7	3	8	5	10	2	10	6	2
Expert3	5	6	3	9	5	9	3	10	5	4
Expert4	6	6	2	9	5	9	4	10	5	4
Expert5	7	7	3	8	5	10	4	10	6	3
Weighted arithmetic mean	6.1	6.2	2.7	8.3	5	9.5	3	10	5.1	3.2
The weights of the second level (sub-criterion)	1/3	1/3	1/3	0.5	0.5	0.0623	0.7013	0.2364	1/9	8/9
Evaluation scores for the second level (sub-criterion)	5			6.65		5.05975			3.411111111	
The weights of the first level (criterion)	0.2179			0.6217		0.109			0.0514	
Total score	5.950648861									

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5.3 Selection of the financing mode and result analysis

Table 5-7 Total Score Table for all the alternatives

Alternatives	A	B	C	D	E
Total score	5.304488267	5.702833371	6.501857981	5.418271091	5.950648861

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The final results show that: the total score of all the ship financing modes ranked from

the highest to the lowest are as follows: Ship financing leasing, Issuing new ordinary shares, Commercial bank loan, Issuing Eurobond, Retained earnings.

Thereinto, the score of the ship financing modes for sub-criterions are as follows:

Table 5-8 Sub-criterions score table

	A	B	C	D	E
The convenience of implementation	9.833333333	7	6.266666667	4.6	5
Financial economic effect	3	5.85	6.65	5.95	6.65
The control of the enterprise	7.8724	3.39814	5.63543	5.10922	5.05975
Subsequent influence	8.533333333	3.311111111	7.544444444	3.111111111	3.411111111

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

In the sub-criterions, for the convenience of implementation, the score of all the alternatives ranked from the highest to the lowest are as follows: Retained earnings, Commercial bank loan, Ship financing leasing, Issuing new ordinary shares, Issuing Eurobond.

For financial economic effect, the score of all the alternatives ranked from the highest to the lowest are as follows: Ship financing leasing and Issuing new ordinary shares (tie for the first), Issuing Eurobond, Commercial bank loan, Retained earnings.

For the control of the enterprise: Retained earnings, Ship financing leasing, Issuing Eurobond, Issuing new ordinary shares, Commercial bank loan.

For subsequent influence: Retained earnings, Ship financing leasing, Issuing new ordinary shares, Commercial bank loan, Issuing Eurobond.

My analysis of this result:

(1) Sort results are consistent with common sense and practical in this case. In five alternatives, the total score of Ship financing leasing ranked first. I suggest COSCO to apply this ship financing mode. The total score of Retained earnings ranked last. I suggest COSCO to give up this financing mode.
(2) Ship financing leasing, as the best option, only has one sub-criterion ranked first. Why it can get the highest mark? As far as I'm concerned, it got the relatively average score of the sub-criterions and ranked more front. Furthermore, it ranked first in sub-criterion of "financial economic effect" which holds the largest weight.
(3) It's not surprising that "Retained earnings" ranked last. In practice, very few shipping companies will completely adopt this financing mode. According to this model to analyze the reasons, although this mode ranked first in three sub-criterions (the convenience of implementation; the control of the enterprise; subsequent influence), it ranked last in sub-criterion of "financial economic effect" which holds the largest weight.
(4) Generally speaking, the scores of these five alternatives are relatively close. It shows that in this case, although "Ship financing leasing" ranked first, the difference is not great with other alternatives. This is because COSCO has experience in financing through the bond and stock market.
(5) Last but not least, the results of the calculation and analysis of this case can only be applied to the desire of COSCO to buy some new general cargo vessels in the current shipping market conditions and is not applicable to other shipping companies in different market conditions to buy the different types of vessels .But this "ship financing mode selection evaluation indicators system" has certain practical value.

Summary

In this Chapter, through weighted arithmetic mean method to deal with the views of the experts and the calculation of each indicator, the author finally selected "Ship financing leasing" as the most suitable ship financing mode of COSCO's general cargo vessel in the current shipping market conditions. At last, the author analyzed the results of this optimal choice.

Conclusion

From the analysis above, we can draw the conclusion that:

(1) Since September 2008, the financial crisis has lasted nearly one year and a half all over the world. During this period, the global financial market liquidity was retrenched in a large scale. The ship financing business was also suffered from the sharp decline of global financial market. But some experts in International shipping industry proclaimed that International shipping market will resuscitate gradually in 2 or 3 years. Ship financing market will recover step by step.

(2) Ship financing business, as the main business of shipping financial industry, will doubtless have a significant impact on the completion of Shanghai's two Centers. Therefore, how to compare the existing ship financing modes, and then find the most suitable mode to our shipping company under the background of the recovery of shipping market, will play an important role in the development of Chinese shipping financial industry.

(3) When the shipping companies select their ship financing mode, "the convenience of implementation"; "financial economic effect"; "the control of the enterprise" and "subsequent influence" should be considered as four main criterions.

(4) Considered "global economy recovery"; "Shipping Market recovery" and "relatively large age structure of COSCO's general cargo vessel fleet", COSCO should seize the current opportunity (the drop of vessels' price caused by financial crisis), accelerating the pace of the ship updates, eliminating old vessels,

achieving structural adjustment, and establish a modern, energy saving and environmental-friendly fleet.

(5) Ship is a capital-intensive, technology-intensive and labor-intensive product. View from its attribute, "ship financing leasing" should be the best ship financing mode for COSCO in the current shipping market conditions.

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Appendix

Attached table 1 Original experts' consultation sheets on the weights of the indicators and consistency index inspection and their grading record table (Expert 1)

A	The convenience of implementation（U1）	Financial economic effect（U2）	The control of the enterprise（U3）	Subsequent influence（U4）
The	1	1/5	3	5

convenience of implementation（U1）				
Financial economic effect（U2）	5	1	5	8
The control of the enterprise（U3）	1/3	1/5	1	3
Subsequent influence（U4）	1/5	1/8	1/3	1

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

Attached table 2 Original experts' consultation sheets on the weights of the indicators and consistency index inspection and their grading record table (Expert 2)

A	The convenience of implementation（U1）	Financial economic effect（U2）	The control of the enterprise（U3）	Subsequent influence（U4）
The convenience of implementation（U1）	1	1/7	5	4
Financial economic effect（U2）	7	1	6	8
The control of the enterprise（U3）	1/5	1/6	1	3
Subsequent influence（U4）	1/4	1/8	1/3	1

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Attached table 3 Original experts' consultation sheets on the weights of the indicators and consistency index inspection and their grading record table (Expert 3)

A	The convenience of implementation（U1）	Financial economic effect（U2）	The control of the enterprise（U3）	Subsequent influence（U4）

The convenience of implementation（U1）	1	1/4	3	6
Financial economic effect（U2）	4	1	6	9
The control of the enterprise（U3）	1/3	1/6	1	3
Subsequent influence（U4）	1/6	1/9	1/3	1

Source: Drawn by author: ©Copyright Rong Ziwen,WMU-ITL Shanghai,(2010) by Ship Financing Mode Selection for COSCO's General Cargo Vessel

Attached table 4 Original experts' consultation sheets on the weights of the indicators and consistency index inspection and their grading record table (Expert 4)

A	The convenience of implementation（U1）	Financial economic effect（U2）	The control of the enterprise（U3）	Subsequent influence（U4）
The convenience of implementation（U1）	1	1/6	3	7
Financial economic effect（U2）	6	1	7	8
The control of the enterprise（U3）	1/3	1/7	1	3
Subsequent influence（U4）	1/7	1/8	1/3	1

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Attached table 5 General Cargo Vessel of COSCO

General Cargo

>*Multi-purpose*						
Name	**Built year**	**Length(m)**	**Beam(m)**	**Speed(knots)**	**DWT**	**Flag**
DA DAN XIA	2009	166.31	27.4	15	28662	HONG KONG
LEHE	2001	182.67	26.2	14	28450	CHINA
LEYI	2000	182.67	26.2	14	28450	CHINA
LECONG	2000	182.67	26.2	14	28450	CHINA
LELI	2000	182.67	26.2	14	28450	CHINA
JIN SHA LING	1990	161.21	27.2	null	28400	PANAMA
JIN DA LING	1998	169	27.2	9.71	28164	PANAMA
KONG QUE SONG	2010	170.93	27.2	15.1	27300	HONG KONG
FENG HUANG SONG	2009	179.50	27.2	15.1	27299.74	HONG KONG
LONG AN CHENG	1983	164.33	22.86	12.5	23443	PANAMA
JINGANCHENG	1992	174	25.6	16.5	22814	CHINA
TAIANCHENG	1992	174	25.6	16.5	22814	CHINA
YONGANCHENG	1992	174	25.6	16.5	22814	CHINA
HAIANCHENG	1994	173.5	25.6	16.5	22765	CHINA
FUANCHENG	1994	173.6	25.6	16.5	22765	CHINA
LEDING	1998	169	25.2	17.6	21728	CHINA
LEJIN	2000	169	25.2	17.6	21728	CHINA
LESHAN	1999	169	25.2	17.6	21728	CHINA
LETAI	1999	169	25.2	17.6	21728	CHINA
LECHANG	1999	169	25.2	17.6	21728	CHINA
LEMIN	1999	169	25.2	17.6	21728	CHINA
LERONG	1999	169	25.2	17.6	21728	CHINA
LEYE	2000	169	25.2	17.6	21728	CHINA
LESHENG	1999	169	25.2	17.6	21728	CHINA
LETONG	2000	169	25.2	17.6	21400	CHINA
BAO AN CHENG	1985	146.5	25	15	20621	CHINA
XIANG AN CHENG	1985	146.5	25	15	20621	CHINA
FU YUAN SHAN	1985	151	25	15	20225	CHINA
FU YU SHAN	1985	151	25	15	20225	CHINA
FENG SHUN SHAN	1985	156	24.7	15	18277	CHINA
FENG AN SHAN	1985	156	24.7	15	18270	CHINA
FENG KANG SHAN	1985	156	24.7	15	18264	CHINA
AN HUA JIANG	1987	145.5	21	15.9	17324	CHINA
AN BAO JIANG	1987	145.5	21	15.9	17324	CHINA
FU XIN SHAN	1990	162	23	13	17258	CHINA
FU YANG SHAN	1987	162	23	15	17139	CHINA
FU QING SHAN	1989	162	23	14	17139	CHINA
FU KANG SHAN	1989	162	23	15	17139	CHINA
FU WEN SHAN	1986	162	23	15	17000	CHINA
DA ZHONG	1998	153	23	17.6	16957	PANAMA
DA HUA	1998	153	23	17.6	16957	PANAMA
DA FU	1998	153	23	17.6	16957	PANAMA
DA QIANG	1998	153	23	17.6	16957	PANAMA
YONGJIANG	1978	149.8	21	18.1	16270	CHINA
MINJIANG	1978	149.8	21.06	18.1	16270	CHINA
XIANGJIANG	1978	149.8	21	18.1	16270	CHINA
AN LONG JIANG	1985	148	22.7	16	15865	CHINA
AN KANG JIANG	1985	148	22.7	16	15852	CHINA
AN NING JIANG	1985	148.5	22.7	16	15838	CHINA
PINGJIANG	1978	144	20.42	13	15300	CHINA
QINGJIANG	1978	144	20.42	15	15290	CHINA
AN ZE JIANG	1987	149.7	21.8	16.5	14914	CHINA
AN QING JIANG	1985	149.7	21.8	15	14913	CHINA
AN XIN JIANG	1986	149.7	21.8	14.5	14913	CHINA
AN YUE JIANG	1986	149.7	21.8	14.5	14913	CHINA
AN GUANG JIANG	1987	149.7	21.8	14.5	14913	CHINA
AN SHUN JIANG	1987	149.7	21.8	14.5	14913	CHINA
AN TAO JIANG	1980	141.7	21.5	18	10800	CHINA
AN WU JIANG	1980	141.7	21.2	17	10800	CHINA
TIANWANGXING	2007	122.2	19.8	13.5	9106	PANAMA
HAIWANGXING	2008	122.2	19.8	13.5	9106	PANAMA

>General Cargo						
Name	Built year	Length(m)	Beam(m)	Speed(knots)	DWT	Flag
JIN GUANG LING	2009	177.5	28.2	13.9	32000	PANAMA
JIN YUAN LING	2009	177.50	28.20	13.9	32000	HONG KONG
JIN YUAN LING	2009	177.50	28.20	13.9	32000	HONG KONG
COSCO WUYISHAN	2010	177.5	28.2	13.7	31956	PANAMA
WOODLINK	1984	174	26	13	30881	PANAMA
JIN NIU LING	1992	169.03	27.2	13	28470	PANAMA
DA ZI YUN	2010	170.93	27.2	15.0	28451	HONG KONG
YONG SHENG	2002	159.99	23.7	14.3	19461	HONG KONG
HENG SHAN	1984	157.64	22.9	14	16670	CHINA
SONGSHAN	1984	157.6	22.9	14.1	16670	CHINA
LIANGSHAN	1984	157.54	22.9	14	16670	CHINA
JIAOCHENG	1978	148.16	22	16.8	16250	CHINA
HUA SHAN	1982	144	21.4	14.5	15635	CHINA
LUSHAN	1982	144	21.2	14.5	15635	CHINA
AN SHAN	1981	144	21.4	14.5	15631	CHINA
SHUICHENG	1978	161.9	21.2	17	13720	CHINA
CHI YUN	1983	119	18	14.5	7126	CHINA
CHENGYUN	1983	110	18	11	7126	CHINA
HUANGYUN	1984	110	18	11	7126	CHINA

Source: http://www.cosco.com/en/fleet/BoatList.jsp?parCatName=General%20Cargo

Attached table 6 Original experts' consultation sheets on ship financing mode selection for COSCO's general cargo vessel and their grading record table (Expert 1)

	Retained earnings	Commercial bank loan	Ship financing leasing	Issuing Eurobond	Issuing new shares
The complicated degree of the process（U11)	10	6	6	4	6
Operating time (U12)	10	7	7	5	5
The qualifications request of the enterprise (U13)	10	7	8	5	2
Capital cost (U21)	1	6	7	6	7
NPV (Net Present Value) (U22)	5	5	5	5	5
Vessel domination degree（U31)	10	9	4	10	10
Term of repayment（U32）	10	3	6	4	2
Conversion of capital（U33）	1	1	1	6	10
Stabilization of financing mode（U41）	1	7	4	4	4
Convenience of subsequent financing（U42）	10	2	8	2	3

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Attached table 7 Original experts' consultation sheets on ship financing mode selection for COSCO's general cargo vessel and their grading record table (Expert 2)

	Retained earnings	Commercial bank loan	Ship financing leasing	Issuing Eurobond	Issuing new shares
The complicated degree of the process（U11)	10	8	7	5	7
Operating time (U12)	9	8	6	5	7
The qualifications request of the enterprise (U13)	10	7	6	4	3
Capital cost (U21)	1	7	8	7	8
NPV (Net Present Value) (U22)	5	5	5	5	5
Vessel domination degree（U31)	10	10	7	9	10
Term of repayment（U32）	10	2	7	3	2
Conversion of capital（U33）	1	1	2	6	10
Stabilization of financing mode（U41）	3	6	6	3	6
Convenience of subsequent financing（U42）	8	3	7	3	2

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Attached table 8 Original experts' consultation sheets on ship financing mode selection for COSCO's general cargo vessel and their grading record table (Expert 3)

	Retained earnings	Commercial bank loan	Ship financing leasing	Issuing Eurobond	Issuing new shares
The complicated degree of the process（U11)	10	7	7	5	5
Operating time (U12)	9	6	4	4	6

The qualifications request of the enterprise (U13)	10	6	6	5	3
Capital cost (U21)	1	6	8	7	9
NPV (Net Present Value) (U22)	5	5	5	5	5
Vessel domination degree（U31)	10	8	6	10	9
Term of repayment（U32）	10	4	8	6	3
Conversion of capital（U33）	1	1	1	7	10
Stabilization of financing mode（U41）	2	7	5	4	5
Convenience of subsequent financing（U42）	9	4	9	4	4

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Attached table 9 Original experts' consultation sheets on ship financing mode selection for COSCO's general cargo vessel and their grading record table (Expert 4)

	Retained earnings	Commercial bank loan	Ship financing leasing	Issuing Eurobond	Issuing new shares
The complicated degree of the process（U11)	10	7	6	4	6
Operating time (U12)	10	8	6	5	7
The qualifications request of the enterprise (U13)	10	8	7	5	2
Capital cost (U21)	1	7	10	8	9
NPV (Net Present Value) (U22)	5	5	5	5	5
Vessel domination degree（U31)	10	9	5	10	9
Term of repayment（U32）	10	5	7	4	4
Conversion of capital（U33）	1	1	1	6	10

Stabilization of financing mode（U41）	1	8	7	2	5
Convenience of subsequent financing（U42）	10	3	7	3	4

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Attached table 10 Original experts' consultation sheets on ship financing mode selection for COSCO's general cargo vessel and their grading record table (Expert 5)

	Retained earnings	Commercial bank loan	Ship financing leasing	Issuing Eurobond	Issuing new shares
The complicated degree of the process（U11)	10	8	7	5	7
Operating time (U12)	10	7	5	4	7
The qualifications request of the enterprise (U13)	10	7	8	4	3
Capital cost (U21)	1	7	8	6	8
NPV (Net Present Value) (U22)	5	5	5	5	5
Vessel domination degree（U31)	10	10	7	9	10
Term of repayment（U32）	10	4	8	5	4
Conversion of capital（U33）	1	1	1	7	10
Stabilization of financing mode（U41）	2	8	6	3	6
Convenience of subsequent financing（U42）	9	3	8	4	3

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