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World Maritime University

Shanghai, China

Research on the Fluctuation and Forecasting of International Dry Bulk Shipping Market Cycle Based On ROCET

By

Zhang Qianmo

CHINA

A research paper submitted to the World Maritime University in partial Fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

ITL

2011

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DECLARATION

I hereby certify that all the material in this dissertation that is not my own work have all been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and not necessarily endorsed by the University.

(Signature):_____

(Date):_____

Supervised by Professor

Sha Mei

Shanghai Maritime University

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I extremely want to show my indebtedness to my beloved parents, who offered me full support and encourage during my whole life.

Last but not least, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.

Abstract

With the rapid development of the international economic trade and the division of labor, as a derivative market, the shipping market has expanded fast. In the market, the international dry bulk shipping market is an important component and develops fast the same of the whole market. This market is a perfectly competitive market and its competition is more intense than the container liner market. Cyclical characteristic is the most important one. Baltic index BDI is the most indexes reflecting the market decline or prosperity. BDI index has dramatic fluctuations in recent years. BDI reached the highest point-11793 point in history on May 20, 2008 and reached the lowest point-663 point on December 5, 2008. Only about half a year, the index dropped from the highest to the lowest point, a decrease of 95%. It can be seen that risk of the dry bulk shipping market is very large. Therefore, the study of dry bulk shipping market cyclical characteristics is meaningful particularly.

From the basic economies perspective with the supply and demand theory, this paper tries to find out the factors which effect the fluctuation of dry bulk shipping market firstly. And then through the deeply discussion with marketing characteristics and the others related elements, the reader will well known the international dry bulk shipping market situation and its cycle. The paper based on the history of past dry bulk shipping market to find out the practical value to identify the causal relationship between these factors from the analysis of economic events. Finally, this paper tries to detect and analyze the relationship between the rates of world economic growth with the BDI index sequence by the method of rate of change economic tracking. This method directly observed the chart and find out the timing Series between the factors. All of these working wanted to reach ahead of time to predict the turning point of BDI curve. With this prediction, people can easily apply it to dry bulk shipping market, marketing strategy, business and investment decision-making and so on.

This paper attempts to interpret the development and the principle of dry bulk cycle fluctuations through the dry bulk market characteristics and structure. The content will

help shipping companies and other related businesses to develop investment strategies and choose a rational decision-making, this paper also will enhance t he dry bulk shipping market participants in their own competitiveness for enlargement of the operating income and effective operation of risk prevention.

Keyword: dry bulk, shipping, cycle, BDI index, the rate of economic change

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Chapter 1 Introduction

1.1 Background Information

In the establishment and development process of the international market, international shipping industry not only plays the role of supporting and promoting, but also the twin brother of international trade. It is inextricably close linked with the world economy and international trade, and is an important part of the international market. The shipping industry has made great contributions for the development of the world economy and international trade, meanwhile transports a large number of industrial raw materials and fuel for countries and becomes the lifeblood of many industrialized countries. On the contrary, the world economy and international trade is a powerful driving force to promote maritime industry.

Shipping market includes three plates: container, tanker and dry bulk market, and the business cycle of the three sections are not the same. And the dry bulk cargo marine transport is one of the most important part of international logistics chain, the volume of which accounts for more than one third of international seaborne trade. Data shows that before 80 years the international dry bulk shipping volume accounted for more than 50% of the total; with the economic restructuring of the developed countries and the rise of container shipping, the share of international dry bulk shipping in the international maritime transport has declined, but still remained at 40% after 80 years. However, with the continuous development of the world economy, the demand for primary energy and raw materials of countries are increasing, and the global dry bulk shipping volume has grown year by year. According to statistics, the volume of global dry bulk shipping raised from 2.45 billion tons in 1990 to 34.16 billion tons in 2000, showing that the international dry bulk shipping transport is playing an increasingly important role to promote the development of world trade. In the current form of globalization, the shipping cycle has gradually replaced the agricultural cycle and other traditional industry cycle and impacted on the overall global econnomy deeper and deeper. Dry bulk shipping market and its fluctuation cycle have been focused

particularly because of some reasons of natures. Dry bulk shipping industry is in the end of the world trade economy, and because of industry classification, the growth on global trade caused by each country's economic growth is the original impetus of development of dry bulk shipping market. In the case of basic balance of capacity, the performance of dry bulk shipping market can be seen as a microcosm of the global economy, and the prediction for dry bulk shipping market cycle can also be understood as the direction of the global economy. The performance of dry bulk shipping market turns out to be the signal of steel, coal, heavy processing industries, agricultural and other economic industries. Hence, the performance of dry bulk shipping market has been seen as a barometer of global economy and more and more people are paying attention to it.

1.2 Literature Review

1.2.1 Research on dry bulk shipping market

There are many studies on shipping market at home and abroad, most of which focus on the research on freight index. In 1995, foreign scholars Veenstra and Franses (1997) made the use of the same plot and unit root test method in Advanced Time Series Econometrics and adopted freight index time series of different dry bulk ship and different routes to establish VAR(1) model for index forecast. In 2001, British scholar ManolisG. Kavussanos and Amir H. Alizadeh-M (2001) created a single variable Seasonal ARIMA-SARIMA/Multivariate Seasonal Cointegration and Seasonal Cointegrating VAR model to study on the index and draw seasonal fluctuations of dry bulk shipping market. In 2002, Ho Ying-jie (2002) in COSCO Bulk Carrier Co. LTD. made use of time series T, S, C, I and ARMA model to analysis the freight index, and pointed out the long-term growth trend of the index, cycle fluctuation and the characteristics of seasonal fluctuations. In 2004, Chen Qinghui (2004) in Dalian Maritime University analysis the logarithmic rate of change of the index in dry bulk shipping market, established the ARCH model of daily return of the freight index,

and obtained the internal raw of index fluctuation.

1.2.2 Research on dry bulk shipping market cycle theory

At present, research on shipping market cycle theory at home and abroad is very little. Well-known scholar Martin Stopford (2006) made a more detailed discussion about the shipping market cycle theory in his book “Maritime Economics”. The shipping market cycle is divided into four stages, trough, recovery, peak/plateau and collapse. In which he analyzed in detail the formation mechanism of the shipping market cycle, described the characteristics of four stages of the shipping market, and introduced a number of factors of the shipping cycle fluctuation. At the same time, he analyzed the characteristics and causes of the 11 shipping market cycles from 1873 to 1989 in detail. Although more detailed on the shipping cycle in the book were described, he focused on the theory of the shipping cycle fluctuations, and not proposed how to predict the length of the shipping cycle and the timing at all stages of a cycle. Robert Scarsi (2007) studied on that what kind of impact the dry bulk shipping cycle would have on the decision-makers on behalf of the shipowners. Firstly, he described the formation theory of the shipping cycle by Martin, and then pointed out that how to make the right decision at all stages of the shipping cycle as s rational decision-maker. Next he proposed that some shipowners would deviate from the rational decisions at all stages of the shipping cycle when making decisions, and produced the so-called “herd behavior”. Finally, he took the handysize market as an example to discuss the non-rational decision-making behavior of the shipowner (or policy makers) in the shipping market cycle, and analyzed the reasons. However, the problems of cycle time and length prediction were not resolved.

1.3 The main contents and the technical line of the paper

1.3.1The main contents

From the basic economies perspective with the supply and demand theory, this paper tries to find out the factors which effect the fluctuation of dry bulk shipping market firstly. And then through the deeply discussion with marketing characteristics and the others related elements, the reader will well known the international dry bulk shipping market situation and its cycle. The paper based on the history of past dry bulk shipping market to find out the practical value to identify the causal relationship between these factors from the analysis of economic events. Finally, this paper tries to detect and analyze the relationship between the rates of world economic growth with the BDI index sequence by the method of rate of change economic tracking. This method directly observed the chart and find out the timing Series between the factors. All of these working wanted to reach ahead of time to predict the turning point of BDI curve. With this prediction, people can easily apply it to dry bulk shipping market, marketing strategy, business and investment decision-making and so on.

1.3.2 The technical line

Today, in the analytical methods, one is for text analysis and presentation, the other is to describle the sophisticated statistical thinking by complex assumptions and formulas. In order to understand the dry bulk shipping market and its fluctuation cycle, I make use of data of relevant elements to track the operation of dry bulk shipping market, which I think is a new economic perspective. It's Dow said that, the economic activity will repeat themselves, because it reflects the human nature and repeatability. Also, Elis said that a direct correlation between a variety of economic indicators will periodic return, because they reflect direct causal effect of economic. So it is entirely possible for me to understand the dry bulk shipping market and its cycle by drawing and observing the chart.

This technical line is full of my ideas and research method:

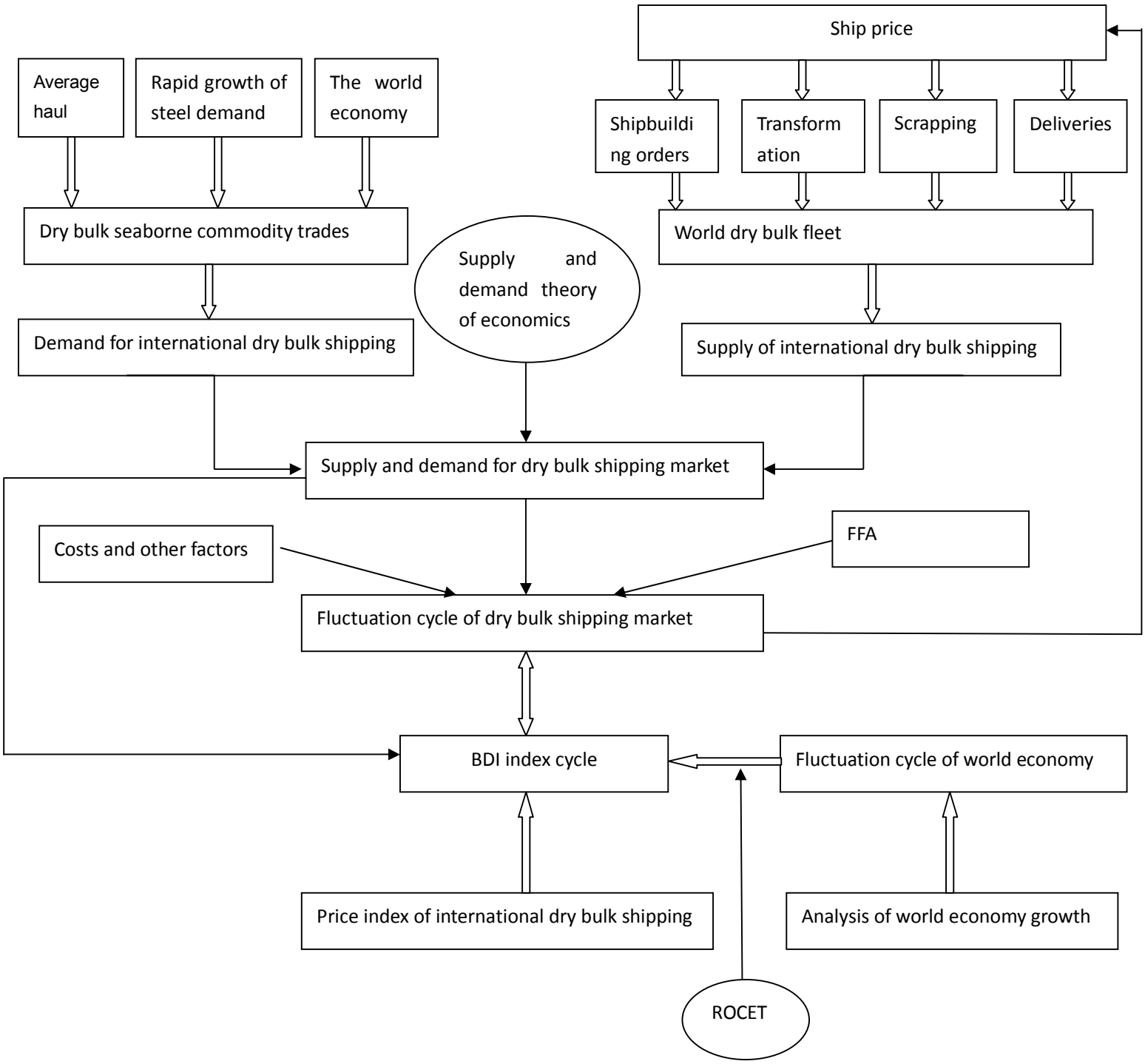

Figure 1.1 The technical line of the paper

Chapter 2 Overview of international dry bulk shipping market

2.1 The elements of international dry bulk shipping market

2.1.1 Dry bulks

According to the shape and packaging of goods, marine commodities are divided into 3 categories: liquid bulk, dry bulk and general cargo.

(1) Liquid bulk requires tanker transportation. The main ones are crude oil, oil products, liquid chemicals such as caustic soda, vegetable oils, and wine.

(2) Dry bulk: a variety of primary products and raw materials. Usually based on the size of bulk transportation, dry bulk can be divided into major bulks and minor bulks. The “five major bulks” covers the five homogeneous bulk cargoes-iron ore, grain, coal, phosphates and bauxite. Minor bulks cover the many other commodities that travel in shiploads. The most important are steel produces, cement, gypsum, non-ferrous metal ores, sugar, salt, sulphur, forest products, wood chips and chemicals.

(3) General cargo includes loose cargo, containerized cargo, palletized cargo, pre-slung cargo, refrigerated cargo, heavy and awkward cargo large and difficult to stow.

If oil is the energy of modern industrial society, the five major bulks are the building blocks from which it is constructed. Iron ore and coal are the raw materials of steelmaking and steel is the principal material used in the construction of industrial and domestic building, motor cars, merchant ships, machinery and the great majority of industry products. The staple foods of the modern industrial society are bread and meat, both of which require large quantities of grain-for baking and as the raw material of modern factory farming for the production of meat. Bauxite and alumina are the raw materials of aluminium making, the second most important structural metal in modern industrial society, while phosphate rock is the principal bulk fertilizer used in crop

production.

Iron ore, coal and grain have become a major component of the main dry bulk shipping demand, and the three dry bulks impact on world economy to the largest extent. So iron ore, coal and grain should be as the main line when analyzing demand for dry bulk shipping market.

2.1.2 The bulk carriers

Nowadays the major bulk cargoes and the great majority of minor bulk cargoes are transported in bulk carriers. Usually they are all single-deck ships with a double bottom, vertical cargo access through hatches in the weatherdeck and a speed generally in the range of 13—16 knots, though the average for most sizes is about 14.5 knots. Since the mid-1960s there has been a steady upward trend in the size of ship used in most bulk trades. For example, in 1969 only about 5 per cent of the iron ore was shipped in vessels over 80,000 dwt, but by the early 1990s over 80 per cent of the trade was shipped in vessels of this size.

In the bulk cargo market, the focus is on low cost transport. A bulk carrier fleet can fall into four main parts generally referred to as Handy bulk carriers (10—29,999 dwt), Handymax bulk carriers (30- 49,999 dwt), Panamax (50—79,999 dwt) and Capesize (over 80,000 dwt). These ships carry a wide spectrum of bulk cargoes ranging from grain, phosphate rock, iron ore and coal, to toxic chemicals, with a premium on economy and flexibility.

2.1.3 Dry bulk routes

International dry bulk routes are determined by the trade flows of the main types of goods. It has mentioned above that the international dry bulk shipping market is mainly constituted of iron ore, coal and grain. As a result, the main international dry bulk routes happen because of the flow of these three main dry bulks.

From the main flow of the main dry bulks, we can get that the main exporters of iron ore are Brazil, Australia, Canada, Sweden, South Africa, and the importers are Japan, EU, China, South Korea; the main exporting countries of coal are Australia, South Africa, United States, Canada, Colombia, China, Indonesia, importing countries are Japan, South Korea, Taiwan and the EU; the five regions of grain exports is the United States, Canada, Argentina, Australia, European Union, and the importers are the Middle East countries, Russia, North Africa, Japan , South Korea, China and other countries. Therefore, the important dry bulk routes also form among these countries.

From the point of view of distance, international dry bulk routes belong to unrestricted navigation area routes, which have a long transport distance and relevant long time period. In general, the routes are divided into the Pacific routes, Atlantic routes and Indian Ocean routes. The main branch line route group are as follows:

a. Pacific routes group: (1) Far East-the west coast of North America. (2) Far East-Caribbean and the east coast of North America. (3) Far East- the west coast of South America, (4) Far East- Australia and New Zealand and Southwest Pacific island countries, (5) Far East- Southeast Asia, (6) Australia, New Zealand-North America, North America- Southeast Asia.
b. Atlantic route groups: (1) the north-western Europe-North America East Coast, (2) North-West Europe, North America East Coast-Mediterranean, the Suez Canal to the east, (3) North-West Europe, North America East Coast-Caribbean. (4) North-West Europe, Mediterranean-South America East Coast, (5) North-West Europe, North America East Coast-Cape of Good Hope, Eastern route, (6) South America East Coast-Cape of Good Hope route.
c. Indian Ocean routes group: (1) route across the Indian Ocean, (2) routes among the northern Indian Ocean countries, (3) routes among the Persian Gulf littoral states, (4) routes among countries of the east coast of Africa.

2.2 Freight index

The Baltic Exchange is the world's only independent source of maritime market information for the trading and settlement of physical and derivative contracts. Its international community of over 550 members encompasses the majority of world shipping interests and commits to a code of business conduct overseen by the Baltic. Baltic Exchange members are responsible for a large proportion of all dry cargo and tanker fixtures as well as the sale and purchase of merchant vessels. The company was founded in the mid-18th century. The first use of the name was at the Virginia and Baltic Coffee House in Threadneedle Street in 1744, and was registered as a private limited company with shares in 1900. Today the exchange is owned by its member companies and is not publicly traded on a stock exchange. It is operated by a member-elected Board of Directors. It has 20 employees and is located at 38 St Mary Axe in central London. The exchange publishes six daily indices:

Baltic Dry Index (BDI)

Baltic Panamax Index (BPI)

Baltic Capesize Index (BCI)

Baltic Supramax Index (BSI)

Baltic Handysize Index (BHSI)

Baltic Dirty Tanker Index (BDTI)

Baltic Clean Tanker Index (BCTI)

2.2.1 How BDI works

The index provides "an assessment of the price of moving the major raw materials by sea. Taking in 26 shipping routes measured on a time charter and voyage basis, the index covers Handymax, Panamax, and Capesize dry bulk carriers carrying a range of commodities including coal, iron ore and grain."

Every working day, a panel of international shipbrokers submits their view of current freight cost on various routes to the Baltic Exchange. The routes are meant to be representative, i.e. large enough in volume to matter for the overall market.

These rate assessments are then weighted together to create both the overall BDI and the sizespecific Supramax, Panamax, and Capesize indices. The BDI factors in the four different sizes of oceangoing dry bulk transport vessels：

Table 2.1 Ship Classification

Ship Classification	Dead Weight Tons	% of World Fleet	% of Dry Bulk Traffic
Capesize	100,000+	10%	62%
Panamax	60,000-80,000	19%	20%
Supramax	45,000-59,000	37%	18% w/ Handysize
Handysize	15,000-35,000	34%	18% w/ Supramax

Source: Wikipedia

The BDI contains route assessments both on the basis of "USD paid per ton carried" (i.e. before fuel, port and other voyage dependent costs are deducted) and "USD paid per day" (i.e. after voyage dependent costs are deducted, often called "Time charter equivalent earnings"). Fuel (="Bunkers") is the largest voyage dependent cost and moves with the crude oil price. In periods where bunker costs fluctuate significantly, there BDI will therefore move more than the shipowners' realised earnings.

2.2.2 The significance of BDI

Most directly, the index measures the demand for shipping capacity versus the supply of dry bulk carriers. The demand for shipping varies with the amount of cargo that is being traded or moved in various markets (supply and demand).

The supply of cargo ships is generally both tight and elastic — it takes two years to build a new ship, and ships are too expensive to take out of circulation the way airlines park unneeded jets in the Mojave and Sonoran deserts. So marginal increases in

demand can push the index higher quickly, and marginal demand decreases can cause the index to fall rapidly. e.g. "if you have 100 ships competing for 99 cargoes, rates go down, whereas if you've 99 ships competing for 100 cargoes, rates go up. In other words, small fleet changes and logistical matters can crash rates..." The index indirectly measures global supply and demand for the commodities shipped aboard dry bulk carriers, such as building materials, coal, metallic ores, and grains.

Because dry bulk primarily consists of materials that function as raw material inputs to the production of intermediate or finished goods, such as concrete, electricity, steel, and food, the index is also seen as an efficient economic indicator of future economic growth and production. The BDI is termed a leading economic indicator because it predicts future economic activity.

Because it provides "an assessment of the price of moving the major raw materials by sea," according to The Baltic, "... it provides both a rare window into the highly opaque and diffuse shipping market and an accurate barometer of the volume of global trade -- devoid of political and other agenda concerns."

2.3 Impact of 2008 financial crisis

On 20 May 2008 the index reached its record high level since its introduction in 1985, reaching 11,793 points. Half a year later, on 5 December 2008, the index had dropped by 94%, to 663 points, the lowest since 1986; though by 4 February 2009 it had recovered a little lost ground, back to 1,316. These low rates moved dangerously close to the combined operating costs of vessels, fuel, and crews.

By the end of 2008, shipping times had been already increased by reduced speeds to save fuel consumption, but lack of credit meant the reduction of letters of credit, historically required to load cargoes for departure at ports. Debt load of future ship construction was also a problem for shipping companies, with several major

bankruptcies and implications for shipyards. This, combined with the collapsing price of raw commodities created a perfect storm for the world's marine commerce.

During 2009 the index recovered as high as 4661, but by early 2011 it was again below 1100, after continued deliveries of new ships and flooding in Australia. The trend of BDI from 2008 to March in 2011 can be seen in Figure 2.1.

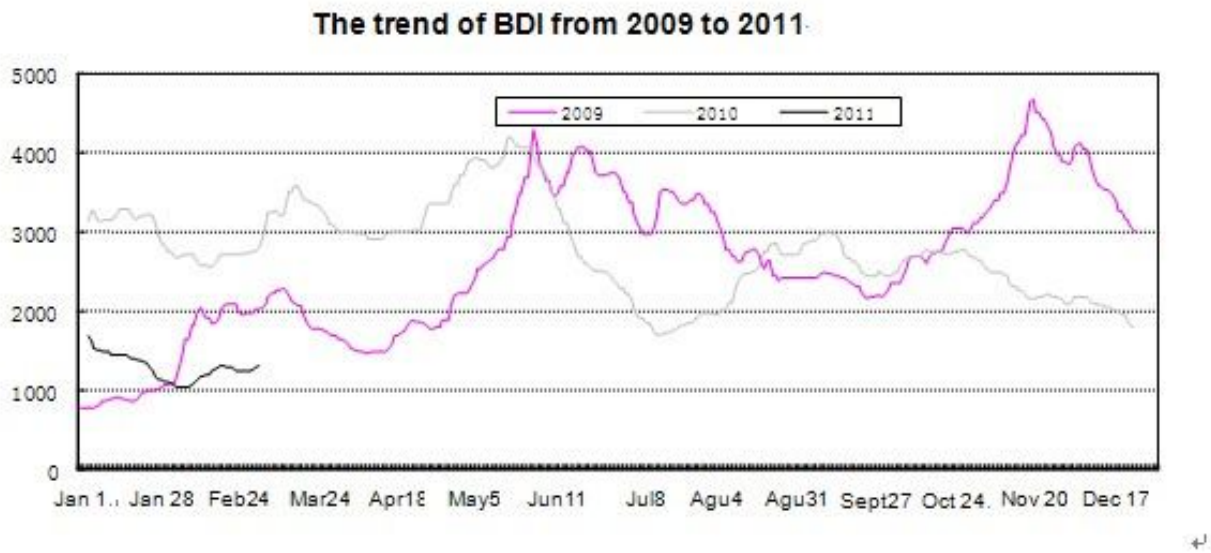

Figure 2.1The trend of BDI from 2009 to 2011

Source: www.snet.com.cn

Chapter 3 Analysis of demand for international dry bulk shipping market

3.1 Demand for international dry bulk shipping market and its characteristics

In Economics, market demand is defined that in a period of time and a certain price level, consumers are willing and able to buy the total amount of goods and services. Specific to the demand for international dry bulk shipping market is in a period of time, a certain tariff level, the international dry bulk shippers demand for the total capacity at sea. Shipping demand includes traffic volume, cargo flows, transport distance, delivery time, delivery speed and types of goods and so on. The demand for

international dry bulk shipping market has the following characteristics:

(1) Derivative of dry bulk shipping demand

International dry bulk seaborne transportation is due to the demand for international dry bulk trade, and the international trade has caused long-distance movement of goods. In order to meet the needs, international shipping provides displacement products. Therefore, the demand for international dry bulk shipping market is derived, which is based on social and economic activities and international trade. In order to understand the demand for dry bulk shipping market, we must firstly be clear about the maritime trade situation of the major dry bulks, which will be analyzed in the next section.

(2) Lag of dry bulk shipping demand

Because dry bulk shipping demand is derived demand of international trade, there is a certain incubation period of half a year to 2years when the rise and fall of world economy reflects to the international trade. The changes in demand for dry bulk shipping caused by international trade usually need about six months, that is, the change in demand for dry bulk shipping is one to two years later than the recovery or recession of world economy.

(3) Imbalance of dry bulk shipping demand

The imbalance of dry bulk shipping demand is determined by regional demand for dry bulk locality. This feature is not only a result of imbalance of resource distribution, economic development and international trade, but also the force to promote the development of dry bulk shipping market. This imbalance has been able to promote the development of the shipping market, because it has different requirements for the necessary factors of developing dry bulk shipping market, such as fleet size, fleet composition, transport price and improvement of the transport system.

(4) The identity of dry bulk shipping demand

The nature of dry bulk cargo determines the shipper's requirements of the transport services. In addition to the low freight, they do not require much about the rules of transport, speed and cabin equipment. The dry bulk shipping demand is not sensitive to the way of meeting the needs and technically organizational measures. When tariff level has been set, dry bulk shipping demand is very high identity, that's to say, it is all displacement of the object, and there is no physical substance or new material products in the transport process. This characteristics makes it simple to describe the dry bulk shipping demand, and is the underlying cause to make the market perfectly competitive.

3.2 Typical dry bulk cargo demand analysis

3.2.1 The trend of the total demand for international dry bulk shipping

As mentioned above, iron ore, coal and grain constitute the main demand for dry bulk shipping, and these three dry bulks have the greatest impact on world economy and trade, so they shall be the main line when analyzing the demand for dry bulk shipping market. With a node of a longer time for observation, the absolute amount of the major dry bulks has an increasing trend, because global economy and trade volume are gradually pulled in the fluctuations. Figure 3.1 illustrates the trend of international dry bulk seaborne trade from 2000 to 2009.

Table 3.1 international dry bulk trade weights by marine shipping from2000 to 2009 (Unit: million tons)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
International seaborne dry bulks trade(million tons)	2040	2093	2162	2279	2464	2557	2716	2996	3183	2969

Growth rate(%)		2.6	3.3	5.4	8.1	3.8	6.2	10.3	6.3	-6.7

Source: Data before 2007 are collected from Clarkson Shipping News and data in 2008 and 2009 are from International Information Website

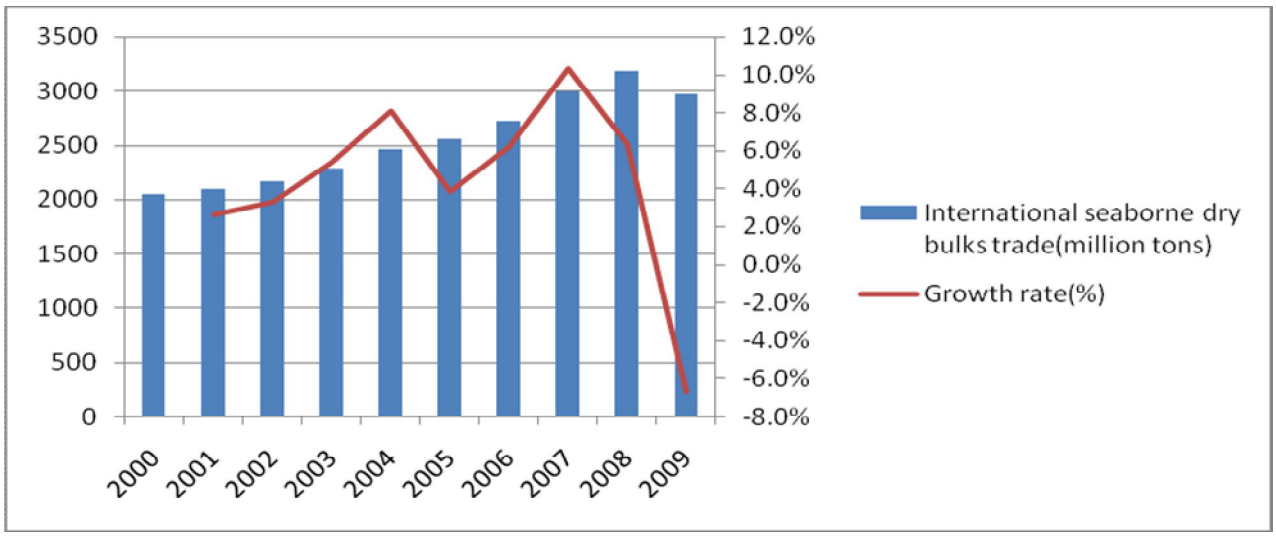

Figure 3.1 International dry bulk seaborne trade and growth from 2000 to 2009

Source: Table 3.1

3.2.2 Analysis of seaborne iron ore demand

3.2.2.1 Iron ore imports

The mainly importers are China, European Union countries, Japan, Korea and others. Self-sufficiency of iron ore is about 50% in China, and Japan is entirely dependent on imports of iron ore. Korea and EU are most dependent on imports of iron ore, and 10% of iron ore is dependant on imports in America. Global iron ore consumption in 2005 was 1.325 billion tons and trade volume was 7.31 billion tons, of which the imports of China, the European Union (25 countries) and Japan accounted for 78.3% of total world imports.

3.2.2.2 Iron ore exports

The world's major exporter of iron ore are Australia, Brazil, India, South Africa and other countries. The global iron ore consumption in 2005 was 1.325 billion tons, trade

volume 7.31 million tons, and iron ore exports in the three countries Australia, Brazil and India accounted for 75.7% of world exports. The share of exports of the three iron ore monopoly groups BHP Billiton, Rio Tinto mining company and CVRD iron ore in Australia accounted for 60% of the world iron ore export production.

3.2.2.3 Demand for iron ore in China

The rapid development of heavy industry and infrastructure makes the prosperity of steel industry, which lead to the rapid increase of demand for iron ore in China. Although China is the world's largest producer of iron ore, the production is mainly low-quality iron ore and the costs are higher. In contract, CIF price of iron ore continues to rise, while there are still the advantages of high quality and low cost. China's yearly iron ore output reached 260 million tons in 1995, after that it declined year by year and fall to 226 million tons in 2002. Neither the quality nor the quantity of domestic iron ore can keep up with the development of steel enterprises, resulting in China's increasing dependence on imports of iron ore. In 2003, China imported iron ore reached 148 million tons, surpassing Japan and the European Union, and became the world's largest iron ore importer. After that iron ore imports grew year by year and the increment of global iron ore seaborne trade almost flows to China. In 2010, China's iron ore imports were a staggering 6.19 billion tons, accounting for more than 50% of the global iron ore seaborne trade. (Table 3.1) Steel enterprises' demand for iron ore in China largely determines the supply and demand of international dry bulk shipping market. (Figure 3.1)

Table 3.2 China's steel output from 2000 to 2010 (Unit: million tons)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Steel output (million tons)	128	151	182	222	273	353	423	490	500	568	627

Source: Economic and Social Development Statistical Bulletin (National Bureau of

Statistics)

Table 3.3 China's annual imports of iron ore from 2001 to 2010 (Unit: million tons)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Imports of iron ore in China	92	112	148	208	275	326	383	440	628	619

Source: China Customs Statistics Information Network

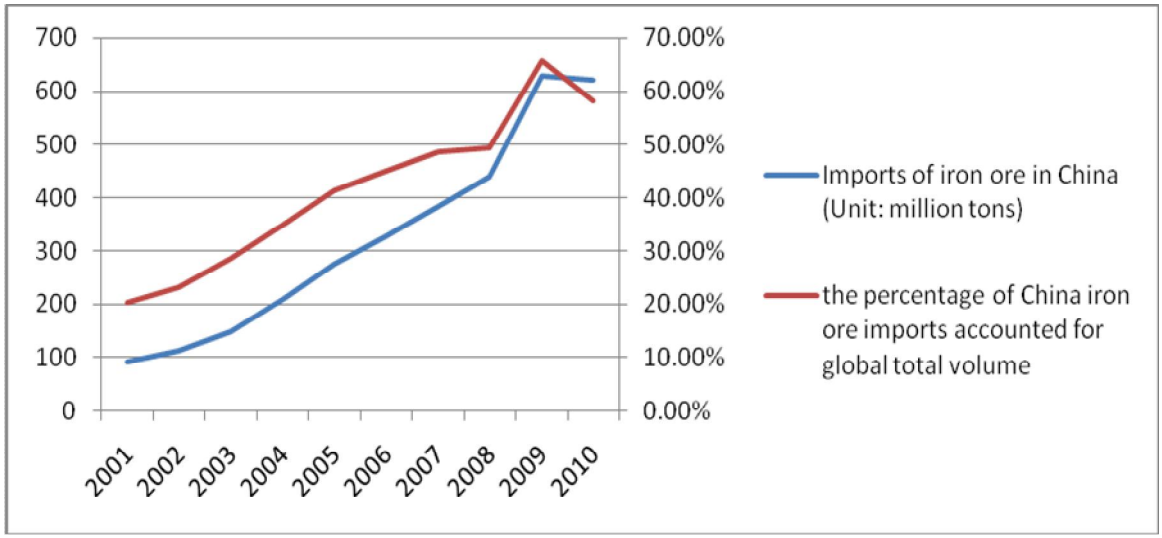

Figure 3.2 China's iron ore imports trend

Source: Data from Table 3.2 and Table 3.3

3.2.2.4 Global demand for iron ore

Table 3.3 and Figure 3.2 show that iron ore seaborne trade volume increased by 105% from 2001 to 2010, and it shows the trend of accelerated growth.

Table 3.4 Iron ore's trade weights by marine shipping from2001 to 2010 (Unit: million tons)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010

Global iron ore trade volume	451	481	518	597	661	721	787	889	955	1060
Growth rate		6.65	7.69	15.3	10.7	9.08	1.94	1.95	7.42	10.99

Source: Clarkson Shipping News & Shanghai International Maritime Information and Documentation Network

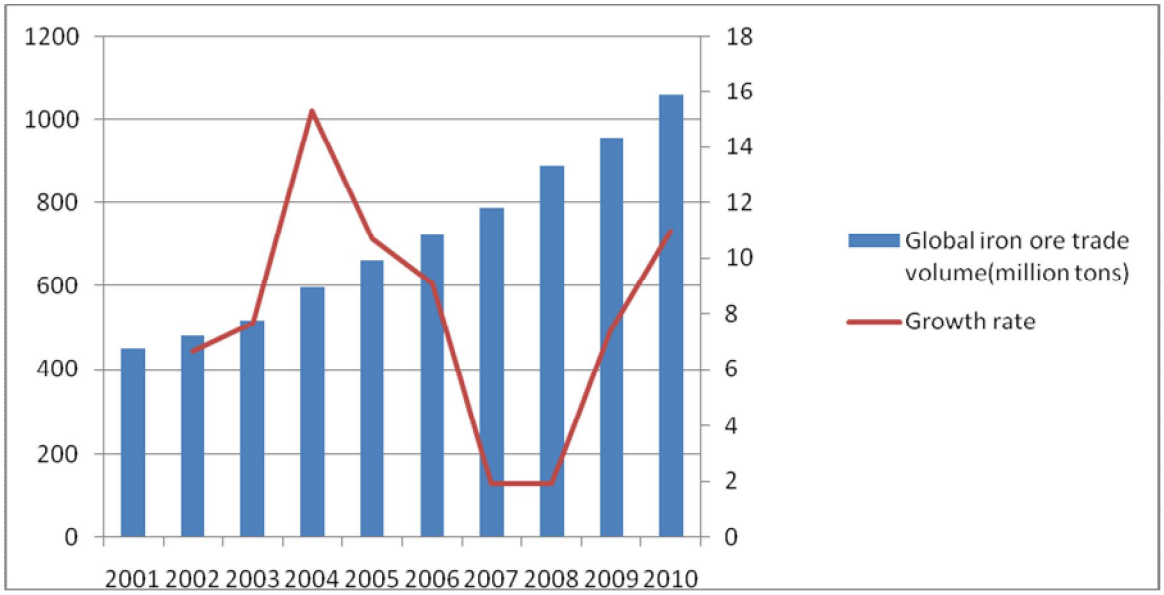

Figure 3.3 Global iron ore seaborne trade and growth from 2000 to 2010

Source: Data from Table 3.3

3.2.3 Analysis of seaborne coal demand

Demand for coal in international trade can be divided into two categories, one is steam coal, and the other is coking coal. Seaborne steam coal demand is from energy consumption and electricity production; seaborne coking coal demand is from the iron and steel production. Coal is one of the largest kinds of goods in international dry bulk shipping market. In 2008, world seaborne trade of coal reached 855 MDWt. Decades, annual global coal seaborne trade increased year by year, and growth in every three years exceeded one hundred million tons. From the following table we can get that the world coal seaborne trade increased from 524 million tons to 855 million tons between

2000 and 2008, the annual average growth rate up to 6.51%. However, due to the financial crisis in 2008, the trade volume of coal fell sharply to 795 million tons in 2009, growing to 814 in 2010 but still lower than that in 2008.

Major exporters of steam coal are Australia, South Africa, China, Indonesia, the United States and other countries, and the main importing countries are European Union, Japan, South Korea, Taiwan and other countries and regions. Steam coal seaborne trade increased by 1.08 times from 1998 to 2008, which exceeded 5 million tons in 2006 and the annual growth rate was significantly faster than that of coking coal. In recent years, rapid increase in steam coal is mainly due to the global electricity supply. Steam coal is mainly used in power plants, and large-scale construction of power plants in Asia makes the demand for steam coal continuously increasing. As a result, steam coal seaborne trade maintained an increasing trend. In contract, the trade volume decreased by 2.54% in 2009, and had a slight growth of 2.22% in the next year.

Coking coal exporters are mainly Australia, Canada, United States, Poland and other countries, and importers are the European Union, Japan, Korea and Taiwan. Global seaborne trade in coking coal increased from 174 to 254 million tons between 2000 and 2008. The growth rate of coking coal was relatively small, mainly because the owners use it and iron ore for steel-making. Hence, the trade volume is affected by the steel production. Due to the financial crisis, the steel production fell to a large extent in Japan, South Korea and the European Union in 2009, resulting in the sharply fell of coking coal seaborne trade, and it increased by 2.87% in 2010. (Seen in Table 3.5)

Table 3.5 Coal's trade weights by marine shipping from 2000 to 2010 (Unit: million tons)

	Coal's trade weights by marine shipping from 2000 to 2010										
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010

Total coal	524	556	579	632	654	680	707	765	855	795	814
Annual growth rate(%)		6.11	4.14	9.15	3.48	3.98	3.97	8.20	11.86	-7.02	2.39
Steam coal	350	387	407	453	474	498	522	563	601.3	586	599
Steam coal growth(%)		10.57	5.17	11.30	4.64	5.06	4.82	7.85	6.80	-2.54	2.22
Coking coal	174	169	173	179	180	182	185	202	254.4	209	215
Coking coal growth(%)		-2.87	2.37	3.47	0.56	1.11	1.65	9.19	25.94	-17.8	2.87

Source: Raw data are from Clarkson Shipping News and growth rates are accounted based on raw data

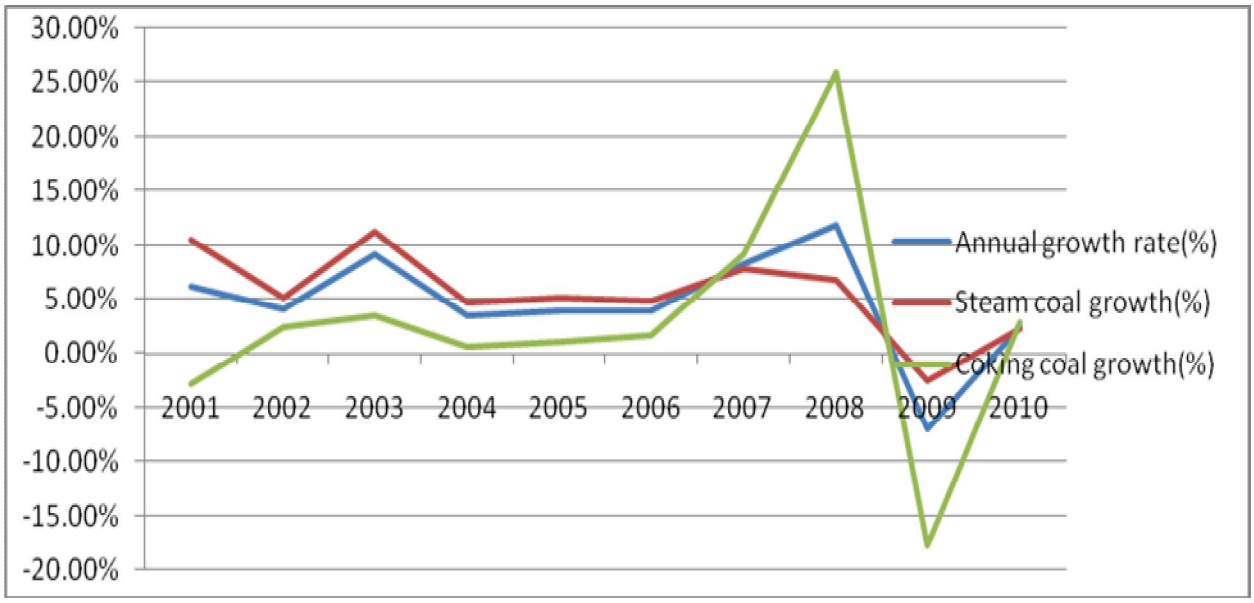

Figure 3.4 Comparison of growth rate of coal in international maritime trade

Source: Data from table 3.5

3.2.4 Analysis of grain seaborne trade demand

Although grain is grouped with iron ore and coal as one of the five major bulks, in both economic and shipping terms it is fundamentally a different business. Whereas iron ore and coal form part of a carefully structured industrial operation, grain is an agricultural commodity, seasonal in its trade and irregular in both volume and route.

Consequently it is extremely difficult to optimize, or even plan, grain shipments and the trade depends heavily on general-purpose tonnage drawn from the charter market.

The major exporting countries of grain are the United States, Canada, Australia, Argentina and the EU, and importing countries and regions are concentrated in the Middle East, Japan, China, Korea, Taiwan Province, Northern Europe, Southern Europe, South Africa, and Latin America, so the seaborne transport of grain is relatively dispersed.

The steady upward trend in seaborne grain trade was shown Figure 3.4 before 2007 and the average growth rate remained in 2% more or less. Global seaborne grain trade was close to 3 million tons in 2007. While the financial crisis and “Foot and mouth disease” throughout Europe lead to the significant decrease of seaborne grain trade in 2008.

However, patterns of trade in global grain import and export market will change after 2011, which will put pressure on the sea freight market. Because of frequent natural disasters in 2010, Russia issued a ban to temporarily stop the export of grain, which has a great influence on Middle East and North regions where import grain from Russia. Ethanol demand in the United States and other countries also increased, leading that the world's major grain exporting countries exports will fall significantly, and the traditional trade pressure on the global food market has doubled.

While grain imports of developing countries will continue to rise. With population growth and economic development, China, Korea and other Asian countries will significantly increase wheat imports, in particular the growth of China’s grain demand will stimulate the development of world grain import and export market. Reducing China’s grain reserves and rising price in grain market have caused close attention to international grain market.

Table 3.6 grain trade weights by marine shipping from 1998 to 2008 (Unit: million tons)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Seaborne grain trade	226	247	264	260	271	264	275	271	281	294	237.2
Growth rate (%)		9.29	6.88	-1.51	4.23	-2.58	4.17	-1.45	3.69	4.63	-19.32

Source: Data before 2007 are collected from Clarkson Shipping News and datum in 2008 is from International Maritime Information Website

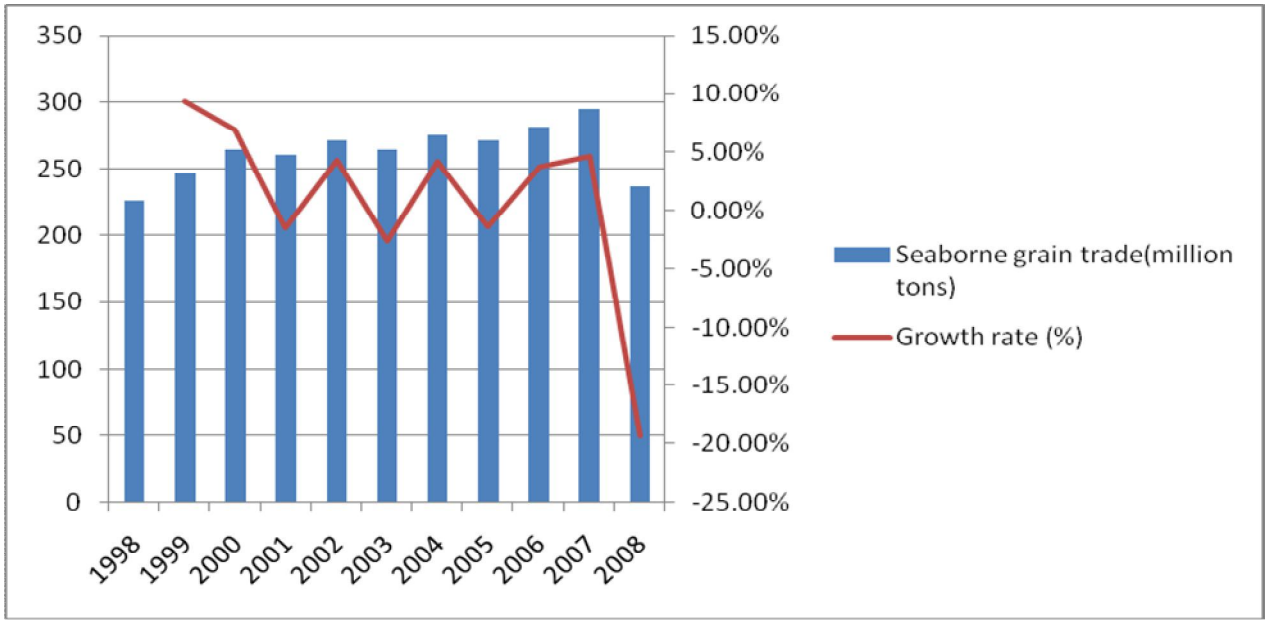

Figure 3.5 Annual seaborne grain trade and growth rate from 1998 to 2008

Source: Data in Table 3.6

3.3 Factors of demand for international dry bulk shipping market

3.3.1 Macroeconomic impact on demand for dry bulk shipping market

Derivative of demand for international dry bulk shipping determines that booming of international dry bulk shipping market has a direct and close contact on the world economy and regional economy, and economic development is one of the important

factors affecting demand for international bulk shipping market. The movement of dry bulk shipping market is closely related with global economy. Dry bulk shipping involves iron ore, coal, grain and other raw materials necessary for economic development, energy and basic livelihood needs, and is closely related with global economy and trade.

Since 2000, with the recovery of global economic growth, the dry bulk trade volumes have continued to show steady growth. Especially after the United States launched the war in Iraq, the U.S. economy grew rapidly, and the dry bulk shipping market also changed positively. Since 2007, the subprime crisis and later evolved into the worldwide financial crisis has led to significant global slowdown in economic growth. IMF shows that world economic growth in 2009 was only 0.5%, and international dry bulk shipping market also fell into the winter. The comparison of specific world growth rate and increment of dry bulk shipping are shown in Figure 3.6

. **Table 3.7 China and world economic growth from 2001 to 2010**

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
China economic growth(%)	7.5	8.3	9.5	10.1	10.4	11.6	11.9	9.0	8.7	10.5
World economic growth(%)	2.6	3.1	3.1	4.1	5.3	4.9	4.9	3.4	0.5	4.8

Source: International Monetary Fund

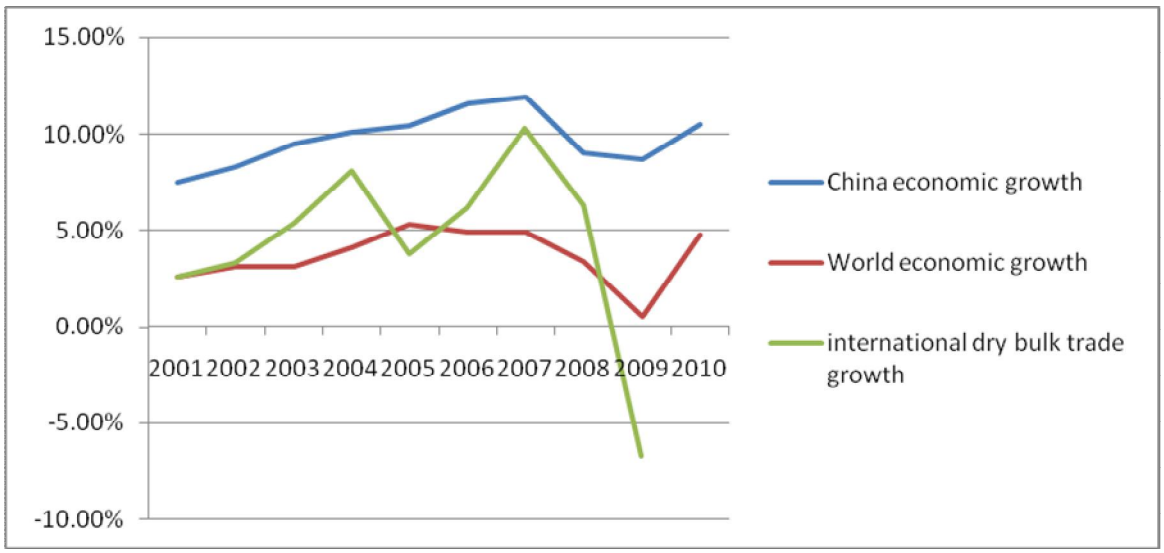

Figure 3.6 Contrast of dry bulk growth and macroeconomic growth

Source: Table 3.1 and Table 3.7

Figure 3.6 shows us that world economy is an important factor affecting the demand for dry bulk shipping. And China's economic development has an increasingly greater impact on dry bulk shipping market. China, as the new global economy manufacturing center, has become the main driving force of demand for dry bulk shipping market. Even in the current maritime economic winter, China is still the reason why performance of dry bulk market can be a little better than those of tanker and container shipping market.

3.3.2 Impact of steel production's pulling up effect on dry bulk shipping demand

The seaborne trade volume of iron ore, coking coal and steel, which are associated with steel industry, reached 50% of the total. This ratio makes the world steel industry profound impact on the development of dry bulk shipping market. Therefore, the world steel demand and production are the key factor of international dry bulk shipping market. Date shows that there is a strong correlation between BDI and CRU, which is up to 83% according to Clarkson.

Table3.8 Global steel production and growth rate from 2001 to 2009 (Unit: million tons)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Global steel production(million tons)	851	904	964	1015	1117	1217	1344	1330	1220
Growth rate(%)	0.30	6.25	6.71	5.27	10.05	9	10.43	-1.04	-8

Source: World Steel Association

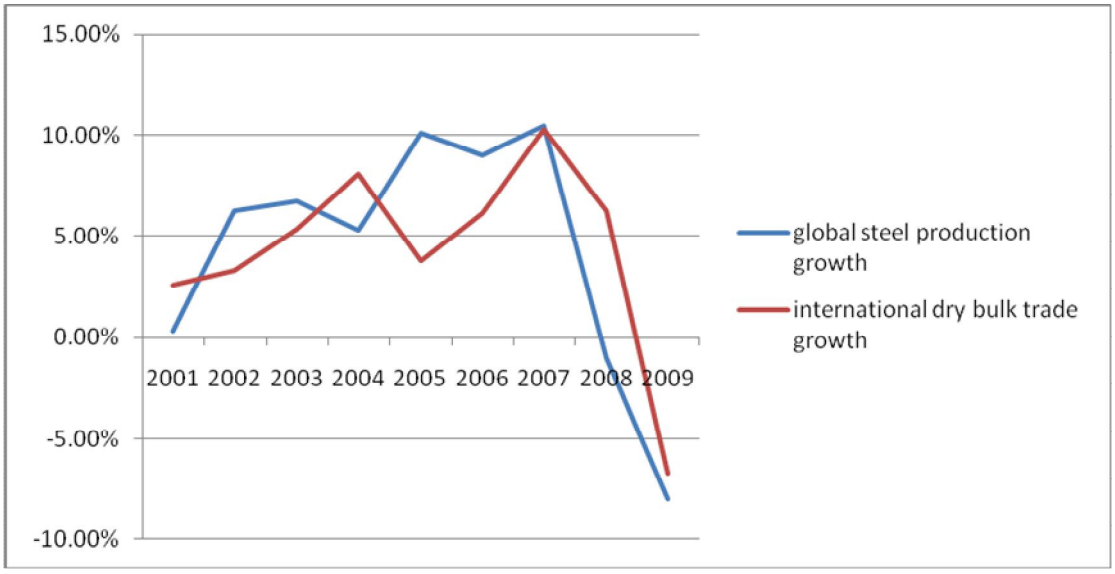

Figure 3.7 Comparison of steel production increment and dry bulk trade growth

Source: Table 3.1 and Table 3.8

As shown in Figure 3.7, the incremental rate of steel production and the dry bulk trade growth have similar fluctuation cycles, and it means steel production is one of the important factors of dry bulk shipping demand.

3.3.3 Impact of lengthening the average haul on dry bulk shipping demand

Demand for dry bulk shipping market depends on the distance over which the cargo is shipped to a large extent, and there is a linear relationship between dry bulk shipping

market and the average haul. With the continuous development of international trade, longer average haul changed the balance of supply and demand in dry bulk shipping market to a large extent. Asia, particularly China, continued rapid development of industrialization, resulting in a structural change in international dry bulk shipping market. Restructuring the allocation of global goods and cargoes beyond distance have become a trend. For example, because Indian iron ore exports decreased, China had to turn to Brazil for more iron ore imports; Australia's exports of grain have been on decline for 8 years because of the drought, and due to the increasing domestic demand, China's corn exports fell, all of these lead to more grain imports of Asia and Europe from the United States and South America. To some extent, these have changed the main routes and extend the distance, resulting in an increase of shipping capacity. Overall, the average haul of dry bulk maintains a steady upward trend which shows world dry bulk transport has expanded in a broader scope.

3.4 Analysis of demand for dry bulk shipping market in the short term

Overall, the growth of three main seaborne dry bulks is expected to continue to fall in 2011, and the prediction of the current downside risk of dry bulk shipping market in a short run continues to dominate. Of course, there may be upward, especially since taken a more forceful policy, the improvement of global financial situation may be faster than expected. Thereby improve the confidence of consumers and business, ease the credit crunch, enhance global economic growth, enlarge the total global trade and open the dry bulk shipping market access. However, in a long run, the international dry bulk market will experience a relatively long bear market. Because this round of global dry bulk booming is driven by the China factor. In the early development of China's industrialization, extensive production consumed huge resources, demand for transporting a large amount of raw materials, thus boost the prosperity of the international dry bulk shipping market. But now China has gradually stepped into the middle and late industrialization, economic growth is undergoing major adjustments and freight intensity will enter the stage of rapid decline. Demand

for iron ore imports and coal import and export transport will remain relatively stable in China. Therefore, the global shipping "once" had been to the good old days, and winter has come. This “winter” may be relatively long and the fittest to survive.

Chapter 4 Supply of international dry bulk shipping market

4.1 The characteristics of supply of dry bulk shipping market

As special service products, the supply of international dry bulk shipping has the following three main features:

(1) Non-storage of transportation products

What the shipping supply provides is service, and the production activities of shipping companies are to change the spatial location of object, not the production of new materials. The production and consumption in the supply of international dry bulk shipping happen at the same time, and transport products can not exist independently from the production process, which is the non-storage of transportation products. This characteristic determines that transport reserves can not take the form of products, but only adapt to the demand for dry bulk shipping through the increase or decrease of the transport capacity.

(2) Imbalance of supply capacity

The imbalance of supply of dry bulk shipping reflects in the following three aspects: The first is supply and demand imbalance, which can be manifested in the short supply or oversupply of shipping capacity, and the latter is more common. Secondly, the international dry bulk shipping supply imbalance is reflected in seasonal changes. The demand for capacity changes from peak to trough in different seasons, resulting in the alternation of shortage and waste of capacity in the same year. Finally, the imbalance of supply reflects in the transport direction, which is due to the flow of the

three major dry bulks. Therefore, the distribution of shipping capacity in different regions, different routes and even round-trip flight between the same route is uneven.

(3) Spatial and temporal difference in shipping production

Shipping product can only be generated in the transport process, but the production and consumption of transport can not be combined well. For example, a dry bulk vessel of 2.5 million tons can provide the shipping capacity of 2.5 million tons, but in a voyage the actual cargo shipped don't reach the deadweight. Loss of load results in the waste of capacity, this is the time and space differences between the demand for capacity and supply of it.

4.2 Supply of dry bulk fleet capacity

4.2.1 Trends of international dry bulk shipping capacity

The trend of dry bulk shipping capacity over the years is shown in Figure 4.1, and specific data in Table3.1. The trend of dry bulk shipping capacity shows a linear growth, and the trends of shipping capacity and dry bulk volume are similar. Because of the shipbuilding cycle, the change in capacity will slightly lag behind that in volume. The fleet capacity growth rates over the years have a cyclical fluctuation, which lag behind the grow rate of demand for dry bulk shipping for about two years, and this is related with a longer manufacturing cycle of providing new shipping capacity.

Table 4.1 Dry bulk shipping capacity and its growth ratio from 2001 to 2011(E)

(Unit: million tons)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011(E)
Dry bulk shipping capacity(million tons)	283.7	294.7	303.5	340.4	360.7	376.7	391.3	421.3	457.0	537.0	614.0

Growth rate(%)	3.24	3.88	2.99	12.16	5.96	4.44	3.88	7.67	8.48	17.5	14.34

Source: Data before 2010 are from Drewry Shipping Consultants Ltd. and datum in 2011 is forecast datum

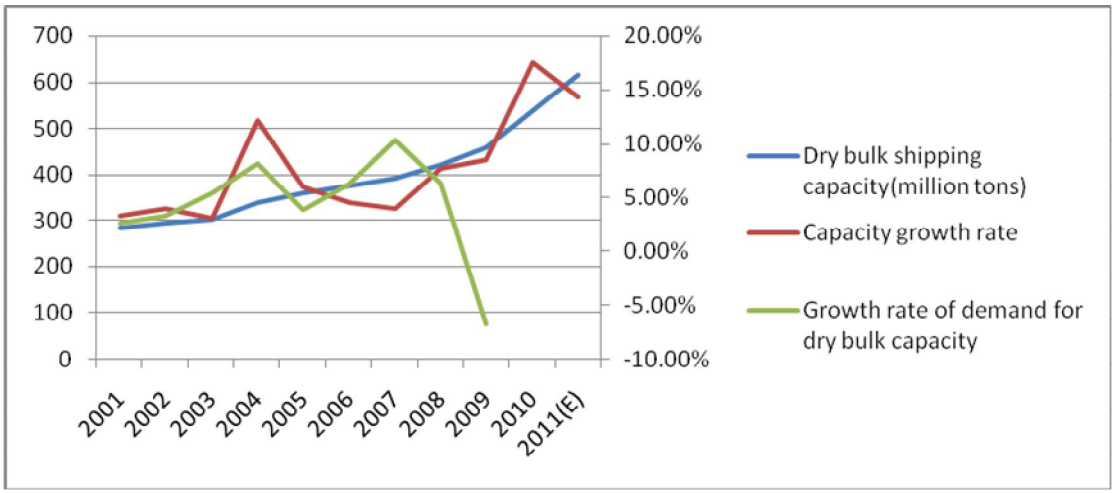

Figure 4.1 International dry bulk shipping capacity trends

Source: Table 3.1 and Table 4.1

4.2.2 Analysis of dry bulk fleet by ship age and type

Table 4.2 shows that, in the age composition of dry bulk fleet, handy bulk carriers are older than others. Handy bulk carriers more than 20 years account for 54.9% of the total number of this type, and the proportion of Panamax and Capesize are 21.1% and 15.4%; handy bulk carriers less than 10 years share 16.4% of this type vessels, while the proportion of Panamax and Capesize are 50.8% and 50.1% respectively. This shows that the new capacity of Handysize is little, this type has entered the aging, and gradually phase out, while the proportion of young ships of Panamax and Capesize are both more than 50%, that is to say, in recent years these two types of vessels are popular and the proportion in dry bulk fleet are constantly increasing. Therefore, the most striking feature of the world dry bulk fleet has been the rapid escalation of ship sizes. Large and more efficient ships have progressively pushed their way into the market depressed rates for smaller sizes. This trend can also been proved through

Figure 4.2

Table 4.2 The age composition table of international dry bulk fleet in 2010

Ship age	20+	15-19	10-14	5-9	0-4
Handy bulk carriers	1554	147	408	281	449
Tonnage(million tons)	41.6	3.9	10.3	7.6	12.4
Handymax bulk carriers	401	141	362	366	578
Tonnage(million tons)	17.9	6.3	16.7	18.6	31.5
Panamax	375	154	307	340	448
Tonnage(million tons)	25.5	11.2	22.5	25.8	35.6
Capsize	150	168	165	150	305
Tonnage(million tons)	25.7	29.9	28	26.2	57.1
Total number of vessels	2480	610	1242	1137	1780
Percentage of fleet	34.2%	8.4%	17.1%	15.7%	24.6%
Total tonnage of vessels	110.7	51.3	77.5	78.2	136.6
Percentage of fleet	24.4%	11.3%	17.1%	17.2%	30.1%

Source: Clackson

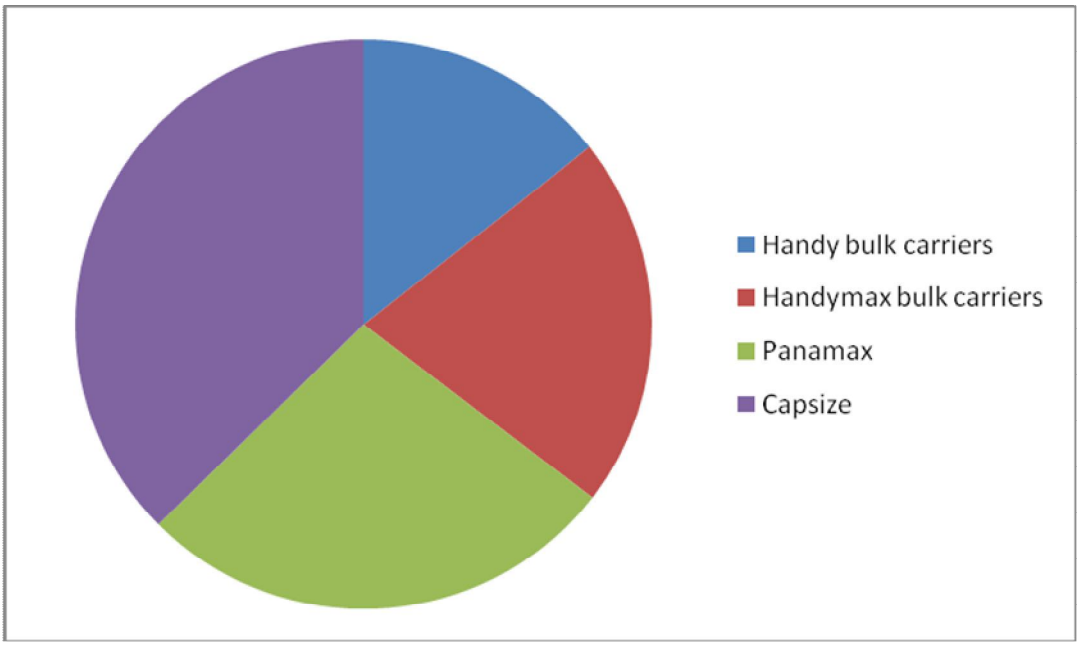

Figure 4.2 The international ship capacity distribution of 2010

Source: Table 4.2

4.3 Factors of supply of dry bulk shipping market

4.3.1 Impact of market demand on fleet size

The shipbuilding industry plays an active part in the dry bulk fleet adjustment process. Adjustments in the level of shipbuilding output on this scale do not take place quickly or easily. Shipbuilding is a long-cycle business, and the time-lag between ordering and delivering a ship is between 1 and 4 years, depending on the size of orderbook held by the shipbuilders. The dry bulk carrier newbuilding market has been comparatively stable in the recent years. However, investment has been very cyclical with deliveries fluctuating between 5 and 15 m.dwt per annum. In a very real sense bulk carriers have to face the problems of overproduction and chronic surplus.

The rate of growth of the dry bulk fleet depends on the balance between deliveries of new ships and deletions from the fleet in the form of ships scrapped or lost at sea. While it is clear that scrapping has a significant part to play in removing ships from the market, explaining or predicting the age at which a ship will actually be scrapped is an

extremely complex subject, and one that causes considerable difficulties in judging the development of shipping capacity. The reason is that scrapping depends on the balance of a number of factors that can interact in many different ways. The main ones are age, technical obsolescence, scrap prices, current earnings and market expectations.

Age is the primary factor determining the tonnage of vessels scrapped. Technical obsolescence may reduce the age at which a particular type of vessel is scrapped because it is superseded by a more efficient ship type. The decision to scrap is also influenced by the scrap prices. Most importantly, the scrapping of a ship is a business decision and depends on the owner's expectation of the future operating profitability of the vessel and his financial position.

4.3.2 Impact of port time on dry bulk shipping capacity

Port time plays an important part in the productivity equation. The physical performance of the ships and terminals sets the upper limit. Congestion produces temporary reductions in performance. For example, port congestion in China absorbed large amount of shipping in 2003 and 2004, and in March, 2007 there was heavy congestion at Australia，with queues of 120 Capesize vessels waiting to load cargoes. This congestion reduced the supply of ships available for trading.

4.4 Analysis of supply of current dry bulk shipping market in a short run

According to Drewry Shipping Consultants, on the basis of 17.5% of growth rate in global dry bulk shipping capacity at the end of 2010, capacity will continue to grow by 14.34% in 2011, and fleet size will reach 614 million tons. Following the financial crisis, capacity growth rate exceed 10% for 2 years, which will bring greater pressure on the future dry bulk shipping market.

From the distribution of fleet capacity increment, the total capacity of Capesize vessels and large bulk carriers will reach 2.50 million DWT, compared to 210 million DWT at the end of 2010, the growth rate up to 19.05%. Capacity of Panamax fleet will reach 166 million DWT in 2011, an increase of 19.42% is expected, which will make the situation of excess capacity worse.

Handysize and Handymax fleet capacity will be 84 million DWT and 123 million DWT, the growth rate 3.70% and 13.89% respectively.

According to supply and demand of global capacity and prediction for new capacity in the next 2 years, the degree of excess capacity of dry bulk shipping market will be further deepened in 2011. A large number of dry bulk vessels were delayed in delivery in 2010, and if these orders are delivered in 2011, the market will be worse. Global dry bulk shipping market will be more competitive in 2011, further weakening corporate profitability.

Chapter5 Analysis of dry bulk shipping market cycle fluctuation

5.1 Characteristics of dry bulk shipping market cycle

In dry bulk shipping market the existence of cycles has long been accepted as part of the shipping business. Although the length of cycles is of great interest, it soon became evident to observers of the dry bulk shipping business that the cycles were far more complex than a sequence of regular fluctuations in freight rates. The cycle is seen as a consequence of the market mechanism. The peaks and troughs in the cycle are signs that the market is adjusting supply to demand by regulating the cashflow.

The dry bulk shipping cycle is described as a mechanism devoted to removing

imbalances in the supply and demand for ships. If there is too little supply, the market rewards investors with high freight rates until owners give up the struggle and ships are scrapped. Looked at in this way the length of the cycle is incidental. They last as long as is necessary to do the job. It is possible to classify them by length, but this is not very helpful as a forecasting aid. If investors decide that an upturn is due and decide not to scrap their ships, the cycle just lasts longer. Since shipowners are constantly trying to second guess the cycle, crowd psychology gives each cycle a distinctive character, yet another reason why the cycles are irregular.

A complete cycle has four stages, trough, recovery, peak and collapse. A market trough is followed by a recovery, leading to a market peak, followed by a collapse. In addition, the cycles are episodic, with no firm rules about the timing of each stage. Regularity is not a necessary part of the process. Finally, there is no simple formula for predicting the shape of the next cycle. Recoveries can stall half-way and slump back into recession. Market collapses may be reversed before they reach the trough. Troughs may last six months or six years. Peaks may last a month or a year. Sometimes the market gets stuck in the middle ground between trough and recession.

5.2 Analysis of Baltic Dry Freight Index

5.2.1 Long-term trend of BDI

BDI 200-day moving average (green curve) in Figure 5.1 shows that international dry bulk freight rates maintained an increasing trend before 2008, mainly because of the continuous development of world economy and an increasing demand for national energy and raw materials. However, the financial crisis in 2008 made BDI to fall sharply, and surplus shipping capacity result in the continuous decline of BDI in recent two years.

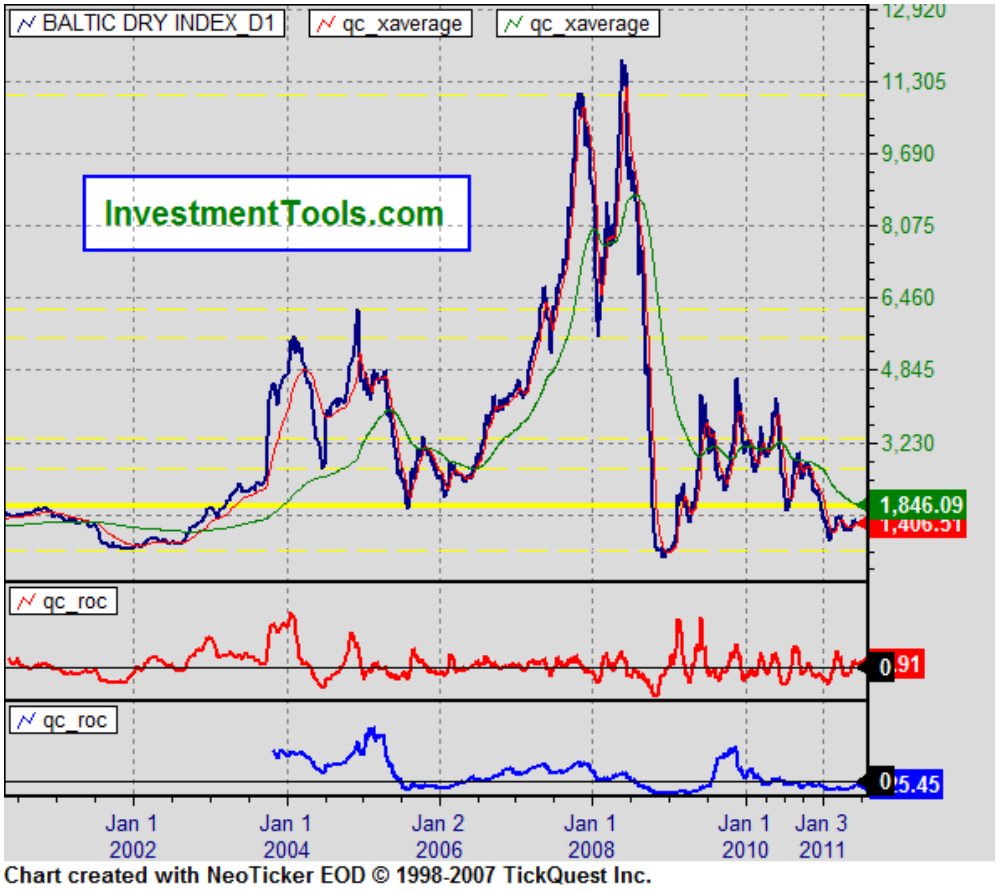

Figure 5.1 Trend of BDI from 2002 to 2011

Source: www.investmenttools.com

5.2.2 Seasonal changes of BDI------in a short run

International dry bulk transport is greatly influenced by the seasons. The advent of different natural conditions in different seasons results in differences of navigation cost. Overall, the cold and windy season makes freight rates up, and the summer is the opposite. In addition, production, storage, trade and consumption of physical goods are obvious seasonal, which makes demand for shipping goods seasonal inevitably. Seasonal activities of both supply and demand parties lead to seasonal fluctuations in freight rates. Production and consumption of the major dry bulks are seasonal more obviously, resulting in seasonal fluctuations of international dry bulk freight rates. From figure 5.2 we can find that there were obviously seasonal fluctuations during a year, and this trend was similar in the year of 2009 and 2010.

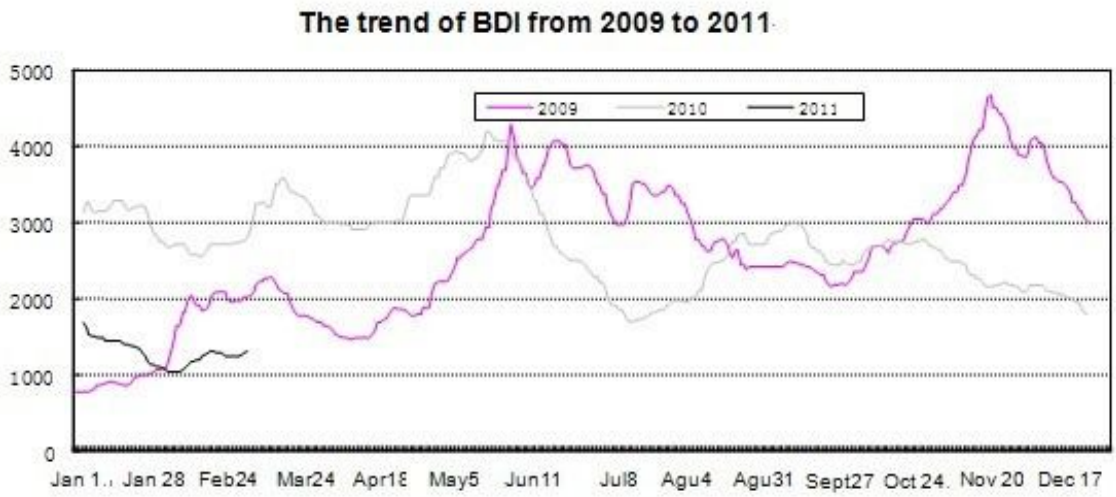

Figure 5.2 The seasonal trend of BDI

Source: Drewry shipping Consultants Ltd.

5.2.3 Periodic changes of BDI-------in a long run

Figure 5.4 can be seen that international dry bulk shipping price index showed the characteristics of cyclical fluctuations. Meanwhile I find that BDI 200-day moving average curve shows the similar trends with that of world economy growth and China economy growth, that is to say, the world's overall economy has an obvious impact on cyclical fluctuations of BDI. I attempt to do time series sequence and correlation analysis of world economy growth and BDI in chapter 6 of the paper.

Periodic changes in BDI have the following characteristics:

(1) Trend: Figure 5.3 shows that BDI went through two cycles between 2001 and 2010, reaching the peak in 2004 and 2008 respectively and falling to the trough in 2002 and 2006. However, the overall dry bulk shipping market maintains an upward trend.

(2) Frequency: BDI remains a cycle of about 4 years. Cyclical fluctuations of world economy is a main factor, which remains a short cycle of 4 to 5 years shown in

Figure 5.3, and cyclical changes in demand for international shipping also caused periodic fluctuations of freight rates.

(3) Amplitude: I find that the amplitude of cyclical fluctuations in BDI annual average curve is more obvious, that is to say, the fluctuations of BDI may be amplified due to some other factors (FFA etc.).

Table 5.1 Annual average BDI from 2000 to 2011(Q1)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011(Q1)
Annual average BDI	1608	1217	1317	2618	4507	3371	3177	3340	7990	2617	2808	1365

Source: Clarkson

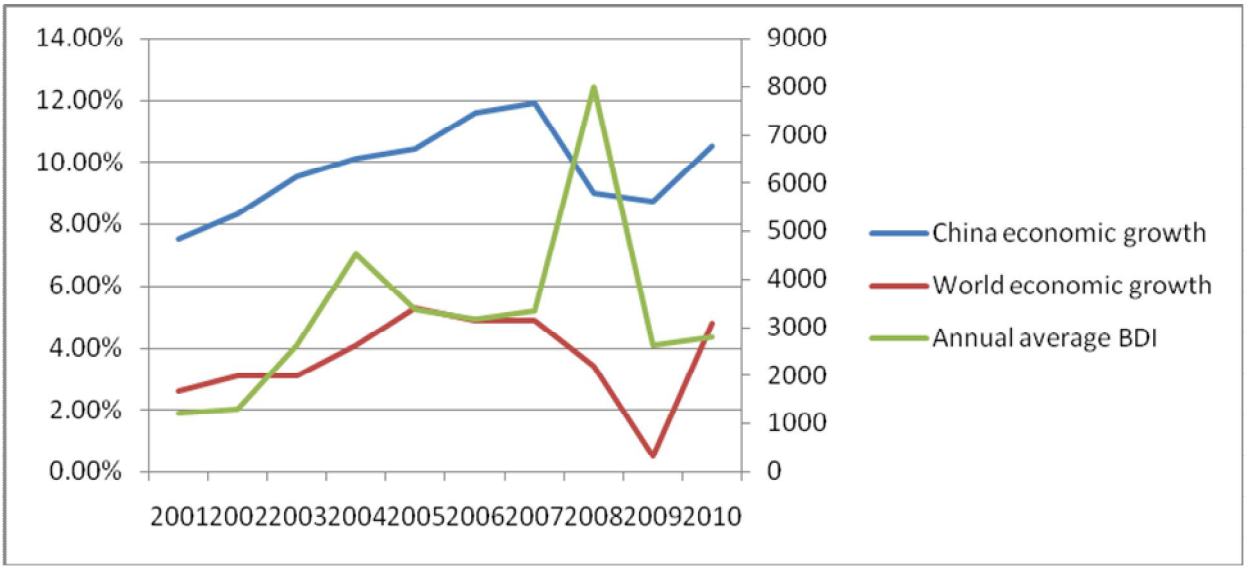

Figure 5.3 Cyclical changes in BDI

Source: Table 5.1 and Table 3.7

5.3 Factors of BDI fluctuations

(1) Supply and demand are the root cause of cyclical fluctuation

International dry bulk freight is affected by supply and demand of the shipping market. Provided the international dry bulk market is perfectly competitive, shipowners and shippers negotiate to establish a freight rate which reflects the balance of ships and cargoes available in the market. Once this freight rate is established, shippers and shipowners adjust to it and eventually this brings supply and demand into balance. Therefore, the supply and demand of shipping market is the fundamental reason for the freight trend.

(2) Rising costs and total world trade volume promote the overall trend

Transport cost is the main basis for determining the freight and has a profound impact on change of freight. Because of scarcity and non-renewable nature of resources, their prices hold a growing trend. Therefore, the increase of the opportunity cost of funds makes transportation cost an upward trend, resulting in the international dry bulk freight higher.

(3) FFA has an impact on cyclical fluctuations of BDI

A forward freight agreement (FFA) is a financial forward contract that allows ship owners, charterers and speculators to hedge against the volatility of freight rates. It gives the contract owner the right to buy and sell the price of freight for future dates. FFAs are built on an index composed of a shipping route for tanker or a basket of routes for dry bulk, contracts are traded ‘over the counter’ on a principal-to-principal basis and can be cleared through a clearing house.

The market prices of bulk shipping have the characteristics of high volatility and difficulty to control. If trading occurs only in spot markets at spot prices, bulk shipping prices will be volatile in the spot markets and participants will be unable to respond to the market situations. Therefore, market participants will eventually lose their competitiveness in the bulk shipping market and be immersed in the uncertain risks. During booming economic periods, the importance of monitoring market movements is not obvious. However, in a weak economy, the speed and quality of market

information become rather essential. Therefore, Forward Freight Agreements (FFAs) are able to speed up market information movements and increase the quality of information. FFAs means that buyers and sellers reach a freight agreement which defines the specific sailing routes, prices, quantities and settlement dates, with the parties agreeing to receive or pay the freight balance between the agreement prices and the Baltic dry index (BDI) at a future point of time. FFAs are a form of risk management for products. In simple terms, the participants engage in FFAs mostly for at least one of the four motivations of derivative instruments: the risk hedging motivation, that is, to hedge the risk of spot assets or transportation costs; the speculation motivation, that is, to obtain a higher return by bearing risks using FFAs; the arbitrage motivation, that is, to discover the price imbalance between spot markets and derivative instrument markets; or the price discovery motivation, that is, to predict the market trends by using the derivative instrument market quoting system as the index.

Chapter 6 Forecasting of BDI trend based on ROCET

6.1 Research methods of BDI

International dry bulk shipping market is risky and competitive, and BDI can effectively reflect market changes. Therefore, more and more domestic and international shipping economic analysts use a variety of forecasting techniques and methods of study of BDI, trying to find out the internal rules for market forecasts, and thus invest and avoid risks. At present, domestic and foreign scholars has made significant progress in predicting Freight Index, and put forward a number of linear or nonlinear types of forecasting models.

Today's analysis tools of dry bulk freight index mentioned above tend to complex assumptions and formulas, and some advanced statistical ideas are used when

modeling, which only a few scholars can understand. In fact, most people can not use these theories, even if they knew them, the relevant data is also very difficult to get. That is to say, people can not find out some operational approach from these methods to invest and participate in activities in dry bulk shipping market.

I attempt to find out an effective, feasible and relatively simple trend forecasting method, the result of which is easy to understand and predictable. In addition, it is easy to get the data, applied to policy-making, business operation and investment decision in dry bulk shipping market. Thanks for the book “Ahead of the curve-a commonsense guide to forecasting business and market cycles” written by Joseph H. Ellis. He proposes Rate of change economic tracking (ROCET), and makes use of indicators of consumer spending to predict the performance of U.S. stock market. Here I draw on this approach, and make use of indicator of world economy growth rate to predict the trend of dry bulk freight. Given my limited time and little talent and learning, the method is hard to avoid vulnerability, so I am glad if readers can understand and correct me.

6.2 Feasibility and significance of ROCET

6.2.1 Feasibility of ROCET in BDI forecasting

Economic events are not, as expected, completely random and unpredictable. There are a lot of causal relationships with practical predictive value in Economics. These relationships have been recurring with the economic cycle in the past few decades, have also maintained high correlation, and repeat in each round of the cycle. Joseph H. Ellis mentioned, when forecasting the upward, downward trend and the inflection point of economic series with ROCET, the first thing to do is to assume there is a significant causal relationship between the two indicators with intuition, and then to test the relevance of two indicators. The relevance can be obtained through visual observation of the chart made by historical data. For example, the upward and

downward trends of sequence A have always been ahead of sequence B, and there is the same trend and fluctuation between the two year-on-year rises, then we can confirm that sequence A and B are relevant. After that we can make use of the causation of the relevant factors and track the change rate of the leading indicator, rather than the absolute value of it, to speculate the trend of lagging indicator. This method is still applicable, even if time of the two indicators' sequence is different with the different cycles, or the difference of the rates in peaks or troughs also varies by period. The effectiveness of this tool is to predict the trend of the lagging indicator ahead through the fluctuations of the growth of the leading indicator. In other words, when the growth rate of the leading indicator begins to fall, you should be aware of the followed downward trend of the lagging indicator.

Therefore, we are concerned about two issues before further analysis. Firstly, is there a consistency and repeated correlation between the two indicators to be tested-----world economy growth and BDI? Secondly, is the causal relationship of the two indicators consistent with common sense? We can find that world economy growth and BDI have the same fluctuation in the trend of upward and downward through observing Figure 6.1, to infer a correlation between the two. According to the former text, it's known to all that there is a causal relationship between world economy growth and dry bulk shipping market.

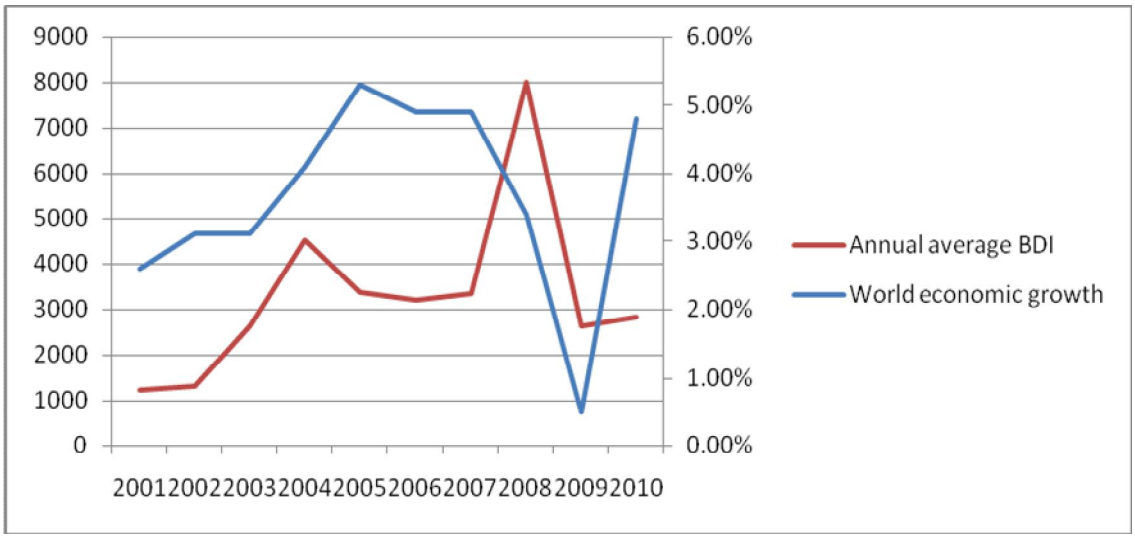

Figure 6.1 Changes in world economy growth and trends in BDI

Source: Data from Table 3.7 and Table 5.1

6.2.2 The significance of ROCET in BDI forecasting

The participants of dry bulk shipping market are lack of vigilance for the economic downturn and the subsequent bear market, and they are too much concerned about the concept of “recession” and the fact in terms of ideology or the actual analysis. The danger of this approach is similar with that water resource management departments are not concerned about the gradual decline of water level, but enact the water ban when there is almost no water in the reservoir. In fact, most of the losses have taken place from all over the water level dropped to one third. People define a recession as an absolute decline in the economy, so that the concern and vigilance for the recession is too late and this is not a real definition that can depict the actual operational situation of the market. If analyze this problems with the increment of the increment, the fact is that half the time on the rise, and the other half in the fall.

In the cycle of dry bulk shipping market, the major loss of shipping companies and investment institutions occurred in the recession after the peak, instead of the slump. Therefore, the usual approach is to discuss the trend of BDI with an absolute level, that is to say, discuss the depression in the peak and debate for the bounce in the trough, when the market participants have lost a lot of opportunities. Often the use of leading indicator can predict the recession after six months, but it is too late to shrinking business when the economy approaching recession. Actually, it is better to expend business and wait for the arrival of recovery. So the method of ROCET will take place of the traditional method to analyze the growth rate of the leading factor and measure the lagging indicators, finally identify recession and recovery ahead.

6.2.3 Advantages and disadvantages of ROCET in BDI forecasting

As the beginning of the article mentioned, I will make the curve with data, analyze problems by observing the chart, and forecast BDI after analyzing the trend of the indicators. I will examine the relationship between BDI and world economy growth, emphasize the timeline of the two economic series in each round and the causal relationship, to take advantage of the world economy growth to predict BDI in advance, making the prediction as early as possible, "walk in ahead of the curve".

This method is an effective, feasible, relatively simple and greatly ahead prediction method; and the results are easy to understand, predictable; data sources will be simple and easy; most important practical significance of this method is to predict in advance the turning point of the dry bulk shipping market, not discuss the change of investment policy under the circumstances of having enough information. So it is easy to be applied in policy-making, business operation and investment decision.

Also there are some deficiencies. The method can only predict the fluctuations of BDI, but not for specific quantities research on the fluctuation amplitude. In addition, the method can only be significant of medium and long term cyclical fluctuations of BDI, and not reflect the short-period fluctuations. Meanwhile I am limited in terms of data access, resulting in a decline in the expected precision. But it is undoubtedly commendable for me to increase the amount of the forecast period in advance. Once again thank readers for their understanding and welcome your correction.

6.3 Practical application of ROCET in predicting BDI trend

There is a non-symmetric circular causality relationship between dry bulk shipping market and global economy. World economic growth reflects the trend of world trade which affected the dry bulk shipping market; and dry bulk shipping market also affects the level of world economic growth levels. But there is no doubt that the influence of the former on the latter much greater. So world growth rate is ahead of the dry bulk freight fluctuations over the time series, which can also be observed in Figure 6.2.

In Figure 6.2/3, the blue line represents the world economy growth and the red line shows the BDI trend. Through careful observation of Fig 6.2, we can find:

(1) Blue line is ahead of the red line, which due to a great impact of world economic growth on BDI, that is to say, world economic growth indicators are leading indicators, and annual average BDI is a lagging indicator.

(2) The cycle fluctuations of world economy growth is little ahead of BDI since 2001, in other words, the warning signals of world economy growth when forecasting BDI trends are getting more and more weak. When the dry bulk market participants noticed the change of economic growth, it is too late for them to change the investment strategy.

(3) In the whole timeline, there has been a non-coincident phenomenon of the two curves in the time series, which is completely understandable, because many factors affect the BDI. This phenomenon doesn't prevent us from using the tool, because we are just predicting the long-term trend of the lagging indicator through the leading one.

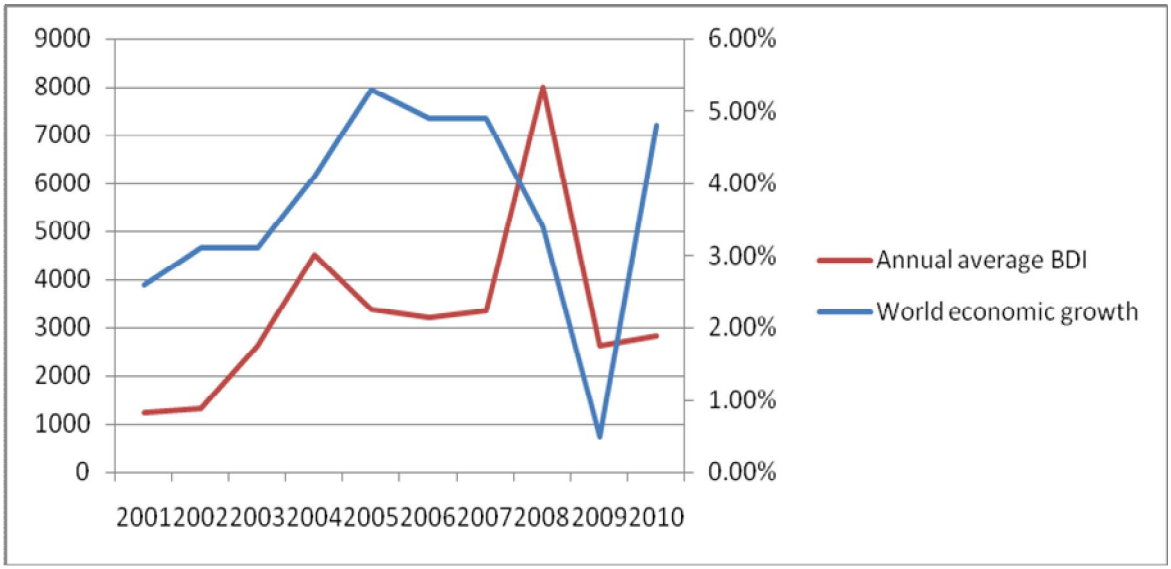

Figure 6.2 Coincidence of cycle between world economy growth and BDI

Source: Data from Table 3.7 and Table 5.1

In Figure 6.3, inspired by the method of ROCET, I will observe and study the curves of increment of world economy growth and freight index. Here the time series relationship between the two indicators are determined, BDI as the lagging factor being predicted by the increment of world economy growth (second derivative).

I find that the blue line is still ahead of the red line sequence, but the interval between the blue line and red one is widened, on average, to about 1 year. The observation just meets my thinking and mathematical basis, which means we are able to prejudge the inflection point and trend of the BDI curve for 1 year in advance. It is the fundamental significance of adopting the method of ROCET that widening the interval time for prejudging much earlier, so dry bulk shipping market participants can adjust their strategies and investments.(Seen in Figure 6.3)

The anomaly in Fig 6.2 is removed in Fig 6.3, which is unexpected. Probably it is the derivation of growth that eliminates some noise (Often times items), making the two curves can be a good fit in the time series in the anomalistic area.

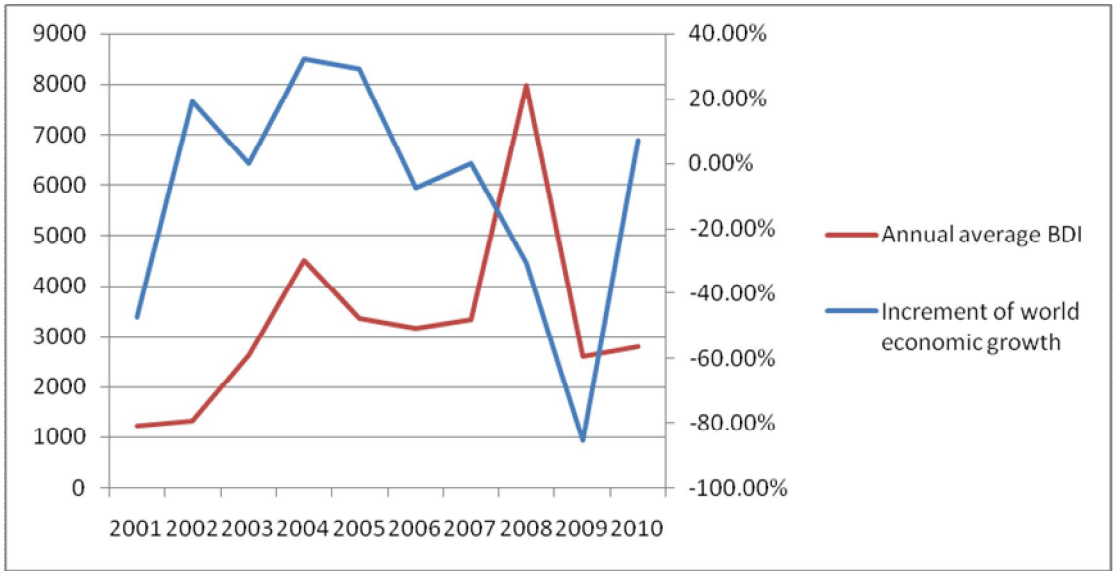

Figure 6.3 The direct time series relationship between increment of world economy growth and freight index

Source: Table 3.7 and Table 5.1

6.4 Conclusion

Many experts and scholars believe that the world economy will follow the form “U” type of trend, and China may achieve “U” type trend in case of adjusting effectively. Obviously, most scholars’ attitude towards world economy tends to be pessimistic, because the economy of the major economic countries still keeps on recession. According to such a bold prediction that world economic growth in 2011 driven by the China factor can achieve 1.0% growth, then the dry bulk shipping market will turn better in mid-2011.

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