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Forecasting the recovery of the international container shipping market in the presence of COVID-19

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Declaration

I certify that all the material in this research paper that is not my own work has been Identified.

This paper reflects my personal views, based on my study and research in this major.

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Outline and Contents

1、Introduction

1.1. Background of this dissertation

During the period of COVID-19, the market of global container market first suppressed and then raised. In the first half of 2020, the epidemic situation is rampant, countries around the world have introduced corresponding epidemic prevention measures, the development of international maritime trade is hindered, and the trend of container market is falling all the way. Especially for ocean routes, the spread of the epidemic has made the recovery of cargo volume slow, and the major liner companies have to reduce their capacity on a large scale, but the freight rate is still falling all the way; there are many problems such as insufficient capacity, suspension of centralized transportation, flight blank and empty space. By the middle of 2020, the transport capacity of the integrated transport market has dropped sharply, the maritime trade in the world integrated transport market has been blocked, the trade volume has dropped by 7.65% (Cai, 2021) year on year, the European routes and American routes have dropped by 14% and 10.5% (Cai, 2021) year on year, and the routes in Asia and Australia and New Zealand have dropped by 7.3% and 2.7% (Cai, 2021) year on year. In conclusion, Covid-19 has been overthrown by the Sino US trade frictions in mid 2018, and the world market has been greatly impacted and severely damaged by the 2020.

However, there was a dramatic reversal in the second half of the year. With the further alleviation of the epidemic situation, enterprises in the centralized transportation market recovered steadily. The epidemic situation in Europe and the United States showed a slight increase, the rigid demand for daily necessities and medical supplies increased, and the transportation demand occupied a high position. In particular, China's container freight index has been rising all the way, reaching a new high since 2005, with CCFI fluctuating between 830 and 1600 (up 14% year-on-year) (Cai, 2021); the average freight index of European routes, North American routes and South American routes are 1135 points, 886 points and 717 points (Cai, 2021) respectively, up 3.8%, 27.1% and 25.2% (Cai, 2021) year-on-year. At the same time, driven by the

container shipping market, the performance of liner companies has also been greatly improved, and the performance of many liner companies has reached a new high in recent years. For example, Maersk, through strict cost control and flexible deployment of transportation capacity, made the shipping EBITDA reach US $1.805 billion in the third quarter of 2020, with a profit margin of 25.4%. (Cai, 2021) With the rebound of the global container shipping market, sea intelligence, a shipping company, has also made a new forecast of the loss of the whole market. The loss of 23 billion US dollars has been replaced by the pretax profit of 14.2 billion US dollars. (Cai, 2021)

In addition, the concentration of the global container market has also increased in this epidemic. By the end of 2020, the shipping giants headed by Maersk, COSCO Shipping, HMM and other top ten liner companies in the world will account for 83.9% of the market share, up 0.9% (Cai, 2021) from 2019. The capacity of Maersk, Mediterranean Shipping and COSCO Shipping is also expanding - 711 vessels, 4.137 million TEU, 579 vessels, 3.856 million TEU and 504 vessels, 3.03 million TEU. (Cai, 2021)

At the same time, the cooperation between the global container industry is also in an orderly way. In Korea, five famous Korean shipping companies, HMM, SINOKOR, SM line, Pan Ocean and Heung-A line, have formed a new shipping alliance, K-a alliance. HMM has also made equity transfer with TTIA, the Spanish terminal, in order to obtain greater voice or volume to improve operational efficiency and profitability.

The global container shipbuilding market is also warming up. In 2020, the turnover of new ships in the container shipbuilding market will reach 89, an increase of 16.4% (Cai, 2021) compared with the same period. Especially in the second half of 2020, the enthusiasm of shipowners for investment is high, and a huge amount of funds will return to the new shipbuilding market.

1.2. The purpose of the dissertation

Economic globalization is a great wave of the times, and maritime trade is closely linked with it. From the Sino US trade friction in 2018 to the global market of COVID-19 in 2020, the container shipping market has been greatly impacted. The purpose of this paper is to conduct qualitative and quantitative market resuscitation prediction for COVID-19 in 2 years of the supply, demand and freight rates of the container shipping market. It mainly includes：

(1). What aspects of the container shipping market have been affected by the epidemic;

(2). The current situation of the centralized transportation market in the epidemic situation, the situation of the centralized transportation market in the next two years and how to recover;

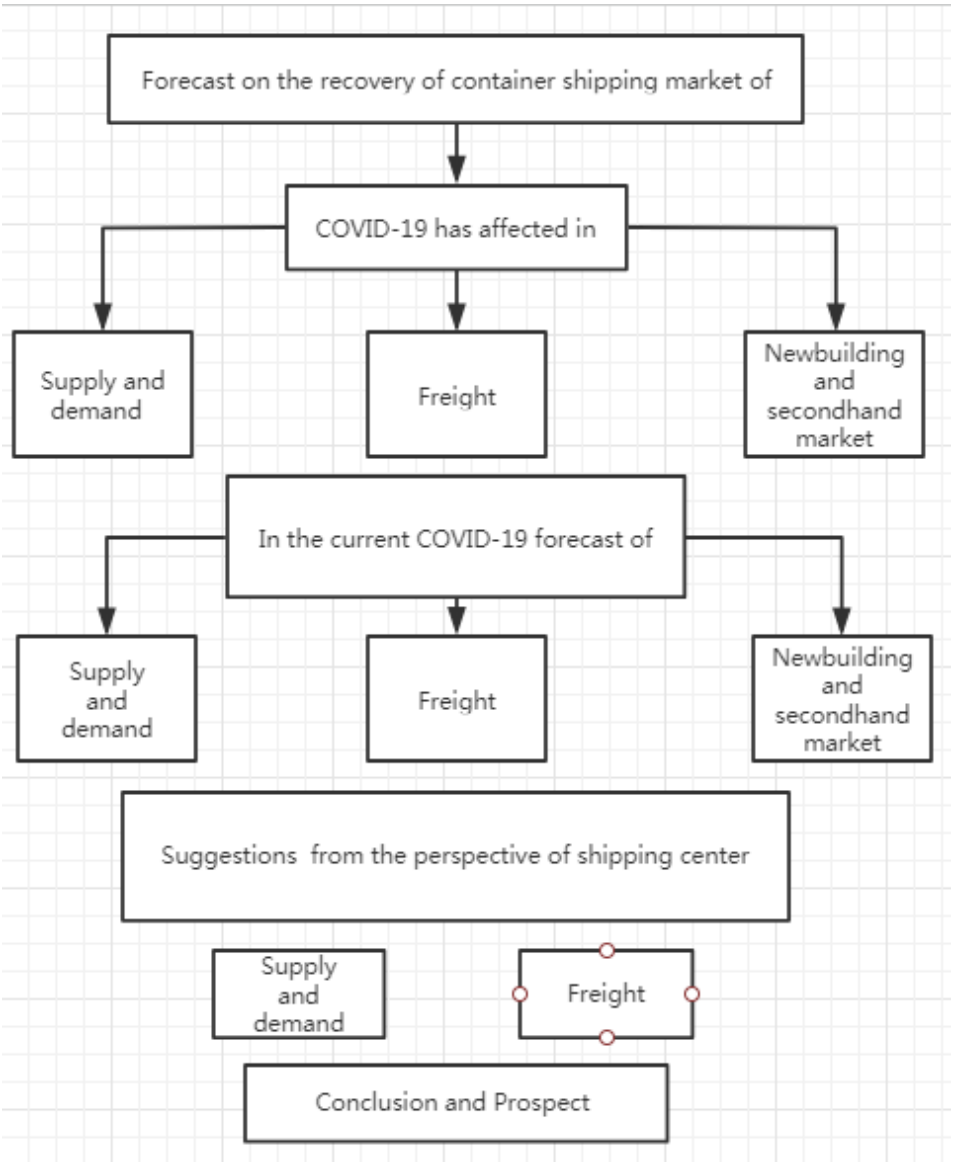
(3), in the case of COVID-19's "disruption" of supply chain, the supply and demand of the market are qualitatively analyzed.

(4). By using relevant software and mathematical model, the paper makes a quantitative analysis of the freight rate of the container shipping market according to the time sequence;

(5). From the perspective of shipping center to give some suggestions.

1.3 Dissertation structure

Figure 1.1



Source: Own Composition

2、Literature review

2.1. Recent research and forecastingon the container shipping market during COVID 19 .

2020 is enough to make container transport workers learn "humility".(Zheng, 2021)

We first focused on the first half of 2020, and COVID-19 increased the number of empty flights sharply: the analysis cycle was the first half of the epidemic spread rapidly, that is, fifth weeks to twenty-sixth weeks, a total of 22 weeks. If no vessel leaves Asia within a given week, it is recorded as a blank flight. During this period, there were 215 (Xu, 2020) blank flights on the trans Pacific and Asia Europe trade routes, 153 (Xu, 2020) of which were caused by the Covid-19. In Asia Europe trade, there are 154 (Xu, 2020) blank flights, 108 of which are caused by the Covid-19. The 261 blank flights on these trade routes, together with 123 (Xu, 2020) blank flights on other deep sea trade routes, indicate that the total number of blank flights caused by the Covid-19 has reached 384 (Xu, 2020). If converted into capacity calculation, the total number of blank flights in the trans Pacific 1.3 (Xu, 2020) million TEU and Asia Europe trade 1.7 million TEU is 3 million TEU (Xu, 2020), and the capacity is reduced by 15%. (Xu, 2020) China's new year's decline in transport capacity is far less than the impact of the epidemic. Sea intelligence's analysis report points out that if Asia Europe and trans Pacific trade are regarded as a representative of global development, the reduction of 3 million TEU's transport capacity is equivalent to 2.4 times the reduction of normal transport capacity in 2020.Unfortunately, this standard was surpassed in the 13th week. In other words (Xu, 2020), by the middle of April 2020, the impact of the Covid-19 on the shipping industry is equivalent to adding a group of blank flights equivalent to the Chinese New Year holiday. (In previous years, the Chinese New Year holiday would reduce global demand by about 2.7 million TEU).

From the 15th week to the 26th week, the number of blank flights on the trans Pacific route and the Asia Europe route increased, while the number of blank flights on the trans Pacific trade route and the Asia Europe route increased by 14% - 15% and 19% - 26% respectively, equivalent to a reduction of 810000 TEU and 1.2 million TEU. (Xu, 2020) From the 13th week, with the spread of the epidemic, the transport capacity of

trans Pacific routes and Asia Europe routes was reduced to 15% - 20% and 25% - 30%.(Xu, 2020) It is reported to count the percentage of empty flights of the three major shipping alliances (2m + modern, ocean and the alliance) from the 15th week to the 26th week. The analysis shows that the capacity of “2m + modern” and “the alliance” on the trans Pacific route has been reduced by 20%, the capacity of Ocean on the west coast of Asia North America has been reduced by 11% (Xu, 2020), and the capacity of Ocean on the east coast of Asia North America has been reduced by 6%. (Xu, 2020) At the same time, the capacity of 2m + modern and the alliance's blank flights on Asia Europe routes is 25% of their normal capacity. (Xu, 2020) The alliance's blank capacity on the Asia Mediterranean route is about 44%. In contrast, ocean's capacity has been reduced slightly (11% on the Asia Europe route and 15% on the Asia Mediterranean route). (Xu, 2020)

Optimistic, even if the new routes are not cancelled, container demand will return to the same level in 2019 in 26 weeks, and the annual demand will drop by 4% in 2020. (Xu, 2020) However, we expect blank flights in the future, so total demand is expected to drop by 10% in 2020. (Xu, 2020)Of course, even in the period of no epidemic, there are errors in the prediction of the centralized transportation economy. What's more, in the current special period, any forecast of the centralized transportation economy is uncertain.

At that time, someone used the freight rate sensitivity and volume model in Maersk's 2019 annual report, and the above-mentioned 10% drop (Xu, 2020) in demand as the benchmark to predict the impact of the loss of freight volume and the drop in freight rate on the profitability of the world's top 12 shipping companies (accounting for 85% of the world's total capacity), and drew five different conclusions. The given forecast interval is the second to the fourth quarter of 2020:

(1). The most ideal situation is that the elastic coefficient of annual growth rate remains unchanged, and only 10% of the traffic volume decreases; (Xu, 2020)

(2). From the second quarter to the fourth quarter, the elasticity coefficient of annual growth rate decreased by 5% compared with the same period last year; (Xu, 2020)

(3). Corresponding to the average impact of 2002 (9.11 leading to economic recession) and 2009 (global financial crisis) on China's container freight index (CCFI) composite index, it fell by 16%; (Xu, 2020)

(4). The decrease of 23% is equivalent to the impact of global financial crisis on CCFI composite index in 2009; (Xu, 2020)

(5). Decrease by 26%, corresponding to the decrease of shipping companies in 2008 and 2009 financial reports; (Xu, 2020)

Under the most pessimistic conditions, a 10% volume loss and a growth rate elasticity loss equivalent to the same level reported in 2009 will result in a loss of US $23.4 billion in 2020. This worst-case scenario will be devastating for the shipping industry, as the 12 largest shipping companies have made a total profit of $20.9 billion over the past eight years. (n.d, 2021)

However, the market trend of container transportation in the second half of 2020 is surprising. The global container shipping market was depressed first and then rose, the new shipbuilding market was rebounded, and the profits of container ship owners were greatly increased. The fierce competition between Chinese and Japanese shipbuilding enterprises in the new shipbuilding market led the liner companies to start the new shipbuilding plan.(Cai, 2020)In the second half of the year, the container transportation market changed from "chaos" in the past. After a series of hardships and twists, such as the closure of ports in the first half of the year, the increase of blank flights, and a large number of ships were derelicted, it changed its declining trend, and on the contrary, there was a strong historical rise.(Liu, 2021)

First, China Shipbuilding Group signed the construction contract for four 240000 TEU (Liu, 2021) Container Ships, and then Yangtze River Group signed the construction contract for two 240000 TEU (Liu, 2021) Container Ships. Moreover, as China has effectively controlled the epidemic, the container transport market in the second half of 2020 has performed very well, the transport demand remains high, and the market

freight rate of most routes is rising, driving the composite index to rise continuously. At the same time, Japan has also confirmed the order for six 24000 TEU container ships (Liu, 2021) built by Japan, and EVA shipping is also scheduled to build more than 15000 TEU (Liu, 2021) Container Ships (cost 1 billion US dollars), so it seems that large container ships are still popular. On the other hand, due to the discovery of a mutated Covid-19 in the UK on European routes, European countries have strengthened their control measures. In addition, the problem of brexit has made the port business busy, aggravated the congestion of European ports, impeded the turnover of containers, highlighted the contradiction between supply and demand, and greatly increased the market booking price. On the Pacific route, affected by the spread of the epidemic, a number of U.S. economic data are lower than market expectations, the economy is slowly recovering, and the transportation demand is relatively stable. With the increasing pressure of ports in Australia, Britain and North America, there are still some challenges for container port operators.(n.d, 2021)

However, the major market participants (logistics giants and shipping companies) have made predictions that by the middle of 2021, the shortage of shipping space and the shortage of container equipment will be completely solved. With the completion of a large number of container orders, the capacity of the container market will increase dramatically. At the same time, with the recovery of trade market demand, it is expected that more capacity will return to the market in 2021.(Zheng, 2021) The premise of the return of idle capacity is the effective support of the demand side, and the shipping companies are still cautious about the input of capacity. Therefore, in the second half of the year, the container transportation industry is in a better profitable State.（Han.2020）In short, with the development of epidemic control, container shipping trade will recover again. It is estimated that the global container shipping volume will grow by 5.0% in 2021, and the global container fleet capacity will grow by about 3.4%. (Liu, 2021) The relationship between supply and demand in the container shipping market will also be improved, and the global container shipbuilding market will also usher in a new round of orders.

2.2. Literature assessment

During the period of COVID-19, the experts and relevant experts in the industry have analyzed and predicted the global container market. However, there are still some omissions, which need further qualitative and quantitative analysis.

(1). As for the "supply and demand" of the container market, the price of new ships in the global container market has a slight downward trend. From the early 2021, the arrival of a new round of orders has made the competition within the industry increasingly fierce, and the shipbuilding market has to adopt the strategy of sharp price reduction. From the fourth quarter of 2020, the elasticity of Supply Chain Capacity in Europe and the United States is relatively weak, which is mainly manifested in the aggravation of port congestion, the decline of container transportation punctuality, the lack of container capacity and the shortage of containers. After the epidemic, the strong demand of the market will lead to the disorder of the supply chain, and the actual operation efficiency will be reduced in the short term. How will the container shipping market recover in the next two years? Such problems need to be added.

(2). As for the "freight rate" of the container Market: the freight rate of the container market, especially the forecast of the situation in the next few years, is lack of quantitative analysis and relevant data. Select the appropriate model to do regression analysis according to the time sequence.

(3). The above articles all focus on analyzing and forecasting the container trade and market situation of Japan, South Korea, China and Europe. However,at present, the biggest unknown is the US market. What about the situation in North America? COVID-19 vaccine will soon be in the world, how will it help to the market recoveryand whether Australia is still in a closed state at present have not been taken into consideration. To predict the recovery of global container shipping market, more comprehensive data support is needed.

3.COVID-19's impact on container market

3.1. COVID-19's impact on supply and demand of the container shipping market

In 2020, the epidemic of covid 19 has swept the world, and every society and all walks of life in the world have been greatly and slightly impacted. The change of the epidemic always affects every link in the global trade - commercial activities, production and manufacturing, logistics and transportation, etc. In the early stage of the epidemic, in the face of sudden attacks, the regional airline economies lack of experience to deal with, and the relevant measures are slow, which have been greatly affected. The imbalance of supply and demand, the low turnover rate of containers and the lack of elasticity of supply chain emerge in endlessly. From the second quarter of 2020 to the end of the year, the epidemic situation is gradually developing and getting better and under control. Most countries gradually liberalize the control measures and launch economic stimulus programs to adapt to their own national conditions, thus making the world shipping trade economy breathing.

The status of container shipping trade is different in the world, and the trading volume trend of trade channels and each region is also significantly different. First of all, the rapid control and "restart" of China's epidemic situation has given strong support to the intra Asian container trade, with the turnover rapidly exceeding the same period level in August 2019 (a year-on-year increase of 2%). However, the main reason for improving the volume in the second half of 2020 is mainlane trades. This was followed by the peak of trans Pacific regional trade, which increased by 34% in November 2019. Of course, the most striking is the trade channel between the Far East and North America, which shows a strong driving force in trade activities. Although volume fell 7% year-on-year in the first half of 2020, it returned to the same period in previous years at its peak in July and soared to a record level at the end of the year. Under the influence of the epidemic, the retail industry in the United States rebounded strongly, and retailers rebuilt inventory to seize the market. In the third quarter, it increased by more than 15% compared with the same period in previous years, and in the fourth quarter, it reached 26%. All in all, the annual trading volume increased by about 8%. A similar situation

has occurred in the Far East. Although the trend is not so dramatic, the trading volume has recovered from a 14% year-on-year decline in the first half of 2020. With the support of reserves before brexit, the final annual decline is only about 4%, which is more optimistic.

From the final result, although the volume of trade is also estimated to have fallen by 1.1% in ton miles (the volume of trade is also estimated to have fallen by 1.1%) in 2020, this is also the second contraction after the global financial crisis in 2009 (it fell by about 9.5%), But the final negative result is much smaller than the worry of the initial spread and spread of the epidemic - it is obvious that the dramatic monthly change of the whole year conceals this result, which is enough to make the container shipping market workers learn "humility". It can be seen from this that the growth of container market demand is still hot. At the same time, with the release of "depressed" demand, the opening of inventory and consumer activities, the trading volume is growing strongly. Even some experts predicted that these trends could last until the first half of 2021“ After the outbreak, the improvement of container trade is faster and stronger than originally expected. "

As expected, in the early 2021, the container shipping market will have a strong recovery in demand. Even in the context of continuous logistics interruption, continuous port congestion and limited supply growth, the container shipping market will continue to maintain a strong performance. Both the supply side and demand side trends are very firm, also due to the unlocking of "depressed" demand, timely replenishment of inventory and a series of support for consumer activities (the continuous strong demand for personal protective equipment transportation and national medical supplies). Global seaborne container trade from January to February increased by 9% compared with the same period in 2020 (6% compared with the same period in 2019). In particular, the main line trading volume is still very strong, with the trans Pacific trade area increasing by 45% over the same period in 2020 and 28% over 2019. Similarly, the momentum of the container transport market remained unchanged

in March and April. Continuous port congestion and logistics disruption (including the impact of the closed Suez Canal) have created a spectacular "perfect storm", with port capacity increasing by 13% in March compared with the average level in 2019. Throughout April, the average 32% of container ship fleet capacity was in port, which was in line with the average level in the first quarter, higher than 29% in the same period of 2019. It's not just the liner transport market. Charter rates continued to rise sharply in March and April. The "basket" index has risen by 55% since the beginning of the year, reaching the highest level since 2005. The situation is still optimistic. In a word, under the favorable environment of epidemic development, the trade mode is gradually on the right track, and the supply chain is stable. The year-on-year growth later this year may be relatively soft, but 2021 will be a "bumper harvest" year.

3.2. COVID-19's impact on Freight rate of the container shipping market

From the end of 2020 to the beginning of 2021, container freight soared in a dramatic way, reaching an all-time high (nearly double). First, after the initial impact of COVID-19's trade in the container market, the volume rebounded in the second half of 2020, coupled with the interruption of logistics, pushing up the price of freight. The 7-day moving average of containers capacity in ports globally on 12th January was up 8% on late August triggered a "perfect storm" and expanded the impact of trade growth on the market.

3.2.1 China Sanghai area

Just take Shanghai, China's shipping center, as an example, the benchmark SCFI composite index reached 2885 points in mid January, setting a historical record. Compared with the second half of 2020 and the beginning of 2020, it increased by 188% and 201% respectively. The index has remained at an impressive level throughout the first quarter of 2021, with an average of 2780 percentage points in the first quarter, 205% higher than the average in the first quarter of 2020. The profit margin of operators has improved significantly, which is the best performance in this period for many years. Until March, the current freight price of container ships

remained at an all-time high. Dramatically, at the end of April, it soared again, and SCFI hit a new high (2980 points).

3.2.2 North American routes

Under COVID-19, the trade trend between China and the United States has picked up, and the market price of the North American route has taken the lead. At the beginning of 2020, when it is the traditional transportation peak season before the Spring Festival, shipping companies are trying to push up the freight rate one after another: on the one hand, although the transportation demand of the US west route market is slightly weak, the freight rate can not be stable after the rise; On the other hand, due to the tight supply of space on the US east route, the freight rate has been supported and stabilized by the market fundamentals. After the Spring Festival, the transportation market gradually entered the off-season, the demand for transportation dropped, and the freight rate in the spot market also gradually fell. Although some shipping companies are still implementing the strategy of pushing up the freight rate, the transportation demand is relatively weak, and the revenue effect of the plan is not big. From March to may, after the shipping companies saw clearly the market demand, they began to implement the strategy of capacity suspension, and the market fundamentals gradually improved. Taking the ocean route from Shanghai port of China to North America as an example, the average utilization rate of shipping space in Shanghai port has gradually increased from 70% in February to more than 80%. By the end of the second quarter, the recovery of transport demand exceeded market expectations again, and the relationship between supply and demand of transport capacity was further improved. The average utilization rate of shipping space in Shanghai Port reached 90%. The spot market freight rate has been rising continuously since the middle of 2020, reaching US $3800 / feu in early September. This result has also attracted the attention of regulatory agencies in various countries. Since then, the market freight rate still fluctuated slightly around the high level. At the end of 2020, Shanghai Shipping Exchange issued the basic port market freight rates for Shanghai's exports to the western and eastern regions of North America, which were respectively US $4018 / feu and US $4729 / feu, up 145.7% and 68.4%

respectively from the beginning of the year. In addition, in 2020, the average freight rate of Shanghai's routes to the western and eastern regions of North America will be US $2745 / feu and US $3610 / feu respectively, up 80.0% and 37.1% respectively compared with that in 2019.

3.2.3 Australia New Zealand route

Australia and New Zealand routes are relatively less affected by the epidemic, and the market freight rate will rise rapidly after the integration in the first half of 2020. At the beginning of the year, due to insufficient export demand from China, the market freight rate only slightly boosted before the Spring Festival. After the Spring Festival, the traditional transportation off-season is coming, the market volume reserve is not enough, and the spot market freight rate is low under pressure; However, due to the relatively small impact of the epidemic in Australia and New Zealand and the relatively stable relationship between market supply and demand, the average utilization rate of shipping space between Shanghai port and Australia and New Zealand experienced a short decline to 80%, then returned to more than 90% and remained stable. After entering the second quarter, the market freight rate gradually went out of the trough and began to rise steadily. In the middle and late August, China's export demand picked up rapidly, not only the supply of shipping space began to be tight, but also the shortage of empty containers was aggravating, which led to the rapid rise of spot market freight rates. After 20 weeks of rising, spot market freight rate climbed to nearly US $2500 / TEU at the end of the year, up 133.1% compared with the price before rising in mid July. Since then, the shortage of space supply has not been effectively alleviated, resulting in the market freight rate has always maintained at a high level. On December 31, 2020, Shanghai Shipping Exchange announced that the market freight rate for Shanghai's exports to the basic ports in Australia and New Zealand was US $2465 / TEU, up 159.7% from the beginning of the year. In addition, the average freight rate of Shanghai's export routes to Australia and New Zealand in 2020 is US $1339 / TEU, which is 124.7% higher than that of the same period in 2019.

3.2.4 South America route

In the first half of 2020, the market of South American routes is going down slowly; Dramatically, in the second half of the year, the South American airline market broke through the sky. At the beginning of the year, due to the overall weakness of the market volume, the market freight rate fell week by week. After the outbreak of the epidemic, the demand for transportation fell rapidly, and the market fundamentals further deteriorated. Shipping companies have to take strategic measures to reduce capacity to improve the relationship between supply and demand, but the market is still weak, and the spot market freight rate continues to decline. In mid July, the booking rate from Shanghai port to Santos port has dropped to US $500 / TEU, reaching a new low since April 2016. After August, the demand for imported materials and transportation in South American countries increased rapidly, and the average utilization rate of shipping space in Shanghai Port returned to more than 90%. With the reversal of market supply and demand, the spot market freight rate rose sharply to nearly US $4000 / TEU at the end of the month. However, the shortage of empty containers and shipping space continued unabated, the supply of market capacity was seriously insufficient, and the spot market freight rate rose again after a month's high consolidation. In the last three weeks of December, booking rates rose by almost $1000 per TEU per week. On December 31, 2020, the market freight rate of Shanghai's exports to South America's basic ports issued by the Shanghai Shipping Exchange was US $8173 / TEU, up 274.4% from the beginning of the year (see Figure 6). In 2020, the average freight rate of Shanghai's export routes to South America was US $2426 / TEU, up 45.0% over the previous year.

3.2.5 Far East-Europe route

Initially, COVID-19 was raging in Central Europe, and the container transport market in the first half of 2020 was also seriously affected. Coincidentally, in the second half of 2020, the container transport market trade rebounded rapidly. However, logistics and other problems lead to a surge in freight rate and SCFI spot box freight rate. By the end of 2020, it will soar to US $4000 / TEU, far higher than US $1168 / TEU in the past

third quarter. At that time, the logistics problem provided continuous support for the freight rate level, the interruption and other problems were alleviated to some extent, and the interest rate may gradually soften from the previous alarming high.

3.2.6 Transpacific route

Compared with other regional routes, the trading volume of trans Pacific routes is relatively strong in 2020. In the second quarter, strong trade growth and logistics disruption led to a surge in freight rates in the third quarter, which remained extremely stable throughout the fourth quarter. In particular, it grew by 17% in the third quarter and even 27% in the fourth quarter. By the end of 2020, the SCFI rate of China to trans Pacific trade area is more than $4000 / feu (about $1400 / feu by the end of 2019). In this case, the "operational capability" of the route has risen to a record level. Similar to far east Europe, interest rates have remained strong, but will gradually soften as supply chain disruption.

3.3 COVID-19's impact on the container shipbuilding market

3.3.1 Newbuilding Market

In the context of soaring freight and charter market conditions, container orders rebounded sharply in the fourth quarter of 2020, and some projects were eventually postponed due to the delay in COVID-19's proliferation. Due to travel disruption, equipment supply chain problems and market uncertainty affecting shipyard activities, container ship order delivery in 2020 decreased by 20% year-on-year to 0.85 million TEU. Most of the time, the demand for new orders is still limited. However, with the increasing market interest in new construction projects, a large number of transactions continue to increase. The total volume of new container contracts in 2020 is 0.89 million TEU. In particular, ship orders exceeded 0.7 million TEU in the fourth quarter. Overall, 89 vessels (0.9 million TEU in total) will be ordered in 2020, an increase of 16% compared with 2019. Contracting remained focused at the large and small ends of the fleet, 78% of the total annual capacity was ordered for vessels with more than 15000 TEU, 11% for vessels with 3500teu or less, and only 2 orders for container .

Clarkson's new built container ship price index will remain at 75 points at the end of 2020, and will drop by 1% in the last three months of 2020, continuing the overall downward trend since 2019. Overall, the price index of new container ships will drop by 5% in 2020. On the other hand, steel prices seem to have bottomed out by the end of 2020, with the rise in steel prices in early 2021 leading to a slight rise in the index. For example, in the fourth quarter of 2020, the price of a 23000 TEU new container ship was 142 million dollars, down 3% from the end of 2019, but it had risen to 144 million dollars by the end of January 2021. In terms of feeder sizes, the price of 1700 TEU Container Ships is 23 million dollars, which is 2% lower than that at the end of 2019, but it will rise to 23.5 million dollars at the beginning of 2021.

3.3.2 Second-hand Market

The uncertainty of covid-19 has led to a sharp decline in container ship trading in the first half of 2020. However, in the context of market improvement, the situation improved in the second half of the year. By the end of 2020, the price of second-hand container ships began to rise. In the last three months of 2020, the second-hand price index rose by 17%. For example, the price of a 10-year-old 6600 TEU second-hand container ship rose from 21 million dollars to 34 million dollars.

With the further acceleration of container ship trading market activity, a total of 61 25000 TEU Container Ships have been sold, which is the highest sales since the second quarter of 2018. This also reflects a series of factors. The environment of charter market is very tense, and it is expected that the "disruption upside" of the market may last for a period of time. During this period, it will also promote the purchase demand of shipping companies. Meanwhile, sharply rising second hand prices led to a large number of new sales candidates hitting the market, with some owners sensing the opportunity to exit certain investments, in some cases for a considerable fit .

A total of 159 used vessels of 620000 TEU will be sold in 2020, which is comparable to the level in 2019. It has to be said that sales in the second quarter of 2020 are the lowest

quarterly sales since the 2009 financial crisis. The Covid-19 COVID-19's popularity has increased more uncertainty in the second-hand ship market.

Under the extremely tight charter market environment, the price of second-hand container ships will rise sharply at the end of 2020 and the beginning of 2021. By the end of 2020, the second-hand price index was 41 percentage points, the highest level since 2018. By 2021, prices will rise further. In the first month of 2020 alone, the index will rise further by 7% (reaching 44 points at the end of January), with sales reaching a record 400000 TEU. Asset values soared and rose regardless of ship size. At the end of 2020, the 10-year-old 8800 TEU Container ship will sell for 3.8 million dollars, up 25% from the end of the third quarter“ The price increase of "old Panama" model is more obvious. The price of 4400 ton TEU with 10-year-old ship has increased by 81% to 1900 million dollars by the end of 2020. As for the feeder sector, the price of 1700 TEU "eco" ships with five years of age increased by 13% in the fourth quarter to 17 million dollars at the end of the year.

3.3.3 Demolition market

Containership recycling has remained sluggish from mid-2020 to March 2021. In particular, the total recovery capacity from early October last year to the end of March this year was less than 16000 TEU, the most "quiet" six months since 2008. Among the ships recovered in this period, they are less than 2500 tons (average capacity: 970teu), with an average age of 29 years (average age across 2018-2019:24).

At present, China's steel demand is strong, and there are reports that China's steel exports may reduce production in March. Against this background, the price of scrap steel has risen sharply recently. Take the Indian market as an example. In 2021, the price of scrapped ships in India increased by 19% (8% in March alone), reaching 495 dollars / LDT at the end of the month, the highest level since 2014. In Bangladesh, the waste price of 2000 TEU containment increased by 9% to 500 dollars / LDT.

3.3.4Conclusion

In 2020, containment fleet capacity increased by 2.9%, reaching 23.6 million TEU (5431 vessels) by the end of the year. However, it grew by 4.0% in 2019 and 5.6% in 2018. This is the slowest year since 2016 (fleet growth is only 1.2%).

In 2020, 137 containers will be delivered, reaching 0.85 million TEU, a year-on-year decrease of 20%, the lowest level since 2004. This reflects Covid-19 to some extent, and the uncertainty of the market has been increasing. Orders for "non delivery" increased from a paltry level in 2019 to about 25% for the whole year.

The delivery of large end of container ship fleet is still the driving force of overall fleet capacity growth. By the end of 2020, there will be 74 "mega containment" vessels of 20000 tons, with a total of 16 million TEU, one fourth of which has been delivered.

In 2020, fleet capacity in the 12999-14999 TEU increased by 6.3%, reaching 266 vessels, a total of 3.6 milloin TEU. In 2020, delivery of this size range slowed by 13% year-on-year to a total of 16 vessels, totalling 39048 TEU. In the 8000-11999teu fleet, delivery remains relatively stable, with a total of 623 container ships (5.8 million TEU) by the end of 2020.

Within the scope of less than 8000 Tue, it will increase by 0.3% in 2020. By the beginning of 2021, 4363 container ships have been delivered, reaching 10.8 million TEU. The growth of the sector is entirely driven by the expansion of small end of the fleet. The fleet of 3999-7999 TEU fell by 1.2% year on year, marking the fifth consecutive year of decline. At the same time, the fleet capacity of less than 3000 TEU will increase by 2.6% to 3030 vessels in 2020, totaling 4.2 million TEU.

4.Prospects of the container shipping market

4.1.Prospects of supply and demand of container shipping market

In 2020, COVID-19 spread around the world, and the world economy was seriously affected. But the Covid-19vaccine is being produced and widely inoculated, so that the

epidemic will be effectively controlled this year. Therefore, the world economy will also slowly recover, but the prospects for recovery are also long, unbalanced and uncertain. The IMF forecasts Covid-19: the world economy is expected to grow by 5.2% in 2021, and the pace of recovery of different economies is not consistent. On the one hand, the US is relatively affected by the epidemic. The number of confirmed cases and the number of deaths in the Covid-19 are relatively high. The domestic financial market is fluctuating, unemployment is serious, and the debt scale has also increased significantly. It is estimated that the US economy will grow by 3.1% in 2021; On the other hand, the outbreak in Europe and other countries was earlier and lasted for a long time. Although the epidemic was effectively controlled for a time, in the second outbreak of the epidemic, many countries again adopted strict blockade measures, which interrupted the economic recovery. It is estimated that the economic growth of the euro area will be 5.2% in 2021; On the Japanese side, the epidemic has delayed the Tokyo Olympic Games, which undoubtedly worsens Japan's already heavily indebted economy. It is estimated that Japan's economy will grow by 2.3% in 2021; Finally, developing economies and some emerging markets are also affected by the epidemic, and financial market volatility continues to intensify. It is estimated that the economic growth rates of Russia, Brazil, South Africa, India and China will be 2.8%, 2.8%, 3.0%, 8.8% and 8.2% respectively in 2021. In addition, the International Monetary Fund predicts that global trade will recover in 2021 (with a growth rate of 8.4%). The restorative growth of world economy and trade will play a supporting role in the growth of global container shipping trade demand. There are different opinions on the growth of container shipping trade. For example, Clarksons officially predicts that the global container traffic will grow by 5.3% in 2021, 7.1 percentage points higher than that in 2020; The official website of drew predicts that the global container traffic will increase by 6.6% in 2021, 9.9 percentage points higher than that in 2020; The Shanghai Shipping Exchange predicts that the global container traffic will increase by 6.0% in 2021, 9.0 percentage points higher than that of the previous year.

In short, in the next 1 to 2 years, the market is still facing uncertainty, but the relationship between supply and demand will gradually recover and develop for the better. Looking back to 2020, the supply chain system of international trade will be impacted by the epidemic situation, which will drag down the international container shipping market. Problems such as the reduction of transport capacity supply, cargo pressure on the port and soaring freight rates will emerge one after another. However, with the Covid-19vaccine being put into operation, the epidemic is expected to be controlled globally. This also means that the operation of the international container shipping market will be gradually normalized, and the fundamentals of both supply and demand will be gradually improved; Clarkson predicts that the traffic volume of several main routes will increase by 3.1% to 0.8% compared with 2020; The traffic volume of Asia Europe routes will increase by 4.7% over the previous year, expanding by 8.8 percentage points. With the stabilization of the epidemic situation, new capacity will continue to enter the container shipping market, which may bring some pressure to the market. In particular, many large ships are mainly put on the main routes such as Asia Europe routes and Pacific routes, and the main routes market may face the imbalance of supply and demand again; In order to avoid this kind of situation, the main routes will replace part of the transport capacity, which will be shared by the secondary routes and the North-South routes, and will also add pressure to the supply of the secondary routes and the North-South routes.

4.1.1 North American routes

The number of Covid-19cases and the number of deaths in the United States have been the number one in the world for the longest time. The outbreak of the epidemic has caused great impact on the local production and operation activities and supply chain system. Meanwhile, the demand for some necessities and medical supplies has increased in the United States, which has played a supporting role in the transportation demand of the North American route trade market. Deway official forecast: in 2021, the eastbound traffic volume of the Pacific route will be about 21.852 million TEU, an increase of 8.0% compared with the same period in 2020. Covid-19 is still in the US,

which is also a sign that the transport demand in the North American route market has been keeping good in the first half of 2021. But in the long term, the market outlook is not clear: on the one hand, with the introduction of the Covid-19 vaccine, the US epidemic is expected to be gradually controlled, and the demand for transportation in the North American route market will be further enhanced. The shortage of transportation capacity and the shortage of empty container supply will be alleviated to a certain extent, so as to realize the balance of supply and demand; On the other hand, if the Sino US trade disputes escalate or the US epidemic control effect is not good, the transportation demand of North American airline market may be adversely affected in the long term.

4.1.2 European routes

Before the outbreak of the epidemic, the euro area was already facing the risks of weakening economic growth momentum, upgrading populism and brexit. The outbreak of the epidemic in many European countries is earlier and lasts for a long time. In addition, the second wave of the epidemic is coming near the end of 2020. Although the epidemic plays a certain role in supporting the transport demand of the European airline market, with the gradual alleviation of the epidemic, the market will return to normal in the later stage and face the situation of weak growth. According to the official forecast of drew, the westward traffic volume of the Far East to Europe route in 2021 will be about 10.344 million TEU, an increase of 4.4% compared with that in 2020, with an increase of 10.3 percentage points. As the new large ships are mainly put on the ocean routes in Europe and the United States, and the logistics system will gradually return to normal after the epidemic situation improves, the fundamentals of market supply and demand will return to normal, and the market freight rate of European routes will also fall from the historical high.

4.1.3 Japan route

For a long time, Japan's economic growth has been at a low level due to the aging population, high debt burden and other factors. COVID-19's rampant spread led to the

postponed 2020 Tokyo Olympics one disaster after another. Nevertheless, due to the overall good control of the epidemic situation in East Asia, the trade between China and Japan is basically stable, and the scale of market capacity of China Japan routes remains stable, the market supply and demand fundamentals are stable. On this basis, if the epidemic situation is further controlled in the future, in particular, the market freight rate will remain stable.

4.1.4 North South Route

Affected by the epidemic, financial market volatility intensified, commodity prices experienced extreme market, and major commodity exporting countries such as Russia and Brazil suffered great losses. With the extension of easing policies to 2021, commodity prices may continue to rise, which is conducive to the economic recovery of commodity exporting countries. According to Clarksons' forecast, the transportation demand of Latin America, Oceania and Africa will increase by 4.9%, 4.3% and 4.2% respectively in 2021 compared with 2020. As the epidemic situation stabilizes, the market capacity of North-South routes will resume growth, which will exert certain pressure on the market freight rate.

4.1.5 Regional routes in Asia

Asian countries also suffered from the impact of the epidemic, but the overall situation is better than that of European and American countries, so that the routes in the Asian region can recover quickly. In addition, during the epidemic period, Asian countries will further deepen regional economic integration and formally sign the regional comprehensive economic partnership agreement, which will greatly promote the development of intra regional trade in Asia. According to Clarksons' forecast, in 2021, the transportation demand of routes in Asia will increase by 10.3% compared with that in 2020, and the growth rate will be greater than that of other routes. Nevertheless, due to the low market access threshold of routes in the Asian region, the shortage of transport capacity supply will gradually ease with the stabilization of the epidemic situation, and it is difficult for the market freight rate to maintain the rising trend.

4.1.6 Conclusion

Overall, the strong "rebound" may continue in the near future. It is preliminarily estimated that the growth rate of seaborne container trade in 2021 will be 5.7%, which is far higher than that in 2019. In the long run, the "demand" in late 2021 may gradually "normalize" (the popularity of vaccines). In addition, the preliminary forecast for 2022 shows that the volume of container trade has increased by 3.6%. However, the market outlook is still affected by uncertainty. In this case, it will take a long time for the trading volume to maintain the dominant level, and the chain effect on unemployment and enterprise closure may still be realized.

4.2.Prospects of freight in container shipping market

4.2.1 Research model--ARMA

Basic definition and principle:

The full name of ARMA is**A**uto**r**egressive **m**oving **a**verage mode, is an important method to study time series, which is based on autoregressive model (AR) and moving average model (MA). In market research, it is often used for long-term tracking data research, numerical analysis and prediction.

There are many methods for ARMA model parameter estimation:

Linear class: if the input sequence {U (n)} and output sequence {a (n)} of the model can be measured, the model parameters can be estimated by the least square method. This estimation is linear and the model parameters can be estimated with sufficient accuracy;

Nonlinear class: in many spectral estimation, only the output sequence {x (n)} of the model can be obtained. In this case, the parameter estimation is nonlinear, and it is difficult to obtain the accurate estimation of ARMA model parameters. Some best estimation methods of ARMA model parameters are derived theoretically, but they have the disadvantages of large amount of calculation and can not guarantee

convergence. Therefore, a suboptimal method is proposed in engineering, that is, estimating AR and Ma parameters separately, instead of estimating AR and Ma parameters at the same time as in the optimal parameter estimation, so that the amount of calculation is greatly reduced.

However, in either case, the basic principle is that the data series formed by the prediction index over time is regarded as a random series, and the dependence of this group of random variables reflects the continuity of the original data in time. On the one hand, the influence of factors, on the other hand, it has its own change law.

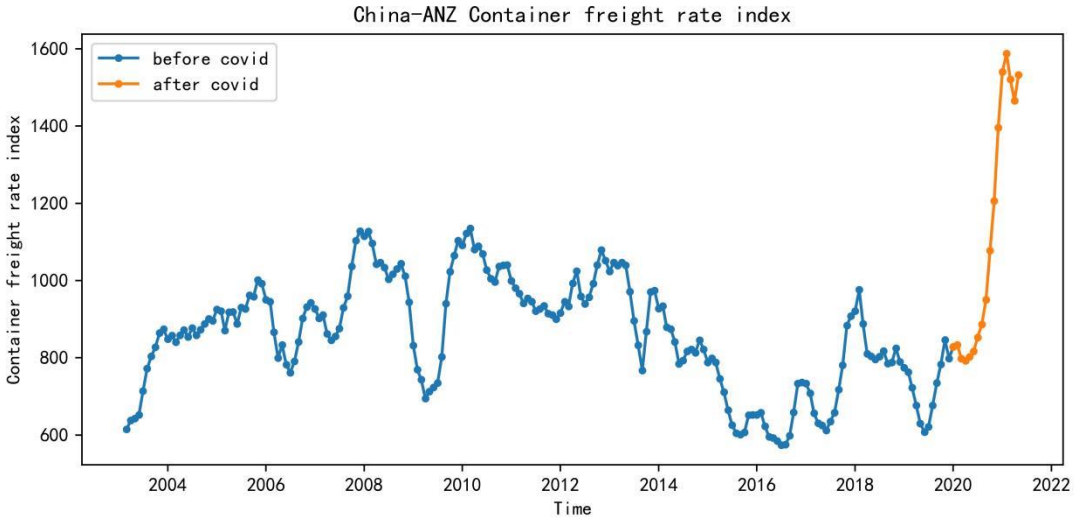
4.2.2 Research methodology of the freight rate

This part aims to predict COVID-19's freight rate index in the following years with the ARMA model. It selects three international routes: North-South line, Mainlane line, Intra-Aisa line, and four representative routes to China: China-ANZ, North-South, and North-South. The specific ideas are as follows: in order to improve the accuracy of prediction, collect the monthly average freight rate index before the end of COVID-19 15-20 years ago, and then divide the data into two parts for application. First step: assuming that there was no COVID-19 in 2020, the freight rate index in the container shipping market from 2020 to 2022 will be forecasted with the data before 2020. The second step is to predict the freight rate index in the container shipping market as of 2022 by the data before March 2021 by the data of the COVID-19 epidemic, which is known to have occurred in 2020.

The epidemic situation is an emergency, so the model can not fully reflect the impact of the epidemic situation on the freight rate (especially in March this year, the congestion of Suez canal also increased the error in the freight rate forecast), which can be corrected by the expert investigation method in the later stage, such as AHP method

4.2.3 China-ANZ Container freight rate index

（1）Rawdata Figure 4.1



Source: Own Composition

（2）Regardless of Covid-19

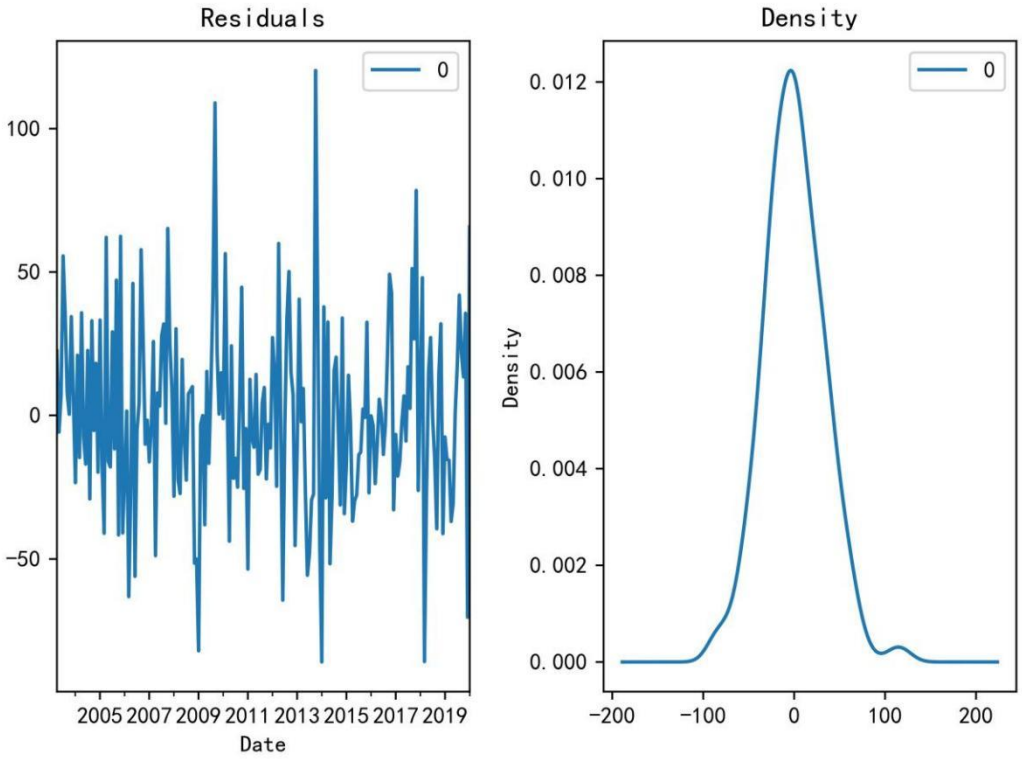
0 order： P=0.386493

1 order： P=0.000013

As a result，d=1

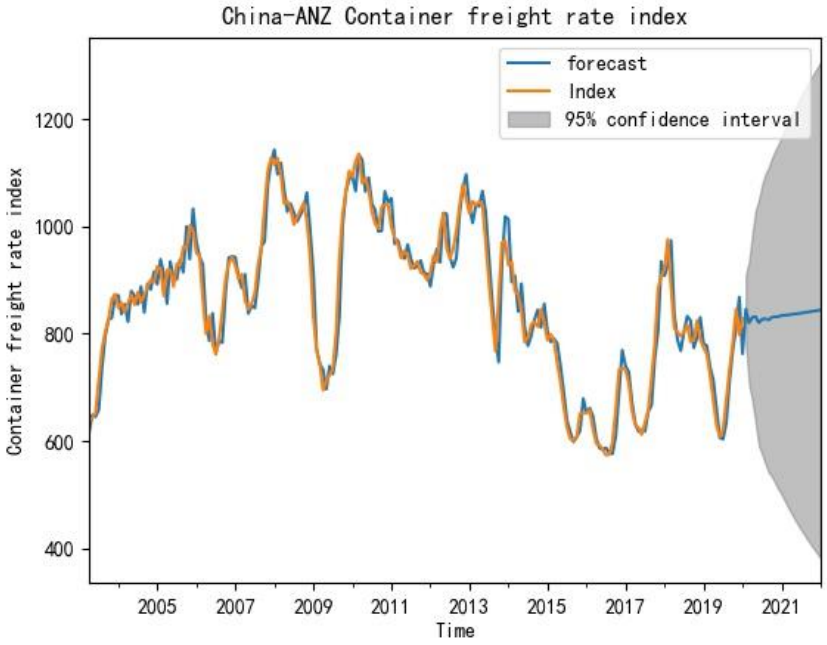
According to the BIC criterion, the order of P and Q is (4,0)

Residual test： Figure 4.2



Source: Own Composition

Forecast result：　　Figure 4.3



Source: Own Composition

（3）Consider Covid-19

0 order： P=0.234704

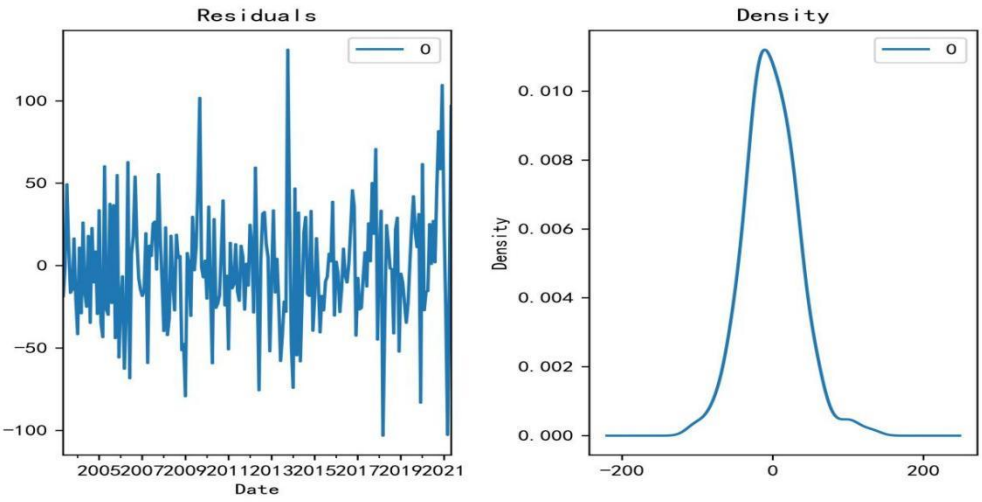
1 order： P=0.292698

2 order： P=0.000000

As a result，d=2

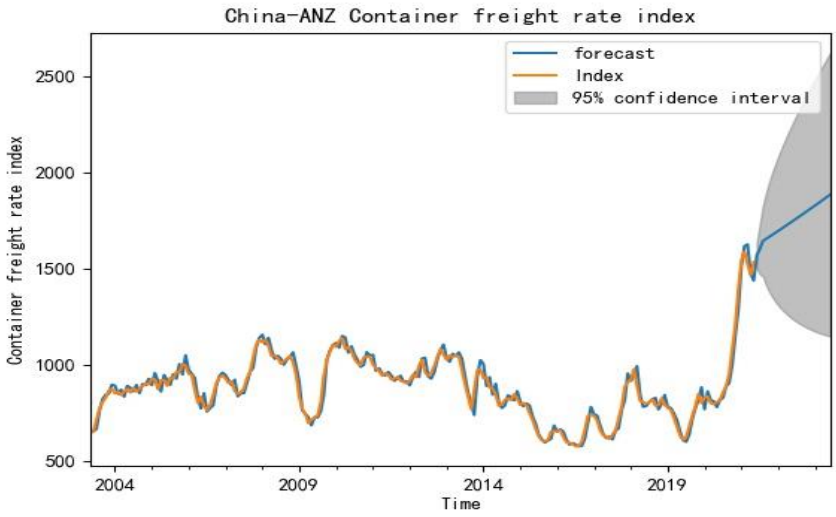
According to the BIC criterion, the order of P and Q is (4,0)

Residual test: Figure 4.4



Source: Own Composition

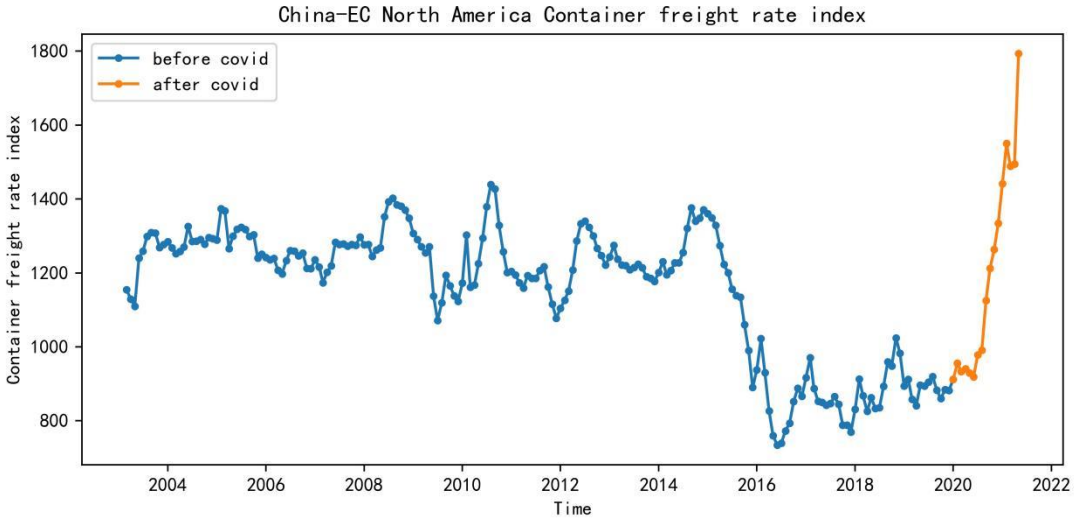
Forecast result： Figure 4.5



Source: Own Composition

4.2.4 China-EC North America Container freight rate index

（1）Rawdata Figure 4.6



Source: Own Composition

（2）Regardless of Covid-19

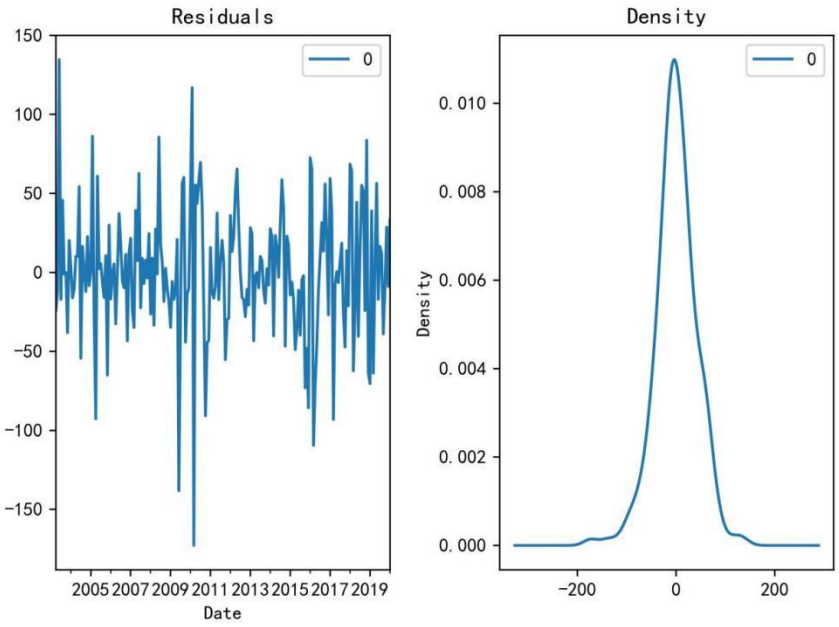
0 order： P=0.525931

1 order： P=0.000000

As a result，d=1

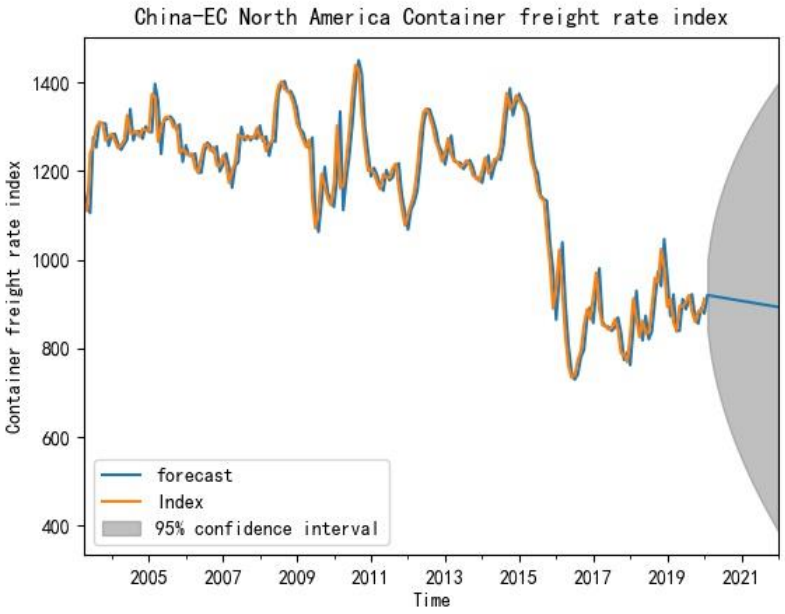
According to the BIC criterion, the order of P and Q is (0,1)

Residual test： Figure 4.7



Source: Own Composition

Forecast result： Figure 4.8



Source: Own Composition

（3）Consider Covid-19

0 order： P=0.710813

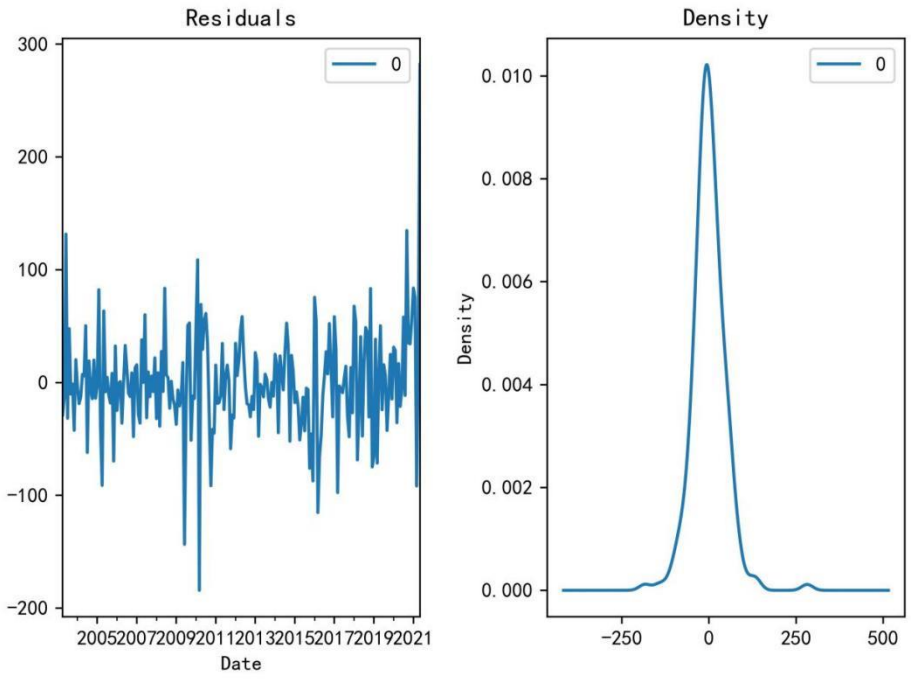
1 order： P=0.000000

As a result，d=1

According to the BIC criterion, the order of P and Q is (0,1)

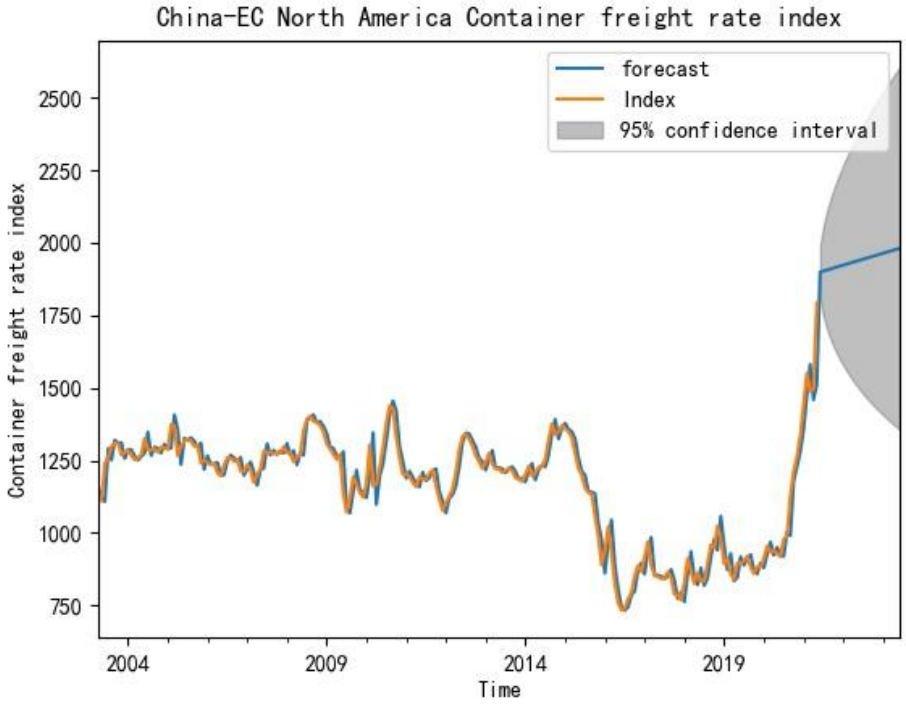
Residual test：

Figure 4.9



Source: Own Composition

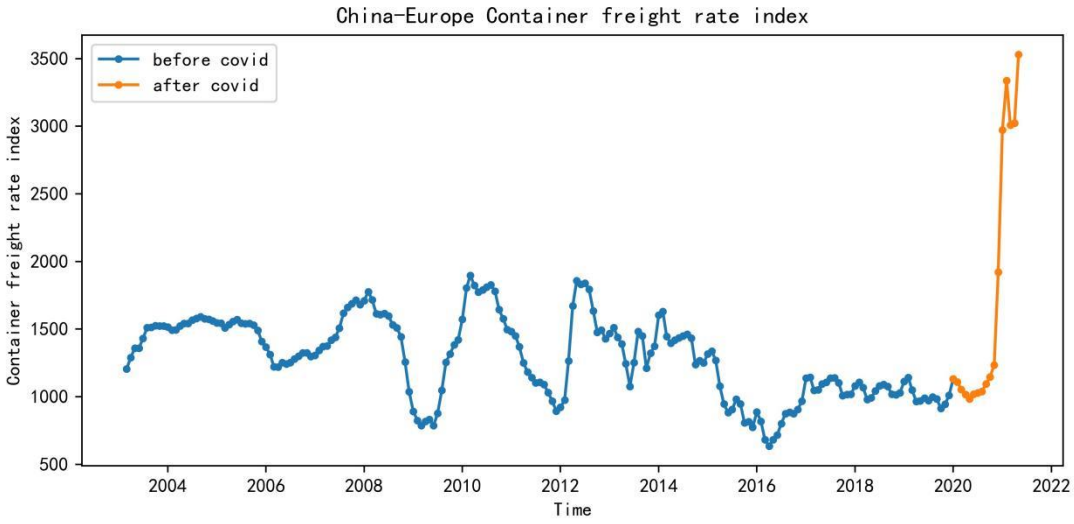
Forecast result： Figure 4.10



Source: Own Composition

4.2.5 China-Europe Container freight rate index

（1）Rawdata　　Figure 4.11



Source: Own Composition

（2）Regardless of Covid-19

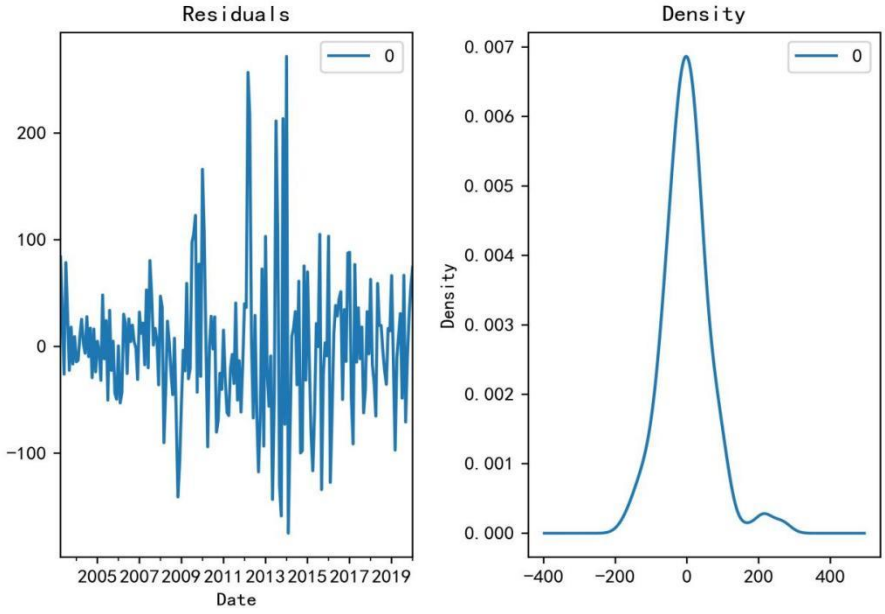
0 order： P=0.377092

1 order： P=0.000000

As a result，d=1

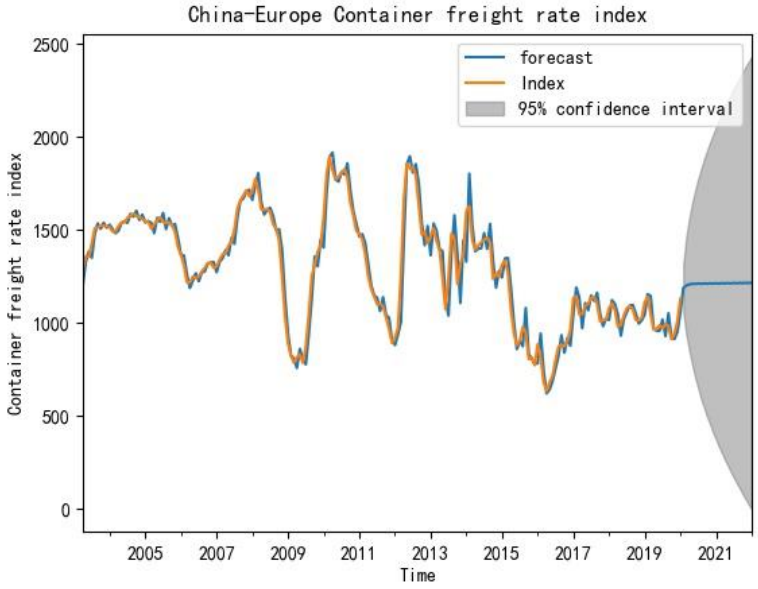
According to the BIC criterion, the order of P and Q is (3,2)

Residual test：　　Figure 4.12



Source: Own Composition

Forecast result：Figure 4.13



Source: Own Composition

（3）Consider Covid-19

0 order： P=0.557181

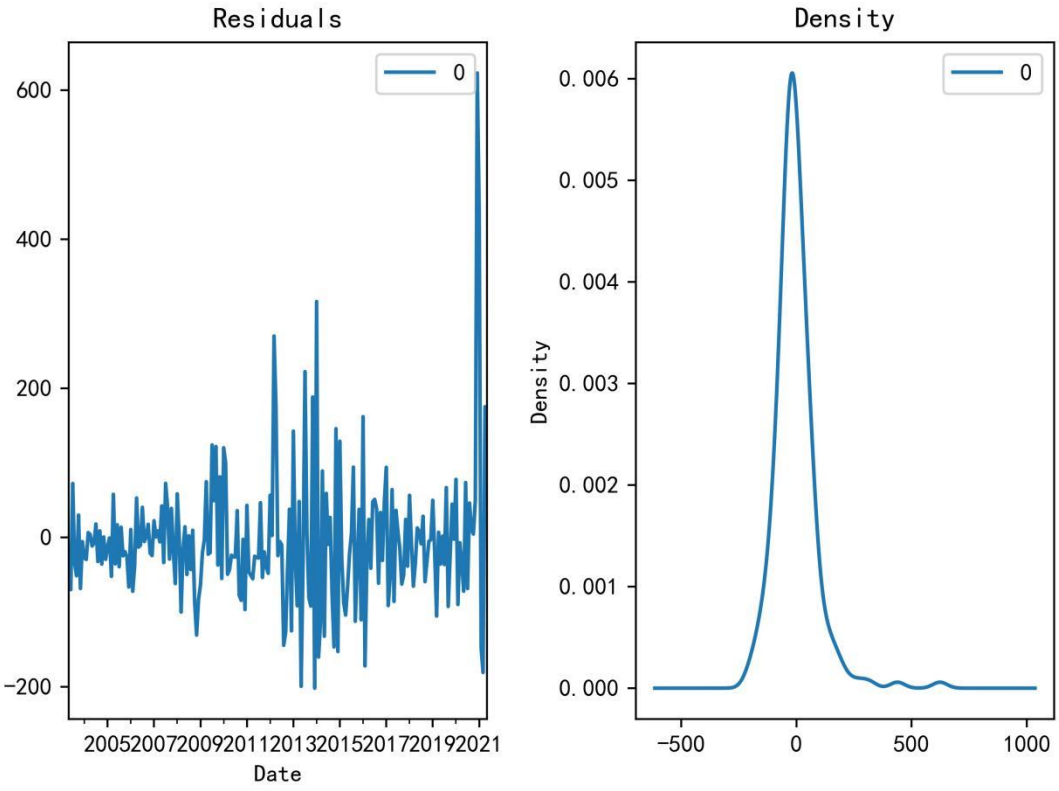
1 order： P=0.039535

2 order： P=0.000000

As a result，d=2

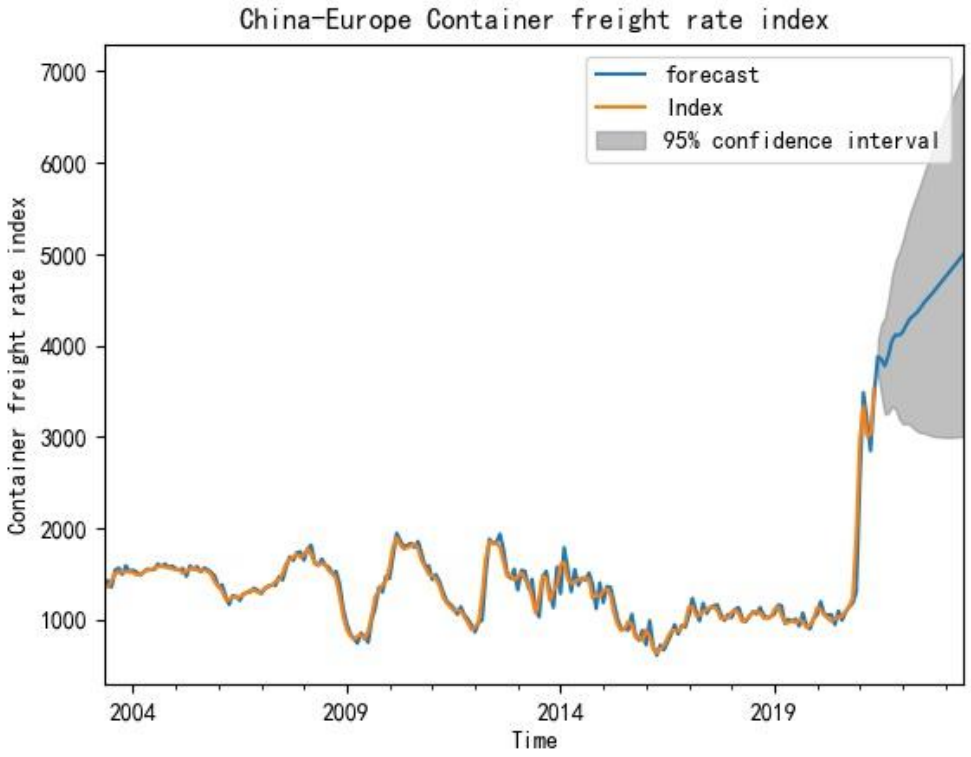
According to the BIC criterion, the order of P and Q is (4,2)

Residual test： Figure 4.14



Source: Own Composition

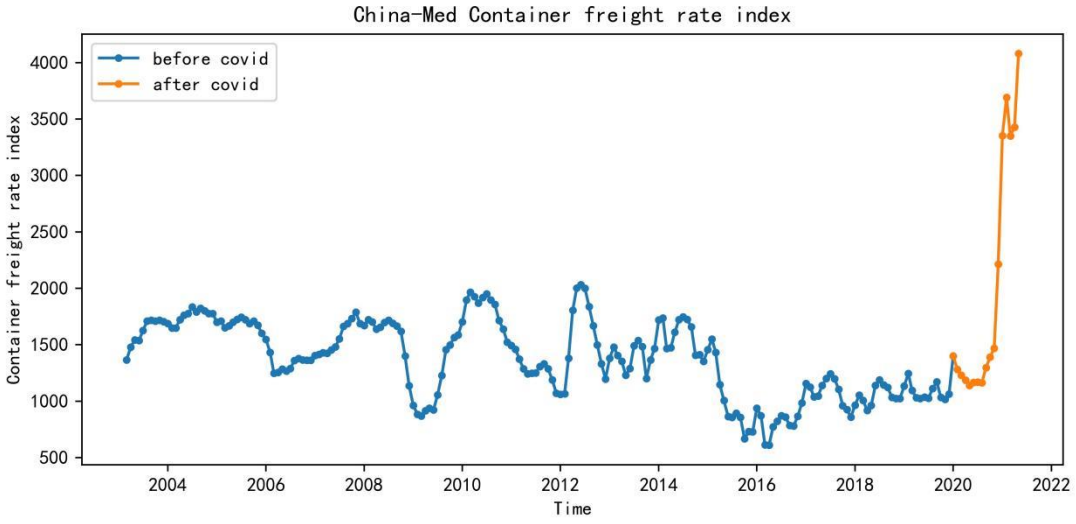
Forecast result： Figure 4.15



Source: Own Composition

4.2.6 China-Med Container freight rate index

（1）Rawdata Figure 4.16



Source: Own Composition

（2）Regardless of Covid-19

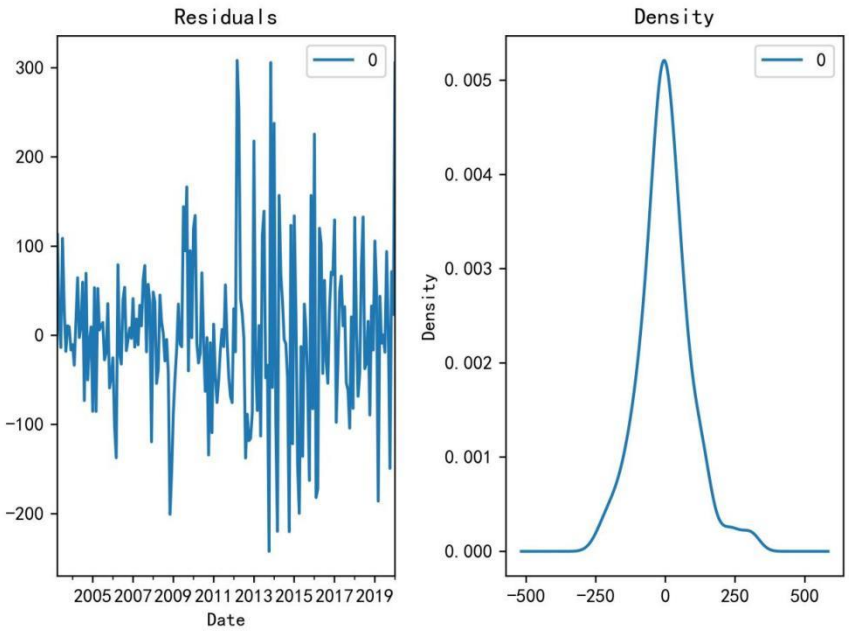
0 order： P=0.224529

1 order： P=0.000005

As a result，d=1

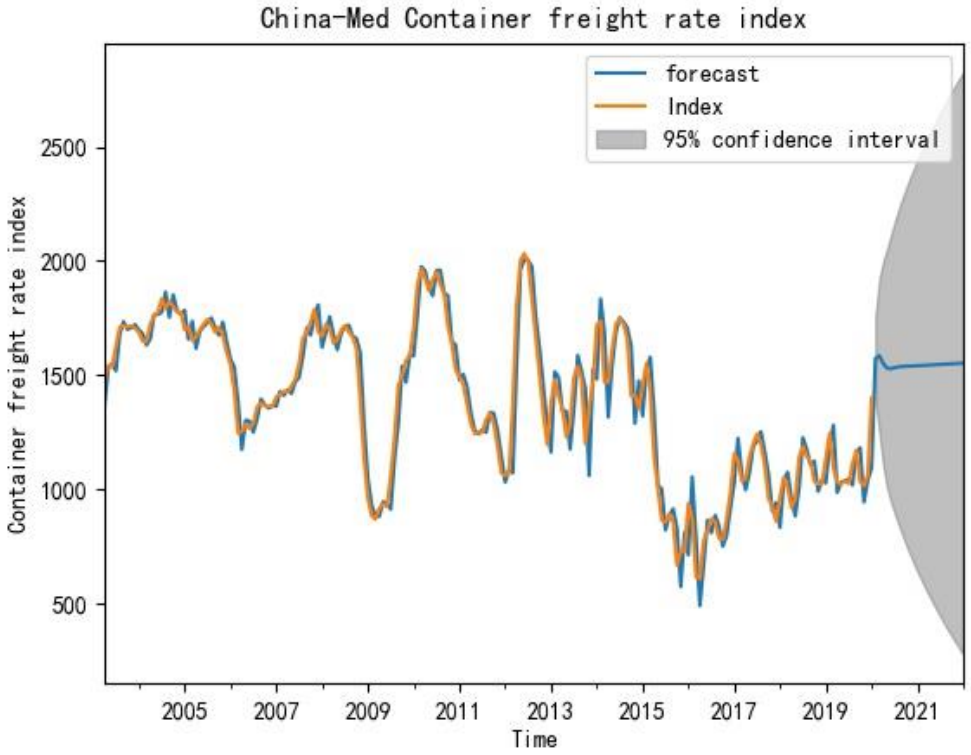
According to the BIC criterion, the order of P and Q is (2,0)

Residual test： Figure 4.17



Source: Own Composition

Forecast result： Figure 4.18



Source: Own Composition

（3）Consider Covid-19

0 order： P=0.628021

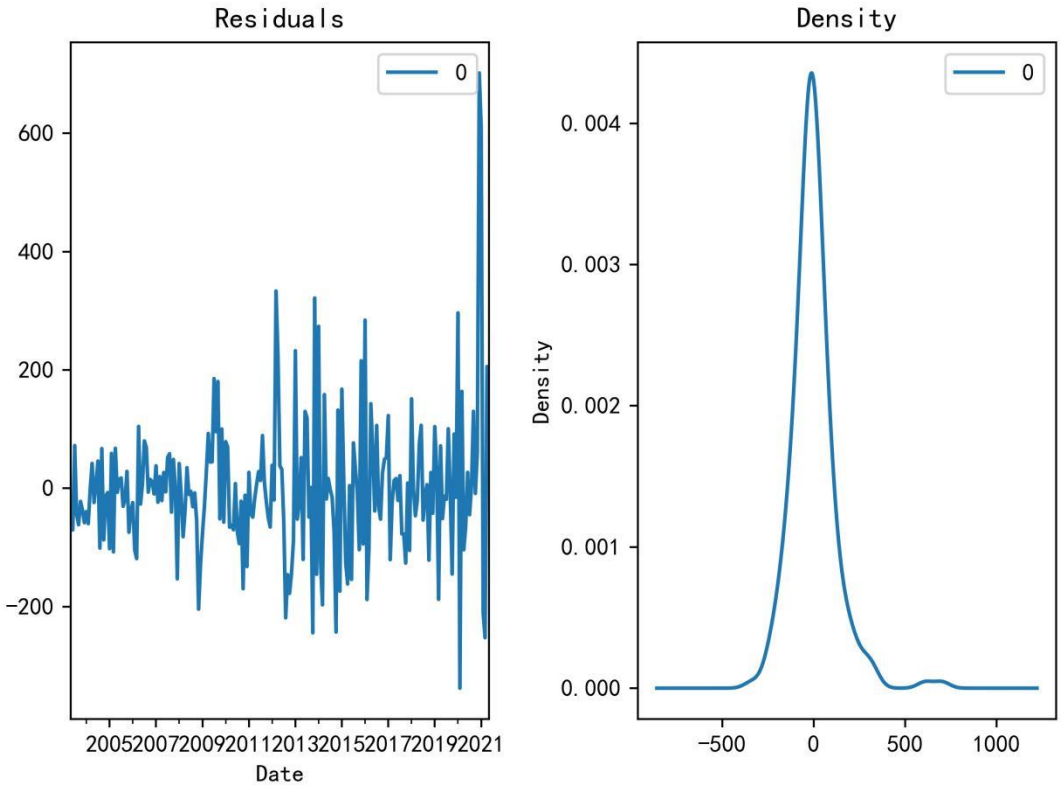
1 order： P=0.088341

2 order： P=0.000018

As a result，d=2

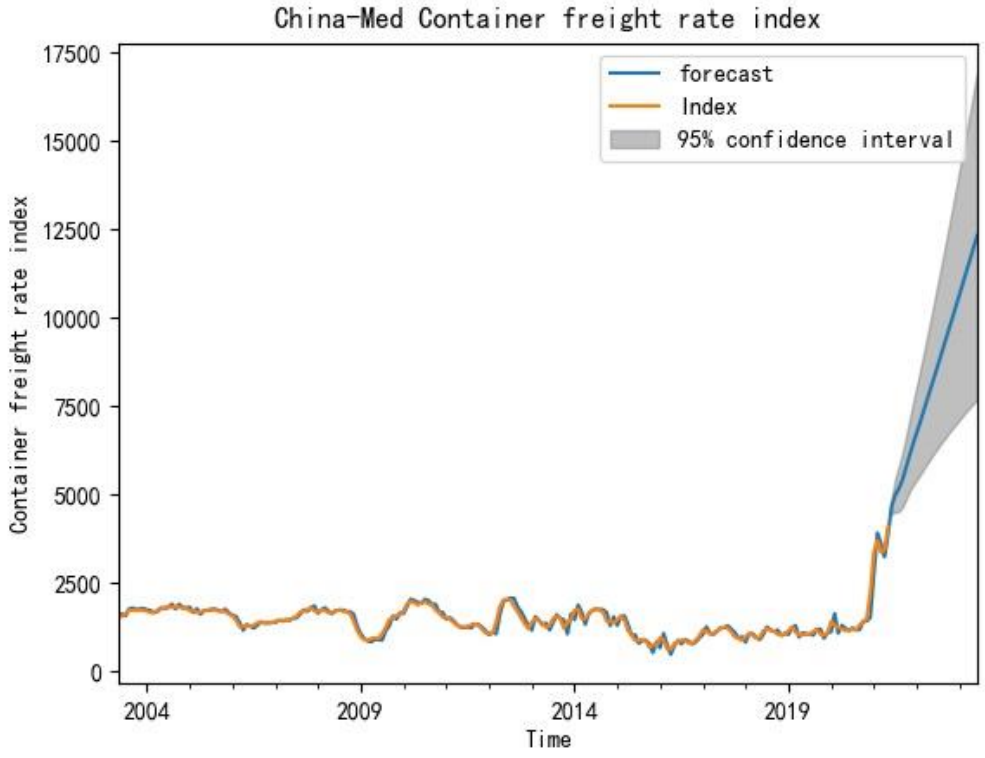
According to the BIC criterion, the order of P and Q is (2,1)

Residual test： Figure 4.19



Source: Own Composition

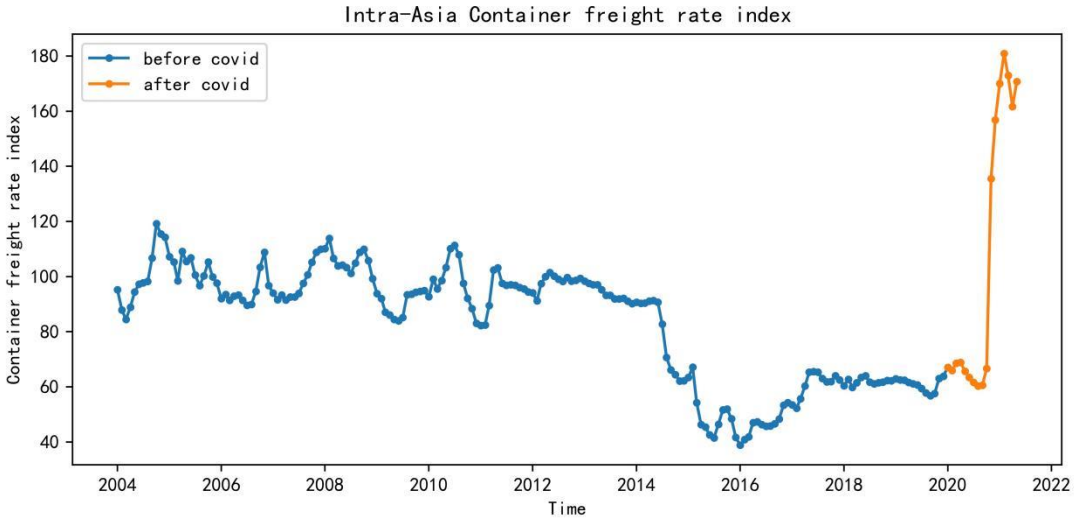
Forecast result： Figure 4.20



Source: Own Composition

4.2.7 Intra-Asia Container freight rate index

（1）Rawdata　　Figure 4.21



Source: Own Composition

（2）Regardless of Covid-19 （Fitting failed）

0 order： P=0.665653

1 order： P=0.000000

As a result，d=1

According to the BIC criterion, the order of P and Q is (1,2)

（3）Consider Covid-19

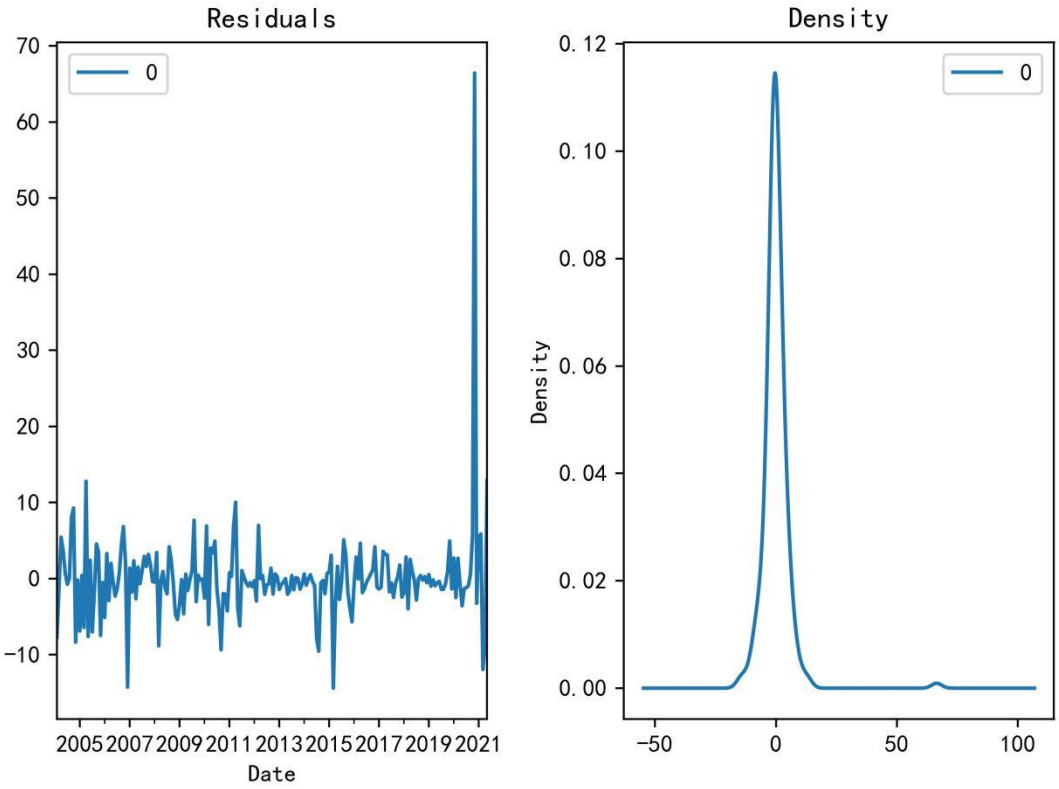
0 order： P=0.513662

1 order： P=0.000000

As a result，d=1

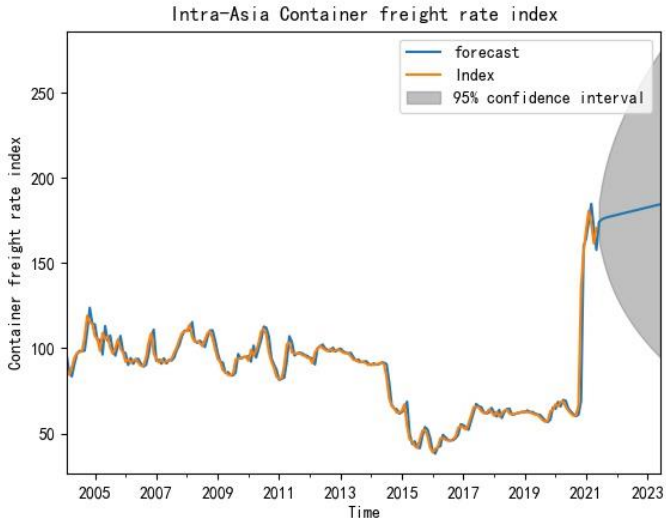
According to the BIC criterion, the order of P and Q is (1,0)

Residual test：　Figure 4.22



Source: Own Composition

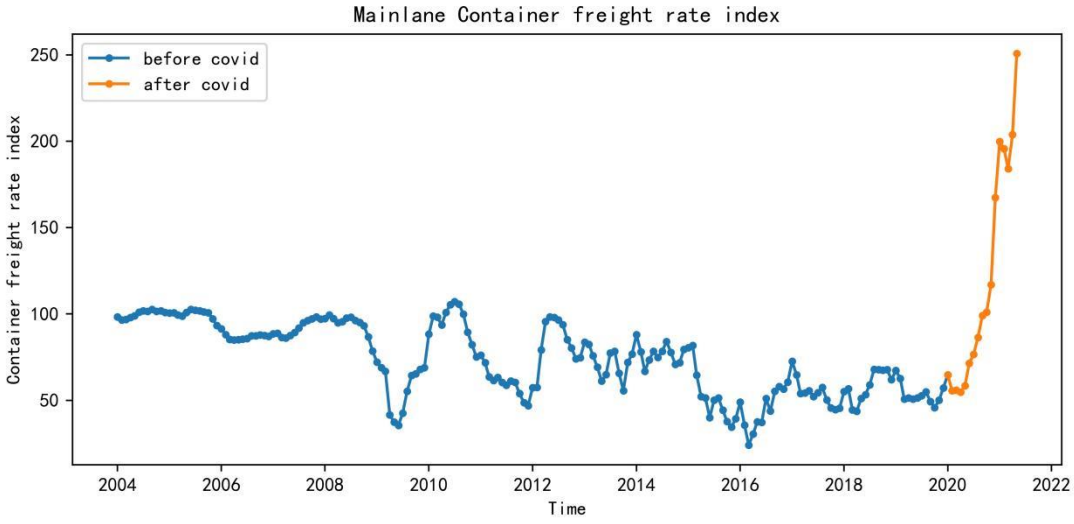
Forecast result：　Figure 4.23



Source: Own Composition

4.2.8 Mainlane Container freight rate index

（1）Rawdata　　Figure 4.24



Source: Own Composition

（2）Regardless of Covid-19

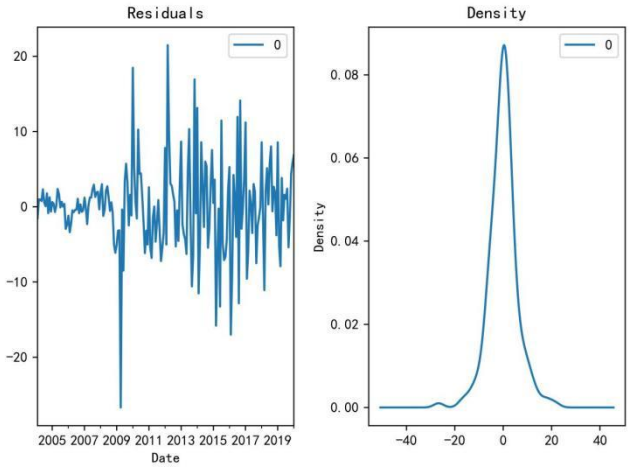
0 order： P=0.355659

1 order： P=0.000000

As a result，d=1

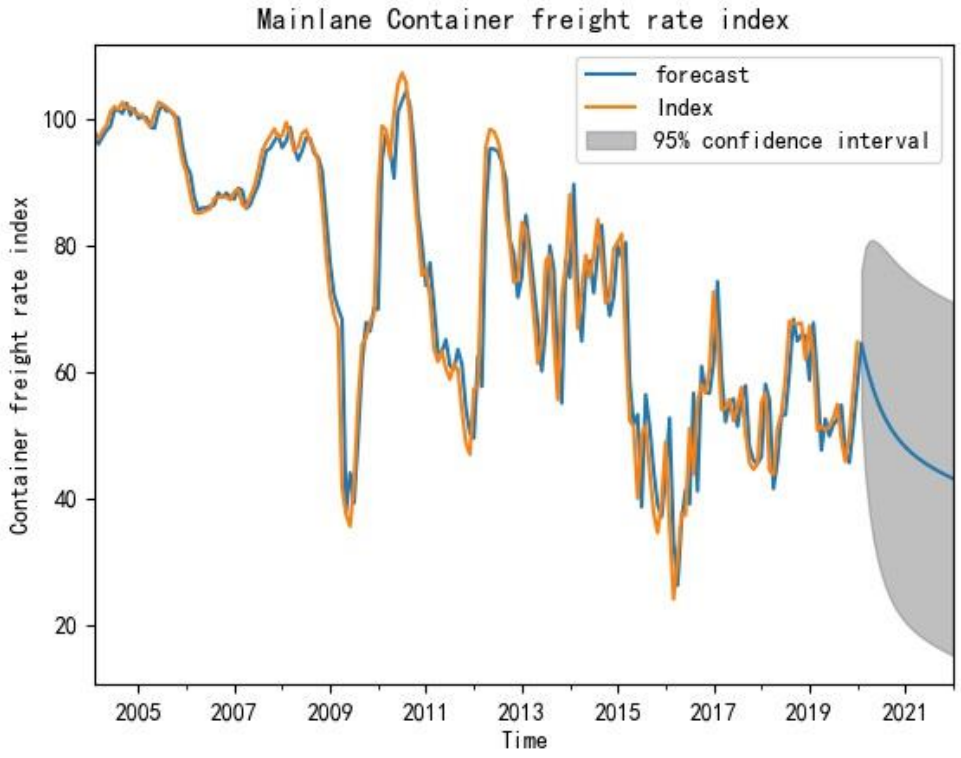
According to the BIC criterion, the order of P and Q is (1,2)

Residual test：　Figure 4.25



Source: Own Composition

Forecast result： Figure 4.26



Source: Own Composition

（3）Consider Covid-19

0 order： P=0.746172

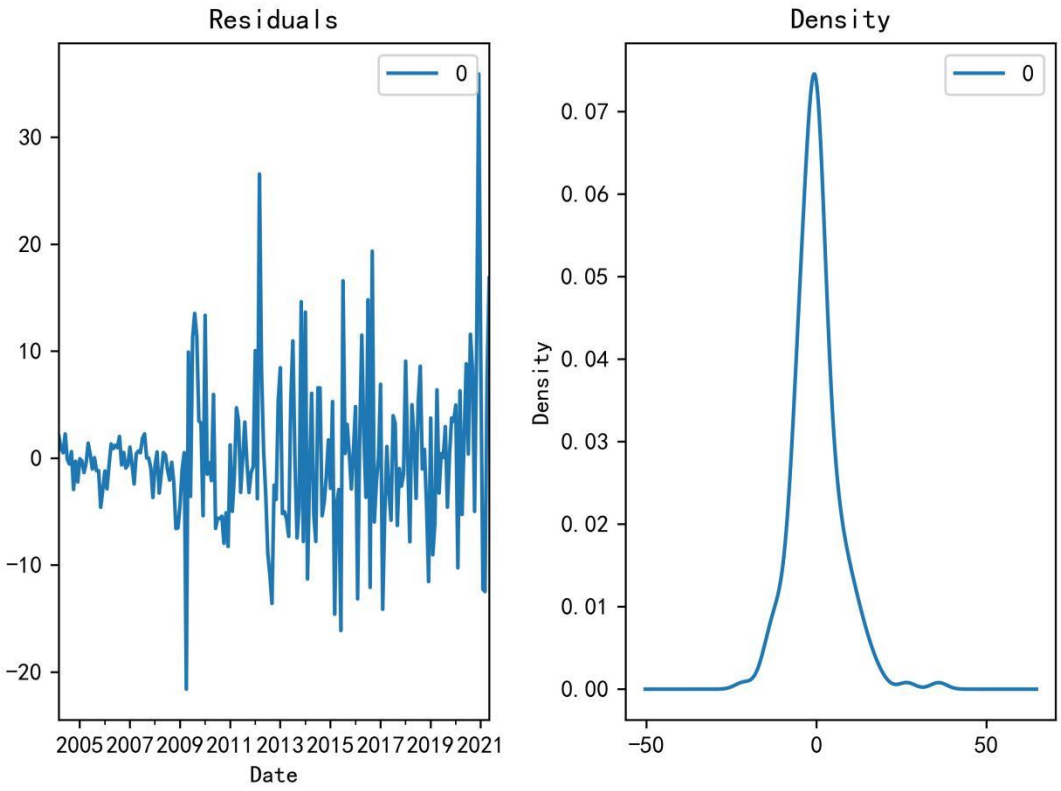
1 order： P=0.199072

2 order： P=0.000000

As a result，d=2

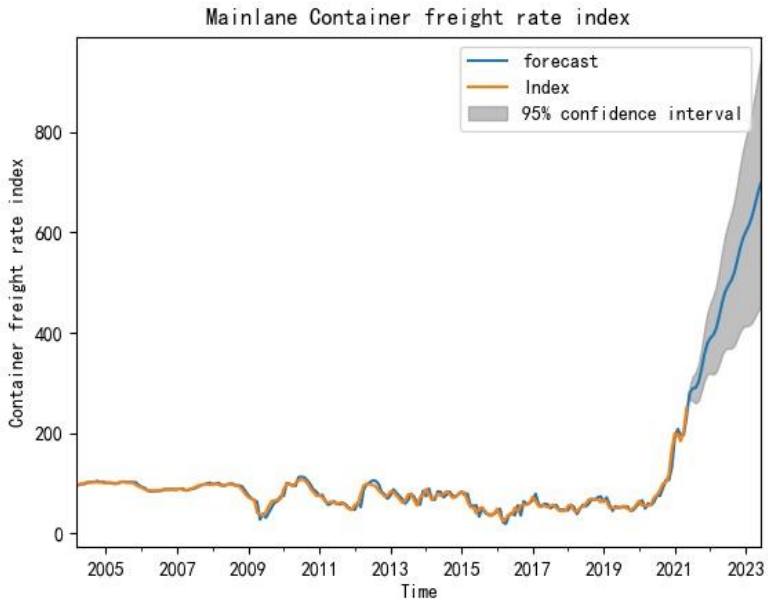
According to the BIC criterion, the order of P and Q is (2,4)

Residual test： Figure 4.27



Source: Own Composition

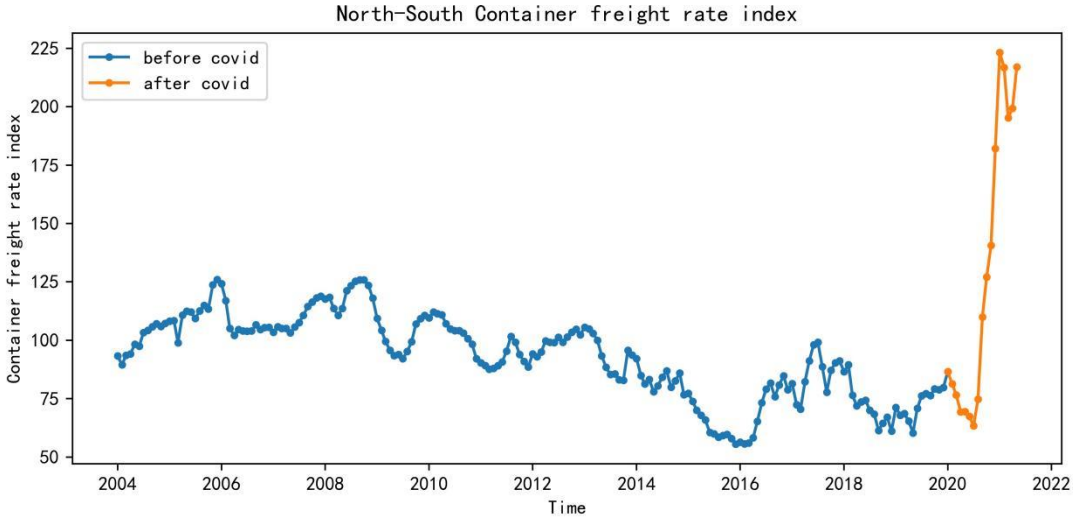
Forecast result： Figure 4.28



Source: Own Composition

4.2.9 North-south Container freight rate index

（1）Rawdata　　Figure 4.29



Source: Own Composition

（2）Regardless of Covid-19

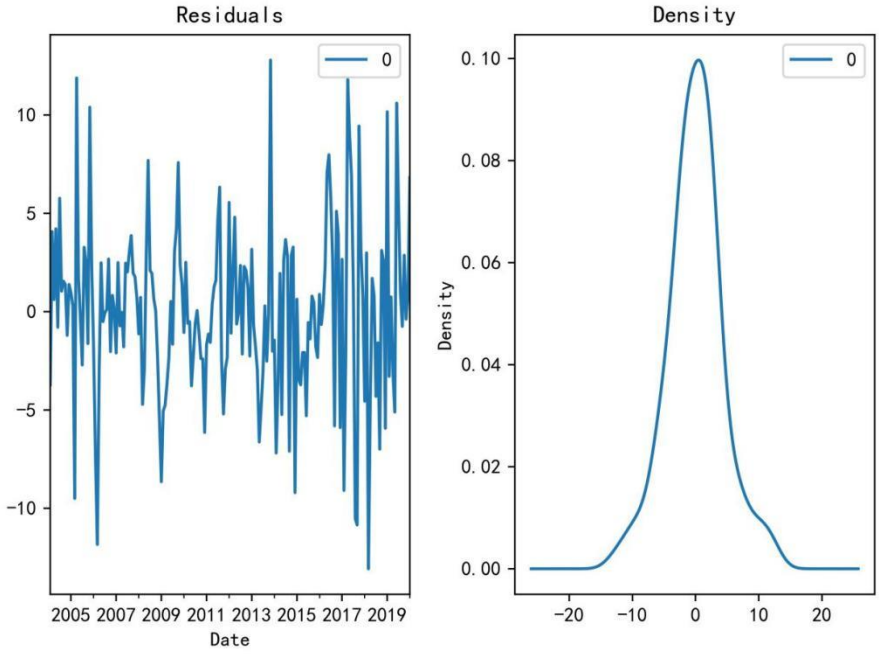
0 order： P=0.272775

1 order： P=0.000000

As a result，d=1

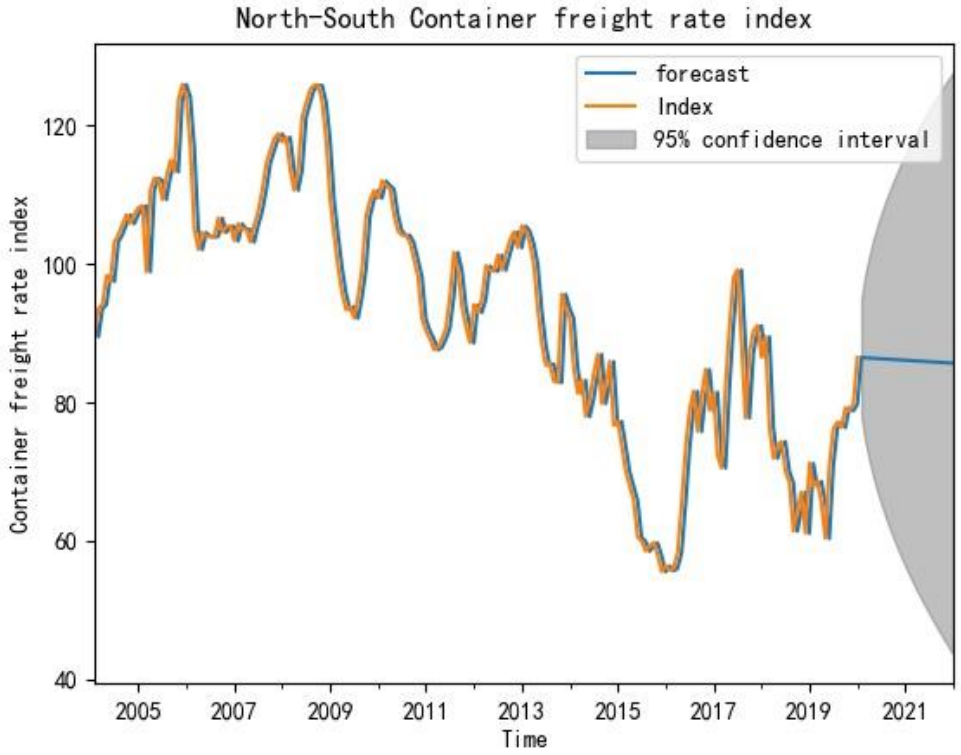
According to the BIC criterion, the order of P and Q is (0,0）

Residual test： Figure 4.30



Source: Own Composition

Forecast result： Figure 4.31



Source: Own Composition

（3）Consider Covid-19

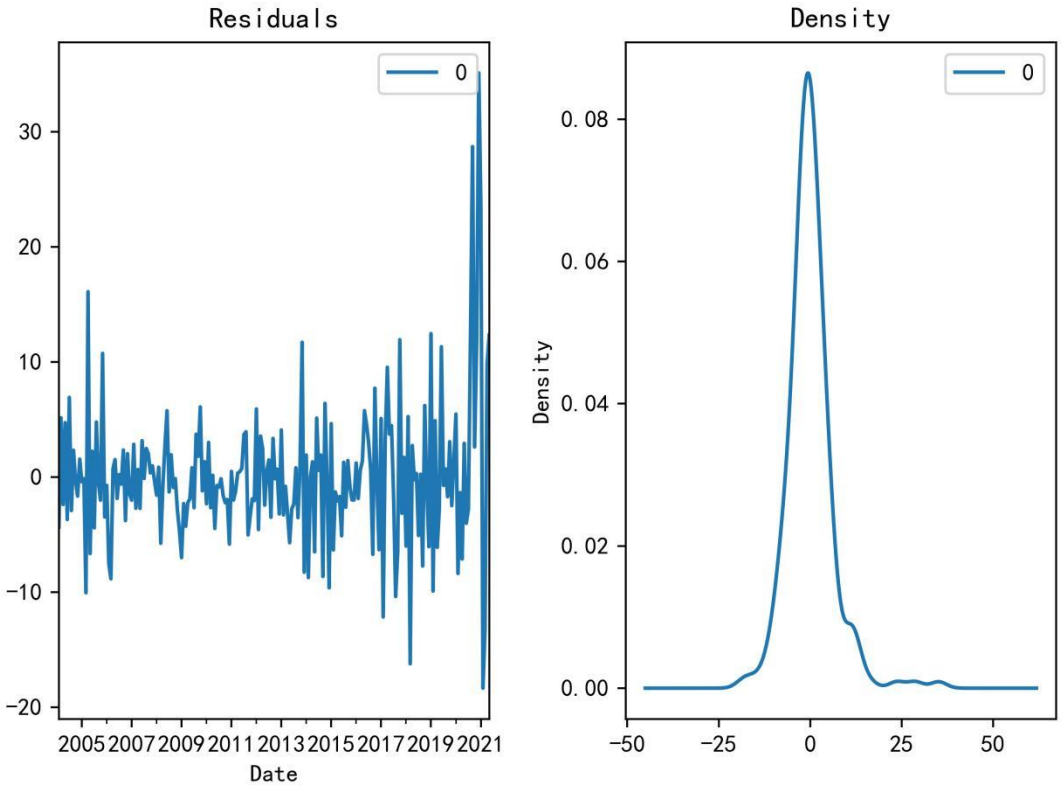
0 order： P=0.504193

1 order： P=0.000000

As a result，d=1

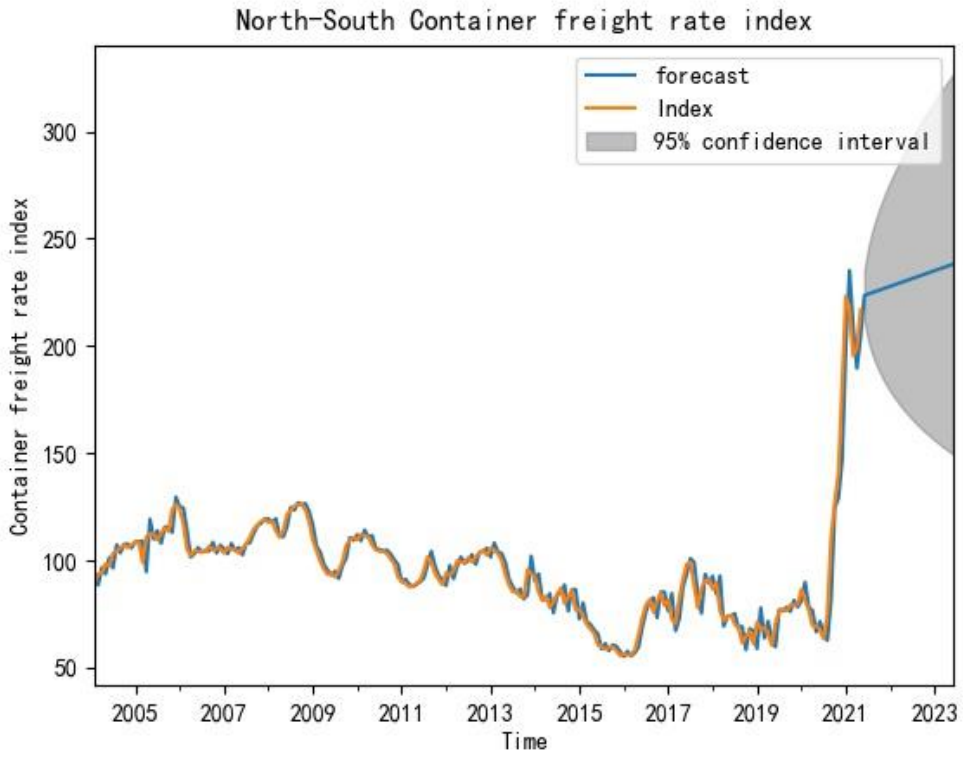
According to the BIC criterion, the order of P and Q is (0,1)

Residual test： Figure 4.32



Source: Own Composition

Forecast result： Figure 4.23



Source: Own Composition

4.2.10 Conclusion

In 2021, the normalization of COVID-19 has become a big probability event. The global economy is threatened by the two epidemic impact. The epidemic is still the biggest test and uncertainty factor for the container shipping industry. Besides the impact of the shipping market's supply and demand, the freight rate is not optimistic.

The growth of market capacity supply is higher than that of demand. Since the second half of 2020, the freight rate has been soaring, which has been divorced from the supply and demand fundamentals. Port congestion, shortage of container equipment, decline in Trailer turnover, shortage of unpacking staff... The domino of supply chain imbalance has long fallen. This maritime storm needs the joint breakthrough of the whole supply chain

From the analysis of the above seven routes, it is not difficult to see that the freight rate will still be in an upward trend in the next one to two years. In particular, the trend of some routes will be very dramatic. For example, U.S. importers, most of the large retailers and manufacturers, have signed annual agreements with shipping companies to lock in their container freight rates at a level 50% higher than a year ago, which has increased the squeeze on profit margins and increased concerns about global economic inflation. Just in recent weeks, the contracted freight rate of 40 foot container from Asia to North America is about US $2500 to US $3000, which is 25% to 50% higher than a year ago.

The ports of the United States are seriously affected (especially on the West Coast). The relevant departments predict that 78% of the ships arriving at the ports will be delayed, with an average delay of 10 days. Every link of the international supply chain is likely to be delayed. For example, from the shipment of goods from Shanghai to the warehouse in Chicago, the initial outbreak of the epidemic is 35 days, and it

may be extended by more than 70 days in the future. Rotterdam, the largest North Sea port in Europe, has 80 container ships waiting in line to unload their cargoes because of the blockade of the canal; Under the COVID-19, there is a direct impact on the Suez canal incident. Then to the current congestion of China's domestic ports, today's Yantian port and major ports in Southeast China. This will mean that the ship's punctuality rate and reliability will be reduced.

It's not just the container shipping companies that are involved in shipping costs. A New Jersey based bicycle manufacturer employs 225 people to import parts from Asia. Kamler, the company's chief executive, said his transportation costs had more than doubled in recent months. Most importantly, truck drivers often miss appointments to pick up goods from the warehouse, and the lack of spare parts also makes production unable to meet demand. And in the past 12 months, the price of bicycles has been raised four times. The biggest reason is that the cost of freight, raw materials and tariffs is far less than freight.

Rolf habben Jansen, chief executive of Hapag Lloyd, said that container freight rate may remain high in the third quarter or even enter the fourth quarter. And 2022 is unpredictable. He said, "production capacity is still in a state of tension, although the COVID-19 epidemic has improved, but there is no sign that demand is declining rapidly."

In fact, the chaos and extreme phenomena in the container shipping market have lasted for one and a half years. Congestion, shortage of empty containers, shortage of container truck capacity and shortage of ships are not the single root cause of the problem, but they all contribute to the common topic "dramatic increase of freight rate". Now the problem is - shortage of everything. Now, it is not just the above seven routes. The congestion of main ports and terminals is bringing huge pressure, more problems and uncertainty to the already hot container market. This situation

"significantly increases" the risk of serious lack of transport capacity in the container market, which will last until 2022, and the freight rate has been affected by it.

4.3.Prospects of supply and demand of container shipping market

In 2021, the planned delivery volume of new container ships is about 1.191 million TEU, and the dismantling volume of old container ships is about 226000 TEU; If the factors such as ship dismantling and delayed delivery of new shipbuilding are taken into account, it is estimated that the global container ship capacity will reach 24.373 million TEU from the end of 2021 to the beginning of 2022, an increase of 3.4% over the end of 2020 and an increase of 0.7% over 2020 (see the table below).

Table4.24 Global container ship capacity and its growth rate from 2017 to 2021

Global container ship capacity and its growth rate from 2017 to 2021		
particular year	Transport capacity / ten thousand TEU	growth rate / %
2017	2091.0	3.8
2018	2208.3	5.6
2019	2296.6	4.0
2020	2357.6	2.7
2021(Delay in delivery is not considered)	2454.1	4.1
2022 (Delay in delivery is considered)	2437.3	3.4
All data are year-end data, and 2020 and 2021 are forecast values Source: Clarksons Research		

Source: Clarksons

In general, the trend of large-scale container ships will not decrease in 2021, of which the order delivery volume of 12, 000 ~ 14999 TEU is about 0.171 million TEU, and that of more than 15000 TEU is about 0.501 million TEU; If all the orders of the above two types of ships are delivered, it is estimated that from the end of 2021 to the beginning of 2022, the total capacity of more than 12000 TEU Container Ships will reach 7.748 million TEU, an increase of 9.5% over the end of 2020, and an increase of 0.1% over 2020, accounting for 31.8% of the total capacity of global container ships, an increase of 1.8% over 2020.

It is expected that the container fleet capacity growth will remain "manageable" from 2021 to 2022. Although interest in newbuilding ship has increased recently, overall orders are still limited (equivalent to about 10% of fleet), and 1.10 million TEU is currently expected to be delivered in 2021, which is also in line with the average level from 2016 to 2019. At present, the capacity of the fleet will increase by 3.8% in 2021, the sector with more than 12000 TEU will increase by 10%, and the sub-12000 TEU will only increase by 1%. The preliminary forecast for 2022 shows that the delivery capacity will drop sharply to only 0.6 million TEU, which is 25% lower than the average level from 2016 to 2020. This reflects that the next few years may be a period of limited orders in the new shipbuilding market. It is expected that the delivery in 2022 will drop to the lowest level in the past 20 years (the last time was in 2004), which will drive the capacity of the entire container fleet to grow by only 1.5%. China, Japan and South Korea are still big shipbuilding markets. 47% of capcity will be built in Korean shipyards and the rest in China (46%) and Japan (7%).

Looking forward to 2023, the pressure on material supply has obvious potential (base on a positive starting point). With the recent surge of orders, the order delivery in 2023 is expected to exceed 2 million TEU. Therefore, in 2023, the overall supply growth may accelerate to more than 5%, and the premise is considering recycling and slippage, which may exceed the demand growth.

In conclusion, under the circumstance that the global container shipping market has greatly improved, the shipping companies have made a lot of profits, which supports the rebuilding of owners' investment confidence. Some owners will restart the previously shelved new ships, especially the super large container ship ordering plan. It is expected that the global container ship shipbuilding market will usher in a new round of orders. At the end of December 2020, one has announced that it has signed a 15 year term charter for six 24000 TEU Container Ships with Shoei Kisen Kaisha. The six new ships will be jointly built by imabari shipping and Japan United Shipping, and are planned to be delivered successively from 2023 to 2024. Evergreen Marine

Corp said that it will order 6 + 4 15000 TEU Container Ships, and costamare, the Greek owner, has contacted several shipping companies to order 6 15000 TEU Container Ships. Meanwhile, Zim shipping is actively making inquiries around the world. In addition to the super large container ships, the global regional trade, especially the regional trade within Asia, has been active in recent years. The existing fleet ships are relatively old and have limited applicability to new routes. Therefore, the demand for feeder container ships below 3000 TEU is still considerable.

From the perspective of ship type technology development trend, the future container ship technology development characteristics will mainly focus on three aspects: large-scale, green and intelligent. The large-scale container ship will have a profound impact on the global liner route layout and container operation mode. While large container ships bring scale economic benefits, due to the limitation of natural conditions such as channel depth, they also put forward higher requirements for route planning and hub port selection based on channel carrying capacity and port loading and unloading capacity. In addition, when the ship is large to a certain extent, the negative effect of scale economy will be gradually offset by the increase of scale. In terms of greening, from the perspective of the application of environmental protection and energy saving equipment and technology, line optimization, energy saving of main engine, improvement of propulsion efficiency, ballast water treatment, environmental protection coating, waste energy utilization and other technologies have been gradually applied in new shipbuilding, and are constantly optimized and mature. In terms of intelligence, from the current research on Intelligent ships carried out by relevant enterprises and institutions at home and abroad, it mainly focuses on the related products and technologies in intelligent navigation, intelligent engine room, intelligent energy efficiency management and intelligent integration platform.

5. Policy implications

5.1.Improving the operation efficiency of the supply chain in the centralized transportation market

Under the impact of the epidemic situation:

(1). Many routes "rack of containers"

In fact, even if you have money, you can't get the shipping space and empty containers. For example, China's export of empty containers fell into a state of extreme shortage at the beginning of the epidemic (CAX was generally lower than 0.5, or even less than 0.1 at the lowest time). In particular, there is a shortage of 40HQ containers. Due to the large range of lack of containers, the average booking time for cargo owners is 3-4 weeks in advance. An important reason for this result is that the epidemic has led to a serious decline in the operational efficiency of overseas terminals. Take the export trade routes between China and the United States as an example. Generally speaking, empty containers will be shipped back in 3-7 days, but it takes about 21 days for the United States, and even 30 days for some countries in southern Europe, such as Italy and Spain. This also means that the ship returned, but the original containers did not come back, so there is no way to transport more goods. That is to say, there are enough ships, but there are not enough containers for loading.

(2). On shift rate falls sharply

Due to a large number of dock workers infected with the Covid-19, the efficiency of dock operations has seriously declined. Since June, the rate of global container ship punctuality has declined rapidly. In November, it was only 50.1% (alpha liner), 29.5% lower than that in the same period of 2019. The average time delay of global container ship arrival has increased to more than five days. Among them, the trans Pacific route (China US) is the most affected, with the lowest punctuality rate of only 26.4%. Ships wait for berthing for 1-2 weeks, and a large number of ships and containers are stranded at the wharf.

Many problems have been exposed ：

(1). Lack of flexibility and redundancy

The whole international logistics system accumulated in the past decades is extremely inelastic and redundant. When the market pursues the highest efficiency and lower

price, in fact, no asset allocator will reserve redundant transportation capacity and redundant crisis handling capacity in advance for the uncertain demand, which is the deep reason for the lack of flexibility and redundancy. In the future, can we make some strategic reserves in logistics to deal with emergencies, just like the establishment of grain reserves? Personally, I think it is necessary.

(2). Organizations lacking immediate demand response

Many shipping companies are very used to "deterministic demand". For example, after working with a customer for one or two years, the company knows his demand very well, and customer service can prepare the documents he requires and find the information he needs at any time. But to deal with the logistics problems in this epidemic, we have no plan in advance. Can shipping companies keep up with customers' demands when they need to respond quickly to other emergencies in the past cowid period? Can information sharing and solution formulation be efficient? The container shipping companies, logistics companies, freight forwarding enterprises are lack in this aspect.

Although the epidemic has brought us a lot of inconvenience, it has objectively promoted some changes in the container transportation industry, and also provided some ideas for the industry to better stabilize market supply and demand in the future

(1). The roles of container shipping companies, freight forwarders and other industrial chains are speeding up the pace of Digitalization: this year, in the field of container import and export logistics, the proportion of digitalized online booking has exceeded 15%. But a year or two ago, many people said that it might not happen until 10 years later. It can be said that COVID-19 has greatly accelerated the pace of digitalization of the whole industry. Container shipping companies, including some logistics companies or freight forwarding enterprises, need to keep up with this trend, otherwise they may be eliminated.

(2). meet the strong demand of shippers for standardized services and deterministic services: before COVID-19, many shippers pursued the idea of how to get cheaper prices. But with the occurrence of another round of Lack of containers in the next round of the epidemic, shippers no longer simply pursue freight rates, but seek a more secure and deterministic way. Standardized services. Now, when many customers sign contracts with container shipping companies, low price is no longer the first demand. What can you guarantee? Then, based on the deterministic service, a corresponding price is given. So in a sense, when the market fluctuates, it is the best way to build standards for future international logistics services and two-way certainty. Container shipping companies should seize the opportunity in COVID-19.

The above points are only superficial, and there are some more long-term "supply and demand" trends, which are more worthy of the attention of the practitioners of container shipping and logistics companies.

(1)、In the future, the boundary between container shipping companies and logistics and freight forwarding companies will be more blurred, and they will jointly move towards "end to end" integrated logistics services. Maersk has been implementing the strategic transformation for a long time, and is committed to becoming a global integrated container shipping and logistics company. It has launched its own trailer and customs declaration businesses, which were previously the sites of traditional logistics and freight forwarding companies.

For example, on April 19, Maersk announced the opening of the weekly China Europe train from Xi'an, China to Turkey. Located in the Asian part of Turkey, Maersk has always been an important oil transshipment port in Turkey. Tupras, a Turkish oil giant, also has an oil refinery in the port. Since the outbreak of covid-19, the number of international shipping lines has decreased, and the volume of international shipping lines has been increasing. Meanwhile, the crew involved in quarantine and cargo handling has become more and more complicated. Maersk began to find strategies for

maintaining the normal operation of supply chain in the face of poor shipping channels. The integration of the line will be part of Maersk's intercontinental rail service network, which can be shortened to less than 16 days compared with shipping with low container turnover during the epidemic. The whole international logistics market is large, and freight forwarding enterprises still have certain advantages in flexibility and resource integration ability. Shipping companies can consider entering the field of freight forwarding for resource integration. At the same time, every logistics and freight forwarding enterprise must also think about what its core competitiveness is and how to achieve innovation and breakthrough, so as to better cope with this change.

(2).Under the epidemic situation, the container shipping companies that provide single service can not meet the needs of customers, and are being replaced by many companies that provide comprehensive services and strong professionalism. When a container shipping company changes from single service to comprehensive service, it is not enough to rely on its own supply. Now many enterprises not only do their own services well, but also can link more suppliers who provide high-quality services. In fact, it has changed from the professionalism of single service to the professionalism of comprehensive service. Therefore, even if some companies have not touched a certain aspect of logistics before, if they can find a more professional supplier in this aspect in a very short time (especially during the epidemic period), and carry out efficient coordination and management, they can also do a good job in an unfamiliar

(3). The professionalism of order processing becomes the professionalism of demand response. When a container shipping company has the ability to link, many logistics orders are actually handled by professional departments. When you are just a link, can you, as the order initiator, quickly respond to customer needs?

Suppose the demand is to transport masks from Indonesia today, protective clothing from Russia tomorrow, and disinfectant from Germany the day after tomorrow. In

order to respond quickly, we need to be "professional". We say logistics should be professional, but the definition of this specialty has been redefined again and again in this transportation process of rescue materials.

(4). Digitization will become an irreversible trend. After the test of this round of epidemic situation, many logistics enterprises have realized the importance of digital service. According to the prediction of authoritative organizations, it is estimated that in 2-3 years, the proportion of "e-quoting", "e-booking", "E-Tracking" and other technologies in the whole industry will reach more than 40%, and digitization will become the standard configuration of international shipping logistics supply chain, and gradually become the focus of enterprise innovation and breakthrough.

5.2. Suggestion of reasonable pricing of freight

Under the COVID-19, the supply chains of various countries, trade areas and all routes have been greatly impacted. The fluctuation of the market affects the change of freight rates. Due to the differences of different national systems, the elasticity of supply chain is also very different, the feedback of shipping market is different, and the freight price under the imbalance of supply and demand is soaring. In addition to the relatively stable routes between Japan and South Korea, the freight rates of many routes such as South America, the United States and Europe have doubled by five times, even 10 times. Many people will ask, what else can be carried at such a high freight rate? Indeed, we can see that many goods are out of the reach of the market, except for consumer goods and some goods related to manufacturing. In terms of consumer goods, most of them are finished products, such as masks, protective clothing, gloves and other necessities under the epidemic, and the semi-finished products are also rare. Therefore, it can be said that consumer goods and finished products are driving the container shipping trade round by round. Therefore, it has become a trend to keep rising freight rates no matter which route and region they are. In terms of stable freight rates, I have the following opinions and suggestions:

(1)、 China's economy is recovering rapidly and domestic capacity needs to be digested.

As a manufacturing country, even if the cost of shipping costs increases, it can not block the export trend of "made in China". In particular, the recovery rate of China's market is too fast only in the second quarter of 2020 (growth rate of 3.2%). As we all know, manufacturing industry includes the following factors - production, inventory, digestion cycle, etc. in order to ensure the continuity of production line and the whole supply chain, even if the gross profit rate is low and even loss occurs, the enterprise will quickly turn over the finished products. Only when the products flow, the funds will flow with it, and the systematic operation risk brought by the cycle can be reduced. If we plan to go to shipping, even if we do business, the buyer will cut the price to a profit, and the seller will be happy to sell the goods. This is because there is cash flow to make money. Once it becomes inventory, there will be a backlog, and the opportunity of making money and turnover will be lost. Moreover, during the special period of COVID-19's global behoove, the shock of container shipping market is aggravating. It is not just China. At this stage, the big domestic manufacturing industries are badly in need of digestion. Therefore, accepting the rising freight rate is a matter of course. In view of the above situation, some manufacturing industry countries (China and Southeast Asia) governments should properly intervene in the economy, and the production market and shipping companies should establish links, integrate trade export and manufacturing industries, and can not improve production efficiency in a single way, ensure safe inventory and avoid overstocking of goods warehouse, The production efficiency should match the container turnover efficiency.

(2).shipping data support the rise of shipping costs of major shipping companies.

International maritime transportation has a set of its own trading mechanism. Neither shipping companies nor airlines will have the chance to improve, reduce freight or increase or decrease the capacity, especially in special periods. They will use mathematical models to calculate the short-term market profit margin after breaking the price and capacity, and then make decisions. In other words, every freight

adjustment is the product of accurate calculation. Moreover, the adjusted freight will support the ship company to stabilize the gross profit rate within a certain range in the future. If the market supply and demand data fluctuates, causing the change of gross profit rate, the shipping company will immediately use the capacity increase and decrease tool to stabilize the profit rate at the prediction level. Therefore, my personal view is that the pricing of shipping companies in this stage needs to be realized by a set of accurate and large-scale data collection, quantification and prediction algorithms. Strategic cooperation can be established between shipping companies with the same routes or trade areas, and the regional and shipping line freight rate information sharing can be stable confidence interval, At the same time, we can jointly develop new tariff models and incorporate COVID-19's real-time information as a new priority among priorities.

(3). the epidemic intensified the intensity of trade, restricted the import and export of many countries, led to the scarcity of transport capacity and the increase of freight.
On the surface, the floating of freight rate is a simple issue of supply and demand for sea transportation. However, the root cause is the contradiction between countries in the face of epidemic situation and the balance between import and export. For example, India stopped receiving Chinese goods first and inspected all Chinese goods 100%, which led to a 475% increase in shipping charges from China to India. The shrinking demand will inevitably lead to container shipping companies reducing the balance of transportation capacity and supply and demand. The same is true for the freight increase of China US routes.

From the basic analysis, both the supplier and the supplier do not support the continuous rise of shipping charges, regardless of the route and the trade area market. For example, in the early third quarter of 2020, shipping companies have begun to increase their capacity, and have been increasing continuously until the next stage to expand profit margin and reduce losses, reduce freight and increase market demand elasticity; Secondly, from the perspective of customers, most customers generally

complain that shipping charges have embezzled most of the product profits, such as freight charges have increased further. Some exporters without supply chain and capital pressure suspend orders and temporarily exit the market. After the demand of international market increases and the price increases, when there is profit space again, they will sign for the order. From the perspective of both supply and demand, the buyer and the supplier will sign the bill again, The market has been in a stage of losing momentum in such a big environment.

At present, the water products under control in each country are uneven, even some countries are still not under effective control, manufacturing has not been restored, and some developing countries (China and some Southeast Asian countries) are active in production and manufacturing. Moreover, the rising sea freight has restricted the release of capacity in these countries, and affected the normal operation of various industries and affected employment, The state will intervene through policy means. Taking China as an example, at present, shipping companies, international logistics and international freight forwarders operating Sino US and central European routes have received notice successively, reporting the recent shipping plan and freight fluctuation and reasons, and it is estimated that the shipping cost will change significantly in the near future. After the popularity and epidemic situation of COVID-19 vaccine was further controlled in 2021, governments could adopt appropriate means to study and intervene in the fluctuation of freight transport. At the same time, countries in the trade area could adjust the tariff or quarantine aspect or reformulate cooperative strategies to tide over the difficulties of the epidemic.

6. Conclusions and extensions

Market outlook：

Looking forward to the follow-up, with the global COVID-19 entering the turning point, governments will gradually relax their prevention and control measures. At the same time, considering that the dust of the US general election is settled and the new President Biden is in power, economic recovery will become his primary task. Various

stimulus policies will be introduced one after another, and the US economy may gradually recover, thus driving the world economy to return to the level before the outbreak of the epidemic. Therefore, it is expected that the world economy will recover from the middle and late 2021 to 2022, and gradually enter a relatively stable stage of overall recovery.

In terms of trade, judging from the development trend of global container shipping market, container shipping trade will return to the growth track, and the global container trade volume will increase in the next two to three years, but the trade scale may be lower than that before the epidemic. The recent prospects of the container shipping industry are still strong and optimistic, the current market situation is still very stable, the sentiment is strong, and the remarkable momentum is still obvious, especially in the charter market with very limited tonnage supply. It seems that the factors supporting the strong rebound of container trade may continue in the short term, and it may take some time for logistics disruption to ease.

In addition to the positive near-term perspective, the outlook appears to be complex, with a number of factors that may have an impact, as well as major uncertainties about how long it will take for the entire container transport supply chain to be disrupted. Although the timing is not clear, the easing of freight and charter market conditions seems inevitable, and people's expectations seem to be increasing, that is, the "disruptive rise" may now last longer than originally expected. In late 2021, in addition to more "normalized" fundamentals, the impact of the end of the disruption may begin to be seen, although the size of the easing may be moderated by persistent disruptions and the current strong market momentum.

The underlying outlook seems to be relatively positive, although there may be some "normalization" of demand conditions in late 2021 or early 2022. Covid-19 is likely to continue to provide some support for container trade although the macroeconomic environment has improved significantly (supported by government's major stimulus

and sustained vaccine promotion). But this year, the demand for abnormal strength may be moderate in recent months. With the easing of the Covid-19 restrictions, the volume of trading may undergo some major economies' shift to consumer spending. Container trade is still expected to grow throughout 2021, although uncertainties associated with the covid-19 pandemic remain. At the same time, supply expansion will remain "manageable" for some time to come. Furthermore, from 2022 to 2023, although demand growth may be moderate, slower supply growth may provide new support. However, this is largely due to the rapid disappearance of the impact of logistical disruption.

Post-Covid-19 Planning and Green Transition

Now,Covid-19 program is becoming more and more concerned, especially around two topics, green transition and technology. The greenhouse gas emission of the container ship industry is highly concerned. In the next few decades, the container fleet needs to be updated to meet the accelerated regulations and environmental policies, including the short-term measures and long-term goals of the International Maritime Organization (25% of the capacity of the container ship fleet are ships over 15 years old). Research on alternative fuels (especially liquefied natural gas, although bio-fuels and ammonia are still of great concern) is emerging in an endless stream, and the tracking of emissions and carbon intensity is expected to continue to increase significantly. Continuous efforts to reduce emissions and limit the impact of container transportation on the environment may play an important role in shaping the trend of liner industry in the long term, and will gradually penetrate into the charter market in the later stage.

Other potential long-term trends remain important, including debates about future trade growth and changes in trade patterns, the impact of geopolitics, and the need for infrastructure investment. The potential long-term impact of the covid-19 pandemic on consumer activity and "risk reduction" in the supply chain also remains important.

Reference ：

Liu,F, 2021, Review of the world shipbuilding market in 2020 and prospects for 2021, Vessel, vol.32, pp. 04-05

Liu,F, 2021, Review of the world shipbuilding market in 2020 and prospects for 2021, Vessel, vol.32, pp. 10-11

Liu,F, 2021, Review of the world shipbuilding market in 2020 and prospects for 2021, Vessel, vol.32, pp. 15

Cai，J, 2021, Global container shipping market situation and future prospects in 2020, World shipping, vol. 44, pp. 01-02

Cai，J, 2021, Global container shipping market situation and future prospects in 2020, World shipping, vol. 44, pp. 04-06

Zheng，J.2021International container transport market: contradiction between supply and demand continues，COSCO Shipping, 2021, Sound, COSCO Shipping, vol. 03, pp. 01

Zheng,W，2021，International container transport market: continuous boom and intensified shock， COSCO Shipping， vol. 01, pp. 02

Han,J，2020International container transport market: maintain enough resilience，COSCO Shipping, vol.08, pp. 01

Zheng, J, 2020, International container transport market: in the doldrums, epidemic situation is the main influencing factor, COSCO Shipping, vol.03, pp. 01

Xu,J, 2020, COVID-19 will swallow all revenue from container shipping industry in the past ten year, China Ship Inspection, vol. 06, pp. 02-05

Shang, H, 2021, Review of container shipping market in 2020 and prospect in 2021 , Shanghai Shipping Exchange, vol. 32, pp. 02

Shang, H, 2021, Review of container shipping market in 2020 and prospect in 2021 , Shanghai Shipping Exchange, vol. 32, pp. 05

Li,B,2021,Review and Prospect of China's export container freight index,Foreign trade and economic cooperation,vol. 04,pp. 01-02

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/5 , pp. 02-03

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/5 , pp. 07-08

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/5 , pp. 12-13

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/5 , pp. 16

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/4 , pp. 02-04

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/4 , pp. 06-08

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/4 , pp. 09-12

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/3 , pp. 02-03

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/3 , pp. 05-08

Clarksons Research , (2021) , Container Intelligence Monthly , Vol. 23/3 , pp. 10-12

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 2 , pp. 08

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 2 , pp. 16

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 2 , pp. 20

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 2 , pp. 22

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 2 , pp. 24

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 1 , pp. 08

Clarksons Research , (2021) , Container Intelligence Quarterly , Qtr. 1 , pp. 16-24

Clarksons Research , (2020) , Container Intelligence Quarterly , Qtr. 4 , pp. 08-12

Clarksons Research , (2020) , Container Intelligence Quarterly , Qtr. 4 , pp. 16

Clarksons Research , (2020) , Container Intelligence Quarterly , Qtr. 4 , pp. 20

Clarksons Research , (2020) , Container Intelligence Quarterly , Qtr. 4 , pp. 24-26