Study about How the Chinese Economic Status Affects to the Baltic Dry Index

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Abstract

China has become one of the world's economic pillars, surely a G2 nation. Along with the enormously fast economic globalization and China's fast growth, exchange consolidation between Korea and China is inevitable. Also, since Korea is a country with a high foreign trade rate, the Chinese variation is crucial.

This research has analyzed the co-relationship between the BDI, ship's space, and the Chinese economic trend, and the effect China has on the merchant marine market, using a hypothesis that says the Chinese economic fluctuation caused by national development is a major factor in the world bulk traffic fee fluctuation. The research has concluded that the Chinese economic fluctuation does affect the dry bulk traffic fee and the bottom constantly.

Keywords: China's economic growth, Shipping index, Korea's economy

1. Introduction

The durability of the high growth of the Chinese economy is the decisive factor of the course of the world shipping industry. The cause can be found from the so called "China effect"—the result of the drastic increase of the Chinese trade volume beginning in 2003, which started to be recognized as a main factor for the shipping industry.

The Baltic Dry Index (BDI), which indicates the dry bulk shipping industry status, was 1,215 in 2001, 2,634 in 2003, and 3,380 in 2005. The index was stable, but suddenly, in December 2007 it reached 10,000. From 1,006 on August 14, 2002, to 2,011 on April 7, 2003, it took approximately eight months to break the 2,000 barrier, and to 3,138 on October 1, 2003, it took approximately six months to break the 3,000 barrier. Reaching 3,039 on October 9, 2003, it took only a week to break the 4,000 barrier, and on January 9, 2005, the index increased to 5,046. At that time, it took only three months to reach the 5,000 barrier. After reaching its peak on May 20, 2008, 11,793, it was affected by the economic crises; in July 2008 it decreased to 775 at the end of the year, showing how unstable the market is. To be more specific, on August 16, 2007, the index was 2,319, and on October 10, 2007 (after about two months), broke the 10,000 barrier, and on January 29, 2008, the index was 5,615, which was almost a half of what it had been, and again broke 10,000 on May 7, 2008. The market was extremely unstable. Affected by the global economic crises in July 2008, the BDI dropped precipitously to 666 in December 2008, and has been around 2,600 until now (October 2010).

Insert figure 1 here

The China effect is one of the big factors of such fluctuation. The continuous progress of the Chinese economy affects the world economy and is changing the world trade flow. In 2004 the Chinese government, trying to avoid the risk of economic overheating, announced an economic control policy by banning new investment in steel, automobile, cement, real estate, and electrolytic aluminum. As a result, the BDI, which was 4,229 on April 27, 2004, decreased continuously and reached 2,622 on June 22 of the same year. The index decreased drastically by 38% in less than two months. This kind of influence, called the China effect or the "Wen Jia Bao effect," can be observed in the May and July 2004 steel industry restructuring policy case. Following a drastic decrease in world iron ore, steel traffic volume followed after the Chinese governmental policy was activated.

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flow. China exported approximately $249.2 billion in 2000, and in 2009 exported about $1,300 billion, which is almost five times the exports in 2000. The Chinese status in world trade volume has expanded from third in the world in 2004 to second in the world in 2006. Because of the 2008 Beijing Olympic and the 2010 Shanghai expo, China's demand for steel has risen constantly and has reached 50% of world steel traffic volume. Coal demand in China has been substituted for oil, since the oil price increased; once a coal exporting country, China has become an importer of coal from Australia.

This research will be covering the cause-and-effect relationship between the Chinese economy and the world dry bulk market, the effect of the Chinese economy, and the ship's space to freight charges found through the econometric model.

Chapter II discusses the pre-study analyzing methods, and chapter III examines the China effect in the dry bulk shipping market. Chapter IV conducts an empirical study, and in chapter V the aim of the research is to illuminate the characteristics of the China effect.

2. Analyzing previous studies and research methods

It is difficult to prove the China effect on the international shipping market through quantitative tools because there have not been many case studies about the China effect. Young Seok Ha (2005) unveiled that the China effect exists by analyzing it through time series analysis. Su Won Mo (2006) defined ocean freight fare as a function of the relationship between trade volume and the Chinese economy; he said that an additional China effect would not appear because it is already well reflected in the ocean freight fare market, and the fare should fall due to the reduction of the China effect. Chang Beom Kim (2008) defined BDI as a function of the relationship between dry bulk carrier's ship's space and the Chinese economy and found that the China shock may increase shipping fares as well as carrier's ship's space and that the shock on carrier's ship's space decreases the fare. He concluded that the reaction of the shipping fare and duration of the shock from the Chinese economy outweigh that of carrier's ship's space in regard to the shock from the Chinese economy.

3. China effect in the tramp shipping market

As noted above, the effect of the Chinese economy on the shipping market is enormous. With China's rapid economic growth, the huge increase of maritime commerce container traffic, and the Chinese government's economic control policy in response to rapid economic growth, the shipping fare market for bulk carriers is fluctuating.

There are two aspects to the China effect, the China impact and the China shock: the China impact means the gradual development of the shipping market, while the China shock means the sudden drop in the shipping market as a result of China.

The GDP of China was $380 billion in 1990, but increased to $1,200 billion in 2002. China's trade volumes were $115 billion in 1990, $620 billion in 2002, and they are expected to pass $1,000 billion. Over the same period, South Korea's GDP was $130 billion in 1990 and $310 billion in 2002. Trading share between China and Japan was 17% to 68% in 1990, 19% to 44% in 2002, and in 2003 the ratio between the two countries was about the same. These data reflect that the leading trading-share country among China, Japan, and Korea moved from Japan to China. Furthermore, the logistics market of China has been growing rapidly since 2002, which contributed to the increase of the tramp fare by five times just in one year. These are all results of the China effect. However, BDI dropped to half its level in the six-year period of the Chinese government's control policy, due to the China shock. The largest importer of iron ore was traditionally Japan, but China overtook Japan's position in 2003 and became the world's largest importer. Considering this fact, Brazil, the world's largest exporter of iron ore, conducted trade negotiations with China instead of Japan. At the conclusion of this negotiation, China made a decision to invest a billion dollars in Brazil's infrastructure, such as ports. The imported iron ore is transported by train to steel mills which are mostly located in inland areas of China; the lack of infrastructure in China causes delay of freight and results in the increased price in the shipping market. Also China has become an importing country of grains, and this has caused a rise in the Panamax market.

The background of the China effect is the global economic shift. Before 1996, primarily new investment was conducted, but after 1996 the trend shifted to relocating investment, i.e., moving production plant. As a result, even without US economic growth, large-scale maritime container traffic is being created by China. Before, China's export goods were produced by foreign companies, but now the export goods are expected to be produced by the local Chinese company in bulk, so the second China impact is going to appear soon.

(1) The rising of the Chinese shipping industry

During the last few years, Chinese freight shipping and importing volume have increased enormously. In the

1960s, there was only 470,000 gross tonnage (G/T) of existing Chinese flag ships. COSCO, a Chinese state ownership company founded in 1961, acquired possessing ship's space of 867,000 G/T in 1970, 8.6 million G/T in 1980, 13.9 million G/T in 1990, and 17.4 million G/T recently. Furthermore, imports from 1974 to 1994 increased by 100 million tons; that amount tripled from 1995 to 2003, from 182 million tons to 534 million tons. This rapid growth has affected the shipping industry in a positive way. China makes up 19% of dry bulk traffic and 8% of ocean traffic and is ranked third just after the US and Japan. The world is interested in how long China will sustain this continuous growth after its rapid development over the last 10 years. This question has two bases, which are associated with China's current growth rate; China's growth is analyzed as a transition process entering the mature period. Firstly, the Chinese economy is increasing in volatility, and therefore this rapid growth will not continue to increase rapidly, and, secondly, although China has a huge and complicated economic system, its trade is mostly focused on daily necessities.(2) Chinese economy in transition

In recent years, the Chinese economy is facing a transition period; therefore, the trend of future economic growth over next three to four years should be predicted in advance. In the economic development stage, expectations are focused on the raw material industry. According to *Trade Development Cycle* by Stopford (1997), demand for raw materials, such as iron ore, coal, nonferrous metals, and lumber, increase when the economy passes from the growth to the maturity period. Harmony throughout the domestic and international market is the fundamental factor for economic growth, and the shipbuilding and automotive industries contribute to economic growth because they lead the export market. Japan in the 1950s and other countries like South Korea later went along this path as their economy developed, but China is proceeding along the same path at a much faster speed. Since the 1990s, China recorded a compound annual growth rate (CAGR) of 13.9% with the help of the construction, automotive, and shipbuilding industries' remarkable growth. In addition, China's communication technology and logistics systems enable quick delivery and low logistics costs, which Japan regarded as impossible tasks 30 years ago. For example, the combination of cheap container ship service and a large retailer like Wal-Mart makes it easier to access the American Midwest market. Besides, economic growth in Europe and Japan has slowed, whereas China's import container traffic is following the pattern of Western Europe in the 1950s and Japan in the early 1970s. Thus, the trade development trends and peaks of China should be forecast for the next five years because the same phenomenon that happened in Japan and Western Europe may occur in certain stages in China. Also, understanding the problems that Chinese trade might confront will be important for forecasting future prospects.

In the transition period of the Chinese economy, economic growth may diminish as it steps into the mature stage. It is going to be very difficult to predict the future because there is no economic model to predict the Chinese economy precisely; even though the economy is growing, there is a chance that the trade volume will be reduced. The variable making it difficult to predict the future is that the import container traffic could be reduced when the steel industry in China develops. The rapid growth of the economy becomes more volatile; therefore, China's ability to cope with the crises seems to be weak. Crises will act as obstacles that reduce demand. Crises are an important factor to the shipper who needs to predict the economy in order to make investment.

Transportation of the resources around the country adjacent to the Chinese border does not rely on maritime transportation; this factor is a crucial difficulty for estimating shipping income and container traffic. Also oil and gas, which are delivered from Russia and around the Caspian Sea, will be elements that make it hard to predict the future.

The shipping industry's most important task overall is to predict shipping demand. The demand of the merchant ships is expected to grow by 50–80 million deadweight tonnage (DWT) in 2010, affected by China's increase in import volume. The investment target, the owner of the vessel, and the nature of the fleet expansion also serve as important variables. It is crucial to decide which vessels to invest in and who is taking the risks because predicting trade growth is mostly an uncertain enterprise. Making a decision about whether to expand China's fleet or to fill the bottom needed depending on the international shipping market is important.

It is certain that the shipping industry contributes to the Chinese economy in terms of delivering raw materials and exporting products overseas because China is leading the growth of maritime commerce. China's import container traffic will be about 1 billion tons in 2010, so a large amount of investment in new vessels is needed. However, in the transition period of the Chinese economy, there will be some risks for investors that the new vessel demand may fall.

(3) The impact of the China effect

Barely anyone disagrees that the direction of the shipping industry is highly dependent on the growth of the Chinese economy because the China effect due to the rapid increase of export and import container traffic has

been considered as an important variable since the end of 2003.

As mentioned above, variables associated with China, such as the "Wen Jia bao effect" have affected the major shipping markets of Capemax, Panamax, Handymax, etc., and the container traffic of iron ore and steel.

In the case of the Baltic Capesize Index (BCI), the price in April 2004 was 6,347, but in 2005 it fell to 5,066 in May, 3,078 in June, 2,943 in July; ultimately, the price dropped 53% from April 2005 to July 2007. This kind of phenomenon was also found in the Baltic Panamax Index (BPI): the index declined 53.7% from April 2005 to July 2005. These examples indicate the China effect on the world shipping market. As quoted above, iron ore, which is the raw material for manufacturing steel, is the largest container traffic amount compared to other dry cargo and is transported by Capesize ship, and it has a huge effect on the BCI.

(4) Sustainability of the China effect

Su Won Mo (2006) proved the existence of the China effect by concentrating on the BDI. According to his analysis of the sustainability of the China effect, using "trade volume toward China" and "Chinese economy" as variables was not appropriate in the model because incorrect results were derived because of the collinearity problem in setting up the analysis model.

Therefore, the research analyzed the stability of the model by constructing a model with trade volume towards China, the ocean freight fare, and the GPH test; the result was clear that the model has convergent characteristics with balance. As a result of this research, trade volume towards China and the Chinese economy both are effective at 5% and have a positive number, so the rise of these variables increases the ocean freight fare. However, in analyzing the China effect with the coefficient of determination and f-values, it was revealed that using trade volume instead of the China economy as an explanatory variable was more reasonable. Conducting a forward moving regression to observe the effect of the rise of trade volume toward China on the ocean freight charge, all the coefficients of BDI, BCI, and BPI declined from 2004, representing the China effect's reduction. Coefficient growth, in contradiction to the previous year, has rapidly declined since February 2004. These results do not mean that the China effect is disappearing; they mean that the China effect has already been reflected well, so the additional China effect should not be expected, and the freight fare is expected to decline by the China effect's reduction.

The research conducted variance decomposition analysis to look at how the ocean freight fare can be described in terms of the trade volume towards China and discovered that the trade volume is an external factor of the fluctuation of the ocean freight fare. Also, when some factors impacted trade volume towards China, reaction of the ocean freight fare declined very slowly with a long lasting effect, which represents that the China effect is at first quite weak but the effect becomes more and more powerful as time goes on. The diminishing return of the China effect appears to slow, which indicates that the effect will exist for long time.

4. Material Analysis

Throughout the research, the model analyzing the BDI for dry bulk cargo volume and the Chinese economy was defined as the model shown below Model (1).

$$BDI_t = \alpha_0 + \alpha_1 Ship's space_t + \alpha_2 CDI_t \quad (1)$$

Here, the "BDI" stands for Baltic Dry Index, "Ship's space" means the total space of a dry bulk ship, and "CDI" stands for the China Diffusion Index. The information was found on the websites of the Korea Maritime Institute and the Chinese Bureau of Statistics.

Table 1 indicates the level variable and the Unit Root Test results for the primary differential variable. Because it is not possible to reject the null hypothesis in all level variables at a 5% significance level, the primary time series data is able to reject the null hypothesis. To achieve stability, it is found that it is essential to use the primary differentiated time series data.

Insert table 1 here

The linear combination between the time series was analyzed using the Johansen's multivariate co-integration model.

$$\lambda_{trace} = -T \sum_{i=r+1}^{p} \ln(1 - \hat{\lambda}_i)$$

$$\lambda_{max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+1})$$

Using the two test statistic based on the eigenvalue, Johansen's Multivariate Test is shown to be rejected in null hypothesis at the 5% level of significance; through that result we could see there exists 1 co-integration vector.

Insert table 2 here

It is shown that the co-integration model exists; the Error Correction Model is used to find dynamic causality between the variables.

$$\Delta x_t = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta x_{t-i} + \sum_{i=1}^{m} \gamma_{1i} \Delta y_{t-1} + \sum_{i=1}^{n} \delta_{1i} \Delta z_{t-1} + \sum_{i=1}^{\gamma} \xi_{1i} ect_{\gamma t-1} + \varepsilon_{1t} \quad (2)$$

$$\Delta y_t = \alpha_2 + \sum_{i=1}^{i} \beta_{2i} \Delta x_{t-i} + \sum_{i=1}^{m} \gamma_{2i} \Delta y_{t-1} + \sum_{i=1}^{n} \delta_{2i} \Delta z_{t-1} + \sum_{i=1}^{\varkappa} \xi_{2i} ect_{\varkappa t-1} + \varepsilon_{2t} \quad (3)$$

$$\Delta z_t = \alpha_3 + \sum_{i=1}^{i} \beta_{3i} \Delta x_{t-i} + \sum_{i=1}^{m} \gamma_{3i} \Delta y_{t-1} + \sum_{i=1}^{n} \delta_{3i} \Delta z_{t-1} + \sum_{i=1}^{\varkappa} \xi_{3i} ect_{\varkappa t-1} + \varepsilon_{3t} \quad (4)$$

In here, "x" means the fee, "y" means the ship's space, "z" means the vector of the Chinese economic trend, "Δ" means the difference operator, and "ect" means the error-correction term.

The review of the dynamic causality conclusion found from the vector error-correction model is shown in Table 3. We can see that the Chinese economic trend affects the maritime transportation fee and the bottom. In brief, the economic trend and the shipping fee, as well as the economic trend and the trade volume have unilateral causality. Also, only in the case of the shipping fee, the Error Correction Model has reached statistically significance level.

Insert table 3 here

Likewise, through the vector error correcting model, the variation trend throughout the variables can be found, but to comprehend the variation that works on a specific variable, it is necessary to use the predicted error disperse variance.

Insert Figure 2 here

Insert Figure 3 here

Insert Table 4 here

Graph 1, Graph 2, Table 4 show the effect of a disperse variance and that, in 15 steps, shipping volume has a 64.15% rate for its own innovation, a 29.83% rate for the Chinese economic trend, and a 6% rate for the maritime traffic fee; the Chinese economic trend affects the maritime traffic volume. Also, the Chinese economic trend has been explained to be affected by the traffic fee variation at a 21.75% rate, a 9.5% rate by the traffic volume, and a 68.8% rate because of the traffic fee itself. The traffic fee is hugely affected by the Chinese economy.

5. Conclusion

China has become one of the world's economic pillars, surely a G2 nation. Along with the enormously fast economic globalization and China's fast growth, exchange consolidation between Korea and China is inevitable. Also, since Korea is a country with a high foreign trade rate, the Chinese variation is crucial.

This research has analyzed the co-relationship between the BDI, ship's space, and the Chinese economic trend, and the effect China has on the merchant marine market, using a hypothesis that says the Chinese economic fluctuation caused by national development is a major factor in the world bulk traffic fee fluctuation. The research has concluded that the Chinese economic fluctuation does affect the dry bulk traffic fee and the bottom constantly.

Regarding the Chinese fluctuation effect, more detailed research of how it will affect the Korean maritime industry is needed. It is necessary to thoroughly monitor the Chinese economic status continuously. Although the Chinese economy is the second most influential in the world, the economy is not mature, and it cannot be disregarded that it might face a huge economic fluctuation as a result of its immaturity. Such an unstable situation increases the uncertainty, and since Korea is one of the countries that will be most affected by the situation, Korea should observe the situation more closely. Therefore, the Korean industry and the government should develop a more specific system to monitor the Chinese economic situation more effectively.

References

Cheung, Y.W., and K.S. Lai. (1993). A Fractional Cointegration Analysis of Purchasing Power Parity. *Journal of Business and Statistics*, Vol.11. pp.103-112.

DURU, O. (2010). A fuzzy integrated logical forecasting model for dry bulk shipping index forecasting: An improved fuzzy time series approach. *Expert Systems with Applications,* 37(7), pp. 5372-5380.

Fuller, W.A. (1976). *Introduction to Statistical Time Series*. New Yook, Wiley.

Granger, C.W.J. (1986). Developments in the study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics*, Vol.48, pp.213-228.

http://stat.kita.net

http://stats.gov.cn

http://www.bok.or.kr

http://www.kmi.re.kr

Johansen, S. (1988). Statistical Analysis of Cointegrating Vectors. *Jounal of Economic Dynamics and Control,* Vol.12, pp.231-254.

Korea Maritime Institute. (2006). KMI World Marine Outlook.

LEE, DOOWON. (2003). Economic Developments of Korea and China. *JOURNAL OF ECONOMIC RESEARCH,* 8(1), pp. 71-102.

Newey, W.K., and West, K.D. (1987). A Simple, Positive Semi-Definite, Heterosedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica*, Vol.55, pp.703-708.

Osterwald-Lenum, M. (1992). A Note with Quantiles of the Asymptotic Distrubution of the Maximum Likelihood Cointegration Rank Test Statistics. *Oxford Bulletin of Economics and Statistics*, Vol.54, pp.461-471.

SCHWARTZ, M.O., RAJAH, S.S., ASKURY, A.K., PUTTHAPIBAN, P., and DJASWADI, S. (1995). The Southeast Asian tin belt. *Earth-Science Reviews,* 38(2-4), pp. 95-293. 1995.

WANG, X., FANG, C., HONG, H., and WANG, W. (2010). Gender differences in TBT accumulation and transformation in Thais clavigera after aqueous and dietary exposure. *Aquatic Toxicology,* 99(3), pp. 413-422.

Table 1. Unit Root Test result

	BDI	Ship's space	CDI
level	-1.94	-1.08	-2.37
1st difference	-5.88***	-8.96***	-16.8***

Note: 1. Shows the t statistics including the constant term and the trend variable.

2. '***' means the hypothesis is rejected at 1% of significance level.

3. Criticality was taken from Fulle (1976)

Table 2. Indexing co-integration and the co-integration model

$\lambda_{trace}(r)$		$\lambda_{max}(r, r+1)$	
$\lambda = 0$	66.40***	$\lambda = 0 \mid r = 1$	60.16***
$\lambda \leq 1$	6.240	$\lambda = 1 \mid r = 2$	3.698
$\lambda \leq 2$	2.542	$\lambda = 2 \mid r = 3$	2.542

$$BDI_t = 12.23 - 3.72Bottoms_t + 2.74CDI_t$$

(-2.42) (5.42)

Note: 1. '***' indicates that with the rejection of the null hypothesis, the co-integration does not exist $(r = 0)$ at the 1% significance level

2. Threshold refers to Osterwald-Lenum (1992)

Table 3. Causality exam

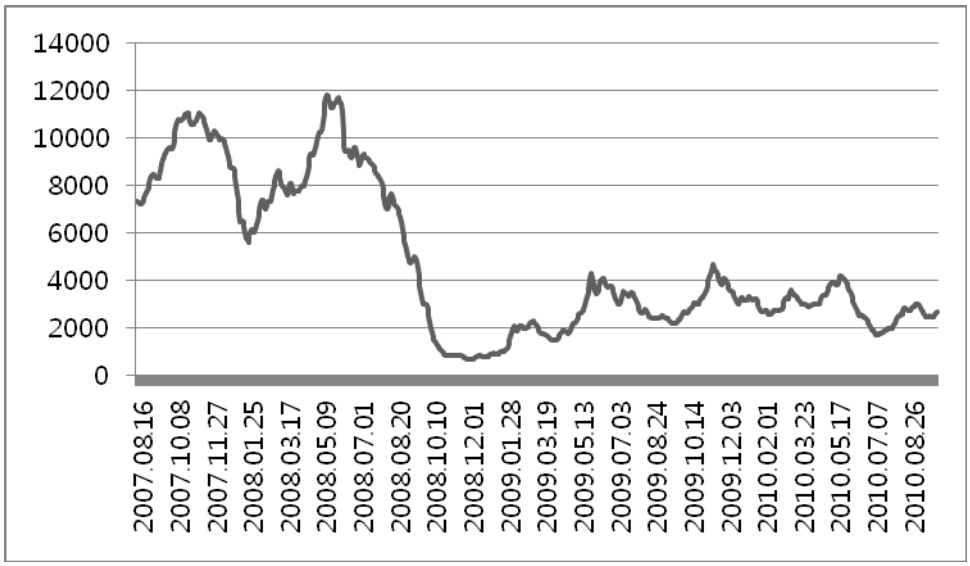
	ΔCDI	Δ ship's space	ΔBDI	ect
ΔCDI		0.861	1.951	-0.061
ΔShip's space	2.988*		0.127	-1.510
ΔBDI	4.097***	0.783		-2.755***

Note: 1. '***'means at 1% they have reached significance level and '*'means at 10% they have reached significance level

2. ect is a "t" statistics, and the others are "F" statistics

Table 4. Predicted error disperse variance

		CDI	Ship's space	BDI
CDI	1	100.0	0.000	0.000
	2	98.85	0.012	1.129
	4	97.90	1.156	0.944
	8	95.93	3.009	1.055
	15	92.78	4.108	3.107
Ship's space	1	0.000	100.0	0.000
	2	1.594	98.35	0.050
	4	10.59	89.20	0.206
	8	19.21	80.43	0.352
	15	29.83	64.15	6.004
BDI	1	0.000	0.000	100.0
	2	0.022	0.014	99.96
	4	0.405	1.735	97.86
	8	1.801	7.403	90.79
	15	21.75	9.402	68.84



Source: Korea Maritime Institute (http://www.kmi.re.kr) statistics

Figure 1.

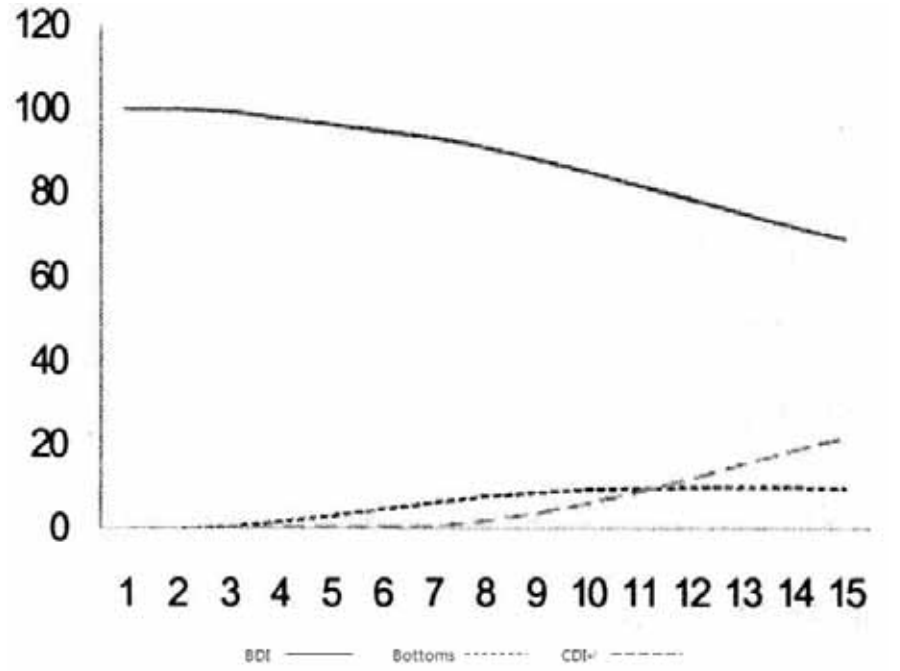


Figure 2. Disperse variance of the traffic fee

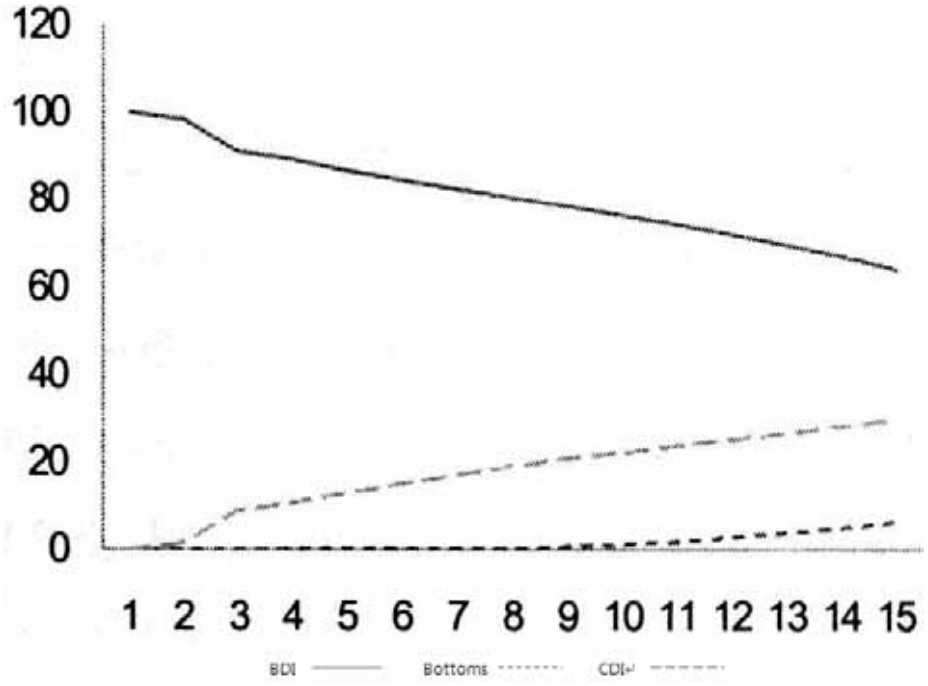


Figure 3. Disperse variance of the maritime traffic volume