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Research Article

Stock Market as an Indicator of Maritime Transport Demand: An Evidence from Turkey and ISTFIX Region

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Abstract: The aim of this study is to determine asymmetric causal relationship between Turkish economy and freight rates in the ISTFIX region by separating the positive and negative shocks in the variables. Therefore, asymmetric causality test developed by Hatemi-J is used. Unlike other studies, some stock market variables in Turkey are selected as economic indicators and included in the analysis. Selected stock market variables are BIST 100, BIST Industrial and BIST Transportation indices. The data set used in the study consists of 558 observations on a weekly basis covering the dates between 1st January 2018 and 10th September 2018. As a result of the study, while causal relationships are expected between both negative and positive shocks, only negative shocks in all three stock exchanges are found to cause negative shocks in the ISTFIX index. This results suggest that negative news in the economy is felt directly in the maritime market, but the impact of positive news is not immediately reflected. Furthermore, it is thought that the producers refrain from ordering more raw materials when they encounter negative shocks in the market and negatively affect the demand for sea transportation, which also causes to decrease in the freight rates. These results also indicate that the stock values in Turkey may be a leading indicator for the freight market in the ISTFIX region.

Keywords: Asymmetric causality, ISTFIX, Stock exchange, Freight market.
Jel Codes: C58, L16, R4.

Deniz Taşımacılığına Olan Talebin Bir Göstergesi Olarak Borsa: Türkiye ve ISTFIX Bölgesinden Bir Bulgu

Öz: Bu çalışmanın amacı Türk ekonomisi ve ISTFIX bölgesindeki navlun oranları arasındaki asimetrik nedensellik ilişkisini değişkenlerdeki pozitif ve negatif şokları ayırarak incelemektir. Bu nedenle, Hatemi-J tarafından geliştirilen asimetrik nedensellik testi kullanılmıştır. Diğer çalışmalardan farklı olarak, Türkiye'deki bazı borsa değişkenleri ekonomik göstergeler olarak seçilmişler ve analizlere dahil edilmişlerdir. Seçilen borsa değişkenleri BIST 100, BIST Sanayi ve BIST Ulaştırma endeksleridir. Çalışmada kullanılan veri seti 1 Ocak 2008 ve 10 Şubat 2018 yılları arasını kapsayan haftalık bazda 558 gözlemden oluşmaktadır. Çalışmanın sonucunda, hem pozitif hem de negatif şoklar arasında bir nedensellik ilişkisi beklenirken, sadece üç borsa değişkenindeki negatif şokların ISTFIX endeksindeki negatif şoklara neden olduğu tespit edilmiştir. Bu sonuçlar ekonomideki negatif haberlerin denizcilik piyasasında anında hissedildiğini, ancak pozitif haberlerin etkilerinin hemen yansımadığını göstermektedir. Dahası, üreticilerin negatif haberler karşısında ham madde sipariş etme konusunda çekimser kaldıkları ve deniz taşımacılığına olan talebi olumsuz etkiledikleri düşünülmektedir. Bu durum ayrıca navlunlarda da bir düşüşe neden olabilmektedir. Bu sonuçlar ayrıca Türkiye'deki borsa değerlerinin ISTFIX bölgesindeki navlun piyasası için öncü gösterge olabileceğini göstermektedir.

Anahtar Kelimeler: Asimetrik nedensellik, ISTFIX, Borsa, Navlun Piyasası.
Jel Kodları: C58, L16, R4.

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The maritime markets are generally divided into liner shipping and tramp shipping. While liner shipping refers to the system that serves regularly in certain routes based on certain timetable, tramp shipping refers to the system that operates without a fixed route and timetable (Chou et al., 2015). Dry bulk cargo transportation is one of the largest markets with tramp shipping properties. The cargoes carried in dry bulk transportation are iron ore, coal, grain, bauxite/alumina and phosphate, which are generally referred to as five major bulks (Wright, 1991). As can be seen from the cargo types, dry bulk cargo transportation is like the backbone of international trade and world economy. Because the transported cargoes are used in the production of iron and steel, construction, electricity, food, automotive, electronics and many other vital industries in the world. Therefore, dry bulk cargo provides the most practical and cost-effective transport of large volume of natural resources that are haphazardly distributed around the world (Dai et al., 2015).

Dry bulk cargo transport is also divided into four sub-markets as other maritime markets; freight market, newbuilding market, second hand market and demolition market (Stopford, 2009). The market, which consists of revenues from transport activities, is called the freight market and constitutes the main revenue item of maritime transportation activities. For this reason, it is very important for the shipowners to be able to read the situation and movements of the freight rates in terms of ship chartering and investment decisions (Wright, 1991). The sign of a good shipowner is to read the market properly and take every investment decision at the right time (Scarci, 2007). Because reading the market is vital in the maritime market, which is volatile, capital intensive and very sensitive to shocks (Chistè and Vuuren, 2014).

The freight rates in the dry bulk market derive from the balance between supply and demand. While the global economic situation affects the demand side, the size and availability of the global fleet affects the supply side (Bornozis, 2006). The demand for maritime transport increases when there is an improvement and recovery in the global economy, followed by increase in freight rates (Chistè and Vuuren, 2014). In other words, the freight rates are determined by seaborne trade. An increase or decrease in seaborne trade affects the volume of maritime transportation and is reflected in freight rates (Lun and Quaddus, 2008).

Various indices are used in the maritime sector in order to follow the freight rates and read the market well (Karamperidis et al., 2013). The most basic index used in the dry bulk market is the Baltic Dry Index (BDI). It is calculated according to various types of ships based on certain routes and gives information about the general situation in the market. There are also sub-indices based on the type of ship that make up the BDI; Baltic Capesize Index (BCI), Baltic

Panamax Index (BPI), Baltic Supramax Index (BSI). Apart from these indices, there are some regional indices, and Istanbul Freight Index (ISTFIX) is one of these regions.

ISTFIX, showing the developments in the freight markets of small tonnage vessels, has been published by Istanbul Shipping R&D and Consulting Inc. since 1 January 2008. ISTFIX consists of a main index and some sub-indices based on the ship tonnages (Köseoğlu and Mercangöz, 2012). The main index is called ISTFIX Today, and apart from this, there are also several indices of 4 different ship tonnage scale for 5 serviceable routes. The routes covered by the index are Black Sea-Marmara, Black Sea-West Mediterranean, Black Sea-Central Mediterranean, Black Sea-East Mediterranean and Black-Sea-Continent (Ünal and Köseoğlu, 2014). The different volume ranges covered apart from the main index are 2000-4000 dwt, 4000-6000dwt, 6000-8000dwt, 8000-12000dwt (Köseoğlu and Mercangöz, 2012). Many different types of general cargo and bulk cargo are carried on these routes. The most transported cargoes are minerals, steel and steel products, grains, coal, metals, fertilizer, cement, scrap and wood, and the first three cargoes constitute approximately 70% of the total tonnage carried (Ünal and Köseoğlu, 2014).

In this sense, operators providing transport services in this region fulfill an important duty for the Turkish economy and industries which suffer scarcity of raw materials. In addition to this important duty, as the sea transportation is a derived demand, the freight market in the region is directly affected by the developments in the Turkish economy and industries. Economic indicators vary widely, but economic indices are limited in terms of frequency and immediate sense of impact. At this point we hoped that the stock market data in the country would be appropriate for reflecting the economic situation in the country. According to many studies, the stock market is influenced by macroeconomic variables (Adaramola, 2011; Mukherjee and Naka, 1995; Kwon and Shin, 1999; Ali et al., 2010; Nishat and Shaheen, 2004; Maysami et al., 2005; Hussainey and Khanh, 2009; Lee and Gan, 2006; McMillan, 2005) and is the leading indicator of economic growth (Enisan and Olufisayo, 2009; Chaudhuri and Smiles, 2004; Olweny and Kimani, 2011; Aylward and Glen, 2000). The fact that the industrial production variable has been discovered many times especially in the macroeconomic factors affecting the stock prices, strengthens our claim to use the stock market as an economic indicator. Also (Aylward and Glen, 2000) have expressed that stocks are significantly better investment indicators than GDP or consumption, and the prospective structure of stock prices make them leading indicators of economic activities. Therefore, it is assumed that the increases in stock prices indicate the recovery in the economy.

In this context, the aim of this study is to examine the relationship between ISTFIX and Turkey's economy through the stock market values. For this purpose, BIST 100, which is the basic index of Borsa Istanbul, BIST Transportation Index consisting of transportation companies, and BIST Industrial Index consisting of industrial companies are used. As a method, asymmetric causality test which is developed by Hatemi-J (2012) and which determines the causal relationship between positive and negative shocks is used. Because the agents in the market do not react to each news in the same way, and therefore a non-linear relationship between the variables is inevitable. The data set used in the study consists of 558 observations on a weekly basis covering the dates between 1st January 2018 and 10th September 2018. As a result of the study, while causal relationships are expected between both negative and positive shocks, only negative shocks in all three stock exchanges are found to cause negative shocks in the ISTFIX index. This results show that negative news in the economy is felt directly in the maritime market, but the impact of positive news is not immediately reflected. These results also indicate that the stock values in Turkey may be a leading indicator for the freight market in the ISTFIX region.

The rest of the study is organized as follows: the framework of the study is explained in the first section; the method used in the study is introduced in the second section; the results of the analysis is presented in the third section; and finally, findings are discussed and suggestions are presented in the last section.

1.THE FRAMEWORK OF THE STUDY

When the literature is reviewed in order to draw the general framework of the study, any study examining the similar relationship before couldn't be find. Therefore, the framework of the subject is tried to be formed by approaching from other angles. Due to its structure, demand for maritime transportation is derived from economic activities. So, it is a reflection of the economic activities in the country. The purpose of this study is to examine the impact of the some stock exchange variables to ISTFIX. In order to establish the theoretical relationship between these variables, the studies examining the macro variables affecting the stock market and the contribution of stock market to economic growth are examined. Because if the stock market is affected by macro variables representing economic activities, or if it is related to economic growth, the hypothesis that it represents the demand for shipping will be based on stronger foundations. Therefore, such studies discovered in the literature are examined.

Firstly, studies examining the relationship between macroeconomic variables and stock markets are being reviewed. Adaramola (2011) has examined the effects of macroeconomic variables

such as money supply, interest rate, exchange rate, inflation rate, oil price and gross domestic product on Nigeria stock exchange. He has found that while the inflation rate and money supply have insignificant effect on stock prices, interest rate, exchange rate, oil price and gross domestic product have significant effects. In another study, Mukherjee and Naka (1995) have examined the relationship between macroeconomic variables and stock returns in Japan. They have found long run cointegration relationship between stock prices and macroeconomic variables such as exchange rate, inflation rate, money supply, real economic activity, long-term government bond rate and call money rate. Kwon and Shin (1999) have examined similar research on Korean stock market. They have found cointegration relationship between production index, exchange rate, trade balance and money supply. In other words, they have discovered a long-run relationship between stock market and macroeconomic variables. Ali et al. (2010) have examined the causal relationship between macro-economic indicators such as inflation, exchange rate, balances of trade and index of industrial production and the general price index of the Karachi Stock Exchange in Pakistan. They have found cointegration between industrial production index and stock exchange prices. But, any causal relationships cannot be found between macro-economic indicators. In another study conducted by Nishat and Shaheen (2004) in Pakistan, they have found that macroeconomic indicators have effects on stock price movements, and especially industrial production has been found to be the most influential variable in stock prices. Maysami et al. (2005) have examined relationship between Singapore's stock market and macroeconomic variables such as interest rates, industrial production, price levels, exchange rate and money supply. They have found that stock market of the country formed significant relationship between all macroeconomic variables. Slightly different from other studies, Hussainey and Khanh (2009) have examined the effects of US macroeconomic variables such as interest rates and industrial production on Vietnamese stock prices. They have found significant relationship between variables. The study conducted by Lee and Gan (2006) investigated the same relationship in New Zealand. They have found that New Zealand Stock Index is determined by the interest rate, money supply and real GDP. In another study, McMillan (2005) has tested the relationship between stock prices and industrial production and interest rates, and he has found a significant positive relationship between the industrial production and stock prices.

Secondly, studies examining the relationship between economic developments and the stock market are being reviewed. Enisan and Olufisayo (2009) have examined the relationship between stock market development and stock markets of seven sub-Sahara African countries.

They have found that there are long run cointegration relations between stock market development and economic growth in Egypt and South Africa. In another study, Chaudhuri and Smiles (2004) have examined the relationship between stock prices and some economic indicators of Australia. They have found long-run relationships between real stock price and real GDP, real private consumption, real money and the real price of oil in the Australian market. In another study conducted by Olweny and Kimani (2011), the causal relationship between stock market performance and economic growth in Kenya has been examined. They have found unidirectional causality from Nairobi stock exchange to GDP. They have revealed that the macroeconomic condition of the country is reflected by the movement of stock prices in the Nairobi stock exchange. Aylward and Glen (2000) have examined whether stock prices are leading indicators of economic activity or not. They have found that stock price changes lead some macroeconomic indicators such as GDP, consumption and investment in most countries.

According to the studies examined, the stock markets of various countries are affected by various macroeconomic variables. In addition, the stock markets are the leading indicator of economic growth or are affected by economic growth. Within the framework of these results, it has been decided that it would be appropriate to use stock market as a variable in this study based on the hypothesis that the stock markets are indicators for economic activities in the country. Since the maritime transport is also in the structure of a derived demand, it is inevitable to have an interaction with the stock market. Therefore, causal relationship between some stock market indices in Turkey and freight rates in ISTFIX region is examined in this study.

The indices used are the basic index of Borsa Istanbul Equity Market (BIST100), BIST Transportation Index (XULAS) and BIST Industry Index (XUSIN). BIST100 has been established in order to measure the joint performance of 100 shares with the highest market value and transaction volume traded in Borsa Istanbul markets. This index includes companies from all sectors and can therefore be seen as a measurement tool for the overall economic situation. XUSIN is composed of 147 companies engaged in industrial production activities in Turkey. The companies that make up this index show their activities in sectors such as cement, textile, chemistry, food, fertilizer, iron and steel, electricity, real estate, mining, automotive, fuel oil, white goods and furniture. Considering the components of this index in terms of maritime, it can be said that it undertakes an important task for the transportation of raw materials and final products in an economic and sustainable way. XULAS, our latest index, consists of large companies operating in the field of transportation in the country. The sectors

that make up the index are car rental, airway transportation, airway catering, sea transportation, and logistics transportation. In this context, we included the BIST100 and XUISN indices as an indicator of the country's overall economic performance. We included the XULAS index as a component to transportation network in the ISTFIX region and by considering that the interest in transport activities within the country is related to the economic revival. In the next section, the method used in the study is introduced.

2. METHODOLOGY

In this study, the relationship between freight rates and economic variables is examined by a causality analysis. On the basis of the simple causality analysis, there is a linear causality analysis developed by Granger (1969). This analysis examines the causal relationship between two (or more) variables and examines whether the current value of a variable is explained by past values of the other variable. If the dependent variable is explained better by the past values of the independent variable, the independent one is expressed as Granger cause of dependent one (Dura et al., 2017). Causality tests have been developed over time and have taken on many different structures.

Economic and financial series may adopt non-linear structures since they are exposed to many unexpected events (Bildirici and Turkmen, 2015). Nonlinear methods are considered to be more suitable since this study also includes variables that are very volatile and open to shocks, such as the stock market and the freight market. So in this study, asymmetric nonlinear causality test developed by Hatemi-J (2012) that takes into account potential asymmetries is used. This test separates the positive and negative shocks in the series and tests the causal relationship between them. Hatemi-J uses bootstrapping simulation technique for the estimation, because ARCH effects needs to be considered and investigated (Tugcu et al., 2012). He also provides bootstrapped critical values which are imposed to leverage corrections to get accurate values (Hatemi-J and Uddin, 2012). Also it is important to determine order of integration in this test since it is based on Toda Yamamoto (1995) procedure (Umar and Dahalan, 2016). Unit root test is implemented first, and if the series includes unit roots, an extra lag(s) is added to the unrestricted VAR model (Hatemi-J and Uddin, 2012).

The analysis of the relationship between the variables according to the types of news (positive or negative) is important for the purpose of this study. Because market agents can give different responses to different types of information. This mechanism is more suitable for practical life. In the next section, the method is implemented and the results are presented.

3. FINDINGS AND RESULTS

The graphical representation of the raw data used in the study is presented in Figure 1. It can be argued that the series of BIST100 and XUSIN generally move together and the XULAS series is more fluctuating.
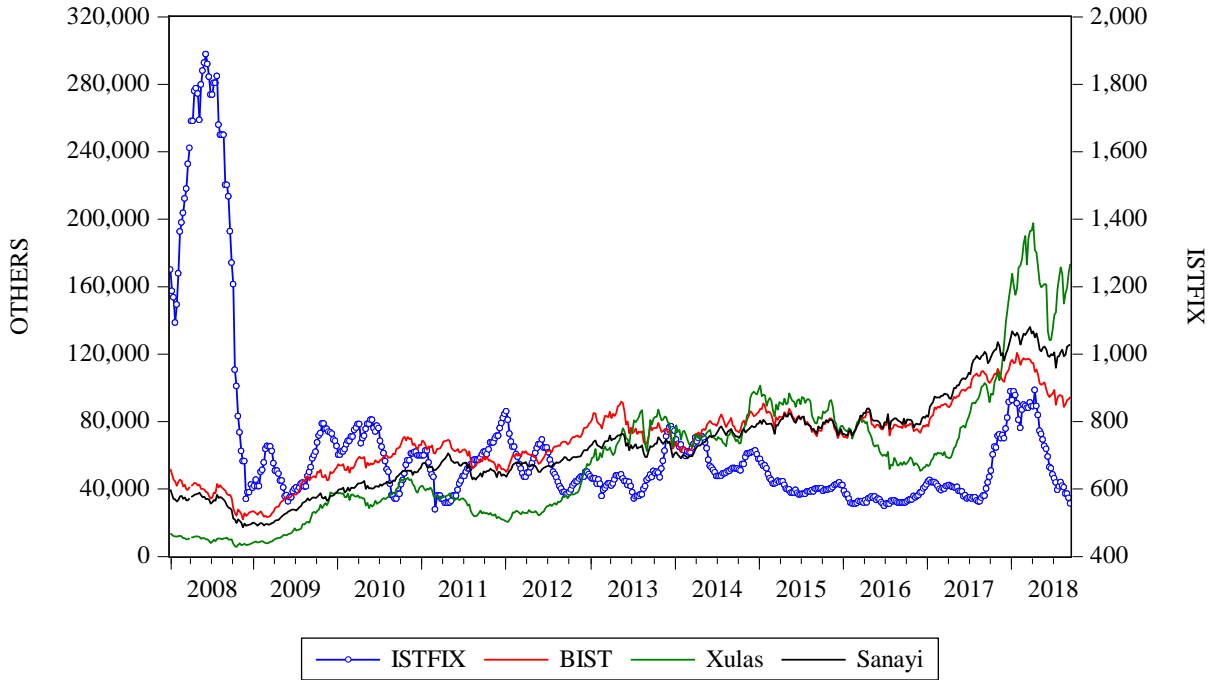

Figure 1. Graphical Display of the Variables

The descriptive statistics of the raw data used in the study are shown in Table 1. The data set used in the study consists of 558 observations on a weekly basis covering the dates between 1st January 2018 and 10th September 2018. In the subsequent course of the analysis, the process is continued with the natural logarithmic states of the series.

Table 1. Descriptive Statistics of the Variables

	ISTFIX	BIST	XULAS	XUSIN
Mean	723.8509	69453.44	58876.17	65731.51
Median	647.5000	71528.82	55436.71	63701.61
Maximum	1889.000	120701.9	197673.9	136028.5
Minimum	539.4000	21965.96	5560.090	17279.25
Std. Dev.	255.2312	21291.39	40436.75	28279.88
Skewness	3.143939	-0.047999	1.137295	0.584397
Kurtosis	12.54898	2.777884	4.356518	2.862723
Jarque-Bera	3039.250	1.361311	163.0732	32.19949
Probability	0.000000	0.506285	0.000000	0.000000
Observations	558	558	558	558

In such analyzes, it is first necessary to make unit root analysis to the series. Series do not have

to be stationary, but the degree of integration needs to be known. Therefore, the Augmented Dickey-Fuller (ADF) unit root test is performed and the results are presented in Table 2. According to the results obtained, ISTFIX is stationary at level, but the variables BIST100, XULAS, and XUSIN become stationary when the first differences are taken. In other words, ISTFIX is I (0) and the other variables are I (1). In this case, the maximum degree of integration used in the analysis is set as 1. Then, the asymmetric causality test developed by Hatemi-J (2012) is applied to the series in GAUSS econometric software. This test offers economic and financially important findings since the agents in the market can react differently depending on the type of shocks (news). Therefore, this method analyzes the causal relationship between these shocks by separating the positive and negative shocks in the variables subject to the examination.

Table 2. ADF Unit Root Test Results

Variable	Level		First Difference	
	Intercept	**Trend and Intercept**	**Intercept**	**Trend and Intercept**
ISTFIX	-2.78619***	-3.56812**	-8.30351*	-8.28741*
BIST 100	-1.09132	-2.66453	-24.4125*	-24.3910*
XULAS	-0.56978	-1.63174	-21.5202*	-21.5013*
XUSIN	-0.23886	-2.81087	-15.6692*	-15.6593*

Critical Values at Intercept: -3.44 for *1%, -2.86 for **5%, -2.56 for ***10%. Critical Values at Trend and Intercept: -3.97 for *1%, -3.41 for **5%, -3.13 for ***10%.

The results of the applied asymmetric causality test are presented in Table 3. The asymmetric causality test revealed that all of the three market variables have one causality for each to the ISTFIX variable in the same structure. The negative shocks in these markets have been identified as the cause of negative shocks in the ISTFIX variable. These results indicate that negative shocks in the economy of Turkey is more effective in the movement of freight rates in ISTFIX region.

Table 3. Asymmetric Causality Test Results

	BIST 100 => ISTFIX				XULAS => ISTFIX				XUSIN => ISTFIX			
	S^+I^+	S^+I^-	S^-I^-	S^-I^+	S^+I^+	S^+I^-	S^-I^-	S^-I^+	S^+I^+	S^+I^-	S^-I^-	S^-I^+
Optimal Lag; VAR(p)	4	4	6	4	4	4	9	4	4	4	9	4
Additional Lags	1	1	1	1	1	1	1	1	1	1	1	1
Test Stat (MWALD)	1.67	0.65	22.1	3.14	3.81	1.60	32.3	1.08	0.70	1.34	26.0	0.93
Asym. chi-sq. p-value	0.79	0.95	0.00*	0.53	0.43	0.80	0.00*	0.89	0.95	0.85	0.00*	0.91
Critical Val. 1%	12.7	13.8	23.2	13.1	14.8	14.2	29.1	13.5	13.0	14.1	26.6	14.3
5%	9.66	9.64	13.9	9.52	9.99	9.69	19.1	9.21	9.46	9.83	19.1	9.01

	10%	7.98	7.63	10.8	7.57	7.81	7.64	15.6	7.71	7.79	8.03	16.2	7.59

*Significant at 1%

CONCLUSIONS

In this study, the relationship between freight rates in the ISTFIX, where the ships are operated in the Black Sea, the Mediterranean Sea and coasts from Portugal to Finland, and Turkey's economic situation is examined. In the economies, the stock market variables, which reflect the current situation and future expectations, are considered as indicators of the economic situation. In addition, they are influenced by macro variables and they contain macro effects. In this respect, the general stock index in Turkey (BIST100), and additionally transport sector index (XULAS) and industrial sector index (XUSIN) are also included in the analysis. According to the results, the negative shocks in these three stock market index are the causes of negative shocks in the freight rates in the ISTFIX region. We also expected the causal relationship between positive shocks, but the results came out this way.

This results may be due to the fact that transport activities in the ISTFIX region are mainly based on raw material transport. A negative development in the economy may generate a perception that consumption will slow down in the domestic market. This may lead to a slowdown in the raw material supply process and to follow up the developments in the domestic market. Due to the decreasing demand for raw materials, the demand for maritime transport may decrease and freight rates may be negatively affected. Because of the inventory costs of the orders placed, the responses to the positive news may be slower, or the freight prices in the maritime market may not be positive for a while as they are sticky. As a result, stock market indices in Turkey can be used as leading indicators for ship owners who trade in the ISTFIX region. While developing strategies to be more prepared for negative shocks, they can also achieve revenue optimization by reducing stickiness of the prices in positive shocks.

The originality of the study arises from two different aspects. Firstly, the relationship between a regional freight index and the economic variables of a country in that region is examined for the first time. The use of stock market indices as an economic indicator increases the frequency of the interaction and generates a more dynamic relational structure. Secondly, the relationship between the freight market and another variable is examined for the first time by asymmetric causality test. Each agent in an economy can respond differently to different news. Therefore, it is important whether the news is positive or negative.

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