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Research on Stock Price of Two Listed Ship Companies

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Abstract: The development of the manufacturing industries is crucial to the country's economic growth and technological development. In this study, the stock price return rate of two listed companies (JIANIANHUA and JIALEIBI) are selected as data, and the VAR model is established to conduct impulse response analysis and variance decomposition analysis on the data. We may also find the economic relations by analysing the 2 ship companies's stock under covid. Through the analysis of the results, the following findings can be given: first, VAR model indicates that the companies shows significant impact on each other. Second, in the cruise ship industry, both JIANIANHUA and JIALEIBI's stock price have strong self-adjustment ability. Third, JIANIANHUA's rate of return is less influenced by the rate of return of JIALEBI, while JIALEBI's rate of return is much highly influenced by JIANIANHUA. The paper's findings might be helpful to related investors interested in the cruise ship industry.

Keywords: VAR Model, Impulse Response Function, Variance Decomposition, Cruise Ship

1. Introduction

The first modern cruise ship emerged in the 1830s, and from the 1920s to the 1960s, it played a key role in the modernization of North America. The current cruise industry is focused mostly on big cruise ships, with international travel as its primary business. It is a high-end offering in the travel industry. The number of cruise travelers worldwide increased from 2009 to 2018 as people's pursuit of worldly and spiritual goals improved. According to the data, the number of tourists in the global cruise market in 2018 increased again. It reached to 28.5 million. In 2019, combined with Statista's 2020 data, it is calculated that the number of global cruise tourists in 2019 is about 29.3 million. The data shows that the Caribbean and Mediterranean regions are still the most important cruise tourism destinations with their unique advantages; the European market is developing strongly and moving forward steadily;from the standpoint of geographic distribution, the Caribbean, Mediterranean, Asia, and Pacific areas make up the majority of the world's cruise routes. Among these, the Caribbean Sea currently has the most cruise routes worldwide and is the subject of nefarious investigations.

There are several studies on the variables impacting the valuation of cruise industry businesses and the growth of the cruise industry, but there are few studies on the impact of the stock prices of listed firms in the cruise industry. The following are the contributions this paper contributes to the literature, to the best of our knowledge. First, two listed cruise industry businesses' daily stock price return rates were obtained for this study from the wind database. Second, data cleaning is done to match the financial time series' period of time. Third, a VAR model is utilized in this study. The data

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were subjected to a stationarity test, an examination of impulse responses, and a variance decomposition analysis. This paper might be helpful to related investors interested in the cruise ship industry.

2. Methods

In this paper, in order to study the mutual influence of stock price return rate changes of two listed companies in the industry, we choose to establish k-order VAR model with two variables [1-2]:

$$JIALEBI_t = C_1 + \alpha_{11}JIALEBI_{t-1} + \cdots + \alpha_{n1}JILEBI_{t-n} + \beta_{11}JIANIANHUA_{t-1} + \cdots + \beta_{n1}JIANIANHUA_{t-n} + e_t \quad (1)$$

$$JIANIANHUA_t = C_2 + \alpha_{12}JIALEBI_{t-1} + \cdots + \alpha_{n2}JIALEBI_{t-n} + \beta_{12}JIANIANHUA_{t-1} + \cdots + \beta_{n2}JIANIANHUA_{t-n} + \varepsilon_t \quad (2)$$

where $JIALEBI_t$ refers to the return of the company of JIALEBI, $JIANIANHUA_t$ represents the return of JIANIANHUA. $t-i$ represents the time lag of the corresponding variable.

3. Data Collection

The data we used in this article are derived from Wind. We selected two representative companies listed in China from cruise ship industry, JIANIANHUA and JIALEBI to study the interaction of stock prices within the industry for closing prices from October 5th, 2020, to October 4th, 2022. We transfer these closing prices to returns and some basic information is shown in Table 1.

Table 1: Descriptive statistics of the selected assets.

	JIALEBI	JIANIANHUA
Mean	0.0030	-0.0033
Variance	0.0017	0.0020
Max	0.2879	0.3929
Min	-0.015	-0.2325

Through analyzing the data of two representative companies, we can discover that the JIANIANHUA' has the highest average return, while the 'JIALEBI' has the lowest average return. When it comes to variance, 'JIALEBI' is the lowest, while 'JIANIANHUA' is the highest. Moreover, the 'JIANIANHUA' has the highest max return, but 'JIALEBI' has the lowest min return.

4. Results

4.1. VAR Model Stability Test for Certain Stocks

In order to make the model estimate reliable, it is necessary to test the stability of the model [3-4]. When the model is stable, it can make any variable in the model under the external impact, as time goes by, constantly reduce the influence of the external impact, and finally make the system reach a new equilibrium state [5]. However, if the stability of the model is poor, the influence of any variable is more and more severe when it is affected by external impact, and the model will eventually become invalid. Therefore, it is necessary to test the stability of the model.

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In this paper, the unit circle test method is used to test the stability. By analyzing whether the characteristic roots of each variable fall within the unit circle, the modulus of the characteristic roots is confirmed to be less than 1. As shown in the figure 1, the characteristic roots of all variables fall within the unit circle. Therefore, the constructed model is stable and reliable.

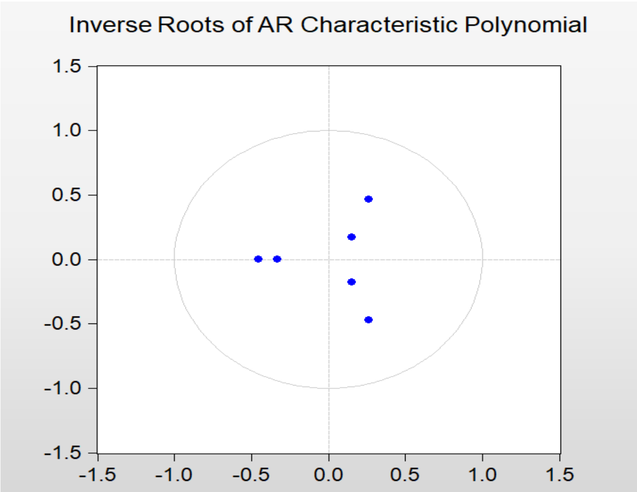

Figure 1: VAR model stability test judgment for certain stocks.

4.2. ADF Unit Root Test Results

There are many ways to assess stationarity; however, the ADF unit root test method is the one used in this study [4]. There are three different ways to express the test equation for the ADF unit root test: intercept, trend and intercept, and none (no constant term and trend term). Typically, the exam proceeds as follows: Trend and intercept, Intercept, simple to complex, continue to test the significance of the coefficient of the time trend item if the first equation form is chosen for testing and the test result rejects the null hypothesis. The series is in a stable trend if the coefficient of the time trend item passes the significance test; otherwise, the second equation form test is continued, and so on. In general, if one of these three formal tests yields a unit root, the time series data are stationary; otherwise, if none of the formal tests yields a unit root, the time series data are stationary [5].

From the following table 2 we can see that both JIALEBIE and JIANIANHUA does not have unit roots as the T statistics values are both larger than the critical values. Therefore, we reject the null hypotheses that JIALEIBI or JIANIANHUA has a unit root and conclude that there is no unit root.

Table 2: Unit root test for the two companies.

	T-Statistic
Augmented Dickey-Fuller test statistic	-21.3209***

4.3. AR Lag Order Selection

Selecting the order of the autoregression based on the same data later used to create the impulse response estimates is a crucial first step in empirical studies. The most typical approach used in empirical investigations is to choose the lag-order based on a predetermined criterion and to condition the construction of the impulse response estimates on this estimate [8].

There are statistical techniques that can be used to determine how many lags should be utilized as regressors. Economic theory can occasionally be used as assistance for selecting lag durations for AR and ADL models [9]. In general, adding too many lags causes the standard errors of coefficient

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estimates to rise, which implies that the forecast error will also rise, while leaving out necessary delays could lead to an estimation bias.

The order of an AR model can be determined using many approaches in the literature. This empirical paper uses several of these lag-order selection criteria, which are listed in the accompanying table 3. From the table 3 we can see that LR (sequential modified LR statistic), Final prediction error, Akaike information criterion, and Hanna-Quinn information criterion all indicate that we should use the lag of three for the stock price of the two companies.

Table 3: AR lag order selection.

Lag	Logl	LR	FPE	AIC	SC	HQ
0	2223.494	NA	4.66E-07	-8.90378	-8.886899*	-8.89716
1	2227.398	7.760388	4.66E-07	-8.9034	-8.85275	-8.88352
2	2228.687	2.55336	4.71E-07	-8.89253	-8.80811	-8.85941
3	2235.501	13.43731*	4.66e-07*	-8.903814*	-8.78562	-8.85743
4	2236.554	2067534	4.71E-07	-8.892	-8.74004	-8.83237
5	2236.819	0.518375	4.78E-07	-8.87703	-8.69131	-8.80415

*indicates lag order selected by the criterion

4.4. VAR Model Results

The VAR model of estimation on the model (1) and (2) can be seen from Table 4. From Table 4 we can see that none of the lags of JIANIANHUA's stock prices has effect on the current prices of both JIANIANHUA and JIALEIBI's current stock prices [6]. This conclusion can be drawn from the first three rows. From the first raw, we can see that effect of JIANIANHUA's lag one price on both JIANIANHUA and JIALEIBI's current price is same positive 0.06. From the row 2 and row 3 we can see that although we find that that effect of JIANIANHUA's lag two price on both JIANIANHUA and JIALEIBI's current price is negative -0.123 and -0.125. Similarly, there are negative effects of JIANIANHUA's lag two price on both JIANIANHUA and JIALEIBI's current price and the estimation results are -0.137 and -0.07.

From the row 4 to row 6, we can see that effect of JIALEIBI's lag price on both JIANIANHUA and JIALEIBI's current price is negative -0.083 and -0.033. Similarly, there are negative effects of JIALEIBI's lag three price on both JIANIANHUA and JIALEIBI's current price and the estimation results are -0.014 and -0.024. However, we see that effect of JIALEIBI's lag one price on both JIANIANHUA and JIALEIBI's current price is positive at 0.145 and 0.126.

Table 4: VAR parameter estimation results.

	JIANIANHUA	JIALEBI
JIANIANHUA(-1)	0.060203	0.062627
	-0.11707	-0.10231
	[0.51424]	[0.61213]
JIANIANHUA(-2)	-0.123144	-0.125304
	-0.11742	-0.10262
	[-104872]	[-1.22108]
JIANIANHUA(-3)	-0.136922	-0.072192
	-0.11983	-0.10472
	[-114268]	[-0.68941]
JIALEBI(-1)	-0.08292	-0.033284
	-0.13594	-0.1188

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Table 4: (continued).

	[-0.60999]	[-0.28018]
JIALEBI(-2)	0.144669	125671
	-0.13632	-0.11913
	[1.06127]	105491]
JIALEBI(-3)	-0.014314	-0.024776
	-0.13672	-0.11948
	[-0.10470]	[-0.20736]
C	-0.000461	-0.000119
	-0.00201	-0.00176
	[-0.22919]	[-0.06751]
R-squared	0.021705	0.023802

4.5. Impulse Response Function for Certain Stocks

In order to describe the dynamic interaction relationship and dynamic interaction effect among variables more directly, impulse response function method is adopted in this paper [7]. Impulse response analysis method is a method to analyze the response degree of other variables when the random disturbance term of an endogenous variable is impacted by one-unit standard deviation [5].

Figure (2) is the impulse response analysis diagram of VAR model for the response return rate of JIANIANHUA to the one standard deviation of JIALEBEI [7]. For the return rate of JIANIANHUA’s stock price, the impact of one standard deviation impact of JIALEBI's return rate was about zero in the first place, then has a negative and a positive effect in alternate response fluctuation to the level of around -0.01 and 0.02 in the second and third phases, which reaches the maximum value -0.0015. With the increase of lag period, the effect will start converging to 0 from the fourth phase. This result shows that the impact of JIALEBI's stock price fluctuation on JIANIANHUA’s stock price is complex, with the influence of negative and positive response intersection. The final approach to 0 indicates that JIANIANHUA’s stock price has strong self-adjustment ability.

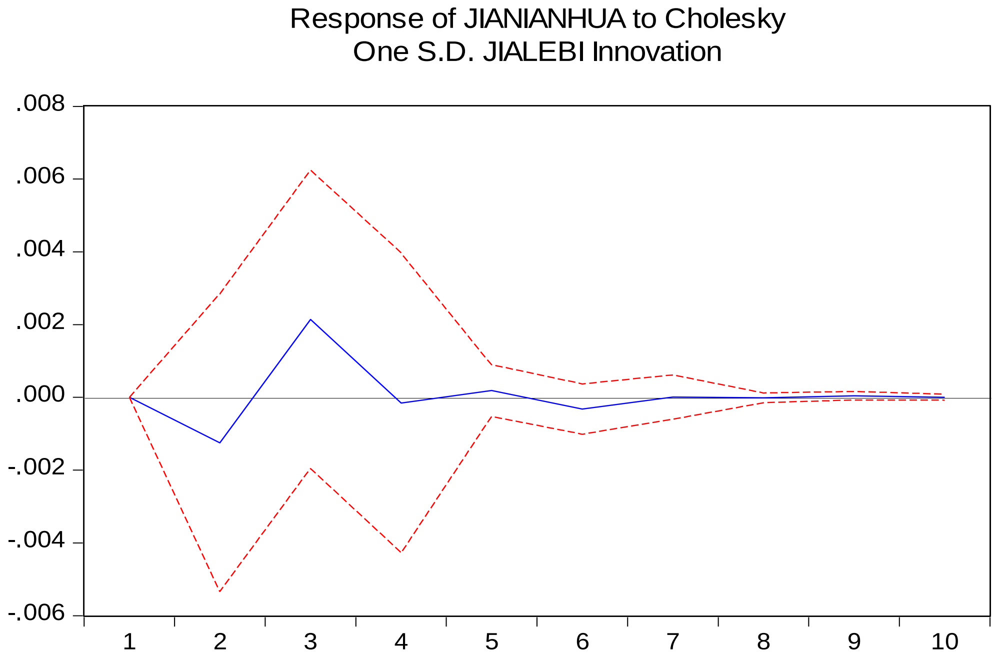

Figure 2: Response of JIANIANHUA to one standard deviation of JIALEBEI.

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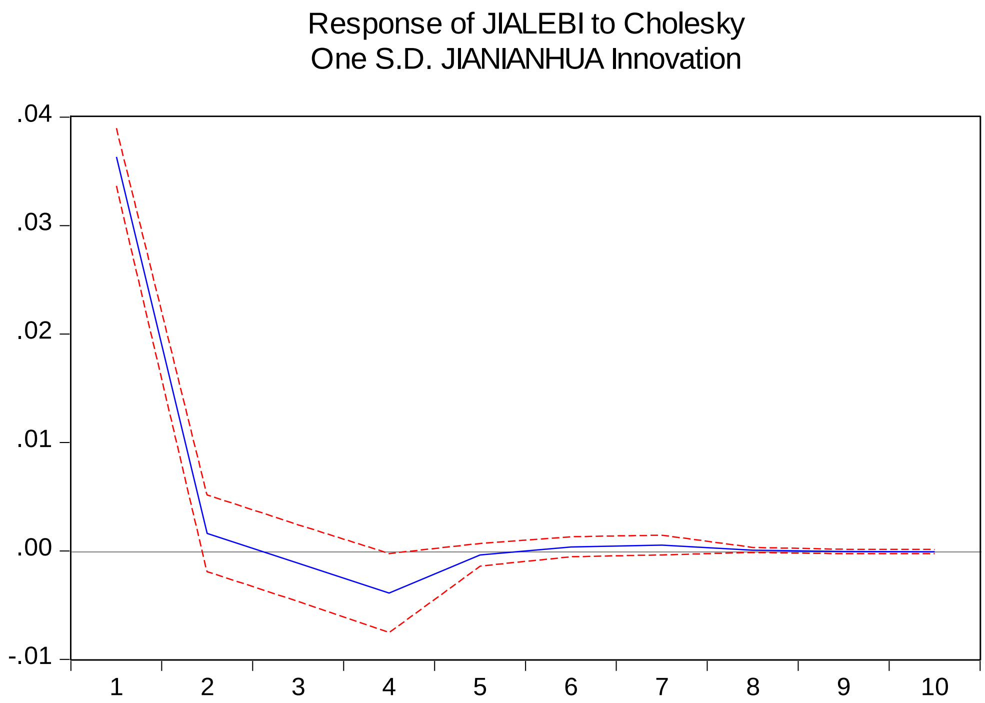

Figure 3: Response of JIALEBEI to one standard deviation of JIANIANHUA.

As shown in Figure 3, for the return rate of JIALEBI's stock price, the impact of one standard deviation impact of JIANIANHUA's on the return rate of JIALEBI was as high as positive 0.04 in the first phase, then has a positive effect and negative effect in alternate response fluctuation. This impact drops all way down to the minimal negative response value around -0.005 in the fourth phase. With the increase of lag period, the effect will start converging to 0 from the fifth phase. This result shows that the impact of JIANIANHUA's stock price fluctuation on JIALEBI's stock price is also complex, with the influence of positive and negative response intersection. The final approach to 0 indicates that JIALEBI's stock price also has strong self-adjustment ability, which shares similar results as JIANIANHUA.

4.6. Variance Decomposition Analysis for Certain Stocks

Variance decomposition transforms the predicted mean square error of all endogenous variables in the system into the contribution of impact of all endogenous variables in the system according to their causes and obtains the mutual influence degree of dynamic changes of JIANIANHUA and JIALEIBI's returns [8-10]. In this paper, the returns of the two companies are variously decomposed, and the lag period is set as 10 periods.

Table 5: Variance Decomposition of JIALEBI.

Variance Decomposition of JIALEBI			
Period	S.E.	JIANIANHUA	JIALEBI
1	0.044979	85.37056	14.62944
2	0.044997	85.38119	14.61881
3	0.04505	85.20976	14.79024
4	0.045494	85.35065	14.64935
5	0.045495	85.35176	14.64824
6	0.045497	85.35092	14.64908

Table 5: (continued).

7	0.045506	85.35357	14.64643
8	0.045506	85.35361	14.64639
9	0.045506	85.35362	1464638
10	0.045506	85.35368	14.64632
Cholesky Ordering: JIANIANHUA JIALEBI			

As shown in the Table 5, JIALEBI's return rate that was affected by its own return rate was finally stabilized at 14.646%. From the variance decomposition of return rate of JIALEIBI, it was impacted by the return rate of JIANIANHUA and finally stabilized at about 85.354% with the increase of lag periods. This shows that JIALEIBI's rate of return is greatly influenced by the rate of return of JIANIANHUA.

Table 6: Variance Decomposition of JIANIANHUA.

Variance Decomposition of JIANIANHUA			
Period	S.E.	JIANIANHUA	JIALEBI
1	0.044979	100	0
2	0.044997	99.92324	0.076759
3	0.04505	99.69746	0.302539
4	0.045494	99.70215	0.297847
5	0.045495	99.70049	0.299514
6	0.045497	99.69545	0.30454
7	0.045506	99.69556	0.304436
8	0.045506	99.69556	0.304444
9	0.045506	99.69547	0.304534
10	0.045506	99.69547	0.304532
Cholesky Ordering: JIANIANHUA JIALEBI			

As shown in the table 6, from the variance decomposition of return rate of JIANIANHUA, it was impacted by the return rate of itself and finally stabilized at about 99.695% with the increase of lag periods. JIANIANHUA return rate that was affected by JIALEIBI's return rate was finally stabilized at 0.3045%.

Overall, comparing table 5 and table 6, we can conclude that JIANIANHUA's rate of return is less influenced by the rate of return of JIALEBI, while JIALEBI's rate of return is much highly influenced by JIANIANHUA.

5. Conclusion

The development of the ship manufacturing industry is of great significance to the country's economic and technological development. In this paper, VAR models are used for examining the changes in stock price returns of two chosen companies. First, we choose to establish k-order VAR model with two variables to study the mutual influence of stock price return rate changes of two listed companies in the industry. Second, we used VAR model to test the stability of the two stocks, analyzing whether the characteristic roots of each variable fall within the unit circle. Third, we used the impulse response function method to describe the dynamic interaction relationship and dynamic interaction effect. The results in this paper can benefit the related investors.

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