



Impact of Covid-19 Pandemic on Dow Jones Index

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Abstract

Covid-19 pandemic emerged as a Black Swan event that has shaken the global economy. In the present study the researchers have tried to determine the Impact of Covid-19 pandemic on the US Stock markets using data of Covid-19 confirmed cases and closing price of Dow Jones Index over the period January 21,2020 to May 31,2020. To determine the relationship between covid-19 and US stock market Granger-Casualty test and Johnsen Co-integration test. The Study findings revealed that there is a short-term relationship between this two which means the Covid-19 pandemic has positive impact on price of stock market in a short run.

Keywords: Granger Causality Test; Cointegration; Pandemic; COVID 19 Impact

Introduction

Stock markets are very sensitive to major events happening in the world. The happening of any event affects the returns of stock market. In past pandemic disasters such as Severe Acute Respiratory Syndrome (SARS) outbreak and Ebola Virus Disease (EVD) outbreak also affected the stock market returns. This study examines the impact of COVID-19 pandemic on United States of America stock market taking Dow Jones Index into consideration. This research is basically the time series analysis for the period between 1/21/2020 to 5/31/2020. The variables considered in the analysis are confirmed cases of COVID-19 in United States of America and the closing price of Dow Jones Index

Review of Literature:

Sansa (2020) suggested that there was a significant positive relationship between Covid-19 on Financial markets of the world. In this study two countries china and United States of

America were taken into consideration. The data was collected for the month of March and it concluded that there was a positive impact of Covid- 19 confirmed cases on the financial markets of Shanghai Stock exchange and New York Dow Jones index. According to Ramelli (2020) the novel coronavirus effect on economic instability of stock market was seen in the months of April and May 2020. In the month of late February and March large price moves of the aggregate market occurred. Wang *et al.*, (2003) was of the opinion that outbreak of contagious disease bring stagnation in economy along with affecting health and lives of people. This study investigates that returns of biotechnology stocks drastically increases after the virus outbreak. A significant abnormal return was found in company shares of biotechnology in Taiwan because of spread of epidemic.

Research Methodology:

Objective of the study

- To study the stationarity of confirmed Covid-19 cases data and closing Dow Jones Index.
- To understand the long run and short run relationship between Covid 19 data of USA and Dow Jones index closing price.
- To develop the forecasting model based upon above variables.

Sample

For this research purpose the sample considered is confirmed cases of Covid-19 of USA and Closing price of Dow Jones index. The data is collected for the period of 4 months starting from date starting 21st January 2020 to date ending 31st May 2020 (1/21/2020 – 5/31/2020).

Sources of Data collection

The secondary data for Covid 19 confirmed cases for the United States of America is collected from the World Health Organization official website and the closing price of the Dow Jones index is collected through the Yahoo finance website.

Tools for Data Analysis

Unit root test

This test is used to examine the stationarity of time series. The presence of unit root in both the variable is tested with the help of Augmented dickey fuller (ADF) test. To make the series stationary first difference of the series with logarithmic transformation was conducted.

Granger Causality test.

Granger-Cause test is used to examine the causality between two variables of the times series. After making the series stationary Granger Causality test was conducted to check the causality between variables.

Co-integration Test

Johansen cointegration test was conducted in order to determine whether the variables are cointegrated or in other words to find out is there any long run or short run relationship between the two variables.

Vector Error Correction Model

The existence of cointegrating vector between the series means that there is a long-term relationship and so we should apply Vector Error Correction Model (VECM).

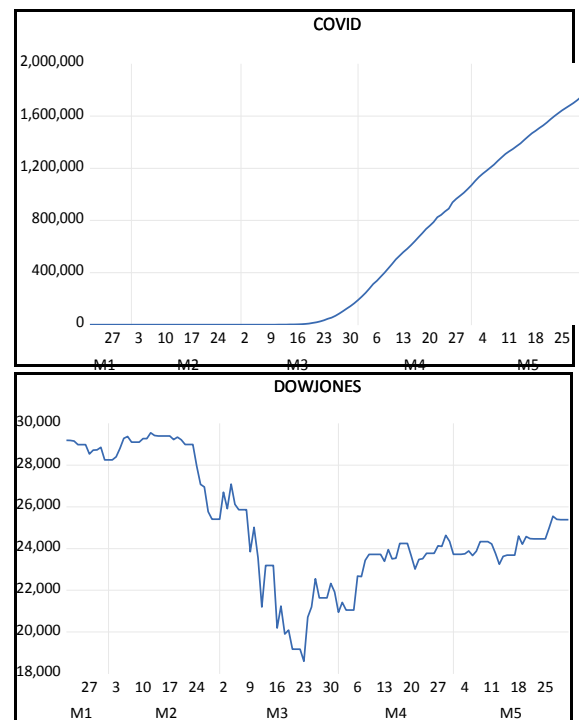
Vector Autoregression (VAR) model

If no cointegration vector is found from the test result means that there is no long-term relationship between the variable, but the short-term relationship can exist. In order to determine shortterm relationship, the Vector Autoregression Model should be applied in order to estimate equation and then forecast the model. Vector auto regression model includes the lag values of the existing variables. This helps for estimating the instantaneous effect as well as dynamic effect in the relationship upto lags.

Result & Discussion:

The main purpose of the study was to determine the impact of Covid-19 on US stock Market with the help of Time series Analysis. The Covid-19 data series shows the upward trend and hence the series was non-stationary whereas the trend of Dow Jones index shows the fluctuating trend and hence the series was non-stationary as shown in Figure 1 and 2.

Figure 1: Covid 19 cases and Dow Jones Index



The Covid-19 cases data series and Dow Jones Index was not stationary at level. The Covid-19 and Dow Jones time series became stationary by taking the logarithm of original series and differentiating at level 1. The Unit Root test was performed on the time series dataset to determine the stationarity as shown in Table 1. The results obtained from the test shows that the Covid-19 data set has become stationary by taking logarithm of original series and differentiating at level 1 whereas the Dow Jones Index data series become stationary by differentiating the original series at level 2.

Figure 2: Normality of Covid 19 cases and Dow Jones Index

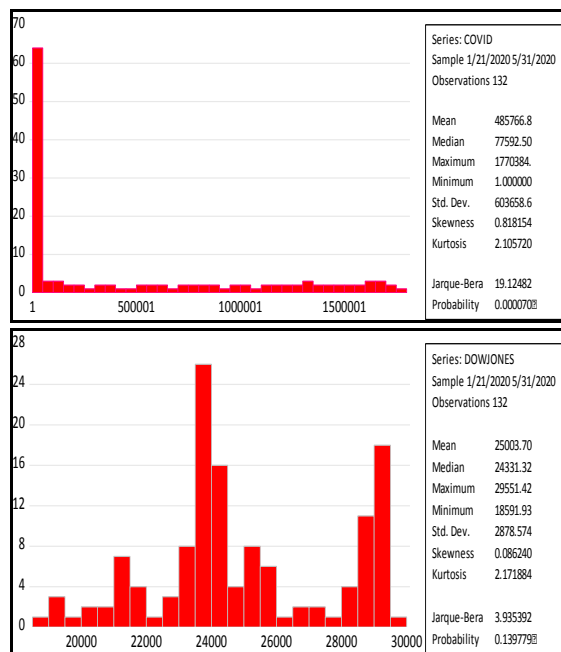


Table 1: Unit Root Testing of Covid-19 and Dow Jones Index

Null hypothesis	t-statistics	P-value	Result
Covid-19 has unit root	-4.064060	0.0091	Reject
Dow Jones has unit root	-6.409616	0.0000	Reject

To examine the cause-effect relationship, the Granger-Causality test was carried out on the time series data set as shown in Table 2. From the result obtained, it can be concluded that there does not exist a cause-effect relationship between the two variables. In order to identify

the relationship between the time series the Johansen Co-integration test was carried out as shown in Table 3.

Table 2: Granger Causality Test

Null Hypothesis:	Obs.	F-Statistic	Prob.
DLCOVID does not Granger Cause DOWJONES	128	0.12128	0.8859
DDOWJONES does not Granger Cause DLCOVID		0.13162	0.8768

Table 3: Johansen Cointegration Test

Null Hypothesis	P-Value	Result
No Co-integrating Vector (Trace Statistics)	0.5789	Failed to reject
No Co-integrating Vector (Eigen Value)	0.4979	Failed to reject

According to Johansen co-integration test there does not exist any co-integrating vector between the time series dataset. This means that there does not exhibit a long term relationship between the two time series data set. As Vector Error Correction model was insignificant as shown in Table 3 and Table 4 researchers applied Vector Auto Regressive Model to study the short-term relationship between Covid 19 cases and Dow Jones Index. It can be concluded that number of Covid-19 confirmed cases do affect the Dow Jones Index only in short run as shown in Table 5.

Table 4: Akaike Information Criteria

Criteria	Covid-19	Dowjones
Akaike (AIC)	-1.074356	-3.891502

Vector Autoregression Model is a good model fit for this time series data test. After removing all the non-significant terms from model, the final equation is given below:

$$DL\text{DOWJONES} = C(8) * DL\text{DOWJONES}(-1) + C(9) * DL\text{DOWJONES}(-2)$$

Table 5: Regression Analysis

Dependent Variable: DLDOWJONES				
Method: Least Squares (Gauss-Newton / Marquardt steps) Date: 06/25/20 Time: 17:41				
Sample (adjusted): 1/25/2020 5/31/2020 Included observations: 128 after adjustments				
DLDOWJONES = C(8)*DLDOWJONES(-1) + C(9)*DLDOWJONES(-2)				
Coefficient		Std. Error	t-Statistic	Prob.
C(8)	-0.867713	0.084412	-10.27950	0.0000
C(9)	-0.319408	0.084412	-3.783918	0.0002
R-squared	0.490452	Mean dependent var		4.58E-05
Adjusted R-squared	0.486407	S.D. dependent var		0.046782
S.E. of regression	0.033527	Akaike info criterion		-3.937446
Sum squared resid	0.141629	Schwarz criterion		-3.892883
Log likelihood	253.9966	Hannan-Quinn criter		-3.919340
Durbin-Watson stat	2.224203			

Conclusion:

From the above equation it can be seen that Dow Jones does not depend on any other series but depends on its 1st and 2nd lag. Based on this equation Dow Jones series was forecasted and it was found that the actual series and the forecasted series are very close to each other. In other words, we can say that the difference between the actual series data and the forecasted series data is negligible. The reliability of the above-mentioned model is high as there is only 1.11% chance of systematic error in the forecasted series.

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Conflicts of Interest:

The authors declare that the research review was conducted in the absence of any commercial or economic associations that could be construed as a potential conflict of interest.

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