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Event Study on Nucleic Acid Testing Industry--Whether the Number Of COVID-19 Cases Will Affect the Stock Price of Nucleic Acid Testing Industry

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Abstract: Since the outbreak of COVID-19 in 2020, the epidemic has caused different changes in a variety of industries, and nucleic acid testing has become commonplace. This paper will analyze the impact of the COVID-19 cases which are confirmed on nucleic acid testing industry through the Efficient Markets Hypothesis and linear regression. Our study found that the mentioned COVID-19 cases had a significant impact on the stock price of the nucleic acid testing industry, and a linear regression was established between the COVID-19 cases and the stock price on the nucleic acid testing industry. However, this study has some limitations, for example, in the Novel Coronavirus testing market, the stock price cannot fully reflect the market share and ignores the influence brought by the government.

Keywords: Nucleic acid testing industry, event study, COVID-19, efficient markets hypothesis, linear regression.

1. Introduction

On December 31, 2019, a case of pneumonia was reported in Wuhan, Hubei Province, China. As of 3 January 2020, a total of 44 cases of pneumonia of unknown cause have been reported to WHO in China [1]. The virus has been brought to many cities and regions due to the Spring Festival travel rush. More than two years have passed since the outbreak in late 2019, and the COVID-19 pandemic has posed a huge test to the capacity of the global public health system. Taking China's actual situation into consideration, China launched the "Dynamic Zero Crown" strategy in August 2021. However, the recent outbreak of COVID-19 in Shanghai has prompted a new round of testing.

Every coin has two sides, so does the Covid. A number of industries suffer from it (e.g. Catering), while certain industries thrive (e.g. Covid testing). The essay will focus on how the pandemic influences the Covid testing industry in China, reflecting on stock prices. The hypothesis is that the stock price rises when pandemic breaks out and vice versa as for Covid testing.

2. Methodology

Two main methods are used in this essay: Efficient Market Hypothesis and linear regression.

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The efficient market hypothesis is a hypothesis states that share prices reflect all the information and consistent alpha generation is possible. EMH hypothesizes that stocks trade at their fair market value on exchanges. [2]

Linear regression is a linear equation that predicts the relationship between two variables in observed data. There are two types of variables: independent variable and dependent variable.

$$Y = a + bX \tag{1}$$

We will find the value of a and b by using the below formula

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \tag{2}$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \tag{3}$$

3. Data Collection

We selected 18 representative nucleic acid testing companies, including Medicalsystem Biotechnology Co.,Ltd., Meinian Onehealth Healthcare Holdings Co.,Ltd., Wuhan Easy Diagnosis Biomedicine Co.,Ltd., Daan Gene Co.,Ltd., WuXi AppTec Co.,Ltd. Shanghai RAAS Blood Products Co., Ltd., Anhui Anke Biotechnology (Group) Co., Ltd. Improve Medical Instruments Co., Ltd. Beijing Bohui Innovation Biotechnology Group Co., Ltd. Zhejiang Crystal-Optech Co.,Ltd., Shanghai Kehua Bio-Engineering Co.,Ltd., Dian Diagnostics Group Co.,Ltd., Zhejiang Crystal-Optech Co.,Ltd. Maccura Biotechnology Co.Ltd, Guangdong Hybribio Biotech Co.,Ltd., Tellgen Corporation, BGI Genomics Co.,Ltd., Shanghai Fosun Pharmaceutical (Group) Co., Ltd. and Guangzhou Kingmed Diagnostics Group Co., Ltd.

We collected the stock price data of these 18 companies and weighted them according to their stock prices to obtain the stock price data of the nucleic acid testing industry.

4. Data Analysis

Through linear regression analysis, we obtained the P-P diagram and Histogram as shown in the figure 1. [4-21]

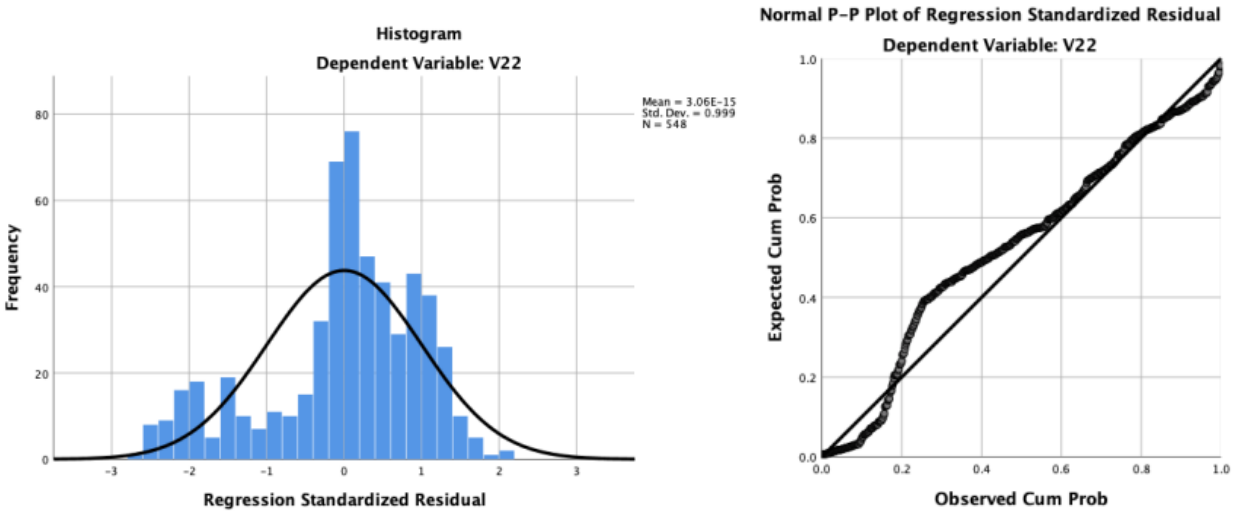

Figure 1: Histogram and P-P graph.

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In a normal P-P plot, the closer the distribution of points is to the diagonal, the closer the data is to a normal distribution. Therefore, according to the figure, we believe that this study satisfies regression residuals that are close to normal distribution.

Table 1: Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.195	0.038	0.036	5.98947412

The exponent R is the multivariate correlation coefficient of regression. When simple linear regression has only one independent variable, Pearson correlation coefficient of dependent variable and independent variable is the same as R value, which indicates the degree of correlation between them. Table 1 shows that R= 0.195, the share price of the NAT sector is slightly correlated with the amount of cases of COVID-19.

The R Square index indicates the extent to which the change in the dependent variable in the regression model is explained by the independent variable. In this study, R Square = 0.038, indicating that the number of confirmed COVID-19 cases can explain 3.8% of the change in stock price effect. R square is valued based on data from the sample, it is possible to overstate the level of independent variables influence dependent variables.

Adjusting R squared eliminates the effect of the number of independent variables. According to the data, the Adjusted R Square=0.0.36 was less than R Square=0.038, which corrected the exaggerated effect of R Square on the influence degree of total independent variables on dependent variables. In addition, the Adjusted R Square is an indicator of the degree of impact. In this study, the Adjusted R Square = 0.036 has little influence.

Table 2: ANOVA table.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	776.127	1	776.127	21.635	0.000
Residual	19587.095	546	35.874		
Total	20363.221	547			

In the ANOVA table, P=0.000<0.001 showed the regression model of this study was statistically significant. In addition, F(1,546)=21.635, which shows that there is a linear correlation between dependent variables and independent variables.

The regression equation of this study can be expressed as:

$$Stock\_Price = B_0 + (B_1 \times cases) \quad (4)$$

Where b0 is the intercept and b1 is the slope. If these two indicators are available, we can forecast the dependent variable (NAT stock price, Stock_Price) based on the independent variable (number of COVID-19 cases, cases). The output results of regression intercept and slope are shown in the table 3.

From the table, we can see that the Constant value is 38.176. It can also be seen from P=0.000 that the intercept value of this study is statistically significant.

The slope is the dependent variable because the independent variable changes by one unit. In this study, the slope is 0.001, i.e. an increase of 1 COVID-19 case and an increase of 0.001 yuan in stock

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Table 3: Coefficients.

Model	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
Constant	38.176	0.265		143.891	0.000	37.655	38.697
cases	0.001	0.000	-.195	-4.651	0.000	0.000	0.003

price. For example, if the number of COVID-19 cases increases from 5 to 105 per day (an increase of 100 per day), the share price of the NAT industry will increase by 0.001 * 100=0.1 yuan. Similarly, we can calculate the increase in the share price of the NAT industry for each increase in cases number of 50,150,200 people/day. However, we cannot change the number of confirmed cases indefinitely.

As can be seen from the table, the 95% confidence interval for slope is 0.000-0.003. At the same time, the detection results of slope P value can be obtained in the Sig column, P=0.000<0.001, indicating that the slope value is statistically significant, and that there is a linear relationship between NAT industry-related stock prices and the number of COVID-19 cases.

Substitute the coefficient into the regression equation, get:

$$Stock\_Price = 21.635 + (0.001 \times cases) \quad (5)$$

From this equation, we can calculate the stock price data corresponding to any number of COVID-19 cases within a reasonable range. However, in this case, it is technically questionable to calculate the share price of the NAT industry only based on the quality of COVID-19 cases, because not only the size of COVID-19 cases can affect the share price, but also the company's internal operations and government policies. Therefore, we only believe that the size of COVID-19 cases can partially explain the share price changes in the NAT industry-related sectors.

5. Evaluation of Data

R square is generally thought to be greater than 60%. It is an important indicator to reflect the goodness of fit of linear equations. Its response the ability of regression model to explain changes in dependent variables. The closer R square value is to 1, the closer it is to a linear equation. It can be seen from the results that R square = 0.038, the initial judgment of the fitting effect of the model is not good.

The significance value of ANOVA was 0.000, indicating that the linear regression model established by the size of cases of COVID-19 as independent variable and the stock price of NAT as dependent variable had extremely significant statistical significance. The linear relationship between the increase of confirmed cases and the increase of stock price was significant.

The left side and the right sides of the histogram are not perfectly symmetrical, and the scattered points of the P-P diagram are not all near the diagonal. It's not perfect. Generally speaking, the results cannot be perfect. However, in practical analysis, ideal normality is rare, so close normality can be considered.

It can be found that the fitting validity of this group of data is low but the correlation is high, indicating that there is a relationship between the two variables but the correlation coefficient is low and there may be singular values in the sample.

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6. Limitation

There exist some limitations in data analysis.

Firstly, the weight for each stock is based on the stock price, indicating that higher price matches heavier weight. However, the stock price cannot completely demonstrate the market share in the Covid testing market.

Secondly, we only consider the correlation between the number of cases and the stock price, ignoring the impact caused by the government. For instance, government financing guarantee institutions are encouraged to provide credit support to eligible micro, small and medium-sized enterprises in the catering industry, fulfilling their compensation responsibility in a timely manner in accordance with the law, and actively help enterprises affected by the epidemic to renew their insurance and loans. [22] Such policy has posed a huge difference on the industry, which distorts the correlation.

7. Conclusion

This paper mainly studied the relationship between the amount of COVID-19 cases and the stock price of NAT industry. By using Efficient Market Hypothesis and linear regression, we found that the size of COVID-19 cases had a linear relationship with the stock price of NAT industry, but the correlation coefficient was only slightly positive. In addition, because local governments tend to favor domestic production, NAT testing is also regional, which can reduce transportation costs and support local economies. The chairman of Shanghai Zhijiang Biotechnology, for example, announced daily production of about 3m, or 40 per cent of the city's total supply. Individual investors are therefore advised to look carefully for access to NAT's stock market and select the most profitable stocks based on their past performance and regional characteristics, the government is the largest customer for Novel Coronavirus testing, with monopoly power over which company to supply and at what price to pay. Therefore, investors should be aware of the policies and strategies introduced by the government.

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