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# The Efficacy of the COVID-19 Vaccine against the Mutation of the Corona Virus

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## Abstract

The delta variant (B.1.617.2) was a variant of SARS-CoV-2, the virus that causes COVID-19; it has mutations in the gene encoding the SARS-CoV-2 spike protein. When a virus replicates or makes copies of itself, it sometimes changes a little bit. These changes are called “mutations.” A virus with one or several new mutations is referred to as a “variant” of the original virus. The more viruses circulate, the more they may change. These changes can occasionally result in a virus variant that is better adapted to its environment compared to the original virus. This process of changing and selection of successful variants is called “virus evolution.” Some mutations can lead to changes in a virus’s characteristics, such as altered transmission A COVID-19 vaccine is a vaccine intended to provide acquired immunity against Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes Coronavirus disease 2019 (COVID-19). Correlation is one of the analytical techniques in statistics that is used to find the relationship of how strong the relationship between two or more variables is quantitative. By using a linearity test where F arithmetic>F Tabel is 28, 9857462> 3.42, and then Ho is accepted. This means that multiple linear regression analysis can be used to predict complete vaccination for COVID-19 by analyzing COVID-19 mortality against and data confirmed COVID-19. Obtained the multiple linear regression equation is Y=4858167192- 10004, 1797X1+5, 866348716X2, the relationship between the variables above is 0,825982 is the superior correlation. Where $t_1$ arithmetic <$t_1$ Table=-7, 5828144<2.069, then $H_o$ is accepted meaning, there is no significant effect partially between COVID-19 mortality and complete vaccination for COVID-19. $t_2$ arithmetic ≤ $t_2$ Table=0,74850696 ≤ 2.069, $H_o$ accepted the meaning, there is no significant (significant) effect partially between data confirmed COVID-19 of complete vaccination for COVID-19.

**Keywords:** Complete vaccination for COVID-19 • Confirmed COVID-19 • COVID-19 mortality • Virus evolution • Multiple linear regression equation • T-test

## Introduction

Coronaviruses are a group of related RNA viruses that cause diseases in mammals and birds. In humans and birds, they cause respiratory tract infections that can range from mild to lethal. Mild illnesses in humans include some cases of the common cold (which is also caused by other viruses, predominantly rhinoviruses), while more lethal varieties can cause SARS, MERS and COVID-19, which is causing the ongoing pandemic. The genome size of coronaviruses ranges from approximately 26 to 32 kilobases, one of the largest among RNA viruses. In cows and pigs they cause diarrhea, while in mice they cause hepatitis and encephalomyelitis. Coronaviruses constitute the subfamily Orthocoronavirinae, in the family Coronaviridae, order. Nidovirales and realm Riboviria. When a virus replicates or makes copies of it, it sometimes changes a little bit. These changes are called “mutations.” A virus with one or several new mutations is referred to as a “variant” of the original virus. The more viruses circulate, the more they may change. These changes can occasionally result in a virus variant that is better adapted to its environment compared to the original virus. This process of changing and selection of successful variants is called “virus evolution.” Some mutations can lead to changes in a virus’s characteristics, such as altered transmission (for example, it may spread more easily) or severity (for example, it may cause more severe disease). Some viruses change quickly and others more slowly. SARS-CoV-2, the virus which causes COVID-19, tends to change more slowly than others such as HIV or influenza viruses. This could in part be explained by the virus’s internal “proofreading mechanism” which can correct “mistakes” when it makes copies of itself. Scientists continue to study this mechanism to better understand how it works [1].

A COVID-19 vaccine is a vaccine intended to provide acquired immunity against Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes Coronavirus disease 2019 (COVID-19). Prior to the COVID-19 pandemic, an established body of

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knowledge existed about the structure and function of coronaviruses causing diseases like Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). This knowledge accelerated the development of various vaccine platforms during early 2020. The initial focus of SARS-CoV-2 vaccines was on preventing symptomatic, often severe illness [2]. During the last decade, the increased awareness of the complexity of the immune system and its determinants, including at the host genetic level, indicated that using system biology approaches to assess how various processes and networks interact in response to immunization could prove more illustrative than trying to isolate and characterize a few components of vaccine responses. Delineating the specific molecular signatures of vaccine immunogenicity is beginning to highlight novel correlates of protective immunity and better explain the heterogeneity of vaccine responses in a population [3].

## Materials and Methods

### Simple linear regression analysis

Simple linear regression analysis can be used to predict changes in the value of certain variables when other variables change. It is said simple regression, because it consists of one independent variable (independent) as a predictor, it uses a simple linear regression equation. Regression analysis is a relationship that is obtained and expressed in the form of mathematical equations which states the functional relationship between variables. According to Drapper and Smith. Regression analysis is an analytical method that can be used to analyze data and draw meaningful conclusions about the relationship of one variable's dependence on another [4]. Regression is divided into 2 namely, simple linear regression analysis and multiple linear regression. Simple linear regression analysis is used to get a mathematical relationship in the form of an equation between the dependent variable and the single independent variable. Simple linear regression analysis is a linear relationship between the independent variable (X) and the dependent variable (Y). This analysis is to determine the direction of the relationship between the independent variable with the dependent variable whether each independent variable is positively or negatively related and to predict the value of the dependent variable if the value of the independent variable has increased or decreased. The data used is usually interval or ratio scale [5].

The simple linear regression equation is as follows: $Y=\alpha+bX$

Information:

Y=Dependent variable (predicted value).

X=Independent variable

α=Constant (Y value is equal to α if X=0)

b=Regression coefficient (increase or decrease value).

The method that can be used to estimate the parameters of a simple linear regression model or a simple linear regression model is the least squares method and the likelihood method [6].

### Simple linear correlation

Correlation coefficient is a number that states the strength of the relationship between two or more variables, can also determine the direction of the relationship of the two variables, the correlation value is $(r)=(-1 \leq 0 \leq 1)$. Simple correlation analysis is an extension of simple correlation analysis. In a simple correlation analysis aims to find out how the degree of relationship between several independent variables (Variable X), with the dependent variable (Variable Y) together. For the strength of the relationship, the value of the correlation coefficient is between -1 to 1, while for the direction expressed in the form of positive (+) and negative (-). The Pearson product. Moment coefficient of correlation, is a measure of the strength of the linear. Relationship between two variables x and y. It is computed (for a sample of n measurements on x and y) as follows [7].

$r=SSxy/\sqrt{SSxx}.\ SSyy$

Where;

$SSxy= \Sigma(x- x^2)(y-y^2)$

$SSxx= \Sigma(x-x^2)^2$

$SSyy = \Sigma(y-y^2)^2$

Recall that a bivariate relationship describes a relationship or correlation between two variables, x and y. Scatter grams are used to graphically describe a bivariate relationship (Table 1). The concept of correlation and how it can be used to measure the linear relationship between two variables, x and y. A numerical descriptive measure of correlation is provided by the Pearson product moment coefficient of correlation, r.

**The intervals for the strength of the relationship (correlation) are as follows:** Simple correlation is a correlation that intends to see the relationship between variables (the dependent variable and one independent variable). Simple correlations relate to the inter isolation of independent variables as well as their correlation with the dependent variable. In addition, according to Akdon and Ridwan a simple correlation is a value that gives a strong influence of variables together with other variables. The assumptions related to the simple regression analysis are [8].

- The independent variables and the dependent variable have a linear relationship.
- All variables, both independent and dependent variables, are continuous random variables.
- Conditional distribution of values of each variable with normal distribution (multivariate normal distribution).
- For various combinations of one variable's value, the variance of the conditional distribution of each variable is homogeneous (assuming homoscedasticity applies to all variables).

For each variable, the observed values are not related. Simple correlation (single correlation) is a correlation consisting of one independent variable (X), and one dependent variable (Y). As for the relationship between variables can be described as follows: From the picture above the problem formulation consists of three or more problems, so simple linear correlation is used (Figure 1). The strength interval of a number of statistical authors makes the interval categorization of the strength of the correlation relationship Jonathan.

Sarwono, for example, makes the strength intervals of relations as follows [9].

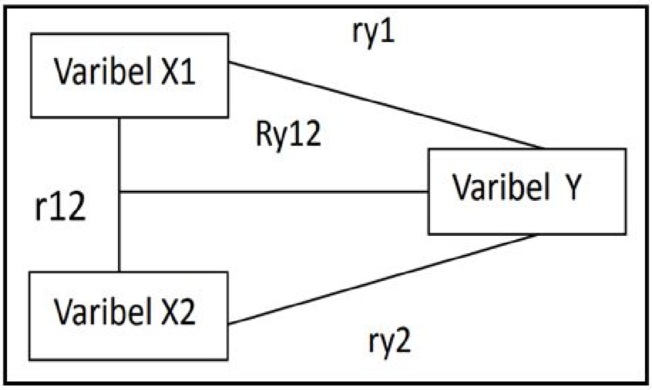

**Figure 1.** Multiple linear correlation.

For each variable, the value of observations from one another is not related. Multiple correlations are a correlation consisting of two independent variables ($X_1$, $X_2$) or more, and one dependent variable (Y). The relationship between variables can be described as follows. From the picture above the formulation of the problem consists of three or more problems, and then multiple linear correlations is used.

## Research methodology

**Types and research approaches:** This research includes explanatory research with a quantitative approach, using multiple linear analysis methods due to more than one independent variable. The variables that influence are called independent variables and the variables that are affected are called dependent variables (dependent variables).

**Variables in measurement:** This study consists of two independent variables, namely the complete vaccination for COVID-19 abroad ($X_1$) and Indonesia's gross domestic income ($X_2$), while the dependent variable is the Rupiah (IDR-USD) currency exchange rate abbreviated as variable (Y).

**Data collection technique:** Data collection techniques carried out to obtain relevant data from the problems studied are through library research (Library Research), namely by reading and studying the literature contained in the library, with the intention to put a theoretical foundation on the main problems being discussed.

## Data collection technique

Data collection techniques carried out to obtain relevant data from the problems studied are through library research (Library Research), namely by reading and studying the literature contained in the library, with the intention to put a theoretical foundation on the main problems being discussed (Table 1).

| Nilai korelasi (R) | Interpretasi (R) |
|---|---|
| 0.00-0.25 | Doubful Correlation |
| 0.26-0.50 | Fair Correlation |
| 0.51-0.75 | Good Correlation |
| 0.76-1.00 | Superior Correlation |

**Table 1.** Pearson correlation value.

The virus can be spread from the mouth or nose of an infected person through tiny fluid particles when the person coughs, sneezes, talks, sings, or breathes. These particles can range from larger droplets from the respiratory tract to smaller aerosols. Corona virus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people who contract COVID-19 will experience mild to moderate symptoms, and will recover without special treatment. However, some people will experience severe pain and require medical assistance (Table 2).

| No | Date | Confirmed COVID-19 |
|---|---|---|
| 1 | 22/08/2022 | 3457028 |
| 2 | 15/08/2022 | 5458596 |
| 3 | 08/08/2022 | 5855295 |
| 4 | 01/08/2022 | 7168081 |
| 5 | 25/07/2022 | 6834586 |
| 6 | 18/07/2022 | 7285514 |
| 7 | 11/07/2022 | 6851015 |
| 8 | 04/07/2022 | 6356880 |
| 9 | 27/06/2022 | 5542133 |

| | | |
|---|---|---|
| 10 | 20/06/2022 | 4580434 |
| 11 | 13/06/2022 | 3705984 |
| 12 | 06/06/2022 | 3500081 |
| 13 | 30/05/2022 | 3279782 |
| 14 | 23/05/2022 | 3463147 |
| 15 | 16/05/2022 | 3845124 |
| 16 | 09/05/2022 | 3929558 |
| 17 | 02/05/2022 | 3707622 |
| 18 | 25/04/2022 | 4033687 |
| 19 | 18/04/2022 | 4746238 |
| 20 | 11/04/2022 | 5816094 |
| 21 | 04/04/2022 | 7488122 |
| 22 | 28/03/2022 | 9491115 |
| 23 | 21/03/2022 | 11131189 |
| 24 | 14/03/2022 | 12767035 |
| 25 | 07/03/2022 | 11676144 |
| 26 | 28/02/2022 | 10551643 |
| 27 | 21/02/2022 | 10948071 |
| 28 | 14/02/2022 | 12889417 |
| 29 | 07/02/2022 | 16294955 |
| 30 | 31/01/2022 | 20153458 |

**Source:** WHO Coronavirus (COVID-19), 2022

**Table 2.** Data on confirmed COVID-19 in the world.

The virus can be spread from the mouth or nose of an infected person through tiny fluid particles when the person coughs, sneezes, talks, sings, or breathes. These particles can range from larger droplets from the respiratory tract to smaller aerosols. Corona virus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people who contract COVID-19 will experience mild to moderate symptoms, and will recover without special treatment. However, some people will experience severe pain and require medical assistance (Table 3).

| **No** | **Date** | **Mortality COVID-19** |
|---|---|---|
| 1 | 22/08/2022 | 7217 |
| 2 | 15/08/2022 | 15079 |
| 3 | 08/08/2022 | 16988 |
| 4 | 01/08/2022 | 16577 |
| 5 | 25/07/2022 | 16853 |
| 6 | 18/07/2022 | 15528 |
| 7 | 11/07/2022 | 13844 |
| 8 | 04/07/2022 | 12018 |
| 9 | 27/06/2022 | 10875 |
| 10 | 20/06/2022 | 10153 |
| 11 | 13/06/2022 | 9099 |

| | | |
|---|---|---|
| 12 | 06/06/2022 | 9256 |
| 13 | 30/05/2022 | 8834 |
| 14 | 23/05/2022 | 10266 |
| 15 | 16/05/2022 | 10487 |
| 16 | 09/05/2022 | 11239 |
| 17 | 02/05/2022 | 13191 |
| 18 | 25/04/2022 | 16710 |
| 19 | 18/04/2022 | 17220 |
| 20 | 11/04/2022 | 19986 |
| 21 | 04/04/2022 | 23354 |
| 22 | 28/03/2022 | 27750 |
| 23 | 21/03/2022 | 46835 |
| 24 | 14/03/2022 | 33825 |
| 25 | 07/03/2022 | 43642 |
| 26 | 28/02/2022 | 51680 |
| 27 | 21/02/2022 | 59868 |
| 28 | 14/02/2022 | 77109 |
| 29 | 07/02/2022 | 75694 |
| 30 | 31/01/2022 | 67814 |

**Source:** WHO Coronavirus (COVID-19), 2022

**Table 3.** Mortality COVID-19 in the world.

You can catch it when you breathe air that contains the virus if you are near someone who is already infected with COVID-19. You can also catch it if you touch your eyes, nose, or mouth after touching a contaminated surface. Viruses are easier to spread indoors and in crowded places.

## Results and Discussion

This research predicts and predicts the position of Indonesia's external debt in the future by processing and analyzing past data, as the dependent variable (bound), is the value of Indonesia's exports outside multiple linear regression analysis with dependent variable is complete vaccination for COVID-19 abbreviated as (Y), and independent variable (independent) is Indonesian COVID-19 mortality ($X_1$), and complete vaccination for COVID-19 as ($X_2$). Data from the variables above are as follows (Table 4).

| No | Date | $X_1$ | $X_2$ | Y |
|---|---|---|---|---|
| 1 | 22/08/2022 | 7217 | 3457028 | 4907506087 |
| 2 | 15/08/2022 | 15079 | 5458596 | 4903289817 |
| 3 | 08/08/2022 | 16988 | 5855295 | 4887555590 |
| 4 | 01/08/2022 | 16577 | 7168081 | 4872424669 |
| 5 | 25/07/2022 | 16853 | 6834586 | 4854082065 |
| 6 | 18/07/2022 | 15528 | 7285514 | 4838060651 |
| 7 | 11/07/2022 | 13844 | 6851015 | 4824130057 |
| 8 | 04/07/2022 | 12018 | 6356880 | 4808720329 |
| 9 | 27/06/2022 | 10875 | 5542133 | 4792619160 |

| | | | | |
|---|---|---|---|---|
| 10 | 20/06/2022 | 10153 | 4580434 | 4777478756 |
| 11 | 13/06/2022 | 9099 | 3705984 | 4753209332 |
| 12 | 06/06/2022 | 9256 | 3500081 | 4740099304 |
| 13 | 30/05/2022 | 8834 | 3279782 | 4752247085 |
| 14 | 23/05/2022 | 10266 | 3463147 | 4710858723 |
| 15 | 16/05/2022 | 10487 | 3845124 | 4694919778 |
| 16 | 09/05/2022 | 11239 | 3929558 | 4677973745 |
| 17 | 02/05/2022 | 13191 | 3707622 | 4662231996 |
| 18 | 25/04/2022 | 16710 | 4033687 | 4636863951 |
| 19 | 18/04/2022 | 17220 | 4746238 | 4621620437 |
| 20 | 11/04/2022 | 19986 | 5816094 | 4606468303 |
| 21 | 04/04/2022 | 23354 | 7488122 | 4577253593 |
| 22 | 28/03/2022 | 27750 | 9491115 | 4534500003 |
| 23 | 21/03/2022 | 46835 | 11131189 | 4503913189 |
| 24 | 14/03/2022 | 33825 | 12767035 | 4613496584 |
| 25 | 07/03/2022 | 43642 | 11676144 | 4436006267 |
| 27 | 28/02/2022 | 51680 | 10551643 | 4382455875 |
| 28 | 21/02/2022 | 77109 | 12889417 | 4269963536 |
| 29 | 14/02/2022 | 75694 | 16294955 | 4215477416 |
| 30 | 07/02/2022 | 67814 | 20153458 | 4164424948 |

**Source:** WHO Coronavirus (COVID-19), 2022

**Table 4.** Confirmed COVID-19 data (Y), Indonesian COVID-19 mortality ($X_1$) and complete vaccination for COVID-19 ($X_2$).

In a study at the stage of analyzing data, multiple linear regressions is the development of simple linear regression, which can be used to predict future demand based on past data analysis or to determine the effect of one or more independent variables on one variable dependent is used. The application of multiple methods of the number of independent variables used is more than one which influences independent non independent variables. From the table of independent and bound variable data above, we obtain multiple linear regression equations with two predictors. Start by creating a helper table as follows.

| No | X1 | X2 | Y | $X1^2$ | $X2^2$ | $Y^2$ | X1Y | X2Y | X1X2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7217 | 3457028 | 4907506087 | 52085089 | 1,1951E+13 | 2,40836E+19 | 3,54175E+13 | 1,69654E+16 | 24949371076 |
| 2 | 15079 | 5458596 | 4903289817 | 227376241 | 2,97963E+13 | 2,40423E+19 | 7,39367E+13 | 2,67651E+16 | 82310169084 |
| 3 | 16988 | 5855295 | 4887555590 | 288592144 | 3,42845E+13 | 2,38882E+19 | 8,30298E+13 | 2,86181E+16 | 99469751460 |
| 4 | 16577 | 7168081 | 4872424669 | 274796929 | 5,13814E+13 | 2,37405E+19 | 8,07702E+13 | 3,49259E+16 | 1,18825E+11 |
| 5 | 16853 | 6834586 | 4854082065 | 284023609 | 4,67116E+13 | 2,35621E+19 | 8,18058E+13 | 3,31756E+16 | 1,15183E+11 |
| 6 | 15528 | 7285514 | 4838060651 | 241118784 | 5,30787E+13 | 2,34068E+19 | 7,51254E+13 | 3,52478E+16 | 1,13129E+11 |
| 7 | 13844 | 6851015 | 4824130057 | 191656336 | 4,69364E+13 | 2,32722E+19 | 6,67853E+13 | 3,30502E+16 | 94845451660 |
| 8 | 12018 | 6356880 | 4808720329 | 144432324 | 4,04099E+13 | 2,31238E+19 | 5,77912E+13 | 3,05685E+16 | 76396983840 |
| 9 | 10875 | 5542133 | 4792619160 | 118265625 | 3,07152E+13 | 2,29692E+19 | 5,21197E+13 | 2,65613E+16 | 60270696375 |
| 10 | 10153 | 4580434 | 4777478756 | 103083409 | 2,09804E+13 | 2,28243E+19 | 4,85057E+13 | 2,18829E+16 | 46505146402 |
| 11 | 9099 | 3705984 | 4753209332 | 82791801 | 1,37343E+13 | 2,2593E+19 | 4,32495E+13 | 1,76153E+16 | 33720748416 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | 9256 | 3500081 | 4740099304 | 85673536 | 1,22506E+13 | 2,24685E+19 | 4,38744E+13 | 1,65907E+16 | 32396749736 |
| 13 | 8834 | 3279782 | 4752247085 | 78039556 | 1,0757E+13 | 2,25839E+19 | 4,19814E+13 | 1,55863E+16 | 28973594188 |
| 14 | 10266 | 3463147 | 4710858723 | 105390756 | 1,19934E+13 | 2,21922E+19 | 4,83617E+13 | 1,63144E+16 | 35552667102 |
| 15 | 10487 | 3845124 | 4694919778 | 109977169 | 1,4785E+13 | 2,20423E+19 | 4,92356E+13 | 1,80525E+16 | 40323815388 |
| 16 | 11239 | 3929558 | 4677973745 | 126315121 | 1,54414E+13 | 2,18834E+19 | 5,25757E+13 | 1,83824E+16 | 44164302362 |
| 17 | 13191 | 3707622 | 4662231996 | 174002481 | 1,37465E+13 | 2,17364E+19 | 6,14995E+13 | 1,72858E+16 | 48907241802 |
| 18 | 16710 | 4033687 | 4636863951 | 279224100 | 1,62706E+13 | 2,15005E+19 | 7,7482E+13 | 1,87037E+16 | 67402909770 |
| 19 | 17220 | 4746238 | 4621620437 | 296528400 | 2,25268E+13 | 2,13594E+19 | 7,95843E+13 | 2,19353E+16 | 81730218360 |
| 20 | 19986 | 5816094 | 4606468303 | 399440196 | 3,38269E+13 | 2,12196E+19 | 9,20649E+13 | 2,67917E+16 | 1,1624E+11 |
| 21 | 23354 | 7488122 | 4577253593 | 545409316 | 5,6072E+13 | 2,09513E+19 | 1,06897E+14 | 3,4275E+16 | 1,74878E+11 |
| 22 | 27750 | 9491115 | 4534500003 | 770062500 | 9,00813E+13 | 2,05617E+19 | 1,25832E+14 | 4,30375E+16 | 2,63378E+11 |
| 23 | 46835 | 11131189 | 4503913189 | 2193517225 | 1,23903E+14 | 2,02852E+19 | 2,10941E+14 | 5,01339E+16 | 5,21329E+11 |
| 24 | 33825 | 12767035 | 4613496584 | 1144130625 | 1,62997E+14 | 2,12844E+19 | 1,56052E+14 | 5,89007E+16 | 4,31845E+11 |
| 25 | 43642 | 11676144 | 4436006267 | 1904624164 | 1,36332E+14 | 1,96782E+19 | 1,93596E+14 | 5,17954E+16 | 5,0957E+11 |
| 27 | 51680 | 10551643 | 4382455875 | 2670822400 | 1,11337E+14 | 1,92059E+19 | 2,26485E+14 | 4,62421E+16 | 5,45309E+11 |
| 28 | 77109 | 12889417 | 4269963536 | 3584177424 | 1,1986E+14 | 1,88279E+19 | 2,59774E+14 | 4,75049E+16 | 6,55439E+11 |
| 29 | 75694 | 16294955 | 4215477416 | 5945797881 | 1,66137E+14 | 1,82326E+19 | 3,29253E+14 | 5,50373E+16 | 9,9389E+11 |
| 30 | 67814 | 20153458 | 4164424948 | 5729581636 | 2,65526E+14 | 1,77702E+19 | 3,19086E+14 | 6,8691E+16 | 1,23343E+12 |
| Σ | 1,39359E+11 | 3,45552E+15 | 1,01456E+18 | 8,05705E+12 | 32749675373 | 2,16999E+15 | 6,48632E+20 | 1,39359E+11 | 3,45552E+15 |

**Table 5.** Helper data to search for multiple linear regression equations, namely the values of constants $b_1$ and $b_2$.

## Level correlation of multiple linear regression

The Pearson correlation coefficient can be used to express the extent of a linear relationship between two or more variables when the data is quantitative data (interval or ratio scale data) and both variables are bivariate which are normally distributed. Then the multiple linear regression correlation is obtained as follows.

$$R_{X1X2,Y} = \surd(b_1.\Sigma x_1y+b_2.\ \Sigma x_2y)/\Sigma y^2$$

$$= 0,825982$$

From the analysis of the level of multiple linear regression, the equality of complete vaccination for COVID-19 by analyzing COVID-19 mortality against data confirmed COVID-19. The interpretation is superior correlation, ranging from 0.76 to 1.00.

## Linearity Test (F-Test) multiple regression make a hypothesis

$H_o$: Linear regression analysis cannot be used in analyzing the influence of the complete vaccination for COVID-19 and Mortality COVID-19 on the data confirmed COVID-19.

$H_\alpha$: Linear regression analysis can be used to analyze the effect of the complete vaccination for COVID-19 and Mortality COVID-19 on the data confirmed COVID-19.

## Determining the value of $F_{count}$

Formula:

$F_{count}=(R_{x1x2,y})^2\ (n-m-1)/m(1-R_{x1,x2,y}{}^2)$

$F_{count}=28,985746233963$

Information:

$R_{x1.x2.y}$=Correlation of multiple linear regression

n=Number of research samples

m=Number of free variables

## Determine the value of F-table

Formula:

Ftable=F {(α) (dk denominator=n-m-1), (dk numerator=m)}

Where:

m=2, n =7, α=0.05

dk=5-2-1=2

Then;

$F_{tabel}=F_{\{(0,05)(4,2)\}}=3.422$

F count>f table namely; 28, 985746233963>3.422 So, Ho is accepted. So, multiple linear regression analysis can be used in complete vaccination for COVID-19 by analyzing COVID-19 mortality against data confirmed COVID-19.

## Look for the value of constants

**The values of constants $b_1$ and $b_2$ are:**

-$\Sigma x_1^2=\Sigma X_1^2-(\Sigma X_1)^2/n$

-$\Sigma x_2^2=\Sigma X_2^2-(\Sigma X_2)^2/n$

-$\Sigma y^2=\Sigma Y^2-(\Sigma Y)^2/n$

-$\Sigma x_1y=\Sigma X_1Y-(\Sigma X_1)(\Sigma Y)/n$

-$\Sigma x_2y=\Sigma X_2Y-(\Sigma X_2)(\Sigma Y)/n$

-$\Sigma x_1x_2=\Sigma X_1X_2-(\Sigma X_1)(\Sigma X_2)/n$

-$X_1=\Sigma X_1/n$

-$X_2=\Sigma X_2/n$

-$Y=\Sigma Y/n$

Formula of constant $b_1$;

$b_1=(\Sigma x_2^2)(\Sigma x_1y)-(\Sigma x_1x_2)(\Sigma x_2y)$

$(\Sigma x_1^2)(\Sigma x_2^2)-(\Sigma x_1x_2)^2 = -10004,1797$

Formula of constant $b_2$;

$b_2= (\Sigma x_1^2)(\Sigma x_2y)-(\Sigma x_1x_2)(\Sigma x_1y)$

$(\Sigma x_1^2)(\Sigma x_2^2)-(\Sigma x_1x_2)^2$

$=5,866348716$

The value of the constant α is:

$\alpha=\Sigma Y/n - b_1(\Sigma X_1/n)-b_2(\Sigma X_2/n) = 4858167192$

From the results of the multiple linear regression analysis the equation with the formula is obtained as follows.

$Y=\alpha+b_1X_1+b_2X_2+\ldots+b_nX_n$

The results of multiple linear regression analysis obtained the equality of complete vaccination for COVID-19 by Analyzing COVID-19 mortality against data confirmed COVID-19. Then the obtained multiple linear regression equation is as follows.

$Y=4858167192-10004,1797X1+5,866348716X2$

By using the above equation, we can predict complete vaccination for COVID-19 using the multiple linear regression equation.

## Partial effect test (t-test)

That is, determining whether there is a partial influence between the complete vaccination for COVID-19 ($X_1$) and complete vaccination for COVID-19 (Y) and whether there is a partial data confirmed COVID-19 ($X_2$), partial influence test (t-test) between $X_1$ and Y determine the hypothesis (Figures 2 and 3).

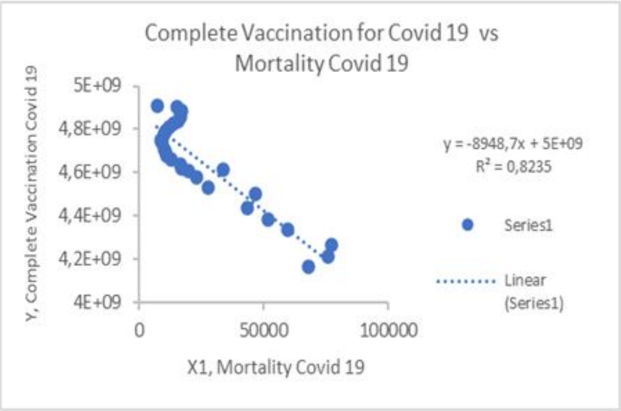

**Figure 2.** Complete vaccination for COVID-19 *vs.* morility COVID-19.

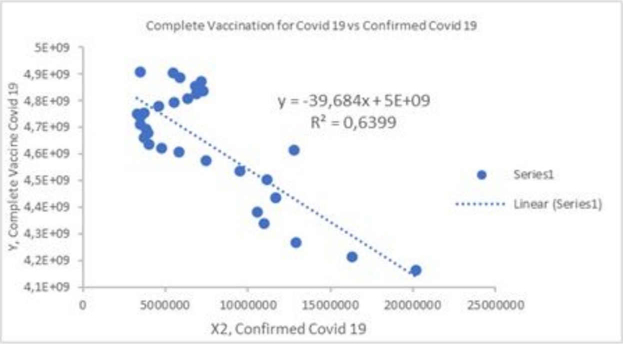

**Figure 3.** Complete vaccination 19 confirmed COVID-19.

$H_0$: There is no partial significant effect between mortality COVID-19 on complete vaccination for COVID-19.

$H_\alpha$: There is partial significant effect between mortality COVID-19 on complete vaccination for COVID-19.

Determine the value of $t_1$ count:

$S_{X1X2}{}^2 = \Sigma y^2-[b_2(\Sigma x_{1y})+b_2(\Sigma x_{2y})]/n-m-1$

$S_{X1X2}=\sqrt{S_{X1X2}{}^2}=90398894,53$

$r_{x1x2}=n(\Sigma X_1X_2)-(\Sigma X_1)(\Sigma X_2)/\sqrt{\{n.\ \Sigma X_1^2-(\Sigma X_1)^2\}\{n.\ \Sigma X_2^2-(\Sigma X_2)^2\}}$

$= -0,56722$

$S_{b1}=S_{X1X2}/\sqrt{[\Sigma X_1^2-n.X_1^2][1-(r_{x1x2})^2]}$

$=1319,322766$

$S_{b2}=S_{X1X2}/\sqrt{[\Sigma X_2^2-n.X_2^2][1-(rx1x2)2]}$

$=7,837400409$

Then, $t_{1\ count}=b_1/Sb_1=-7,582814427$

$t_{2\ count}=b_2/Sb_2=0,748506955$

Menentukan nilai $t_{tabel}$

$t_{tabel} = t\ (\alpha/2)(n-2)$

$= t\ (0,025)\ (5)$

$=2.069$

- So, $t_{1count}>t_{table}$=-7, 582814427>2.069; then Ho is accepted meaning, there is there is no significant (significant) effect partially between COVID-19 mortality and complete vaccination for COVID 19.
- For $t_{2count} \leq t_{table}$ that is 0, 748506955 ≤ 2.069 then Ho is accepted meaning, there is no significant (significant) partial effect between data confirmed COVID-19 of complete vaccination for COVID-19.

## Conclusions

From the results of the study, it can be concluded that statistical data with the variables of complete vaccination for COVID-19 prediction by analyzing COVID-19 mortality against Mortality COVID-19 from 2003-2014 are as follows.

- $F_{count}>f_{table}$ which is 28, 9857462>3.422 So, Ho is accepted. So, linear regression analysis can be used in predicting Confirmed COVID-19 by Analyzing COVID-19 mortality against mortality COVID-19's from 2003-2014.

  The multiple linear regression equation is as follows
- Y=4858167192-10004, 1797X1+5,866348716X2.
- The correlation between the relationships between confirmed COVID-19 and analyzing COVID-19 mortality against data confirmed COVID-19. Shows that the results of 0,825982 with interpretation are superior, ranging from 0.76 to 0.99.
- So, $t_1$ count<$t_{table}$=-7, 582814427<2.069; then Ho is accepted meaning, there is there is no significant (significant) effect partially between COVID-19 mortality and complete vaccination for COVID-19.
- For $t_{2\ count} \leq t_{table}$ that is 0,748506955 ≤ 2.069 then Ho is accepted meaning, there is no partial (significant) influence between data confirmed COVID-19 of complete vaccination for COVID-19.

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