The analysis of mutual funds performance model accuracy

S S Purwaningsih
UP MKU Politeknik Negeri Bandung, Jl. Gegerkalong Hilir, Ciwaruga, Parongpong, Kabupaten Bandung Barat, Jawa Barat, Indonesia
sitisamsiyahpurwaningsih@yahoo.co.id

Abstract. This research is based on the result of the previous research which showed the regression performance model of the 22 mutual fund products. The correlation between inflation, interest rate and the Composite Stock Price Index (IHSG) to mutual fund performance was 98.67% based on data in 2007-2014. This study examines the accuracy of the performance model of mutual fund products by using the accuracy measurement. In addition, it also examines the best regression model of mutual fund products based on the smallest value of the observed data difference (data in 2015-2016) with the predicted value based on the regression model. The results of this study can be applied for decision making in considering the selection of more profitable mutual fund investment type. Based on the results of this study in examining the accuracy of the model obtained from the previous research, the result of difference between the predicted data and the observed data or \((Y - \hat{Y})^2\) of the 22 mutual fund products lies between 0.008 to 0.367 and the best product with the smallest value \((Y - \hat{Y})^2\) is 0.008.

1. Introduction
This research is based on the results of the previous research which showed the regression performance model of the 22 mutual fund products listed in OJK (Financial Services Authority)\(^{[1]}\). From the research it was also obtained that the influence between inflation, interest rate and the Composite Stock Price Index (IHSG) simultaneously to mutual fund performance was 98.67%. Partially, inflation had a significant effect on the performance of mutual funds with negative influence, the interest rate has a significant effect on the performance of mutual funds with positive influence, and IHSG has significant effect on mutual fund performance with positive influence.

This study examines the suitability or accuracy of the regression performance model of the 22 mutual fund products obtained from the results of the previous research with empirical data from the following year (2015-2016). Furthermore, from the regression model of the 22 mutual fund products, it is examined the best mutual fund regression model by using the accuracy measurement, that is how accurately a model estimated the actual events based on the smallest value of the observed data difference with the forecast value of the regression model.

In connection with the research plan, it is known that economy is one of the most important factors to indicate a strong country. The economic growth at any time will improve the system development. However, one of the factors affecting a country's economic condition is the well-controlled stability of the global economy, so the expansion of the financial crisis into various countries can be minimized\(^{[2]}\).

Macroeconomic environment is an environment that affects day-to-day operations of the company. The ability of the investors to understand and forecast the future macroeconomic conditions will be very useful in making profitable investment decisions. To that end, an investor should consider some macroeconomic indicators that can help investors in making investment decisions. Macroeconomic
indicators are often associated with capital markets including fluctuations in interest rates, inflation, and IHSG and GDP growth. Interest rates which are too high will affect the present value of the company’s cash flow so that investment opportunities will not be attractive anymore. High interest rates will also increase the cost of capital that will be borne by the company and will also cause return implied by the investor from an investment will increase.

Interest rate is a benchmark of the economic activities of a country that will impact on the activity of financial flows of banking, inflation, investment and movement of IHSG. The interest rate increased by the Central Bank will be responded by market players and investors to take advantages of the moment to increase their production and investment.

Based on the description above, it can be seen that this research follows the Strategic Plan or Road Map of Polban that is Entrepreneurship with the superior research topic of creative economy entrepreneur business model with the strategic issue of poverty alleviation and strengthening economic competitiveness for the improvement of people’s welfare.

1.1. Research Problem
Based on the description above, two research problems are formulated as follows.
1. How is the accuracy of the regression performance model of the 22 mutual fund products obtained in the previous research results?
2. Which mutual funds regression model is the best of the 22 products from the previous research?

1.2. Research Purposes
The purposes of the research are mentioned as follows.
1. Applying regression of mutual fund performance model influenced by inflation, interest rate, and IHSG for the data in 2007-2014 from research findings in 2015 with the data in 2015-2016.
2. Measuring the accuracy of the mutual funds performance model as a forecasting tool to estimate the performance of mutual funds with the data in 2015-2016.
3. Determining the best performance model of mutual fund products based on the smallest value of the observed data difference with the predicted value obtained from the model (the smallest value $(Y - \hat{Y})^2$).

1.3. Research Significance
The results of this research are expected to be applied as a tool of decision making in the choice of investment in the capital market. It is also expected to provide input for financial institutions.

2. Previous researches
There are four previous researches which are relevant to this research. They are mentioned as follows.
1. A research research entitled “Pengaruh Inflasi, Tingkat Suku Bunga, dan Nilai Tukar Terhadap Indeks Harga Saham Gabungan (IHSG) di Bursa Efek Jakarta” showed that inflation has a positive and significant effect on IHSG [3].
2. The best model to examine the influence of IHSG on Unit Link Performance and Mutual Fund based on panel data. It was found that IHSG has a significant effect on mutual fund performance with a total influence of 44.1%, while the remaining 55.9% was explained by other factors. IHSG has a significant effect on Unit Link performance with total influence of 90.8%, while the rest of 9.2% was explained by other factors, such as inflation, bank interest rates, and so on [2].
3. A research entitled “Pengaruh Inflasi, BI rate dan Kurs Terhadap Indeks Harga Saham Gabungan (IHSG)” indicated that inflation and exchange rate have positive and significant influence on IHSG, while Central Bank rate has negative and significant influence to IHSG [4].
4. The interest rate and IHSG contributed significantly to mutual fund performance with total percentage of influence of 98.67% while the rest of 1.33% was explained by other factors excluded in the generated regression model [1].
Based on the previous studies, especially research conducted by Purwaningsih [1], this study examines the accuracy of mutual fund performance model.

3. Research methods
This research will apply the mutual fund performance regression model influenced by inflation, interest rate, and IHSG for the data in 2007-2014 from research findings in 2015 with data from 2015-2016. Further, this research also examines the accuracy of the mutual fund performance regression model; that is the performance model of the 22 mutual fund products listed in OJK.

To see the accuracy of the model that has been generated, it is calculated based on the smallest value of the observed data difference with the predicted value obtained from the model (the smallest value $(Y - \hat{Y})^2$). $Y$ is the observed value for data in 2015 until 2016, while $\hat{Y}$ is the predicted value obtained from the regression model by substituting the value of the independent variable (interest, inflation and IHSG) for the data in 2015 and 2016. The steps of the research are as follows.

Step 1: Doing literature study.
Step 2: Making the mutual fund performance model from the previous research (2015).
Step 3: Collecting mutual fund performance data as response variable, and independent variables; inflation, interest rate, and JCI in 2015-2016.
Step 4: Applying the model or finding the predicted value of the mutual fund in 2015-2016.
Step 5: Measuring the accuracy of the predicted value with its true value by looking at the value of $(Y - \hat{Y})^2$ for the 22 mutual fund performance products registered in OJK.
Step 6: Determining the best performance model of mutual fund product that has the smallest $(Y - \hat{Y})^2$ value.
Step 7: Drawing conclusions and providing suggestions.

4. Result and discussion

4.1 Statistical Evaluation

4.1.1 T-statistic Test
T-test is done by comparing t-statistic (t value generated from regression counting process) and t value obtained from table or probability value with $\alpha = 5\%$ (0.05). The hypotheses used in t-test are:

$H_0$: There is no significant influence between the independent variables individually towards the dependent variable

$H_1$: There is a significant influence between the independent variables individually towards the dependent variable.

Below are the t statistic calculation and its probability value.

| Variable | t-Statistic | Prob.  |
|----------|-------------|--------|
| C        | 0.758208    | 0.4484 |
| Inflation| -7.188242   | 0.0000 |
| Interest rate | 10.64718 | 0.0000 |
| IHSG     | 78.04594    | 0.0000 |

The explanation of t-test results to the variables that affect the performance of mutual funds is as follows.

1. Inflation variable
The t-statistic value of the inflation variable is -7.188242 with p-value of 0.0000 and it has negative influence, so H0 is rejected. It indicates that partially inflation has a significant effect on the performance with negative influence.

2. Interest Rate Variables
The t-statistic value of the interest rate variable is 10.64718 with the p-value of 0.0000 and it has positive influence, so H0 is accepted. It indicates that the interest rate partially influences the performance of the mutual fund with positive influence.

3. IHSG variables
IHSG t-statistic value is 78.04594 with p-value of 0.0000 and it has positive influence, so H0 rejected. It indicates that partially IHSG significantly affect on the performance of mutual funds with positive influence.

4.1.2. F-statistic Test
The F test is done by comparing F-statistic (F value generated from regression calculation process) and F value is obtained from table or probability value with α = 5% (0.05). Hypothesis used in the t-test are:

H0: There is no significant influence between independent variables simultaneously (together) to the dependent variable.

H1: There is a significant influence between independent variables simultaneously (together) to the dependent variable. Below is the calculation of F statistic and its probability value.

Table 2 The calculation of F statistic and its probability value

|                      | Value          |
|----------------------|----------------|
| R-squared            | 0.986728       |
| Adjusted R-squared   | 0.986575       |
| S.E. of regression   | 0.105318       |
| Sum squared resid     | 23.14869       |
| Log likelihood        | 1769.408       |
| F-statistic          | 6465.081       |
| Prob (F-statistic)   | 0.000000       |

Based on the above calculation, it is obtained the value of F statistic is 6465.081 with p-value of 0.0000; H0 is rejected. It indicates that there is a significant influence between independent variables simultaneously (together) to the dependent variable.

4.1.3 Determination Coefficient Test ($R^2$)
The purpose of this test is to determine the magnitude of the independent variables influence to explain the dependent variable simultaneously. This test is also useful to measure the strength and accuracy of relationships among variables in the model used. The value of $R^2$ ranges from zero and one. The closer to one, the closer the relationship between independent and dependent variables is. Conversely, if $R^2$ is getting closer to zero, the further the relationship between independent and dependent variables is.

In the estimation results, the $R^2$ is amounted to 0.986728. This shows that the independent variable explains the mutual fund performance variable of 98.67%, while the rest of 1.33% is explained by other factors which are not included in the model.

4.2 Selection of the Best Model
Table 3 shows the performance model of mutual funds of 22 products that have been obtained based on data from 2007 to 2014. Then, the predicted value and observed value ($Y - \hat{Y}$) are calculated based on 2015-2016 data for 22 mutual fund products registered in OJK with assisted Excel program. Before the calculation is done by using panel data regression, firstly the data unit is equaled (smoothing data) by
using natural logarithms, so that the estimation result is not biased. The variables are IHSG and mutual fund performance because the unit is rupiah, while inflation and interest rates remain in percentage.

The estimation results from the model obtained from the data from 2007 to 2014 were tested to data from 2015 to 2016. By means of the values of the independent variables (inflation, interest rate, and IHSG), it is substituted in the regression equation estimation obtained from 2007 - 2014 data.

Table 3 shows the calculation results of mutual fund performance estimation for 2015-2016 (Ŷ) and also presents the calculation result of (Y - Ŷ)² based on the regression equation obtained from 2007-2014 data.

### Table 3: Results of Difference between Predicted Mutual Funds Performance and Observed Mutual Funds Performance

| Product code | Predicted mutual fund performance (Ŷ) | Observed mutual fund performance (Y) | Y - Ŷ | (Y - Ŷ)² |
|--------------|---------------------------------------|--------------------------------------|-------|----------|
| BLSDINI      | 8.776                                 | 8.433                                | -0.343| 0.118    |
| BCTWPRI      | 9.914                                 | 9.555                                | -0.359| 0.129    |
| BTCWEKA      | 8.663                                 | 8.370                                | -0.292| 0.085    |
| BTCWEPR      | 8.673                                 | 8.383                                | -0.289| 0.084    |
| BIRADSI      | 11.065                                | 10.836                               | -0.229| 0.052    |
| BADOPTI      | 8.087                                 | 7.827                                | -0.260| 0.068    |
| BNIRBEI      | 8.340                                 | 7.735                                | -0.605| 0.367    |
| MFIPERI      | 10.361                                | 10.102                               | -0.259| 0.067    |
| CITEKUI      | 10.046                                | 9.759                                | -0.287| 0.082    |
| PTLCERD      | 9.738                                 | 9.464                                | -0.275| 0.075    |
| DANMAWI      | 9.348                                 | 9.038                                | -0.310| 0.096    |
| MAKMANT      | 9.086                                 | 8.675                                | -0.411| 0.169    |
| FSISECT      | 8.856                                 | 8.561                                | -0.294| 0.087    |
| MANTRAK      | 8.744                                 | 8.303                                | -0.441| 0.194    |
| MANSHAM      | 9.662                                 | 9.317                                | -0.345| 0.119    |
| PRASHAM      | 8.737                                 | 8.647                                | -0.091| 0.008    |
| PLASHAM      | 9.218                                 | 9.076                                | -0.142| 0.020    |
| SCPDPRI      | 10.515                                | 10.408                               | -0.107| 0.011    |
| SCHPPLU      | 10.438                                | 10.227                               | -0.211| 0.044    |
| SCHISTI      | 8.973                                 | 8.799                                | -0.174| 0.030    |
| TRSMKPI      | 9.334                                 | 9.060                                | -0.274| 0.075    |
| TRISYAH      | 7.760                                 | 7.373                                | -0.388| 0.150    |
From the Table 3, it is seen that the value of $(Y - \hat{Y})^2$ of the 22 mutual fund performance products lies between 0.008 up to 0.367. It can be seen that the value $(Y - \hat{Y})^2$ indicates that the model has been obtained shows its predicted value close to the empirical data. While the best product with the smallest value $(Y - \hat{Y})^2$ is a mutual fund product with Prasham-C code.

5. Conclusion and suggestion

5.1 Conclusion

From the analysis results, it concludes that inflation has a significant effect on the performance of mutual funds with negative influence, interest rate has a significant effect on the performance of mutual funds with positive influence, IHSG has significant effect on mutual fund performance with positive influence, IHSG, inflation and deposit rates significantly influence the performance of mutual funds, with total influence of 98.67% while the rest of the 1.33% influences the other factors which are not observed, the value of $(Y - \hat{Y})^2$ of 22 mutual fund products lies between 0.008 up to 0.367, and the best performance model of mutual fund product with the smallest $(Y - \hat{Y})^2$ is 0.008.

5.2 Suggestion

Based on the analysis result on this research, the investors need to pay attention to fluctuation of interest rate to IHSG. This is needed because the results of the analysis prove that the interest rate significantly affect IHSG. Thus investors will be able to avoid losses due to the fall of IHSG and they can gain profit if they can predict the positive impact of interest rate fluctuations against IHSG.

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