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# The Impact of Macroeconomic Variables on the Financial Growth of Construction Companies in Indonesia: An Analysis with an Error Correction Model (2010.1 – 2021.4)

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## Abstract

This aims to analyze the impact of macroeconomic variables, namely economic growth, inflation rate, and labor wages, on the long-term financial growth rate of construction companies in Indonesia in 2010.1 - 2021.4. The research method uses the Error Correction Model - Engle Grager. The stationary data, a root unit test, the first difference, and a cointegration test are carried out to ensure that the model can be continued with the ECM equation. The data used in this study is a secondary time series data published by the BPS. The result of this study is that there is a long-term balance correlation between economic growth, inflation, and labor wages with the financial growth rate of construction companies in Indonesia for the period 2010.1 - 2021.4. The theoretical contribution of this study is the relationship between macroeconomic variables and the financial growth rate of construction companies in Indonesia. The variables of economic growth, inflation rate, and labor wages correlate with the long-term financial growth of construction companies in Indonesia. The novelty of this research lies in an approach that focuses on the specific characteristics of the construction industry in Indonesia, which is different from previous studies that were primarily conducted in developed countries. This study develops an ECM-based analytical model that considers the adjustment mechanism for short-term imbalances and how macroeconomic variables shape the financial stability of construction companies in the long term. Practically, the results of this study provide policy recommendations for the government and construction industry players in anticipating the impact of macroeconomic variables on the company's financial stability.



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## INTRODUCTION

Eurostat conducted a statistical study indicating that construction companies contribute around one-tenth of the world's economy. (Semenova & Vitkova, 2019). The development of the material production sector and the potential for national income depend on the construction sector's quantity, quality, and growth rate. (Kretova et al., 2020; Lewis, 2004)). On the other hand, the construction service business climate, namely the financial condition and activities of the construction industry, is strongly influenced by globalization, free trade, global and domestic competition, national and foreign investment, economic growth, technological developments, and universal digitalization. (Kapustina et al., 2018)

Meanwhile, domestic internal factors, sectoral policy factors, government regulations, good governance, business structure, economic growth, and the composition of the market supply and demand magnitudes affect the construction service business climate. (Ball et al., 2000). In other words, the construction company directly depends on the country's stability.

This study is essential considering the stability of the external environment, which can help by creating company development strategies with timely responses and effective decision-making to improve the company's financial stability. (Zhuravlyov et al., 2019). Until now, there are many methods and models for analyzing company finances. The construction industry is primarily written by Western authors (Kapustina et al., 2018). Therefore, this study is essential to form methods and models that show the influence of Indonesian macroeconomic variables on the financial stability of the construction industry in Indonesia, which considers the specificities of the construction industry in Indonesia. And the economic and business character of Indonesia. Data on the financial growth rate of construction companies in Indonesia are presented below.

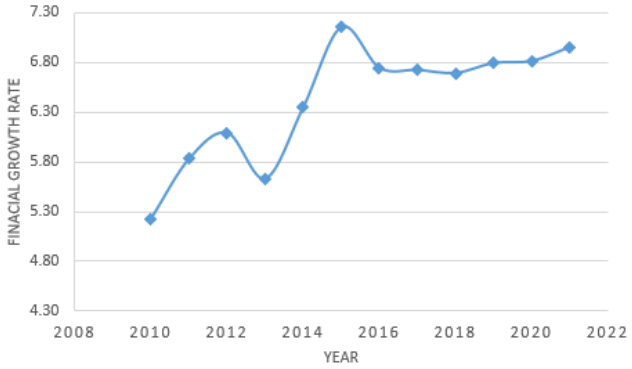



**Figure 1.** Financial growth rate of Indonesian construction companies in 2010 – 2021
Source: Secondary Data Processed, 2024

The financial growth rate of construction companies in Indonesia increased in 2015 by 7.15% (Statistics, 2016); this is because, generally, the construction market industry is growing in line with a stable economy. In 2016, it decreased to 6.74%, which impacted the company's finances. Furthermore, from 2017 until now, the growth has not been encouraging due to the impact of macroeconomic variables, which have quite a significant influence, as shown in Figure 1. The scope of macroeconomic variables is vast. Macroeconomic dynamics are characterized by the complexity and stability of macroeconomic variables (Mankiw, 2010). The external environment of economic entities is heterogeneous, with diverse structures (Kapustina et al., 2018). Thus, it includes many components with varying degrees, characteristics, and periods in terms of their impact on the financial stability of the industry/company.

After studying existing literature, the author selects related indicators to apply this analytical method, namely the variables of economic growth, inflation, and labor wages and their impact on the financial stability of construction companies in Indonesia.

External factors can often cause problems in company performance and interfere with company finances. Several researchers examined this issue; for example, the influence of macroeconomic conditions, in this case, unstable inflation, can disrupt a company's financial stability. (Abbas et al., 2017)This research is supported by another that describes macroeconomic instability as a factor that can exacerbate and harm a company's economic activities. (Dafermos et al., 2018). Likewise, prior research shows that inflation targeting as a macroeconomic indicator significantly affects companies' financial stability. When inflation targeting does not match the condition, it

disrupts the performance of state finances. (Economy et al., 2020) For example, the study of macroeconomic policy in Ukraine encourages sustainability to increase corporate liquidity. They chose a strategic aspect and made it a priority to support corporate financial and economic sustainability. (Gerega, 2020)Aligning with other research, the results concluded that prudential macro policies for inflation stabilization could overcome companies' financial risk in monetary policy. (Fouejieu et al., 2019). Inflation is a variable that has a significant influence on construction service companies. Research conducted by (Semenova & Vitkova, 2019) In the Czech Republic and Spain, there is a correlation between inflation and construction service companies, resulting in quite significant company losses.

Wage policy is a national strategic program to ensure quality economic growth, in which economic equality is created to equalize income. (Kline & Moretti, 2014) (Lin, 2011). In the context of construction companies, labor wages are an essential variable to research, where the better the level of labor wages, the higher the company's productivity (Won et al., 2021) (Marzuki et al., 2012).

Economic growth is one of the variables used as an indicator to measure financial stability. (Mamonov et al., 2018) (Saktiawan et al., 2022). Prior research conducted a panel data test on 63 developing and developed countries from 1980 to 2014; the results showed that the economic growth variable was an indicator for measuring financial stability. Research conducted by (Kalra, 2010) and (Carlson et al., 2012), who examined the effect of financial pressure on economic performance and the rate of economic growth as a measure of financial stability, supported the conclusion of prior research (Aamo, 2018).

This study fills the gap by using the Error Correction Model (ECM) approach**,** which can analyze the short-term and long-term relationship between macroeconomic variables and the financial stability of construction companies in Indonesia. In addition, the model used is adjusted to the characteristics of Indonesia's economy, which tends to be more volatile than developed countries, especially regarding inflation, economic growth, and labor wage policies. With this approach, this study provides a more relevant empirical contribution to the construction industry in Indonesia by considering how national macroeconomic dynamics affect the financial stability of construction companies so that it can be the basis for strategic decision-making in this sector.

**METHOD**

The data used in this study is secondary time series data obtained from the Badan Pusat Statistik (BPS) publication. The data includes the financial growth rate of construction companies, economic growth, inflation, and labor wages in Indonesia in the period 2010.1 – 2021.4.

This study uses the Error Correction Model (ECM) approach to overcome the problem of spurious *regression*. False regression occurs when variables in the model have no actual relationship, but the regression results show a significant regression coefficient with a high determination value. (Price & Insukindro, 1994; Widarjono, 2005). Regressions that produce false regressions often indicate imbalances in the short term, although there is an imbalance in the long term. Therefore, ECM is used to correct these imbalances and more accurately analyze the relationship between macroeconomic variables and the financial stability of construction companies.

ECM was chosen because it could simultaneously analyze the short-term and long-term relationships between macroeconomic variables (economic growth, inflation, and labor wages) and the financial stability of construction companies in Indonesia. In the construction industry, macroeconomic factors directly impact short-term and long-term financial trends. Therefore, ECM is the proper analysis tool to capture these dynamics.

Before applying ECM, this study conducted a cointegration test to determine whether there was a long-term relationship between independent and dependent variables. If cointegration is found, ECM becomes the most suitable method because it can overcome the problem of false regression that often arises in the analysis of non-stationary time series data.

Various external factors, such as changes in fiscal policy, fluctuations in material prices, and the dynamics of foreign and domestic investment, greatly influence the construction industry. These factors can lead to financial imbalances in the short term. ECM measures how the system returns to long-term equilibrium after a short-term shock. Conventional regression methods, such as Ordinary Least Squares (OLS), cannot adequately analyze this aspect.

**Stationarity Test**

The stationarity test can be carried out using the unit roots test. Namely, the data is said to be stationary if the absolute value of the Augmented Dickey-Fuller (ADF) statistic is more negative/more minor than the MacKinnon critical value, and the degree of integration test which transforms non-stationary data into stationary data through the data differentiation process at the first or second level. Data is said to be stationary if the absolute value of the ADF statistic is more negative/more minor than the MacKinnon critical value.

**Cointegration Test**

The cointegration test tests whether the disturbance variables are stationary or not. If stationary, then all variables have a long-term equilibrium relationship. The cointegration tests can be carried out if a study has data integrated to the same degree. The residual value is said to be stationary if the absolute value of the ADF statistic is more damaging or smaller than the MacKinnon critical value.

**Error Correction Model Estimation**

The ECM approach can correct spurious regression results by explaining short-term and long-term parameters. (Wibisono & R, 2019). The form of the ECM E-G equation for short-term estimation is:

$$DYt = \alpha 1DX1t + \alpha 2DX2t + \alpha 3DLX3t + \alpha 4BX2t$$

Where:
DY : Changes in the rate of financial growth of construction companies
$DX_1$ : Changes in the rate of economic growth
$DX_2$ : Change in inflation rate
$DLX_3$ : Changes in labor wages
$BX_2$ : Backward lag cointegration residual inflation operator in the previous period

Form the ECM-EG equation for long-term estimation:

$$DYt = \beta 0 + \beta 1DX1t + \beta 2DX2t + \beta 3DLX3t + \beta 4DX1t\text{-}1 + \beta 5DX2t\text{-}1 + \beta 6DLX3t\text{-}1 + \beta 7ECT$$

Where:
D : Changes in the rate of financial growth of construction companies
$DX_1$ : Changes in the rate of economic growth
$DX_2$ : Change in inflation rate
$DLX_3$ : Changes in labor wages
ECT : $\beta 7(X1t\text{-}1 + X2t\text{-}1 + LX3t\text{-}1 - Yt\text{-}1)$
D : First difference
B : Backward lag operator

**The Classical Assumption Test**

The classic assumption test is carried out to fulfill statistical requirements in multiple linear analysis with OLS, which aims to ensure that the regression equation is unbiased or the BLUE (Best Linear Unbiased Estimator) regression equation. Classical assumption testing can be done by:

**Normality Test**

Testing the relationship between the independent and dependent variables, which can be done using the t-test, will be valid if the residuals are normally distributed. The method that can be used to see whether the residue is usually distributed or not is the Jarque Bera test. This test method determines a large sample (asymptotic) by comparing the J-B statistical results with the $X^2$ table. (Widarjono, 2005).

The test criteria are:
$H_0 : J - B < X_2$ Table, Normality (residual usually is distributed)
$H_a : J - B > X_2$ table, Non Normality (residual not normally distributed)

**Autocorrelation Test**

Autocorrelation is a condition where one observation member has a relationship with a different observation at a different time. The OLS method explains that autocorrelation correlates with one residue and another residue. The assumption is that the residues in the OLS method have no relationship between one residue and another. (Widarjono, 2005).

This study will use the autocorrelation test using the Durbin-Watson method, by looking at the calculated Durbin-Watson statistical value, where there is no autocorrelation problem if the Durbin-Watson statistical value is in the area free of autocorrelation problems by looking at the dU table value.

**Multicollinearity Test**

Multicollinearity is carried out to test the linear relationship between independent variables in the multiple regression equation. The regression equation is considered multicollinear if there is a perfect correlation between the other independent variables in the model. The correlation coefficient (r) between independent variables is tested to test whether there is multicollinearity. As a reference, if the r value is high above 0.85, the model has multicollinearity; conversely, if r is below 0.85, there is no multicollinearity. (Widarjono, 2005).

**Heteroscedasticity Test**

Heteroscedasticity is a condition where the disturbance factor does not have the same variance or is not constant. The consequence of the heteroscedasticity problem is that the estimator we get has a non-minimum variance. Although the OLS mode estimator is still linear and unbiased, the variance that is not minimum will make the calculation of the standard error of the OLS method unreliable. This causes the estimation interval and hypothesis testing based on the t and F distributions can no longer be trusted to evaluate the regression results. (Widarjono, 2005). Heteroscedasticity is an important problem for OLS estimators. Therefore, it is important to test for heteroscedasticity in the model. The method for testing heteroscedasticity problems in the model is to use the Breusch-Pagan-Godfrey test. The reference for testing heteroscedasticity with Breusch-Pagan-Godfrey is that if the chi-square probability value is greater than the X2 table, then heteroscedasticity does not occur. On the other hand, if the chi-square probability value is smaller than the X2 table, then heteroscedasticity occurs.

**Stability Test**

Stability testing is used to determine a model's reliability or specification error. A model is very important for stability testing because it will be used for forecasting and policy simulation in certain observations. (Julaihah & Insukindro, 2005).

## RESULT AND DISCUSSION

**Stationary Test Result**

Table 1 shows that all variables (except variable LX3) are not stationary because the ADF value is more favorable than the critical value. As a consequence of not fulfilling the stationarity assumption at zero degrees or I(0), all variables will be tested by testing the degree of integration at the first difference level. Table 2 shows that all variables are stationary at the 5% and 10% significance levels because the ADF value is more damaging than the critical value.

**Table 1**. Unit Root Test (*in level*)

| Variable | ADF | MacKinnon Critical Value | | | Prob. | Decision |
|---|---|---|---|---|---|---|
| | | 1% | 5% | 10% | | |
| Y | -1.270541 | -3.581152 | -2.926622 | -2.601424 | 0.1856 | Non-Stationary |
| X1 | -1.943874 | -3.615588 | -2.941145 | -2.609066 | 0.2042 | Non-Stationary |
| X2 | -1.362883 | -3.581152 | -2.926622 | -2.601424 | 0.1577 | Non-Stationary |
| LX3 | -3.283533 | -3.596616 | -2.933158 | -2.604867 | 0.0284 | Stationar |

Source: Secondary Data Processed, 2024

**Table 2.** First Difference Test

| Variable | ADF | MacKinnon Critical Value | | | Prob. | Decision |
|---|---|---|---|---|---|---|
| | | 1% | 5% | 10% | | |
| Y | -8.274408 | -3.584743 | -2.928142 | -2.602225 | 0.0000 | Stationar |
| X1 | -4.086693 | -3.615588 | -2.941145 | -2.609066 | 0.0029 | Stationar |
| X2 | -4.438205 | -3.615588 | -2.941145 | -2.609066 | 0.0211 | Stationar |
| LX3 | -5.642158 | -3.596616 | -2.933158 | -2.604867 | 0.0000 | Stationar |

Source: Secondary Data Processed, 2024

**Cointegration Test Result**

The cointegration test aims to determine whether the regression residuals are stationary. It can only be carried out if the related variables have the same degree of integration, as shown in Table 3.

**Table 3.** Result of OLS Cointegration Regression

| Variable | Coefficient | Std Error | T-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.000608 | 0.001034 | -0.588111 | 0.0400 |
| DX1 | 0.011329 | 0.008459 | -0.157137 | 0.0360 |
| DX2 | -0.022198 | 0.001226 | -0.161335 | 0.0027 |
| DLX3 | 0.017852 | 0.163177 | 0.746744 | 0.0099 |

$R^2$ = 0.516975
F-stat = 12.212971
DW-stat = 2.006063

Source: Secondary Data Processed, 2024

**Table 4.** Unit Root Test Results for E

| Variable | t-statistic | MacKinnon Critical Value | | | Prob. | Decision |
|---|---|---|---|---|---|---|
| | | 1% | 5% | 10% | | |
| RESID | -7.166191 | -3.621023 | -2.943427 | -2.610263 | 0.0000 | Stationary |

Source: Secondary Data Processed, 2024

Table 4 shows the stationary RESID (residual) at all significance levels. The stationary cointegration regression residuals show that all variables have a long-term equilibrium relationship and can form a short-term ECM model developed by Engle-Granger.

The results of the OLS Cointegration Regression show that an increase in the economic growth rate of 1% will increase the financial growth of construction companies by 11.33% in the long term, an inflation rate increase of 1% will reduce the financial growth of construction companies by 22.19% in the long term, and wages an increase in labor by 1% will increase the financial growth of construction companies by 17.85% in the long term.

**ECM Estimation Result**

The ECM-EG estimation results show that all coefficients of the variables studied are significant (probability less than 0.05), which means the valid model can be estimated. The ECM estimation results also show that all variables of economic growth, inflation rate, and labor wages significantly affect the long-term financial growth of construction companies.

**Table 5.** ECM Estimation Results

| Variable | Coefficient | Std Error | T-Statistic | Prob. |
|---|---|---|---|---|
| C | -2.727484 | 0.581755 | -4.688369 | 0.0000 |
| DX1 | 0.127632 | 0.019973 | -1.383517 | 0.0444 |
| DX2 | -0.138326 | 0.002804 | -2.969633 | 0.0051 |

| | | | | |
|---|---|---|---|---|
| DLX3 | 1.245609 | 0.273191 | 4.559483 | 0.0000 |
| X1(-1) | 0.135351 | 0.038439 | 3.521151 | 0.0011 |
| X2(-1) | 0.127895 | 0.037455 | 3.414608 | 0.0015 |
| LX3(-1) | 0.263258 | 0.059136 | 4.451727 | 0.0001 |
| ECT | -0.128731 | 0.037610 | -3.422754 | 0.0015 |
| $R^2$ = 0.718297<br>F-stat = 15.706556<br>DW-stat = 2.096967 | | | | |

Source: Secondary Data Processed, 2024

**The Impact of Economic Growth on the Financial Growth Rate of Construction Companies**

The economic growth rate affects the long-term financial growth of construction companies, impacting their financial sustainability.

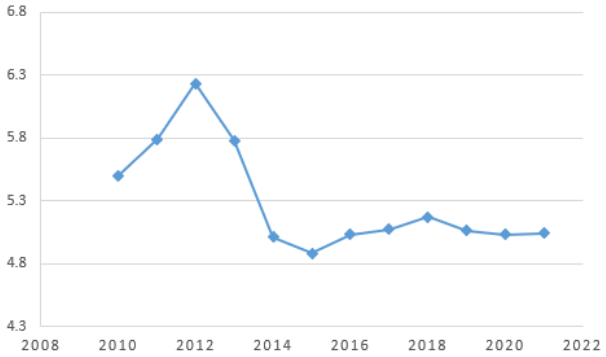



**Figure 2.** Financial Growth Rate of Indonesian Construction Companies 2010-2021
Source: Secondary Data Processed, 2024

The movement of the economic growth rate in 2012 showed an increase of 6.23%, then decreased in 2013 - 2015. From 2016 to 2021, it showed a relatively stable figure, even increasing by 5.06% in 2019, as shown in figure 2. This was influenced by macroeconomic indicators' experience stability, which impacts the financial stability of construction companies.

**The Impact of Inflation on the Financial Growth Rate of Construction Companies**

The estimation results show that the inflation rate variable has a negative and significant effect on the financial growth of construction companies in the short term. If the inflation rate rises by 1%, the financial growth of construction companies will decrease by 13.83% in the short term, as shown in Figure 3.

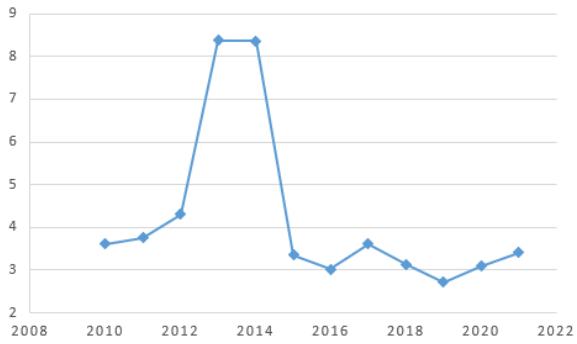



**Figure 3.** Development of the Inflation Rate in Indonesia (%) in 2020 – 2021
Source: Secondary Data Processed, 2024

An increase in prices will increase the costs of production factors for construction companies. Rising prices also cause people's purchasing power to fall, reducing domestic demand. This decline in domestic demand has a direct impact on reducing company output. The company's declining output causes financial instability for construction service companies.

**The Influence of Labor Wages in Construction Companies in Indonesia 2010-2021**

The estimation results show that the labor wage variable has a positive and significant effect in the long term. Changes in labor wage levels are fluctuating, so they do not directly affect the financial growth of construction companies.

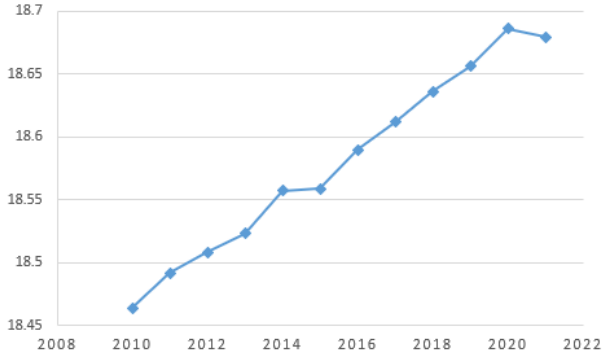



**Figure 4.** Development of Labor Wages in Construction Companies in Indonesia 2010 – 2021
Source: Secondary Data Processed, 2024

The level of labor wages at construction companies in Indonesia from 2010 to 2021 continues to increase. In 2010, it was 18.46%, and in 2021, it was 18.67%. This shows that labor wages play a very important role in construction companies in Indonesia, as shown in Figure 4.

**The Classical Assumption Test Result**

**Normality Test**

The calculation results of the J-B value show the value = 1.380514, and the value of the X2 table with df 2 = 5.991, then the null hypothesis (H0), which states that the residual has a normal distribution, is correct.

**Autocorrelation Test Result**

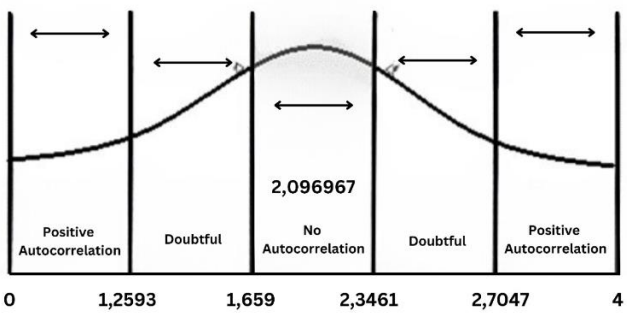



**Figure 5.** Autocorrelation test
Source: Secondary Data Processed, 2024

Based on the Durbin-Watson test statistic calculates 2.096967, with t (number of observations) 47, and k (number of independent variables) 3, then using a dU value of 1.6539. The model is considered free from autocorrelation problems if dU d is calculated (4-dU).

Based on the Durbin-Watson value in the area with no autocorrelation at 1.6590 → 2.096967 → 2.3461 (Figure 5), this regression model has no autocorrelation problem.

**Multicollinearity Test Result**

The correlation matrix can detect the presence or absence of multicollinearity symptoms in the regression model. Based on the regression data in Table 2, it is known that the $R^2$ Value is 0.718297, if $R^2$ between independent variables > $R^2$ Model then there is an indication that there is multicollinearity; on the contrary, if $R^2$ between variables < than $R^2$ Model, there is no multicollinearity.

**Table 6.** Multicollinearity

| | X1 | X2 | LX3 |
|---|---|---|---|
| X1 | 1,000000 | -0,55999 | -0,83419 |
| X2 | -0,55999 | 1,000000 | 0,381471 |
| LX3 | -0,83419 | 0,381471 | 1,000000 |

Source: Secondary Data Processed, 2024

From the results of the multicollinearity test with the correlation matrix, it can be concluded that there are no variables indicated to contain multicollinearity; this is indicated by all the results of $R^2$ Between variables whose value is < $R^2$ Model of 0.718297 means these variables have an uncorrelated relationship, as shown in table 6.

**Heteroscedasticity Test Result**

Heteroscedasticity occurs if the error or residual of the observed model does not constantly vary from one observation variable to another. This study used the white test to detect the presence or absence of heteroscedasticity problems.

**Table 7.** Heteroscedasticity test

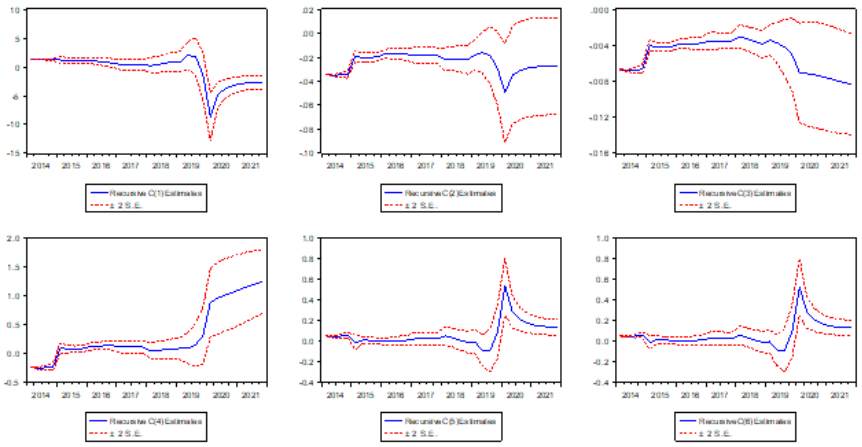
| | |
|---|---|
| Obs*R-squared | 6,554745 |
| Prob. Chi-Square (3) | 0,0875 |

Source: Secondary Data Processed, 2024

Based on the results of the heteroscedasticity test, P-Value Obs*R-squared = 6.554745, and the probability value is 0.0875, where 0.0875> 5%, which means it is not significant, it can be concluded that the model does not have heteroscedasticity.

**Stability Test Result**

The stability test show that all variables in the ECM equation model are stable, as shown in Figure 6.



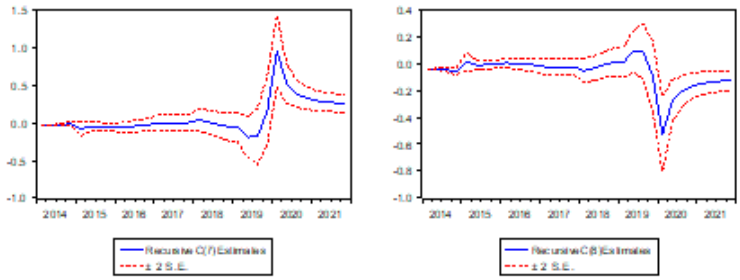


**Figure 6.** Recursive Residuals
Source: Secondary Data Processed, 2024

The results of the Cusum test on the model show that it has stable parameters with a confidence level of 5%, which means that the model in this research shows the statistical stability of the data.

**Discussion**

The result from the research is that there is a long-term balanced relationship between the variables of economic growth, inflation, and labor wages on the level of financial growth in construction companies in Indonesia for the period 2010.1 – 2021.4. The results of the analysis using the ECM approach show that the inflation rate variable has a negative and significant effect on the financial growth of construction companies in the short term; this is supported by research conducted by (Yoo & Kim, 2015)According to research, the rise and fall of inflation will directly influence a company's decision to increase its production. (Taylor, 2000)Based on the results of classical assumption testing, there are no problems testing normality, heteroscedasticity, autocorrelation, and multicollinearity. It is just that the stability test is unstable; this happened because the inflation rate in 2013-2014 increased by 8.38%, and the economic growth rate in 2016 decreased by 3.02%, thus impacting the finances of construction companies in Indonesia.
However, this study has some limitations. First, the ECM model only considers three main macroeconomic variables (economic growth, inflation, and labor wages). At the same time, other variables such as interest rates, exchange rates, foreign investment, and construction raw material prices can also affect the financial stability of construction companies. Second, this study is based on national aggregate data, so it does not describe the difference in financial conditions between construction companies based on business scale (e.g., small companies vs. large companies) or geographical location (e.g., Java vs. outside Java).

In addition, external factors such as changes in government policies, political instability, global fluctuations in commodity prices, and technological developments can also significantly impact the construction industry. For example, fiscal policies related to infrastructure investment can stimulate the industry, while political instability can increase business risks and slow corporate financial growth. Therefore, further research is recommended to include additional variables and consider the impact of external factors to obtain more comprehensive results.

**CONCLUSION AND RECOMMENDATION**

The conclusion of this research shows a long-term balanced relationship between economic growth, inflation, and labor wages on the financial growth of construction companies in Indonesia from 2010.1 to 2021.4. Analysis using the ECM approach shows that inflation has a negative and significant impact on the financial growth of construction companies in the short term. Inflation fluctuations can directly influence a company's decision to increase production. The results of classical assumption testing show no problems related to normality, heteroscedasticity, autocorrelation, and multicollinearity. However, there is instability in the stability test, caused by an increase in inflation of 8.38% in 2013-2014 and a decrease in economic growth of 3.02% in 2016, which impacts the finances of construction companies in Indonesia.

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