# Dividend Policy and Stock Price Volatility: An Error Corrected Approach

Asia-Pacific Journal of Management
Research and Innovation
11(3) 165–171

sagepub.in/home.nav
DOI: 10.1177/2319510X15588387
http://apjmri.sagepub.com

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## Abstract

The purpose of this study is to investigate the relationship between dividend policy and stock price volatility (SV) in the Sri Lankan context. Based on the Hausman test results, the cross-section random effect model (CSREM) is performed in order to test the hypotheses. The Granger causality (GC) test is employed in order to test the short-term relation between dependent and explanatory variables.

The CSREM test revealed that there is a significant negative impact from dividend payout, a significant positive impact from company size and no evidence of significant impact from dividend yield (DY) on SV. Furthermore, GC tests revealed that there is no short-term impact from dividend payout on SV and it showed a feedback exists between company size and stock price volatility. It is also reported that a unidirectional causality exists from DY to SV in any lag level. The management could use dividend policy as a mechanism to control stock price volatility. They could reduce the SV by increasing their dividend payout and it is possible to increase the volatility by enhancing the DY or firms size in the short run. This study is the first to accentuate that DY has a significant impact on SV in the short run and the first to discuss the same phenomenon in the Sri Lankan context, as per the best of the authors' knowledge.

## Keywords

Cross-section random effect model, dividend policy, Granger causality test, stock price volatility

## Introduction

Numerous studies were carried out in the past few decades to examine the theoretical significance for unresolved dividend policy issues. The impact of dividend policy on stock returns was studied by many researchers between the 1950s and 1980s (Black, 1976; Lintner, 1956; Miller & Modigliani, 1961). Black and Scholes (1973) argued that different payout from time to time has a significant impact on a corporation's stock price.

The relationship between dividend policy and stock price volatility (SV) was examined by many researchers the later 1980s. The regression model was used by Baskin (1989) with the purpose of examining the association between dividend policy and stock price fluctuations using two dividend policy variables and four control variables. He argued that both DY and payout have a negative correlation with share price movements. The aforesaid relationship still remains as an unresolved problem due to contradictory findings of various researchers in the past few decades and is yet open for further discussion and investigation.

The Sri Lankan stock market could be classified as a developing market based on the market capitalisation. Firms recognise that shareholders concentrate on their returns of the dividends, and that the investment riskiness could affect stock valuation in the long run. Hence, the stock price movements are as imperative to investors as they are to managers. The argument has been whether corporate payout policy has any association with stock price volatility. On this ground, the study advances the research problem as whether dividend policy has an association with share price volatility. The research objectives are to critically examine the association between dividend policy and stock price movements, the short- and long-term relationship between dividend policy and SV and to examine the impact of structural break point of elimination

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of war for the estimation with special reference to the Sri Lankan stock market. This study analyses firms listed in the Colombo Stock Exchange and excludes financial institutions because of their specific regulations. It concentrates more on the last decade and discusses the theories of dividend policy as well as the causes of share price movements in an attempt to make a contribution where companies would be interested in stock price controlling mechanisms through the dividend policy. Since this study is also focused on the short-term impact of dividend policy on stock price movements and a different method is applied through error corrections for regression assumptions, it could be considered as a different and novel study from other studies which were conducted specially in emerging markets. It is also spotlighting on the vital factors investors should consider when making their investment decisions and by management in developing dividend policies for their organisations.

## Literature Review

The dividend policy could be considered as one of the most unresolved issues in corporate finance. A number of researchers have provided theoretical and empirical insights into the dividend policy puzzle. However, the issues of dividend policy are unresolved as yet due to lack of unanimity among researchers. Dividend policy refers to the policy which a company uses to decide when and how much it will pay out as dividend and it is the management's decision whether to pay or not to pay dividends. A number of studies have been carried out in order to examine the issues of dividend policy and it was embarked from the 1950s and has been tested by many researchers (Allen & Rachim, 1996; Baskin, 1989; Black & Scholes, 1973; Lintner, 1956; Miller & Modigliani, 1961; etc.). It is still open for discussions and investigations due to contradictory findings about the association between dividend policy and stock price movements.

### *Dividend Policy, Value of the Firm and Stock Price*

In 1956, Lintner identified some important research issues which are the same issues raised by managers today: What factors affect to decide on the amount, shape and timing of the dividend payouts? He examined some questions, such as, whether dividend payouts are to be altered or maintained as the previous year, whether shareholders prefer constant dividend payouts or those that depend on the earnings and whether dividend policy supports younger or older shareholders.

Miller and Modigliani (1961) proposed irrelevance theory, concluding that there is no substantial association between dividend policy and stock price. It is argued in their theory that prices of the shares in the marketplace vary irrespective of the dividends due to various other extraneous variables. However, they argued that the aforesaid relationship depends on the nature of the capital market. So the scholars argued that dividend policy does not affect the investor's return in a perfect market condition. Gordon (1963) argued that payout policy has an impact on both value of the firm and the stock price. He concluded that shareholders always wish safe and sound current income as dividends rather than capital gains. As a response to dividend irrelevance theory, he has developed the bird-in-hand theory. It asserts that in a world where uncertain, asymmetric information is aroused, dividends are valued than the retained earnings. Bhattacharya (1979) argued that interpretation of the bird-in-hand justification for dividend relevance is erroneous. He argued that increments in the payouts today may not increase firm value through risk reduction of the future income avenues. The dividend relevance theory is supported by Jensen and Meckling (1976), and extended by Easterbrook in 1984 through the agency theory explanation. This theory originated from the conflicts of interests between management and outside directorships which lead to the creation of agency cost in order to minimise the conflicts. The tax-preference theory revealed that less dividend payments would cause a lesser required rate of return while increasing the stock values. Major shareholders who are in the higher tax brackets would prefer the capital gains due to relative tax disadvantage of dividends (Brennan, 1970). Black and Scholes (1973) concluded that a change in dividend policy may have a significant impact on a corporation's stock price and they have supported the dividend relevance theory. Based on a sample which was taken from Australian Stock Market, Ball et al. (1979) studied the association between dividends and stock prices. The scholars revealed that there is a substantial relationship between stock returns and the DY. Baker et al. (1985) conducted a survey study involving chief financial officers (CFOs) of 562 companies which were listed on the New York Stock Exchange (NYSE). The results revealed that survey participants strongly agreed that stock prices are influenced by dividend policy and findings supported the dividend relevance theory. Nirmala et al. (2014) examined the long-term equilibrium relationship between dividend policy and stock prices. The results revealed that there is bidirectional long-term causality between dividend policy and stock prices. It also supported the dividend relevance theory.

### *Dividend Policy and Stock Price Volatility*

In 1989, Baskin used a novel method in order to examine the relationship between dividend policy and stock price fluctuations. He focused on the SV rather than the stock prices. Proceeding with four basic models, namely, the arbitrage effect, rate of return effect, duration pricing effect

and informational effect, he examined the relationship between SV and dividend policy by adding some control variables. These variables are earning volatility, firm's size, debt and growth. These control variables not only have a significant effect on stock price movements but also affect DY. For example, the asset growth has an impact on stock price movements and it also affects the optimal corporate dividend policy of the organisations.

Baskin concluded that variation in the discount rate has less impact on the stocks which have high dividends. This is because high DY could be a signal of more imminent cash flow. Hence, the firm with higher DY is expected to have fewer fluctuations in the stock price. This is named as duration effect and is used in the Gordon growth model as well. On the other hand, he emphasised that there is a possibility on firms with less DY and less payout could be more valuable than the total assets due to the growth opportunities available for them. Baskin pointed out that managers would control the SV and risk through dividend payout at the time of the earnings announcement, which strongly supports the signalling theory. He concluded that dividend policy could be used as a tool to control the stock price volatility. His findings revealed that if the DY increases by 1 per cent, the SV could be decreased by 2.5 per cent.

Allen and Rachim (1996) revealed that the dividend policy and SV are suggestive of either the arbitrage effect or information effect even after inclusion of a control variable, growth in assets. In contrast to the Baskin's (1989) findings, there was no relationship between the DY and price movements, but it shows a positive relation between stock prices and company size, earnings and leverage, while it shows a negative impact on stock price volatility. Baker and Powell (1999) conducted a survey study using a sample of 603 CFOs of the companies which were listed at the NYSE. In line with the findings of Baker et al. (1985), they revealed that 90 per cent of the respondents concurred that dividend policy has a significant impact on a firm's value and affect a firm's SV too. They made four explanations about the relationship between dividend policy and the value of the firm namely bird-in-hand, signalling, tax-preference and agency explanations. Out of the four explanations on dividend relevance, the respondents generally expressed the highest level of agreement towards the signalling theory. In their study, Nel and Kruger (2001) found that stock price with higher volatility results in greater risk that the share might not perform as expected. They further revealed that if the volatility of a stock price increases, investors will perceive the share to be more risky and vice versa. Guo (2002) defined the stock price movements as 'the systemic risk faced by investors who possess ordinary shares investment'. He argued that the investors are risk-averse by nature, and the volatility of their investments is important to them because it is a measure of the level of risk they are exposed to. In accordance with the tax-preference theory, Al-Malkawi (2007) has segregated the clientele effect into tax effects and transaction cost. His study suggested that investors who are in the upper tax category may prefer retained earnings or capital gains. Investors who are in the lower tax category would prefer dividends in the form of stock price enhancements.

Hussainey et al. (2011) investigated the relationship between dividend policy and stock price movements in the context of United Kingdom. The findings of their study revealed that the dividend payout ratio is the main determinant of the stock price volatility. Out of the control variables, size and debt showed the strongest relationship with share price movements. Contrary to the findings of Allen and Rachim (1996), they showed that a firm's size has significant negative impact on volatility of stock price and discovered a substantial positive impact of DY and debt level on stock price volatility.

Eldomiaty et al. (2014) examined the mutual benefits of transferring stock risks to dividend policy using a two-stage regression and partial adjustment model. The results revealed that there is a mutual association between risk-adjusted dividend growth and stock returns.

In critically reviewing literature, the variable selection has been justified with multiple references and two independent variables and two control variables were added to the model. The firm size and assets growth have been added to the model as control variables in order to eliminate spurious results. Dividend yield and payout have been taken in order to measure the dividend policy and estimate the impact of the same on stock price volatility. Compared to previous studies on the same phenomenon, a different methodology is applied for this research through error corrections for regression assumptions and short-term Granger causality tests.

## Research Methodology

The intent of this non-contrived descriptive study is to fill the gap in the knowledge of dividend policy and stock price movements in the Sri Lankan context. Table 1 explains the operational definitions of independent and dependent variables. The four regresses and the regressed SV are measured in ratio scale.

**Table 1.** Generation and Selection of Indicators

| Dimension | Indicators |
|---|---|
| Dividend Yield | Dividend Per Share/Market Price |
| Dividend Payout | Dividend Per Share/Earning Per Share |
| Company Size | Natural Log Value of the Total Assets |
| Assets Growth | GA it = Δ Total Assets it/Total Assets it |
| Stock Price Volatility | Standard Deviation of Daily Log Return * ✓Number of Days |

**Source:** Authors' construction based on the literature review.

Based on the literature review, it could be identified that there should be a negative impact from both DY and payout on stock price volatility. It can also be argued that the two control variables namely company size and assets growth should show a positive impact on the stock price volatility. The hypotheses were developed based on a rigorous literature evaluation in order to achieve the aforesaid objectives.

### *Hypotheses*

- **$H_1$**: DY negatively affects stock price volatility.
- **$H_2$**: Dividend payout negatively affects stock price volatility.
- **$H_3$**: Firm size positively affects stock price volatility.
- **$H_4$**: Assets growth positively affects stock price volatility.
- **$H_5$**: There is a short- and long-term impact from dividend policy on stock price volatility.
- **$H_6$**: There is a structural break point of elimination of war for the year 2009.

The data necessary for testing the hypotheses were basically secondary data and they were gathered directly from the Colombo Stock Exchange and financial reports of the respective companies. Out of 232 listed non-financial organisations, 139 firms declared dividends to the shareholders, and researchers limited their examination to the period 2004–2013 based on the data availability in the data library at Colombo Stock Exchange. The researchers excluded the firms with missing data for three or more consecutive years. Hence, the final sample consists of 93 cross sections (firms) for 10 years with 930 observations. The principal method employed to analyse the panel data involves cross-section random effect model (CSREM) through panel least square (PLS), estimation by a vector auto-regression (VAR) model and Granger causality test methods. The structural break point analysis was conducted using dummy variable insertion to the PLS test. This study is different and novel from the previous studies due to the employment of new models in order to measure the short- and long-term impact of independent variables on the explained variable, stock price volatility.

### *Econometric Model*

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \xi$$

Y denotes stock price volatility, $X_1$ denotes DY, $X_2$ denotes dividend payout, $X_3$ denotes firm's size, $X_4$ denotes asset growth and $\xi$ denotes error term.

## Discussion of Empirical Results

The first step of the data analysis process involved a test for normality for the variables. Since the probability values of the Jarque–Bera tests were higher than 0.05 at 5 per cent significance level for all the variables, the researcher failed to reject the null hypothesis of normal distribution. It implied that all the variables were normally distributed. The next step involved the relevant tests for stationary; the order of integration of the variables is estimated. For this purpose, Im, Pesaran and Shin test was employed as the unit root test. Before performing the unit root test, trend and intercept of each variable have been tested, and based on the results, the trend stationary process (TSP) was performed. The results of unit root tests revealed that all variables were in stationary in their level ($I_0$). Therefore, $I_0$ variables have been taken into the analysis in order to have the same order of integration. Table 2 indicates panel unit root test results.

**Table 2.** Panel Unit Root Test Summary

| Series | Statistic | Prob.** | Significant or Insignificant |
|---|---|---|---|
| Company Size | −4.080 | 0.000 | Significant |
| Dividend Payout | −12.225 | 0.000 | Significant |
| Dividend Yield | −10.553 | 0.000 | Significant |
| Assets Growth | −3.545 | 0.000 | Significant |
| Stock Price Volatility | −8.617 | 0.000 | Significant |

**Source:** Authors' own.

The third step of the data analysis process involved the test for discriminant validity. It refers to the extent to which the items are indeed novel and not simply a reflection of some other explanatory variable. According to the benchmark for correlations, the test reveals that there is no significant correlation among explanatory variables since the values are less than the minimum accepted level for correlation. It implies that there is no evidence of multicollinearity and resultant high discriminant validity for the study. Table 3 indicates the results of the correlation analysis.

Hypotheses testing through appropriate models were carried out as a further step. The key objective of this study is to critically examine the impact of dividend determinant variables on stock price fluctuations. Further, in this section the findings in relation to testing the $H_1$, $H_2$, $H_3$ and $H_4$ are presented. Based on the findings of the Hausman test, it was recommended to go ahead with the CSREM.

**Table 3.** Correlation among Explanatory Variables

| | Size | DP | DY | AG |
|---|---|---|---|---|
| Size | 1.000 | −0.008 | −0.109 | −0.159 |
| DP | −0.008 | 1.000 | 0.022 | −0.073 |
| DY | −0.109 | 0.022 | 1.000 | 0.035 |
| AG | −0.159 | −0.073 | 0.035 | 1.000 |

**Source:** Authors' own.

Before performing the regression analysis, relevant diagnostic tests were employed in order to test the regression assumptions and to make necessary corrections if there are any violations. The variance inflation factor (VIF) tests[1] also revealed that there were no serious indications of multicollinearity. The autoregressive conditional heteroscedastic (ARCH) test was performed with the specification of two lags in order to test the heteroscedasticity in the residuals. The results[2] revealed that there was no presence of heteroscedasticity for the residuals. The Breusch–Godfrey serial correlation Lagrange multiplier (LM) test (with specification of 2 lags) revealed[3] that there is an evidence for the serial correlation in the residuals. The Cochrane–Orcutt method is adopted with the purpose of correcting the suspected serial correlation in the model. The inclusion of autoregressive (AR1) procedure for estimation as part of the exogenous variables was not applicable for the panel data. Therefore, it was recommended to apply the estimated general least squares (EGLS) test for the estimation. The model specification test[4] implied that there is no substantial evidence of model miss-specification. Based on the diagnostic test results for the PLS assumptions, the CSREM was used for the PLS estimation.

Allen and Rachim (1996), Hussainey et al. (2011) and few other researchers have modified the regression equation based on the less discriminant validity. Since there was no evidence of multicollinearity occurring in this study, the researchers were not focused on modifying the regression model. But based on the literature review, a regression was performed considering DY and payout as explanatory variables and SV as the explained variable. The regression results did not show much deviation from the regression performed along with control variables. Table 4 indicates the results of the performed PLS test along with independent and controlled variables.

The significant value of *F*-statistics of the model is significant at 95 per cent level of confidence implying that the regression model results in significantly better prediction of SV and hence the null hypothesis is rejected. The R square value revealed that 38.4 per cent of the SV variation can be explained through the model. The Durbin–Watson value 2.13 implies that the errors are uncorrelated. Since the *p* values of DY and assets growth are higher than 0.05, it revealed that there is no significant impact from those variables on stock price volatility. It is in line with the Allen and Rachiman's (1996) results but contradictory to Baskin (1989) and Hussainey et al. (2011) findings. Based on the CSREM, it is also noticeable that the size of the companies shows a positive impact, which is contrary to the findings of Hussainey et al. (2011). The significant negative relationship between stock price volatility and dividend payout supports findings of Baskin (1989), Allen and Rachiman (1996) and Hussainey et al. (2011) studies. Finally, the results revealed that if the dividend payout is increased by 1 per cent, there will be a 1.13 per cent decrease in stock price volatility. Based on the findings, it is noticeable that there is a strong evidence to reject hypotheses one and four, but the researcher failed to reject hypothesis two and three.

The second objective of the study is to analyse the long-term impact of dividend variables on stock price fluctuations. Since all the variables were in stationary in level I (0), they are not integrated. If they are not integrated, they cannot be co-integrated. So the researcher failed to perform the unrestricted VAR test in order to determine the long-run equilibrium between explanatory variables due to non-satisfaction of the performing conditions. The third objective of the study was to analyse the short-term impact of dividend variables on stock price volatility. In order to determine the short-term impact of independent variables on stock price volatility, the pair-wise Granger causality test was carried out up to four lags. It is noticeable that previous studies on the same phenomenon were not focused on measuring the short-term impact of independent variables on the explained variable, stock price volatility.

Table 5 indicates the short-term relationship between SV and the company size. Since the *p*-values of both directions are less than 0.05 in any lag level, it revealed

**Table 4.** Results of Cross-section Random Effect Model

| Dependent Variable: SV | | | | |
|---|---|---|---|---|
| Method: Panel EGLS (Cross-section Random Effects) | | | | |
| Variable | Coefficient | Std. Error | *t*-Statistic | Prob. |
| C | 0.637 | 0.343 | −1.858 | 0.023 |
| Size | 0.039 | 0.015 | 2.567 | 0.010 |
| DP | −1.133 | 0.366 | −3.093 | 0.002 |
| DY | −0.011 | 0.012 | −0.899 | 0.369 |
| AG | −0.004 | 0.044 | −0.107 | 0.914 |
| R-squared | 0.440 | *F*-statistic | | 4.592 |
| Adjusted R-squared | 0.384 | Prob (*F*-statistic) | | 0.001 |
| Durbin–Watson Stat | 2.132 | | | |

**Source:** Authors' own.

**Table 5.** Granger Causality Test between Company Size and Stock Price Volatility

| Pair-wise Granger Causality Test | | | | |
|---|---|---|---|---|
| Null Hypothesis: | Prob.—Lag 1 | Prob.—Lag 2 | Prob.—Lag 3 | Prob.—Lag 4 |
| Size does not Granger Cause SV | 0.000 | 0.005 | 0.001 | 0.005 |
| SV does not Granger Cause Size | 0.000 | 0.000 | 0.000 | 0.000 |

**Source:** Authors' own.

**Table 6.** Granger Causality Test between DY and SV

| Pair-wise Granger Causality Test | | | | |
|---|---|---|---|---|
| Null Hypothesis: | Prob.—Lag 1 | Prob.—Lag 2 | Prob.—Lag 3 | Prob.—Lag 4 |
| DY does not Granger Cause SV | 0.000 | 0.000 | 0.000 | 0.000 |
| SV does not Granger Cause DY | 0.887 | 0.497 | 0.724 | 0.897 |

**Source:** Authors' own.

**Table 7.** Structural Break Point Analysis through PLS

| Method: Panel EGLS (Cross-section random effects) | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| BREAK | −0.008 | 0.033 | −0.262 | 0.793 |

**Source:** Authors' own.

a feedback exit between company size and stock price volatility. So it implied that there is a positive impact of company size on stock price volatility, while SV also shows a positive impact on company size in the short run.

Table 6 indicates the pair-wise Granger causality test between DY and SV. The output indicates a unidirectional causality exists from DY to SV in any lag level. So it revealed that there is a positive impact of DY on SV in the short run. Furthermore, Granger causality findings[5] of asset growth and dividend payout revealed that there is no impact from asset growth and dividend payout on SV in the short run. The last objective of the study was to analyse the structural break point. A PLS estimation is carried out in order to test the strategic break point and a dummy variable has been added to the estimation whereas zero is encoded as above the break year while one (1) indicates below the break year. According to the results in Table 7, there is an evidence to prove that there is no significant different impact from strategic break point for the estimation.

## Conclusion

The empirical findings revealed a negative impact from dividend payout on SV and supported the rate of return and the information effect. Furthermore, the findings of this study provide empirical evidence for the signalling theory. With the view point that high dividends are an indicator for an organisation's stability, an inverse relationship between high dividend payout and SV is anticipated. It is consistent with the result of the study. Since the dividend policy has a relationship with SV, it could be concluded that the findings of this study support the relevance theory. Furthermore, the CSREM test revealed that there is no impact from DY to the SV. But the Granger causality results revealed that a unidirectional causality exists from DY to SV in any lag level. Furthermore, based on the structural break point results, it is possible to conclude that there is no significant different impact from the structural break point (elimination of war—year 2009) for the estimation.

The impact of dividend policy on the stock price movements is very vital for the policy makers, investors, portfolio managers, researchers and those who are interested in the same phenomenon. Based on the results of this study, it is well evident that as a practical implication, the management could change the fluctuations of stock prices by adjusting their dividend policy. Furthermore, it is possible for them to use dividend policy as a control mechanism for the SV. The mangers can reduce the SV by enhancing their dividend payout. The larger the size of the company, the greater the company needs to face with the volatility of stock prices. Furthermore, findings revealed that the DY does Granger cause SV in any lag level. Thus, it is possible to conclude that higher DY leads to a more volatile stock price in the short run. As a practical implication, the results recommend adopting companies' dividend policy in order to suit their target investors.

## Appendices

**Appendix 1.** Variance Inflation Factor Test for Multicollinearity

| Coefficient Centred | | |
|---|---|---|
| Variable | Variance | VIF |
| Dividend Payout | 0.002 | 1.013 |
| Dividend Yield | 0.003 | 1.004 |
| Firms Size | 0.000 | 1.001 |
| Assets Growth | 0.000 | 1.011 |

**Appendix 2.** ARCH Test for Heteroscedasticity

| | | | |
|---|---|---|---|
| *F* Statistic | 1.705 | Prob. F (4,15) | 0.335 |
| Obs*R-Squared | 1.723 | Prob. Chi-Squire (4) | 0.329 |

**Appendix 3.** Breusch–Godfrey Serial Correlation LM Test

| | | | |
|---|---|---|---|
| *F* Statistic | 1.705 | Prob. F (2,15) | 0.000 |
| Obs*R-Squared | 1.723 | Prob. Chi-Squire (2) | 0.000 |

**Appendix 4.** Ramsey RESET Test for Model Specification

| | Value | Probability |
|---|---|---|
| t-statistic | 1.702 | 0.1217 |
| *f*-statistic | 2.713 | 0.1217 |

**Appendix 5.** Pair-wise Granger Causality Results—Lag 1 to Lag 4

| | 1 Lag | 2 Lags | 3 Lag | 4 Lag |
|---|---|---|---|---|
| Null Hypothesis | P val. | P val. | P val. | P val. |
| Company size does not Granger cause price volatility | 0.000 | 0.005 | 0.001 | 0.005 |
| Price volatility does not Granger cause company size | 0.000 | 0.000 | 0.000 | 0.000 |
| Dividend yield does not Granger cause price volatility | 0.000 | 0.000 | 0.000 | 0.000 |
| Price volatility does not Granger cause dividend yield | 0.886 | 0.497 | 0.724 | 0.897 |
| Dividend payout does not Granger cause price volatility | 0.383 | 0.173 | 0.297 | 0.307 |
| Price volatility does not Granger cause dividend payout | 0.416 | 0.901 | 0.848 | 0.911 |
| Assets growth does not Granger cause price volatility | 0.236 | 0.194 | 0.325 | 0.197 |
| Price volatility does not Granger cause assets growth | 0.615 | 0.874 | 0.965 | 0.926 |

## Notes

1. See Appendix 1 for the VIF test results.
2. See Appendix 2 for the ARCH test results.
3. See Appendix 3 for the LM test results.
4. See Appendix 4 for the Ramsey RESET results.
5. See Appendix 5.

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