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The Effect of Dividend Policy on Stock Price Volatility: Empirical Analysis of the S&P 100

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Abstract

The purpose of this study is to empirically investigate whether the dividend policy affects the stock price volatility in the S&P 100. A sample of 34 companies was examined on a quarterly basis between 2010 and 2020. The 1,496 observations were analysed using a pooled ordinary least-squares regression, a fixed effect model, and a random effect model. The dependent variable of share price volatility was regressed against the dividend policy represented by the independent variables of dividend yield and payout ratio. To consider further influences on the stock price volatility the control variables leverage, size, asset growth, and earnings volatility were included. The results show that the dividend yield has a positive effect on share price volatility, while the payout ratio was insignificant. Apart from size, which was significantly negative, all other control variables were found insignificant. These findings support the dividend relevance theory and suggest that the share price risk is influenced by dividend policy in the form of dividend yield. Since the fixed effect model was the best estimator, these results are only applicable to the sample, not the population.

Keywords: dividend policy; stock price volatility; regression analysis

1. Introduction

An important aspect within the field of corporate finance is dividend policy, which focuses on the amount of profit distributed to shareholders and in turn how much is retained for future investment and growth. It is common knowledge that volatility serves as the most important measure of an investor's risk. Therefore, a much-debated question is whether there is a link between dividend policy and share price volatility (see e.g., Qammar, Ibrahim & Alam 2017).

Two opposing views are found in the theoretical literature. Miller and Modigliani (1961), who advocate the dividend irrelevance theory, claim that under certain assumptions no connection can be found and therefore the management cannot influence the risk of a stock by adapting the dividend policy. However, Lintner (1962) and Gordon (1963), among others, argue that there is a significant impact, and the volatility can be influenced. According to Kengatharan & Suganya (2021), dividend policy is the most important component affecting the volatility of the share price.

2. Literature Review

The first study on the influence of dividend policy on stock price volatility was conducted by Baskin (1989). As one of the first researchers in the field, he set the standard for future research. He studied a sample of 2,344 companies from various industries in the United States over the period 1967 to 1986. He used stock price volatility against the independent variables of dividend yield and payout ratio. Control variables were utilised to account for confounding effects on the dependent variable. These control variables were earnings volatility, long-term debt, asset growth, and market value. He conducted several simple regression models while excluding the payout ratio at some point due to its high correlation with dividend yield. In addition, he introduced industry dummy variables to account for industry heterogeneity but concluded that the variables were not significant, and the studied phenomenon was not industry specific. He found that dividend yield had a significant negative impact on stock price volatility, while his control variables were positively correlated. He concluded that the results support the dividend relevance theory.

The Amman Stock Exchange (ASE) was studied from 2001 to 2013 in the paper by Al-Shawareh (2014). While he also focused on share price volatility, dividend yield, and payout ratio, he used size, stock repurchases, and cash dividends as control variables. Applying a fixed effect regression firstly without and following including the control variables, he found that dividend yield was significantly, positively related to stock price volatility and payout had a significant inverse relationship. The control variable of share repurchase was insignificant, while size had a positive and stock dividends had a negative significant relationship with the dependent variable.

Abrar-ul-haq, Akram & Ullah (2015) analysed the Karachi Stock Exchange KSE-100 index from 2001 to 2014 using a stratified random sample size of 11 non-financial companies. Their control variables were identical to those in Baskin's 1989 study. After conducting an econometric analysis, they performed a hierarchical multiple regression analysis. Their results show that there was no significant relationship between dividend yield, earnings volatility, leverage, payout ratio, size, and asset growth and stock price volatility. These findings are supportive of the dividend irrelevance theory. They however limit their results because of the small sample size due to time constraints and missing data.

Al Qudah & Yusuf (2015) conducted their study on the ASE from 2001 to 2011, where their variables for the regression analysis were in line with Baskin's study. After running a multiple least-squares regression, fixed effect analysis, and random effect analysis, they concluded that the dividend yield was not significant, and the payout ratio was significantly negatively correlated with stock risk. Their control variables were all found negative and significant.

Huseynov (2018) examined the UK stock market by utilising the FTSE 100 from 2006 to 2015. In his study, he used the variables introduced by Baskin, apart from asset growth. He ran two pooled OLS regression models, one with and one without control variables. As a result, dividend yield had a significant positive effect on stock price volatility, while dividend payout had an insignificant negative effect. Company size had a significant inverse relationship, while earnings volatility was positive. However, leverage did not have any significant impact in the study.

Ahmad, Alrjoub & Alrabba (2018) conducted a study on the ASE in 2018 over the period from 2010 to 2016. They used similar variables, but unlike other studies, they conducted

a generalised moment regression method. They derived that dividend yield and payout ratio were significantly negative in the relationship with volatility, while their control variables all appeared to be significant and positively related to the dependent variable.

The financial services industry in Bangladesh was studied by Provaty & Siddique (2021) from 2014 to 2019. They used the same variables as studies before but added lagging variables for dividend yield and payout ratio, assuming that shareholders' forecasts are based on past information. Their study included various OLS regression models as well as a fixed effect model (FEM) and a random effect model (REM). They concluded that the dividend yield of the current and the previous period had a significant positive relationship with price volatility, while the payout ratio was insignificant and had very little explanatory power. Earnings volatility, size, and growth were also insignificant, while earnings per share was significantly negatively correlated and debt was significantly positively correlated with share price volatility.

Kengatharan & Suganya (2021) analysed a sample of 81 non-financial companies on the Sri Lankan Stock Exchange from 2013 to 2017, using the same dependent and independent variables as the previous studies and opting for dividend per share, size, and leverage as control variables. Their regression of the pooled OLS model, FEM, and REM implied that dividend yield had a positive and payout ratio had a negative relation with stock price risk. All their control variables were negative except for leverage, which was found positive.

Karlsson & von Renteln (2021) published a study on the German market using the DAX. They analysed 30 companies over 21 years from 2000 to 2020. The variables followed Baskin (1989) with the addition of the free float percentage of the shares, to account for the higher risk of companies with a high proportion of publicly traded shares. Based on their pooled OLS regression, firm-, and time-fixed model, they found a statistically negative relationship between stock price volatility and the independent variables. Asset growth was insignificant, while earnings volatility turned out to be positive, contrary to the other control variables.

There are many more studies on the impact of dividend policy on stock price volatility, most of which have been conducted on emerging markets. Concluding, the only study that is consistent with the dividend irrelevance theory is Abrar-ul-haq, Akram & Ullah (2014). Overall, these studies indicate that the dividend payout ratio is either negatively correlated to the dependent variable or insignificant. Further, the evidence presented suggests overwhelmingly that dividend yield has a significant relation with stock price volatility, however, the relationship varies across studies. Given all that has been mentioned so far, one may suppose that the dividend policy has a significant impact on stock price risk.

In summary, most studies have focused on emerging markets such as Bangladesh, Sri Lanka, India, and Vietnam (Kengatharan & Suganya 2021; Nguyen, Bui & Do 2019; Provaty & Siddique 2021; Singh & Tandon 2019). Rarely developed markets have been the subject of current research in this area (Huseynov 2018; Karlsson & von Renteln 2021). To our best knowledge, no recent study has been conducted on the US-Market. As The New York Stock Exchange is the world's largest marketplace for securities and often serves as the lead exchange for other markets, it is of high importance to investigate whether dividends can be a tool to influence stock price volatility in this important market. Consequently, the specific purpose of this study is to determine whether dividend policy has an impact on share price volatility by empirically evaluating the S&P 100. This index was chosen, as the S&P 100 is an index derived from blue-chip companies in the

S&P 500, one of the most important indices in the US market besides the Dow Jones index and aggregated from different sectors.

3. Empirical Study

3.1 Data

The data for the empirical analysis conducted was collected via the Refinitiv Eikon terminal (Refinitiv 2022). As dividends are paid quarterly in the US market, all data was collected as such. The data was gathered for the companies in the S&P 100 during the period from 2010 to 2020. Thus, a total of 44 time periods were analysed. The selected time period was chosen as these were economically calm times (after the end of the financial crisis and before the war in the Ukraine). The sampling requirements were that the companies paid dividends in all periods, the companies were continuously listed in the index, and all required data was available, resulting in a sample of 34 companies. Therefore, a total number of 1,496 observations were analysed. The panel was categorised as fixed because the individuals observed did not change. Since the number of periods exceeds the number of companies it can be classified as a macro panel.

3.2 Choice of variables

The volatility of the share price is used as the dependent variable. Volatility is used as a proxy for share price risk. This is consistent with all previous research on the subject.

Share price volatility (SPV) is calculated as the range between the highest and lowest closing prices of the quarter. It is then divided by the average of the highest and lowest prices squared. Next, the square root transformation is applied to obtain an equivalent of the standard deviation. According to Parkinson (1980), this calculation is superior in studies of time and price dependencies while providing a good proxy of volatility. This method is also used by Baskin (1989).

$$SPV = \sqrt{\frac{P_{High} - P_{Low}}{\left(\frac{P_{High+}P_{Low}}{2}\right)^2}}$$

P_{High} resembles the highest price for the period and P_{Low} is the lowest price for the period.

Dividend yield (DY) is the first independent variable as a measure of dividend policy. It provides a measure of the return on investment from the dividend, balanced out with price adaptions. If the higher risk is associated with a higher return, the relationship between DY and SPV would be expected to be positive. Although a negative relationship has been found in some studies, this expectation is consistent with the findings of Huseynov (2018), Provaty & Siddique (2021), and Kengatharan & Suganya (2021). This would imply that a higher DY increases stock price risk.

The DY is calculated using gross dividends per share, adjusted for stock splits. US-based companies are usually stable and therefore the most recently reported dividend is assumed to be more representative than previous dividends. This is then divided by the share price.

$$DY = \frac{Adjusted\ gross\ dividend\ per\ share}{Share\ price}$$

The second independent variable as a proxy for dividend policy is the payout ratio (POR). This resembles the amount of earnings paid out to shareholders as dividends. Due to the agency effect (Jensen & Meckling 1976), the expected relationship is negative. This expectation is consistent with most studies, such as Huseynov (2018), Kengatharan & Suganya (2021), and Karlsson & von Renteln (2021), who found a negative relationship in their studies.

The POR is calculated by dividing the sum of gross dividends paid to common shareholders by the net income available to common shareholders, excluding the effects of extraordinary items. These items are forms of income that are unusual in nature and infrequent in occurrence.

$$POR = \frac{Total\ gross\ dividend}{Net\ income\ excluding\ extraordinary\ items}$$

To control for influences other than the selected independent variables on the share's volatility, four control variables are included in the regression models.

The Leverage (L) is the first control variable, as the level of debt of a company can have an impact on its risk. A company with higher debt is expected to bear increased risk, which should lead to a negative relationship between the control variable and the dependent variable. In addition, Baskin (1989) as well as Baker & Powell (1999) noted that debt and dividend policy may also be linked.

L is calculated as the ratio of long-term debt and capital lease obligations (over one year) to total reported assets.

$$L = \frac{Long - term\ debt\ and\ capital\ lease\ obligations}{Total\ assets}$$

Size (S) is the second control variable as it can influence the risk of a stock. The expected relationship is negative because larger companies usually are more diversified and therefore not as affected by unique events and circumstances. Consequently, more stability is expected, leading to lower investment risk. In addition, with increasing S, often more information is available which further reduces uncertainty, making investors feel more comfortable investing in such companies.

As a proxy for size, the natural logarithm of the total reported assets is used:

$$S = \log\ (Total\ assets)$$

Another important aspect to consider in the context of stock price volatility is the growth in assets (G). If G is high, uncertainty and thus risk simultaneously increase. As a result, a positive relationship is expected between the growth proxy and stock price volatility.

G is the change between the total reported assets in this period and the total reported assets of the previous period. This is then divided by the total reported assets of the current period.

$$G = \frac{Total\ assets_t - Total\ assets_{t-1}}{Total\ assets_t}$$

The final control variable chosen is earnings volatility (EV). Volatility in income is considered a risk by shareholders as it is subject to uncertainty for the future. Therefore, a positive relationship is expected between EV and SPV.

To calculate EV, the ratio of earnings before interest and taxes (EBIT), excluding non-operating income and expenses, to total reported assets is determined. The standard deviation is then calculated over four periods.

$$EV = \text{std}\left(\left(\frac{EBIT}{Total\ assets}\right)_{t;t-1;t-2;t-3}\right)$$

3.3 Hypothesis and Model Explanation

To answer the research question whether dividend policy has an impact on the share price volatility of companies in the S&P 100, the following three hypotheses will be tested:

Hypothesis a:
H_{0a}: Dividend policy insignificantly affects stock price volatility
H_{1a}: Dividend policy significantly affects stock price volatility

Hypothesis b:
H_{0b}: Dividend yield insignificantly affects stock price volatility
H_{1b}: Dividend yield significantly affects stock price volatility

Hypothesis c:
H_{0c}: Payout ratio insignificantly affects stock price volatility
H_{1c}: Payout ratio significantly affects stock price volatility

To test the aforementioned hypotheses, different regression models are applied. The utilised data was categorised as panel data, as the observation covers different companies over multiple periods. Further, the data was classified as a balanced panel to counter the risk of biased parameter estimations.

Pooled ordinary least-squares regression
The first regression model to be applied is the pooled ordinary least-squares (OLS) regression, as this is the "best linear unbiased estimator" according to the Gauss-Markov theorem (Chipman 2011). This will help to get a first overview, but it is unlikely that the

model is suitable for real panel data as the individuals are being pooled, disregarding heterogeneity.
The following formula will be used for the pooled OLS regression:

$$SPV_{it} = \beta_{\mathrm{DY}} DY_{it} + \beta_{\mathrm{POR}} POR_{it} + \beta_{\mathrm{L}} L_{it} + \beta_{\mathrm{S}} S_{it} + \beta_{G} G_{it} + \beta_{\mathrm{EV}} EV_{it} + u_{it}$$

using the variables as described before.

Fixed effect model

Susequently a fixed effect model (FEM) is conducted to account for heterogeneity. This model only reflects the effects on the companies included in the sample, but will likely be a better fit than the pooled OLS regression. The model applied is a least-squares-dummy-variable-fixed-effect model (LSDV-FEM) using the following formula:

$$SPV_{it} = \beta_{\mathrm{DY}} DY_{it} + \beta_{POR} POR_{it} + \beta_{\mathrm{L}} L_{it} + \beta_{\mathrm{S}} S_{it} + \beta_{\mathrm{G}} G_{it} + \beta_{\mathrm{EV}} EV_{it} + \alpha_i d_i + \varepsilon_{it}$$

using the variables as described before.
The F-test for different group intercepts will be used to test whether the pooled OLS regression or the FEM is more appropriate.

Random effect model

Lastly, a random effect model (REM) is applied to account for serial correlation. Therefore the following formula will be used:

$$SPV_{it} - \theta\overline{SPV_i} = \beta_{DY}(DY_{it} - \theta\overline{DY}_i) + \beta_{POR}(POR_{it} - \theta\overline{POR}_i) + \beta_{L}(L_{it} - \theta\bar{L}_i)$$
$$+\beta_{S}(S_{it} - \theta\bar{S}_i) + \beta_{G}(G_{it} - \theta\bar{G}_i) + \beta_{EV}(EV_{it} - \theta\overline{EV}_i) + (v_i - \theta\bar{v}_i) + (\varepsilon_{it} - \theta\bar{\varepsilon}_i)$$

again using the variables as described before.
To assess whether the pooled OLS regression or REM is the best estimator the Breusch-Pagan test (Breusch & Pagan 1979) will be performed. Additionally, to decide between the FEM and the REM the Hausman test (Hausman 1978) will be conducted.

4. Results

4.1 Descriptive Statistics

Before conducting the regression analysis, the descriptive statistics of the variables are reviewed. The results are summarized in the following Table 1.

Table 1: Descriptive Statistics

Variable	SPV	DY	POR	L	S	G	EV
Mean	0.0502	0.0268	0.4760	0.2502	11.094	0.0125	0.0043

Median	0.0451	0.0256	0.4053	0.2233	10.985	0.0094	0.0027
Min.	0.0132	0.0013	-113.00	0.0097	10.237	-0.2955	3,55e-01
Max.	0.2616	0.1258	47.615	0.9471	12.530	0.5580	0.0509
Std.Dev	0.0255	0.0136	3.4374	0.1731	0.5566	0.0488	0.0053
Skewness	2.3689	1.2850	-21.745	1.3211	0.8127	2.1824	3.3795
Ex. kurtosis	11.100	41.590	820.25	20.592	-0.1695	20.050	19.017

Source: Authors, based on data from Refinitiv

The mean and median of DY, G, and EV are close to each other, which implies that the data are close to symmetrical. In contrast, the values for SPV, POR, L, and S fluctuate more, meaning that the data is more spread out from the average. The largest range of variation is found for POR from -113.00 to 47.615. The negative POR can be explained by the continuous distribution of dividends while income is negative. The lowest standard deviation is found for EV at 0.0053, while the highest is at 3.4374 for POR reflecting the degree of scattering in the data.

The data for SPV, DY, L, S, G, and EV are positively skewed to the right, while POR is skewed to the left. With a conservative research approach, less than -3 and more than +3 would be nonnormal, in this case, POR and EV. However, if a stringent approach is applied -1 and +1 are the critical values, which would result in all but S being nonnormal and highly skewed (Hahs-Vaughn & Lomax 2020).

Since the excess kurtosis for all variables, except S, is positive, they are classified as leptokurtic, meaning that they have a higher peak and a tail of greater depth than a normal distribution. A conservative rule of thumb implies critical values of -3 and +3 (Hahs-Vaughn & Lomax 2020). According to this approach, S can be assumed to be close to a normal distribution, while all other variables are classified as nonnormal.

The normality assumption is of great importance in statistical analysis. However, due to the large sample of 1,496 observations, the central limit theorem confirms the approximately normal distribution is reasonable to assume. Furthermore, it is relevant to note that the assumptions required for a normal distribution should be applied to the error term, rather than to the variables used in the regression models. Therefore the normal distribution will be assumed in the following analysis.

Table 2: Correlation Matrix

	SPV	DY	POR	L	S	G	EV
SPV	1.0000						
DY	-0.0459	1.0000					
POR	-0.0278	-0.0291	1.0000				
L	-0.2566	0.3216	0.0527	1.0000			
S	0.2906	-0.1861	-0.0469	-0.4955	1.0000		
G	0.0435	-0.0444	-0.0083	-0.0332	0.0362	1.0000	
EV	-0.1311	0.1571	0.0128	0.1929	-0.3696	0.0678	1.0000

Source: Authors, based on data from Refinitiv

Table 2 shows that DY and POR are negatively correlated, but only at -2.91%. Usually, it would be assumed otherwise, however, this finding is in line with the study of Huseynov (2018) on the FTSE-100. The correlation between POR, L, and G and SPV is as expected, but the other variables are not. The highest correlation is found between S and L, the inverse connection suggests that larger companies have lower debt-to-total assets ratios. Companies try to decrease the cost of capital by reducing debt to the optimal ratio, bigger firms are probably more likely to do so. Further, the correlation between S and EV of -0.3696, implying that a larger company has lower earnings volatility. This can be explained by the fact that larger companies are more diversified and therefore not as influenced by externalities (Baskin 1989). Moreover, the correlation between DY and L is the third highest at 32.16%, indicating that with a higher dividend yield, the leverage also increases. This finding is consistent with the assumption of the agency effect (Jensen & Meckling 1976), whereby a higher dividend leads to more external financing.

It can be concluded that the overall correlation is relatively low and therefore the risk of high multicollinearity is small.

4.2 Empirical Statistics

Table 3: Pooled Ordinary Least-Squares Model Results – Dependent Variable: SPV

	Coefficient	Std. Error	t-Ratio	p-Value	
const	−0.0499198	0.0158774	−3.144	0.0017	***
DY	0.0961726	0.0487055	1.975	0.0485	**
POR	−5.44217e-05	0.000182173	−0.2987	0.7652	
L	−0.0240536	0.00431673	−5.572	<0.0001	***
S	0.00938086	0.00136598	6.867	<0.0001	***
G	0.0183525	0.0128737	1.426	0.1542	
EV	−0.163760	0.127602	−1.283	0.1996	
With: ***: 1%; **: 5%; *: 10%					
Mean dependent var		0.050217	S.D. dependent var		0.025472
Sum squared resid		0.867767	S.E. of regression		0.024141
R-squared		0.105357	Adjusted R-squared		0.101752
F(6, 1445)		29.22520	P-value(F)		3.18e-33
Log-likelihood		3451.650	Durbin-Watson		0.459195

Source: Authors, based on data from Refinitiv

As shown in Table 3 above, the pooled ordinary least-squares model is overall significant with a p-value of the F-statistic of 3.18e-33. As for the adjusted R-squared, the model can only explain 10.18% of the changes in the dependent variable. This leaves 89.82% unexplained by the first model. The DY is significant at a 95% confidence level with a p-value of 0.0485 supported by the t-ratio of 1.975 being above the critical value of 1.960. In contrast, the POR with a p-value of 0.7652 and a t-ratio between -1.960 and 1.960 is insignificant. The DY has a coefficient of 0.0961726, suggesting a positive relationship with the SPV, while the POR has a negative relationship of -5.44217e-05. The control variables L

and S are significant at 1% with p-values less than 0.0001 and t-values above and below -1.960 and 1.960. In addition, L has a negative relationship with the dependent variables as reflected in the coefficient of -0.0240536, while S is positive at 0.00938086. G and EV are insignificant in this model with p-values of 0.1542 and 0.1996 respectively, as well as t-ratios between the critical values. The relationship of G is positive at 0.0183525 and EV is negative at -0.163760 with the SPV.

Furthermore, the model for the pooled OLS regression was tested for autocorrelation using the Durbin-Watson test. It yielded a value of 0.459195, indicating positive autocorrelation, common for time series data. However, due to the scope of this study, no additional steps are taken to address this issue (as was the case by Huseynov 2018).

According to this first regression the null hypothesis b can be rejected, and the alternative hypothesis b accepted, implying a significant relationship between DY and SPV. However, the regression model cannot reject the null hypothesis c, suggesting that there is an insignificant relationship between POR and SPV. These results indicate that the null hypothesis a can be rejected by accepting the alternative hypothesis a, confirming the significant relationship between dividend policy and SPV.

Next, the fixed effect model (FEM) is conducted to account for the possible covariance between the firm-specific error term and the independent variables due to heterogeneity. This can be assumed because the individuals are independent and therefore probably have divergent error terms. The results are presented in Table 4 below.

Table 4: Fixed Effect Model Results – Dependent Variable: SPV

	Coefficient	Std. Error	t-Ratio	p-Value	
const	0.455560	0.0576716	7.899	<0.0001	***
DY	0.481101	0.0576062	8.352	<0.0001	***
POR	4.08501e-05	0.000132419	0.3085	0.7578	
L	−0.00904794	0.00668560	−1.353	0.1762	
S	−0.0374698	0.00524897	−7.139	<0.0001	***
G	0.0185818	0.00957923	1.940	0.0526	*
EV	−0.124351	0.116496	−1.067	0.2860	
With: ***: 1%; **: 5%; *: 10%					
Mean dependent var		0.050217	S.D. dependent var		0.025472
Sum squared resid		0.439775	S.E. of regression		0.017379
LSDV R-squared		0.546604	Within R-squared		0.077305
LSDV F(38, 1413)		45.00829	P-value(F)		4.8e-219
Log-likelihood		3960.035	Durbin-Watson		0.895507

Source: Authors, based on data from Refinitiv

The FEM is significant overall with a p-value of 4.8e-219, which is extremely decreased compared to the first model. It can explain 54.66% of the changes in stock price volatility. Relative to the pooled OLS regression model, the FEM can explain five times as much of the variance in SPV. The DY is highly significant with a p-value below 0.0001, which is a significant decrease from 0.0485 in the previous model and a t-ratio increase to 8.352.

The relationship remains positive with a coefficient of 0.481101. The other independent variable is still not significant with a value of 0.7578, a decrease from the previous value of 0.7652 and a t-ratio between -1.960 and 1.960. However, the relationship has changed from negative to positive with a coefficient of 4.08501e-05. In this model, the only significant control variable at a 95% confidence level is S with a negative relationship according to the coefficient of -0.0374698 and the p-value of less than 0.0001, the t-ratio being below the critical value of -1.960. It should be noted that the relationship of this variable changed compared to the previously positive relationship. While L had a significant negative relationship with SPV in the pooled OLS regression model, it is now no longer significant with a p-value of 0.1762 and a critical t-ratio. The other control variables G and EV remain non-significant at 0.0526 and 0.2860, respectively, also present in their t-ratios and show the same relationships as before. Similar to the pooled OLS regression, the FEM was tested for autocorrelation. The Durbin-Watson test yielded a value of 0.895507, which is still not in the acceptable range of about 1.13 to 1.81, indicating the presence of autocorrelation (Durbin & Watson 1951). However, consideration of this observed autocorrelation is beyond the scope of the present study.

According to the FEM, the null hypotheses a and b can be rejected, and the alternative hypothesis is accepted in agreement with the pooled OLS model, while the null hypothesis c cannot be rejected, as the model shows no significant relationship between the POR and SPV.

Looking at the R-squared and the p-value of the F-statistic, it can be assumed that the FEM is more appropriate for the analysis compared to the pooled OLS model, but an additional test for different group intercepts was carried out. The null hypothesis („The groups have a common intercept") can be rejected at a confidential level of 95% with a p-value of 1.22939e-188 and the alternative hypothesis is accepted. Hence, it can be concluded that the FEM is a better fit than the pooled OLS model due to the significance of the firm-specific error term.

Table 5: Random Effect Model Results – Dependent Variable: SPV

	Coefficient	Std. Error	z-Ratio	p-Value	
const	0.189910	0.0420660	4.515	<0.0001	***
DY	0.428357	0.0571024	7.502	<0.0001	***
POR	3.38676e-05	0.000134237	0.2523	0.8008	
L	−0.0242991	0.00616870	−3.939	<0.0001	***
S	−0.0130481	0.00378992	−3.443	0.0006	***
G	0.0126807	0.00965976	1.313	0.1893	
EV	−0.120959	0.117304	−1.031	0.3025	
With: ***: 1%; **: 5%; *: 10%					
Mean dependent var		0.050217	S.D. dependent var		3230.151
Between variance		0.000306	S.E. of regression		3230.151
Within variance		0.000302	Θ used for quasi-dem.		0.851924
Log-likelihood		3230.151	Durbin-Watson		0.895507

Source: Authors, based on data from Refinitiv

The final regression analysis performed in this study is the random effect model (REM), to account for possible serial correlation. It can be seen in Table 5 above that the DY is still highly significant with a value below 0.0001 and a z-ratio above 1.96 having a positive relationship with the SPV at 0.428357. The POR, on the other hand, is consistently non-significant at 0.8008 confirmed with the z-ratio between -1.96 and 1.96, the highest p-value for this variable in all three models, with a positive relationship of 3.38676e-05. The relationship is consistent with the FEM and in contrast to the pooled OLS model. S is also significantly negative with a p-value of 0.0006, the highest yet for this control variable, and a z-ratio of -3.442. A coefficient of -0.0130481 is consistent with the second analysis and different from the first. L is also significant and negative in this model with a coefficient of -0.0242991 and a p-value below 0.0001 in line with the z-ratio not being between the critical values. The results are similar to model one and contradict model two in terms of significance. The other control variables G and EV turn out to be non-significant, which is in line with the results of the models above and is also seen in their z-ratios.

Hypothesis tests a, b, and c lead to the same results as in both previous models. The result is that dividend policy in the form of DY influences SPV at 95% confidence, while POR is not significant in this context.

To choose the more appropriate model between the pooled OLS model and the REM, the Breusch-Pagan test was performed and yields a p-value of 0, suggesting the presence of heteroscedasticity. Therefore, the null hypothesis is rejected with a confidence of 95 % and the REM is a better estimator than the pooled OLS model.

The Hausman test was then conducted to determine whether the FEM or REM is more appropriate for analysis in this study. The result indicates that the null hypothesis has to be rejected with a confidence level of 95% at a p-value of 8.61119e-09. Consequently, the FEM is the best fit for this study and the results will be used for discussion in the following section.

4. Discussion

The results of this study indicate that dividend policy influences the SPV of the analysed companies in the S&P 100. This finding is consistent with the research of Baskin (1989), Al-Shawareh (2014), Al Qudah & Yusuf (2015), Ahmad, Alrjoub & Alrabba (2018), Huseynov (2018), Karlsson & von Renteln (2021), Kengatharan & Suganya (2021), and Provaty & Siddique (2021). However, it contrasts with Abrar-ul-haq, Akram & Ullah (2015) who found evidence for the Miller and Modigliani theorem of dividend irrelevance. This discrepancy can be justified by the different methodologies and regression analyses used in their study, which was conducted in an emerging market and included only a small sample. This analysis of the S&P 100 found that DY positively influences the stock price risk with a coefficient of 0.481101, in opposition to Baskin's (1989) original study which found an inverse relationship between these variables of -4.205. Although the variables in his study were largely consistent with this and even though he also analysed the US stock market, the data structure was significantly different with a sample of 2,344 companies and a time period of more than 19 years, additionally, the data of some companies was incomplete. Furthermore, the regression analysis was considerably different, as he

used simple regression models. It must also be mentioned that his study was published in 1989 and it is therefore difficult to draw reasonable conclusions about the discrepancy between his study and this one. The study on the DAX by Karlsson & von Renteln (2021) and on the Jordanian stock market by Ahmad, Alrjoub & Alrabba (2018) also found a negative relationship with a coefficient of -0.499738 and -3.247 between DY and SPV, similar to Baskin (1989) and in contradiction with this study. Karlsson & von Renteln (2021) had a longer time horizon of 20 years compared to the 11 years of the present study. Their regression analysis varied as well, finding the greatest significance when using a FEM with a time-fixed effect and adding an additional control variable of free float percentage. The study by Ahmad, Alrjoub & Alrabba (2018) on the emerging market of Jordan was conducted with a larger sample of 228 companies over 7 time periods and using a generalised method of moments regression. These discrepancies can be seen as the reason for the different results. Moreover, these two studies conclude that the relationship between POR and SPV was significantly inverse with coefficients of -0.038439 for the DAX and -0.496 for the ASE, while the presented study found no significance. In fact, more studies find a negative relationship between these two variables, such as Al Qudah & Yusuf (2015) and Al-Shawareh (2014). Of these studies, Al Qudah & Yusuf (2015), indicates no significance for DY, while they conducted their study on industrial firms in the ASE which is intrinsically different from this study. Additionally, the results were obtained using multiple least-squares regression and adding industry dummy variables similar to Baskin (1989). Despite also finding an inverse relation between POR and SPV, of -0.0217, Al-Shawareh (2014) discovered a positive relationship between DY and SPV of 0.0297, which is in line with the results of this study. While Al-Shawareh (2014) found the same relationship between DY and SPV, analysing a time frame and sample size similar to this study with 12 years and a sample of 53 companies, the analysis was conducted on an emerging market, with the ASE being under study. The regression model is coherent, however, the only similar control variable is firm size, while he included share buybacks and stock dividends.

Several studies agree with the findings obtained in this research and find a positive relationship between DY and SPV, while the POR is found to be insignificant. The study by Huseynov (2018) yielded a coefficient of 0.0584 between DY and SPV while analysing the UK market, which is an established market similar to the US market. The time frame examined was only slightly shorter at 9 years, while the sample was larger at 58 companies. Due to the quarterly observation in this study, the number of 1,496 exceeds the 522 observations in his study. In contrast to the present case, financial services companies, real estate investment trusts, and premium equity trading companies were excluded due to their high fluctuations in share prices. The regression models also differed, as he used solely pooled OLS regressions excluding asset growth, while the best estimator in this study was the FEM. Another study with identical results was the study of the Sri Lankan stock market by Kengatharan & Suganya (2021), who found a coefficient of 0.4406 between DY and SPV. Although they found the same correlation, the study was conducted quite differently as it found the REM to be the most appropriate estimator when analysing 81 non-financial companies over five years. Provaty and Siddique's (2021) observation also supports the findings of this study with a coefficient of 0.1374392 between DY and SPV. They likewise concluded that the FEM was the best estimator, although they included additional lagging variables for DY and POR. Their focus was on the emerging market in Bangladesh by analysing 16 commercial banks and 11 financial institutions over a period of five years. Some of the firms in this study were also financial institutions, however, the US market is highly established and the analysed time frame was longer.

Apart from the independent variables, the only control variable that was found to be significant for the companies under study was the S. The relationship was negative at -0.0374698, in line with Al Qudah & Yusuf (2015), Huseynov (2018), and Kengatharan & Suganya (2021). This indicates that risk decreases as the size of the company increases, which is most likely because the firm is more robust to external factors due to increased diversification.

The results of the hypothesis tests indicate that DY is the main function of dividend policy in influencing stock price risk for the S&P 100 companies studied. This is clearly at odds with the Miller and Modigliani theorem (1961), as dividend policy seems to influence SPV. This could be because the theorem is based on many assumptions that do not apply to the US stock market, such as perfect market conditions, rational behaviour, and perfect certainty. This argumentation is in line with Brennan (1971).

5. Summary and Conclusion

The present study aimed to examine whether dividend policy has an impact on the stock price volatility in the S&P 100. If causality were to be assumed, this study has identified that between 2010 and 2020, the S&P 100 companies analysed could indeed influence their share price risk by adjusting their dividend policy, in particular their dividend yield. To reduce share price risk, they could lower the ratio between dividend and share price. Assuming that analysis of past data feeds into future forecasts, the board of directors can influence share price risk by adjusting dividend policy accordingly. These results are of great interest to the management of the companies studied, investors, policymakers, and consultants in the field.

A limitation of this study is the apparent autocorrelation of the data, but addressing this issue was beyond the scope of this paper. In addition, the sample size was only about one-third of the population because of the sample criteria. Another restriction is that no assumptions can be made about the population of the 100 companies in the index, as the FEM is the most appropriate estimator. The results are limited to the 34 firms under study.

Therefore this study should be repeated using a bigger sample, however, it is problematic to mix different data sources. The autocorrelation issue could be resolved in further research, for example by mathematically transforming the data, adding more control variables, enlarging the sample size, or adding dummy variables. Besides, it would be interesting to include other control and independent variables such as stock repurchase, stock dividend, retention ratio, profit after tax, earnings per share, return on equity, dummy variables, or lagging variables. Additionally, different regression models such as the time-fixed effect could be conducted to observe whether the results are robust. Industry-specific studies could provide information on whether the phenomenon under study is influenced by the sector of the companies, contradicting the original finding by Baskin (1989). Finally, the same methodology could be applied to other established markets or indices to evaluate if the effect carries over.

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