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Examining Volatility in Bank Stock Prices: A Comparative Exploration of Dividend Policies, Macroeconomic Influences, and Company-Specific Factors

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Abstract: *This study aims to ascertain and compare factors influencing stock price volatility in terms of dividend policy, macroeconomic and company specific aspects for selected subset of listed banks in Bangladesh. Eleven years of secondary data (from 2011 to 2021) for fifteen commercial banks (representing 61.5% market capitalization of the banking sector) was acquired from diverse sources. The dependent variable chosen is stock price volatility, whereas the dividend policy is initially represented by dividend payout ratio (PRt & PRt-1), dividend yield (DYt & DYt-1). Several firm and country-specific macroeconomic indicators are used as control variables. A methodical approach followed by panel data analysis has been employed to identify a suitable model that can yield more accurate estimators. Consequently, some diagnostic tests are also performed to account for diagnosed problems: contemporaneous cross-sectional correlation, group-wise heteroskedasticity and autocorrelation; Driscoll-Kraay standard error regression model is finally applied. The study not only found significant negative impact of dividend payout ratio but also spotted a significant influence of inflation, EPS, and firm size on stock price volatility. Price volatility influenced by "No dividend policy" can be reinvestigated from the aspect of behavioral finance in the future. Furthermore, this study also sheds light on to what extent firm-specific and macroeconomic influence impact stock price volatility in Bangladesh's banking sector.*

Keywords: *Stock Price Volatility; Dividend policy; firm-specific and macroeconomic variables, Banking sector; Panel data analysis.*

JEL codes: *G11, G35, G21*

1. Introduction

The stock market is regarded as one of the crucial and essential elements and acts as the primary channel of interactions between corporations and investors. The practice of investors in mobilizing savings and converting them into investments

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is what drives economic development. Many researchers have examined the financial decisions that concentrate to maximize a corporation's value, not only the distribution of earnings to the shareholders, but also the volatile circumstances experienced by corporations that eventually give rise to more difficulty in achieving acceptable level of performance, especially financial performance (Nguyen et al.,2021; Das, 2020; Khan et al.,2019). Therefore, corporate dividend strategy is considered as one of the most significant financial pronouncements that executives may take but as it remains debatable among policy makers, managers, researchers year after year; it is still a widely researched topic in financial field. When a company announces to increase the payout ratio, it sends a message to investors that the corporation anticipates higher earnings. Most research in this topic has been conducted within developed markets. A small number of papers have studied this issue within the framework of Bangladesh in recent times. However, price volatility isn't being impacted only by dividend payout decisions rather can be influenced by macroeconomic issues and firm specific factors. Earlier researchers (Baskin, 1989; Allen and Rachim, 1996; Hussainey et al., 2011; Ali et al., 2015; Provaty and Siddique, 2021; etc.) already evidenced the effect of payout decision on stock price volatility after adjusting company specific factors such as size of the firm, degree of leverage, profitability ratios, tax effect and so on. But no comprehensive study having both macroeconomic and company specific factors have not been examined earlier, particularly for the context of banking industry in Bangladesh. Therefore, the goal is to ascertain and compare factors influencing stock price volatility in terms of dividend policy, macroeconomic and company specific aspects for Bangladesh banking industry.

This study's hypothesis was based on thorough literature review to achieve the aforesaid objective. It is expected that this study will enlighten how dividend policy affects stock price volatility and can help mostly to the investors of banking industry of Bangladesh as well as to the policy makers before formulation of dividend policy strategies by incorporating both country and company specific aspects.

2. Review of Literature

Dividend policy and its impact on stock price volatility have always played a considerable issue in management's decisions. For more than half a century, company's dividend policy has been a common research topic (Gordon, 1963; Lintner, 1956; Miller, 1986) and it has been associated to several crucial firm-specific and market-specific factors. Stock volatility measures risk and represents how quickly a security's price fluctuates over a particular period. Both theoretical framework and empirical studies on stock price volatility in relation to dividend policy have been conducted over the years. Contradictory results have been found by researchers across the market and industry.

Among the theoretical framework of dividend policy, dividend irrelevance theory as proposed by Miller and Modigliani (1961); demonstrates that a company's

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worth is simply based on its ability to produce money from investments and is unaffected by how its earnings are distributed between dividends and retained profits. According to this theory, stock price movements have no connection with dividend policy. The MM idea was first criticized by Gordon (1963) and Lintner (1956), who argued that investors preferred a definite dividend today to an unreliable capital gain in the future. The Gordon-Linter argument was dubbed the "bird in the hand fallacy" by MM because, in his opinion, the majority of investors intend to invest again in shares of the same or comparable businesses, and because the vulnerability of the firm's cash flows to investors is ultimately determined by the uncertainty of operating cashflow. However, Fama (1991), Fama and French (1992), to explain stock returns, focused on dividends or other cash flow factors such as accounting earnings, investment, industrial production etc.

According to Ross et al. (2022), variation in the dividend payout ratio indicates management's opinion of the company's prospects and earning ability. A solid sign that management is confident in increased future earnings to cover the dividend payout increase is the increase in dividend payments made by the companies. However, the tax preference theory states that dividends are subject to a greater tax rate than capital gains. Additionally, capital gains are not taxed until the stock is sold, whereas dividends are taxed right away. Investors desire corporations that retain most of their earnings instead of distributing them out as dividends and are willing to pay little tax due to the tax benefits of capital gains over dividends. Therefore, a minimal payment ratio will reduce the cost of equity and raise the stock price (Ali et al., 2015).

In the past, Baskin's (1989) US study indicated that dividends might be used as an indicator for the risk of potential earnings. He investigated the importance of dividend policy as a factor influencing return volatility. He claimed a deep correlation between the price volatility measure and dividend yield as well as between payout ratio and price volatility. The coefficient of dividend yield remained high and very significant even after he incorporated control variables to account for the impact of business size, leverage, and earnings volatility. He suggested that a 2.5% fall in the yearly standard deviation of stock price changes would result in an increase of 1% in dividend yield.

Numerous empirical studies have been done to learn more about the connection between dividend policy and stock market volatility as a result of these divergent viewpoints. Hussainey et al. (2011) investigated the relationship between share price change and dividend policy proxy variables and discovered that corporate dividend policy is a significant influencer of stock price changes in the UK market based on the sample derived from London stock Exchange. They discovered a favorable association between dividend yield and stock price fluctuations, but an adverse rapport between stock price changes and dividend payout ratio. Additionally, their findings indicate that a company's growth rate, size, debt load, and earnings can all help to explain fluctuations in stock price.

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Allen and Rachim (1996) examined the linkage amongst stock price risk and dividend policy for 173 Australian listed businesses. The paper presents a cross-sectional regression analysis of the link between stock price volatility and dividend policy after adjusting for business size, leverage, earnings volatility and growth. Contrary to Baskin's (1989) US findings, there is no indication that dividend yield is associated with stock price volatility. Contrarily, as predicted, it turns out that there is a large negative association with the payout ratio and substantial affirmative associations between stock price volatility and earnings volatility and leverage.

Another study conducted by Sharma and Pandey (2014); on Indian Stock market examined dividend signaling and market efficiency in emerging economies. Their study revealed that the signaling effect doesn't work for changes in stock price associated with dividend increase/decreases along with financial results announcements. Al-Malkawi (2007) also didn't support signaling hypothesis as derived from his result in Jordan market. However, his research identified some influencing variables, like business size, age, and profitability, that affect corporate dividend policy in Jordan.

The consequences of dividend yield, payout ratio, EPS, return on equity, and profit after tax on stock prices have also been researched in Pakistan (Hunjra, et al., 2014), using a sample of 63 companies (including those in the industries of sugar, food, personal care, chemical, and energy). The result also indicates significant impact of dividend policy on stock price. However, their results are against dividend irrelevance theory as it showed while dividend payout ratio and stock price are favorably correlated, dividend yield and stock price are adversely correlated. Shah and Noreen (2016) conducted another research on a sample of 50 firms from non-financial sector listed at the same bourse identified a significant negative correlation between SPV and the dividend policy indicators, namely dividend payout ratio and dividend yield. The study also discovered a strong positive association between the control variables (asset growth, earnings volatility, and earnings per share) and stock price volatility. In the context of Pakistan's banking sector, Rehman et al. (2018) discovered a substantial negative connection between stock price volatility and dividend yield.

A crucial element in an investor's success is the accessibility of information in the market. Dissanayake and Wickramasinghe (2016) studied the stock price volatility based on earnings changes for 30 listed firms in Sri Lanka, including those in manufacturing, beverage, food, and tobacco. Based on their findings and the P/E Ratio and EPS of Sri Lankan companies, it was evident that the share price was substantially more volatile. Another study by Dewasiri and Banda (2014) is based on Sri Lanka's economy where the sample size was chosen from plantation, food/tobacco/ beverages, service and manufacturing sectors. The findings indicated that dividend policy significantly affects stock price volatility. High dividend payment companies would result in less volatile stock prices after accounting for business size and asset growth.

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Lashgari and Ahmadi (2014) conducted research on the same topic based on 51company's data selected from Tehran stock exchange. The study also found a substantial consequence of dividend policy on stock price volatility applying a fixed effect regression model. By using the panel data regression estimation method, Lotto's (2021) latest research on Tanzanian listed industrial enterprises also found a strong negative influence of dividend policy on stock price volatility.

On a research based on the Bangladeshi financial service industry conducted by Provaty and Siddique (2021) discovered a substantial positive alliance between dividend yield and stock price volatility across the chosen companies. Hossin and Ahmed (2020) attempted to examine the same study on firms chosen from the Ceramics, Food & Allied, and Cement industries listed at DSE index. "Fixed effect" and "Random effect" models have been run using panel data to elucidate the link between dividend payments and stock prices after various variables, such as EPS, logarithm of growth of asset, profit after tax and dividend payout ratio, have been adjusted. This paper also reveals weak form of market existence in Bangladesh and concludes investor's preference for stock dividend instead of cash dividend.

Earlier research on Bangladeshi banking industry was examined by few researchers. Among them Rahman et al. (2012) collected their primary information for selecting variables through structured closed end questionnaire. After that empirical analysis was done to evaluate rigorously the effect of dividend policy on company value using data from four financial years. Their findings are consistent with dividend relevance theory. The study also showed that there are fourteen issues that affect dividend policy, but the primary six are shareholder preferences, dividend stability, cash flows, board decisions, inflation, and capital market conditions. Another study on banking industry performed by Masum (2014) discovered that dividend yield had a negligible influence on stock prices.

The consequences of dividend policy on price volatility have also been examined by Sultana (2021) through a comparative study of DSE listed 35 manufacturing companies having sixteen years study period. Multiple regression analysis has identified a significant inverse association between stock price volatility and dividend policy. Moreover, by employing a simultaneous equation model, a fixed effect model, and pooled OLS; comparative analysis has been performed. Earlier, Rashid and Rahman (2008) applied cross-sectional regression analysis to conduct a study on 104 nonfinancial companies chosen from a variety of industries, adjusting for payout ratio, earning volatility, company size, debt, and asset growth. Research has demonstrated a relationship between stock price volatility and dividend yield, though statistically insignificant.

3. Research Gap Identification Followed by Hypothesis Development

From the previous works in this area, it is identified that few research have been conducted in banking industry of Bangladesh in recent years. However, most of them considered those banks which are distributing only cash dividend. Also,

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their studies were limited to only firm specific variables, whereas macroeconomic indicators may have some impact on stock price volatility. Therefore, based on earlier research on this topic, this study aims to specify the legitimacy of the hypothesis-

Ho_1: Stock price volatility is not significantly influenced by Bank dividend policies.

Ho_2: Firm and country specific factors have less impact on stock price volatility than dividend policy decisions.

4. Sources and Sampling of Data

There are currently 34 Banks listed under DSE (Dhaka Stock Exchange). Among them, only fifteen commercial banks were selected that constitute about 61.5% of the market capitalization (Appended Part-Table:1) of the banking sector. Secondary data have been used in this research which is collected from the websites of the respective banks as well as from their annual reports. However, to get the best possible result from this research, 11 years of data are collected for the years 2011 to 2021. To acquire suitable variables required for this research, raw data were used to perform some calculations. Theoretical underpinnings developed by Baskin (1989), Allen and Rachim (1996), and Provaty and Siddique (2021) are presented prior to the investigation. However, it is different from them in the following ways:

i) It considers only selected banks that are listed in the primary bourse of Bangladesh.

ii) It includes banks that have been disbursing dividends (Cash/Stock i.e., no dividend policy/both cash & stock) for at least 11 years.

iii) It considers some country-specific control variables along with firm-specific control variables.

4.1 Description of the variables

4.1.1 Dependent Variable

Stock Price Volatility (SPV): Stock price volatility serves as dependent variable of the study. To obtain the required variable, firstly the monthly adjusted stock price for every single month of a year has been calculated. From there, both high and low price of share for every year is obtained to originate price volatility data. For this, the high and low prices have been averaged, then squared. This method involved averaging stock price over all available years, followed by a square root conversion to produce a variable that matched standard deviation. Instead of using closing and opening share price, this method is mostly used by previous researchers (Baskin, 1989; Shah and Noreen, 2016; Lotto, 2021; Provaty and Siddique, 2021; etc.) to get price volatility information. Stock price Volatility (PV) formula is as under:

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$$\textbf{Standard deviation of stock price} = \sqrt{\frac{\textbf{High} - \textbf{Low}}{\left(\frac{\textbf{High} + \textbf{Low}}{\mathbf{2}}\right)^{\mathbf{2}}}}$$

4.1.2 Independent Variables

Dividend Yield: A company's dividend yield measures how much of its annual dividend payments are made relative to the price of its stock. Dividend yield for the current year is computed by dividing dividend per share (DPS) by the current market value per share. However, based on dividend yield received in the previous year, investor trades in shares and expects dividend yield for present year. Therefore, dividend yield with a 1-year lag period is considered to find separate influence on stock price volatility. This same procedure is seemed to be more rational as used by most of the researchers. (Baskin, 1989; Shah and Noreen, 2016; Lotto, 2021; Provaty and Siddique, 2021; etc.). Formula for dividend yield of both present year and previous year is as follows:

$$(\mathbf{DY}) = \frac{\textbf{Dividend Per Share}}{\textbf{Market Price Per Share}}$$

$$(\textbf{DYt} - \mathbf{1}) = \frac{\textbf{Dividend Per Share of previous year}}{\textbf{Market Price Per Share of previous year}}$$

Dividend Payout ratio: Dividend payout ratio is the chunk of a company's net earnings that is paid out to shareholders as dividends. Dividend per share (DPS)is divided by earnings per share (EPS) to generate dividend payout ratio of the present year. Only cash dividend has been considered to calculate DPS. That means in case of stock dividend, DPS equals to zero has been considered. However, to find any lagged impact of the payout ratio, payout ratio of immediately preceding year has been considered too in this study. (Shah and Noreen, 2016; Lotto, 2021; Provaty and Siddique, 2021; etc.)

$$\textbf{PRt} = \frac{\textbf{Dividend Per Share}}{\textbf{Earnings Per Share}}$$

$$\textbf{PRt} - \mathbf{1} = \frac{\textbf{Dividend Per Share of previous year}}{\textbf{Earnings Per Share of previous year}}$$

4.1.3 Control Variables

Firm Size: Size of the firm has an impact on dividend policy and thus it is used as one of the control variables in this research. Natural logarithm of total asset of the banks is used to calculate firm size (Provaty and Siddique, 2021).

Size= Ln (Total Assets)

Leverage: To measure the degree of financial risk, the control variable leverage has been used. It is computed by dividing the bank's total debt by its total assets (Baskin, 1989; Shah and Noreen, 2016; Lotto, 2021; Provaty and Siddique, 2021).

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$$Leverage = \frac{Total\ Debt}{Total\ assets}$$

Earnings Per Share (EPS): As a proxy of profitability, earnings per share is used in this research. The variable earnings per share can be derived by dividing net income after taxes by the total number of outstanding shares (Ahmed et al., 2014; Hossin and Ahmed, 2020; Provaty and Siddique, 2021).

$$EPS = \frac{Net\ income}{Number\ of\ shares\ outstanding}$$

Asset growth (AG): Growth of assets can influence the dividend policy and thus can create stock price volatility. The control variable asset growth rate is calculated as the percentage increase or decrease in total assets from immediate last year's total assets (Hossin and Ahmed, 2020; Provaty and Siddique, 2021).

$$Asset\ growth = \frac{Total\ Asset(t) - Total\ Asset(t-1)}{Total\ Asset(t-1)}$$

Earnings volatility (EV): As a proxy of market risk, earnings volatility is used in this study by firstly dividing Earnings before interest and taxes (EBIT) by total asset and then the standard deviation of this result is used for all the years for each bank (Rashid and Rahman, 2008; Provaty and Siddique, 2021).

$$EV = \text{STDEV of } (\frac{EBIT}{Total\ Assets})$$

NPL ratio (NPL %): Non-performing loan to gross loan ratio is frequently used as a proxy for the health and asset quality of a bank. Bank's financial performance is highly impacted by bank's NPL ratio and thus there may have some impact on bank's stock price volatility.

$$NPL\ ratio = (\frac{Total\ nonperforming\ loans\ (NPLs)}{Total\ Gross\ Loans})$$

GDP growth Rate (GDP GR): Economic progression measured by gross domestic product (GDP) can help companies forecast and estimate how their industry will move in the near future and how they may make the best of the booming economy. On the flipside, companies may choose to spend consciously and prudently to sail through in a slow economy which can influence the company's stock price. Therefore, it demands to examine any impact of GDP growth rate on stock price volatility.

Inflation(I): Inflation is the rate of increase in prices or growth in cost of living in a country over a given time frame. With high inflation, companies face difficulties maintaining or improving their profit margins, which ultimately harms company's overall performance. Inflation volatility has impact on financial market volatility (Gruen 1996). The influence of inflation on stock price volatility has thus been examined in this study.

Broad Money Growth rate (MG): Broad money growth rate is an indicator/tool of country's monetary policy. When broad money growth rate is high resulting in

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greater money supply, people tend to invest in risky assets and vice versa. Therefore, to identify any impact on stock price volatility, broad money growth rate has been included.

Weighted Average Lending Rate (WALR): When lending rate is low in an economy, businesses can get finance easily at a cheaper rate. Consequently, the debt ratio of the respective company with increase. Fundamentally firms having higher debt ratio show greater EPS (Earnings per share). However, when lending rate goes up again, firms having higher debt ratio face drastic fall in EPS, creating subsequent stock price volatility.

5. Research Methodology

As mentioned in the above-proposed variables table, to inspect the association between earning distribution policy i.e., dividend policy and stock price volatility of selected companies listed in DSE, a generalized form of the statistical study can be represented as follows:

$$Y = f(P, C, \varepsilon)$$

Where,

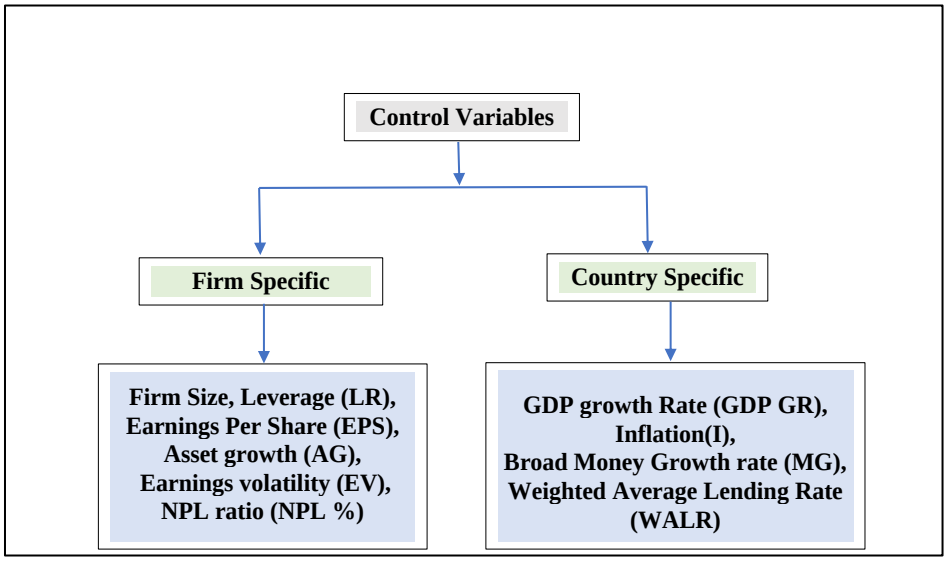
Y= stock price volatility proxy,

P= Dividend policy proxy variables,

C=control variables

and ε= error term.

Dividend yield for present year and dividend yield with a 1-year lag period; Dividend payout ratio of present year and Dividend payout ratio with a 1-year lag period are considered as dividend proxy variables. Control variables are considered based on two categories as follows.



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Therefore, the proposed study initially uses the following equation for running the regression model:

$$Y= \alpha+ \beta 1\ DY_t, + \beta 2\ DY_{t-1} + \beta 3\ PR_t + \beta 4\ PR_{t-1}+ \beta 5\ Size + \beta 6\ EPS + \beta 7\ EV + \beta 8\ LR + \beta 9\ AG + \beta 10 NPL\% + \beta 11 GDP\ GR + \beta 12 I + \beta 13 MG + \beta 14 WALR + \varepsilon$$

Where, β1, β2 ……. β 14 represents coefficients of parameter estimates.

α is constant.

ε the error elements, which considers additional potential influences that the model did not take into consideration.

Statistical Analysis Method

Numerous empirical tests were carried out to determine the validity of the research's hypothesis such as descriptive statistics, correlation matrix, Ordinary Least Squares (OLS) regression are run based on the specified regression model. After that, based on correlation analysis, a stepwise model selection strategy has been conducted to find appropriate model that can produce estimators with better accuracy.

Naturally, the data used in this research are panel data which is also termed longitudinal data or cross-sectional time-series data. Therefore, panel data analysis is applied to figure out the best-fitted regression model. Some diagnostic tests are also performed to discover whether there are any heteroskedasticity, cross-sectional dependency and autocorrelation effects present in the data set. Moreover, to account for contemporaneous cross-sectional correlation, group-wise heteroskedasticity and autocorrelation, Driscoll-Kraay standard error regression model is applied. Microsoft Excel, SPSS (version 26) and Stata (14) have been used for all the preparation & analysis of data.

6. Empirical Results and Discussions

The findings of individual statistical techniques are discussed in each subsection below.

6.1 Summary of descriptive statistics

Following table displays key outcomes of descriptive statistics:

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Table-1: Summary of Descriptive Statistics

Variables Name	Total observations	Mean	Standard Deviation	Min	Max
Stock Price Volatility (PV)	165	0.1417	0.0448	0.0548	0.2960
Dividend Yield (DYt)	165	0.0384	0.0333	0.0000	0.1400
Dividend Yield (Dyt-1)	165	0.0346	0.0335	0.0000	0.1400
Dividend Payout (PRt)	165	0.3143	0.2514	0.0000	1.1700
Dividend Payout (PRt-1)	165	0.2755	0.3043	-1.7900	1.1700
Firm Size (Size)	165	26.2511	0.5527	25.0400	28.1200
Profitability (EPS)	165	3.3915	2.6056	0.3300	21.0000
Earnings Volatility (EV)	165	0.0073	0.0018	0.0000	0.0100
Leverage (LR)	165	0.9119	0.0929	0.1200	1.2400
Asset Growth (AG)	165	0.1478	0.0749	-0.0600	0.4200
NPL Ratio (NPL%)	165	0.0463	0.0148	0.0137	0.0903
GDP Growth rate (GR)	165	0.0645	0.0108	0.0552	0.1017
Inflation(I)	165	0.0674	0.0148	0.0552	0.1017
Broad Money Growth (MG)	165	0.1423	0.0353	0.0924	0.2134
Weighted Average Lending Rate(WALR)	165	0.1065	0.0219	0.0718	0.1380

From the summary table of descriptive statistics, it is noted that the typical dividend yield (DYt) for the selected banks was 3.84%, dividend payout ratio (PRt) was 31.43% of total yearly net income. On average, the degree of leverage as measured by leverage ratio was around 91% whereas banks' assets were growing at 14.78% as indicated by asset growth. Average earnings per share for the selected period was BDT 3.39. Throughout the study period, banks' average percentage of NPL to total loans and advances and average GDP growth rate was around 4.6% and 6.45% respectively. Country faced highest inflation at the rate of 10.17% but mean inflation rate stands at 6.74%. Weighted average lending rate in the economy for the study period was 10.65%. Among all, the highest standard deviation is on the control variable-EPS due to variation in earnings from bank to bank. The lowest is found on control variable-Earnings volatility (0.18%).

6.2 Analysis of correlation among the variables

Table-2 portrays correlation among all the variables studied in this research. From the correlation matrix, it is seen that the dependent variable stock price volatility (PV) has an insignificant and very weak negative correlation with both dividend yield (DYt) of the present year and dividend yield of one year lag (Dyt-1). The dependent variable stock price volatility (PV) also shows insignificant negative correlation with independent variable payout ratio of one year lag (PRt-1) but significant negative correlation with payout ratio of present year PRt.

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Table-2:Correlation Matrix

Correlations

	PV	(DYt)	(Dyt-1)	(PRt)	(PRt-1)	Size	(EPS)	EV	LR	AG	NPL%	GDP GR	I	MG	WALR
PV	1														
(DYt)	-0.018	1													
	0.822														
(Dyt-1)	-0.056	.524**	1												
	0.479	0.000													
(PRt)	-.158*	.846**	.495**	1											
	0.043	0.000	0.000												
(PRt-1)	-0.115	.379**	.746**	.468**	1										
	0.141	0.000	0.000	0.000											
Size	-.442**	0.125	.218**	.226**	.232**	1									
	0.000	0.111	0.005	0.004	0.003										
(EPS)	-.356**	-0.117	-0.088	-0.123	-0.026	0.024	1								
	0.000	0.134	0.260	0.114	0.740	0.755									
EV	0.093	-0.015	0.006	0.030	0.041	0.029	-.215**	1							
	0.233	0.847	0.937	0.705	0.597	0.712	0.006								
LR	-0.072	-0.008	0.127	0.013	0.105	.173*	-0.033	0.042	1						
	0.361	0.920	0.104	0.865	0.181	0.026	0.675	0.593							
AG	-0.016	-.284**	-.300**	-.288**	-.280**	-.266**	0.082	-0.100	-0.043	1					
	0.834	0.000	0.000	0.000	0.000	0.001	0.293	0.201	0.585						
NPL%	.264**	-0.010	0.063	-0.013	0.048	-0.140	-.266**	0.054	-.161*	-.260**	1				
	0.001	0.895	0.421	0.866	0.540	0.073	0.001	0.490	0.039	0.001					
GDP GR	-0.029	-0.062	-0.064	-0.049	-0.065	-0.026	0.028	0.000	0.051	0.040	.214**	1			
	0.711	0.430	0.412	0.531	0.409	0.737	0.719	1.000	0.511	0.611	0.006				
I	0.052	-.300**	-.411**	-.266**	-.311**	-.629**	0.067	0.000	-0.144	.452**	-.199*	-0.150	1		
	0.507	0.000	0.000	0.001	0.000	0.000	0.392	1.000	0.066	0.000	0.011	0.054			
MG	0.113	-0.148	-.221**	-0.146	-.160*	-.570**	0.047	0.000	-0.120	.377**	-.182*	-.164*	.842**	1	
	0.148	0.058	0.004	0.062	0.040	0.000	0.546	1.000	0.124	0.000	0.019	0.035	0.000		
WALR	.165*	-.215**	-.381**	-.173*	-.273**	-.688**	0.036	0.000	-.188*	.332**	0.115	0.104	.794**	.661**	1
	0.034	0.006	0.000	0.026	0.000	0.000	0.642	1.000	0.016	0.000	0.141	0.185	0.000	0.000	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Firm size, Earnings per share (EPS) have significant negative correlation with Stock price volatility. That means if stock price volatility reduces with the increase in firm size and earnings per share and vice versa. Moreover, the percentage of NPL to total loans & advances, Weighted Average lending rate has significant positive correlation with the dependent variable stock price volatility. That indicates a rise in NPL ratio and an increase in the weighted average rate of country will raise stock price volatility.

Apart from these, some significant strong correlation is detected among the independent and control variables. For example, dividend yield of one year lag period (Dyt-1), both payout ratio of present year (PRt) and payout ratio one year lag (PRt-1) period have significant strong correlation with other independent variable dividend yield of present year (Dyt). Control Variable asset growth (AG) has significant and strong correlation with almost all variables except our dependent variable. Moreover, Broad money growth also has a significant strong correlation with another control variable inflation. Therefore, including these correlated variables altogether in the same model can create multicollinearity problem and thus biased estimation of result. Hence it is necessary to reform regression model only with those variables which show significant correlation with dependent variable. As the independent variables are deeply correlated with

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themselves, stepwise model specification process has been performed next to select appropriate model in this study with better estimates.

6.3 Outcome from the initial OLS models and model selection

Based on our result from correlation matrix, step by step model selection procedure is performed (Table-3) for robust model improvement through OLS regression model. Here stock price volatility has been used as dependent variable; Size, EPS, NPL Ratio, GDP growth rate, Inflation and weighted average lending rate as control variables for all the models; Dividend yield of current year (Dyt),Dividend yield of 1-year lag period(Dyt-1), Payout ratio of present year(PRt) and Payout ratio of 1year lag period (PRt-1) has been considered as independent variable in Model-1, Model-2, Model-3 and Model-4 separately.

Table-3: Outcome from the initial OLS models and model selection

Dependent Variable: Stock Price volatility				
	Model-1	***Model-2***	***Model-3***	***Model-4***
Independent Variables	(DY)	(Dyt-1)	(PRt)	(PRt-1)
(DY)	-0.1269			
(Dyt-1)		-0.148		
(PRt)			-0.0299*	
(PRt-1)				-0.0146
Control variables				
Size	-0.0527**	-0.0528**	-0.0499**	-0.0513**
EPS	-0.0054**	-0.0053**	-0.0056**	-0.0052**
NPL Ratio	0.07807	0.12523	0.05443	0.13281
GDP Growth rate	-0.4764	-0.4738	-0.5077	-0.4707
Inflation	-1.2499**	-1.2131**	-1.3324**	-1.1726**
Weighted Average Lending Rate	0.09329	0.02184	0.17244	0.05701
Constant	1.64903**	1.65583**	1.58068**	1.60664**
R Squared	0.397	0.3992	0.4139	0.3981
Adjusted R Squared	0.3701	0.3724	0.3878	0.3712
F Stat	14.77	14.9	15.84	14.83
Prob > F	0.0000	0.0000	0.0000	0.0000

*. At 0.05 threshold level, the result is significant.
**. At 0.05 threshold level, the result is significant.

Model-1: Influence of Dividend Yield of present year (DY) on stock price volatility

From the result attained from model 1 it is seen that a 1 percent increase in stock price volatility occurs with 12.69% decrease in dividend yield insignificantly. R squared and adjusted R squared value for model 1 is 39.7% and 37% respectively.

Model-2: Impact of Dividend Yield of 1 year lag period (Dyt-1) on stock price volatility

In model 2, it is also found that dividend yield of 1 lag year period (Dyt-1) has insignificant negative impact on stock price volatility. However, the explanatory power has increased somewhat higher than the previous one as adjusted R squared has improved from 37% to 37.24%.

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Model-3: Effect of payout ratio (PRt) on stock price volatility

A significant negative influence of payout ratio on stock price volatility is observed in model-3. At present year, around 3% increase in payout ratio can decrease 1% stock price volatility. Like Model 1 & Model 2; firm size, EPS and inflation have significant impact on stock price volatility. R squared and adjusted R squared value for model 3 increases and stands at the highest at 41.39% and 38.78% respectively.

Model-4: Impact of payout ratio of 1year lag period (PRt-1) on stock price volatility

From the result of model-4, it is seen that, payout ratio of immediate previous year has no significant impact on stock price volatility. R squared and adjusted R squared value for model 4 becomes lesser than model 3 and thus it is not acceptable for further analysis in this study.

From the synopsis of Table: "Outcome from the initial OLS model and model selection", it is noted that adjusted R squared value improves and stood highest at Model 3. After that at Model 4 it reduces again. Firm size, EPS, Inflation and Value of constant shows significant impact on price instability in all models but among the independent variables, only payout ratio of the present year (PRt) shows significant impact on stock price volatility.

Therefore, from the comparative analysis of OLS models, Model 3 is the optimum model to be used in this study. So, after excluding variables, the new regression equation stands at as follows:

$$Y = \alpha + \beta 1\ PRt + \beta 2\ Size + \beta 3\ EPS + \beta 4NPL\% + \beta 5GDP\ GR + \beta 6I + \beta 7WALR + \varepsilon$$

Before Jumping into conclusion, with this newly developed equation, various diagnostics tests are run to understand any problem of multicollinearity, heteroskedasticity, autocorrelation within the data. From the "Breusch-Pagan / Cook-Weisberg test" for heteroskedasticity, it is determined that this model has no problem of heteroskedasticity (Prob > chi2 = 0.2314). (Appended Part-Table:2)

Also, the problem of multicollinearity has not been detected in the data set as measured by mean VIF=2.27 (Appended Part-Table:3) However, existence of autocorrelation in the panel data has been detected as measured by the "Wooldridge test" for autocorrelation in panel data (Prob>F = 0.0066). (Appended Part-Table:4) Therefore, Panel data analysis has been performed in the next.

6.4 Panel Data Analysis

In this section, both the "Random effect model" and "Fixed effect model" regressions are used to analyze the panel data set. Asset size, capital size, the number of shareholders and outstanding shares, the type of business, the amount of revenue generated by the company, etc. are all factors that vary depending on the company. Random Effect Model is therefore employed when the sample's

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attributes change. The technique of the Random effect model fits to clarify the differentiation among the companies. However, for a static period, the Fixed Effect Model is employed to constraint the stable features of the firms. This method is renowned for eliminating biased data and subsequently producing better statistical results. Moreover, between these two models, which one is appropriate for our study is determined by another test named the "Hausman specification test". Similar approaches are also applied in their research by Provaty and Siddique (2021), Hossin and Ahmed (2020), Rashid and Rahman (2008), and many more.

6.4.1 Random Effect Model

The outcome of random effect model is displayed in appended Part- Table:5. From the random effect regression model exhibited in appendix table 5. From the result table, it is observed that dividend payout ratio has an insignificant negative influence on stock price volatility respectively and firm size, EPS, GDP growth rate and inflation have significant negative impact on stock price volatility.

6.4.2 The 'Breusch and Pagan Lagrangian multiplier test' for random effects

Another test called "Breusch and Pagan Lagrangian multiplier test" has been undertaken to contrast the baseline OLS regression model and the random effect model (Appended Part Table:6). According to the result of this test, chibar2(01) = 109.39, Prob > chibar2 = 0.0000; between OLS and Random effect model regression, the Random effect model is best fitted.

6.4.3 Fixed Effect Model

Appended Part-Table:7 exhibits the outcome of fixed effect model. From the result of fixed effect model, it is understood that among all the variables, Dividend payout ratio has insignificant positive impact and firm size and GDP growth rate, inflation has significant negative effect on stock price volatility as per fixed effect model.

6.4.4 Hausman Specification Effect

Summary of the Hausman specification effect result is presented below in table 4. The Hausman specification test decides which of the Fixed effect and Random effect models is more applicable for this inspection. The alternative hypothesis is to use a fixed effect model in this situation, while the null hypothesis is to use a random effect model.

Table-4: Result of Hausman Specification Test

Coefficients				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	random	Difference	S.E.
PRt	.0017996	-.0027205	.0045202	.0028763
Size	-.0739578	-.0639628	-.009995	.0109853

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EPS	-.0023325	-.0034774	.0011449	.0009383
NPL %	-.1227993	-.0947157	-.0280836	.0270288
GDP GR	-.460329	-.4550465	-.0052824	.
I	-1.523543	-1.421423	-.1021198	.112357
WALR	-.0829322	.0291659	-.1120981	.1277534

Test: Ho: Differences in coefficients are not systematic
$Chi^2(6) = 14.84$ Prob>chi^2 = 0.0381
Source: Using Stata 14, the authors' own estimation

Here from the output of Hausman specification test it is noted that chi-square value is 14.84 with a probability of 0.0381 which is less than 5%. Therefore, to portray the relationships between the study's variables, fixed effect model regression is more suitable than random effect model. Before making a final decision regarding the study, it is essential to conduct certain diagnostic tests. Several diagnostic tests have been performed at this stage concerning contemporaneous correlation test, group-wise heteroskedasticity test and also autocorrelation test.

Cross-sectional independence testing: From the "Pesaran's test" of cross-sectional independence, it is found that P value is 0.0050 which is less than 5%. Therefore, there is cross-sectional dependence in this data set. Result is presented in appended part on Table:8

Group-wise heteroskedasticity test:

According to the result achieved from Wald test for group-wise heteroskedasticity (appended part Table:9), P-Value > $Chi^2(11)$ 0.0000 which is less than 5%; it means the null hypothesis for the test is rejected and accepts the alternate hypothesis which indicates panel group-wise heteroskedasticity.

Test of autocorrelation:

Wooldridge test has been conducted to check autocorrelation in the dataset. In this test, Null hypothesis was No first-order autocorrelation. From the output result (Appended Part Table:10), Prob > F = 0.0066 which is less than 5%. That means null hypothesis for this test is rejected and we conclude the existence of autocorrelation in the dataset.

6.4.5 Driscoll-Kraay standard error regression model

To account for group-wise heteroskedasticity, cross-sectional dependence and autocorrelation, Driscoll-Kraay standard errors regression model is performed. Result of the test is summarized as below in table 5. From the above regression model, it can be understood that the group of predictor variables can reliably estimate the response variable as the Prob > chi^2 is minuscule. Coefficients in the model are different than zero. Our regression model stands as follows:

$$PV = 1.58 - 0.0298PRt - 0.0498\ Size - 0.0056EPS + 0.0544NPL\% - 0.50768\ GDP\ GR - 1.3323I + 0.17244\ WALR + \varepsilon$$

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Table-5: Driscoll-Kraay standard errors regression model

			R-squared = 0.4139; F(7,10)=126.29 Prob > chi^2 = 0.0000	
PV	**Coef.**	**Drisc/Kraay Std. Err.**	**t**	**P>|t|**
PRt	-.0298943	.0084934	-3.52	0.006
Size	-.0498556	.0107636	-4.63	0.001
EPS	-.0056274	.0009387	-6.00	0.000
NPL %	.05443	.2040978	0.27	0.795
GDP GR	-.5076828	.2480085	-2.05	0.068
I	-1.332392	.452962	-2.94	0.015
WALR	.1724429	.2169111	0.79	0.445
Constant	1.580682	.3197064	4.94	0.001

After examining predictor variables separately, it can be reasonably declared that the higher dividend payout ratio of the present year (DYt) can reduce stock price volatility of the banks within the study period at a moderate level significantly. It means, stocks with higher dividend paying are considerably responsible for the change in price volatility. Firm size has substantial negative influence on stock price volatility. Holding others thing constant, around 5% increase in asset size can decrease stock price volatility. Other control variable, EPS as a proxy of profitability, also shows considerable and tiny negative impact on price volatility. Moreover, among the country specific control variables, inflation has shown a strong negative relationship with stock price volatility very significantly. Inflation impacts stock market adversely also detected by researchers (Boons et al., 2020). However, in an efficient market, asset price volatility would simply reflect volatile economic fundamentals as quoted by Gruen (1996). The control variables NPL% and weighted average lending rate of the country show positive but insignificant impact on stock price volatility. It means when the weighted average lending rate of the country and percentage of NPL to total loans and advances of a bank goes up, investors react positively and thus stock price volatility occurs.

7. Summary of the Key Findings and Conclusion

The table below provides a summary of the study's main findings:

Table-6: Summary of the findings

Variable Type	Factors	Proxy	Outcome	Magnitude Level
Dependent Variable	Stock Price Volatility	Standard Deviation of stock price	-	-
Independent Variables	Dividend Yield	Dividend Yield of the present year (DYt)	Insignificant	-
		Dividend Yield of immediate previous year (Dyt-1)	Insignificant	-

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Variable Type	Factors	Proxy	Outcome	Magnitude Level
	Dividend Payout Ratio	Dividend Payout Ratio of the present year (PRt)	Significant, Negative	-0.0298
		Dividend Payout Ratio of previous year (PRt-1)	Insignificant	-
Control Variables	Firm Specific	Natural log of total assets (Size)	Significant, Negative	-0.0498
		Earnings Per share (EPS)	Significant, Negative	-0.0056
		Earnings Volatility (EV)	Insignificant	-
		Leverage (LR)	Insignificant	-
		Asset Growth (AG)	Insignificant	-
		NPL Ratio (NPL%)	Insignificant	-
	Country Specific	GDP Growth rate (GR)	Insignificant	-
		Inflation(I)	Significant, Negative	-1.3323
		Broad Money Growth (MG)	Insignificant	-
		Weighted Average Lending Rate (WALR)	Insignificant	-

After analyzing our results, we can get the following findings:

i. Among the dividend policy proxy variables in this study Dividend payout ratio of present year has significant negative influence on the stock price volatility of the banking industry. That means this study rejects the (Ho_1) of this research and revealed that higher dividend paying banks have possibility to face lower stock price volatility and vice versa. The obtained result is in accordance with Baskin (1989); Hussainey et al. (2011); Dewasiri and Banda (2014); Lotto (2021); Provaty and Siddique (2021) etc.

ii. Among the other control variables, both firm size and EPS have significant adverse influence on stock price volatility. That means firms/companies that are large enough, shows lower stock price volatility. Normally information of larger firms is more available to public than that of lower size firms and thus size influences on stock price volatility. Smaller companies tend to be less diversified than larger companies, so their stock values will be more volatile when compared to those of larger companies (Allen and Rachim, 1996). On the other hand, if earnings per share inclines, stock price volatility declines and vice versa for the selected companies. The explanatory power of some control variables is somewhere stronger and somewhere weaker over stock price volatility. NPL% and weighted average lending rate of the country have insignificant positive impact on the dependent variable. However, we observed macroeconomic

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indicator inflation has a very significant adverse impact on stock price volatility. So, this research also rejects (Ho_2) as both firm and country specific factors have significant influence on price volatility.

In conclusion, it can be noted that dividend policy for the banking industry provides signal to the investors and can reduce stock price volatility. This result is quite similar to other studies as demonstrated by Baskin (1989); Hussainey et al. (2011); Dewasiri and Banda (2014); Lotto (2021); Provaty and Siddique (2021) etc; but in contrast to result obtained by Allen and Rachim (1996); Sharma and Pandey (2014); Masum (2014). However, it is also noted that dividend policy is not solely responsible for stock price volatility. The significant negative impact of some firm specific control variables (asset size and earnings per share) as well as country specific control variables (inflation rate) is responsible for price volatility of bank's stock. Any other explanatory factor such as investor's behavioral issues, degree of information asymmetry etc. which may impact both dependent and independent variables; can be included further to reduce endogeneity problem, if exists. Therefore, other than dividend policy, window for future research still opens for searching and incorporating other variables such as behavioral aspects of investors, degree of market efficiency, level of political turbulence, change in macroeconomic policy etc. when examining stock price volatility.

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Appended Part

Table 1: Market Share calculation based on Market Capitalization

Serial	Bank Names	Market Capitalization in BDT Million	% of Sector Total
1	Bank Asia Ltd.	23,551.319	3.54
2	BRAC Bank Ltd.	57,618.535	8.65
3	The City Bank Ltd.	26,173.227	3.93
4	Dhaka Bank Ltd.	12,535.047	1.88
5	Dutch-Bangla Bank Ltd.	43,553.95	6.54
6	Eastern Bank Ltd.	34,124.501	5.13
7	IFIC Bank Ltd.	20,537.976	3.08
8	Islami Bank Bangladesh Limited	53,129.692	7.98
9	Mercantile Bank Ltd.	14,754.339	2.22
10	National Credit and Commerce Bank Ltd.	14,594.132	2.19
11	Premier Bank Ltd.	14,915.911	2.24
12	Prime Bank Ltd.	21,626.614	3.25
13	Pubali Bank Ltd.	26,838.479	4.03
14	Trust Bank Limited	27,165.746	4.08
15	United Commercial Bank Ltd.	18,281.076	2.75
	Total	**409,400.544**	**61.49**
	Sector Total	**665,776.447**	

Table 2: Breuscg-Pagan/Cook-Weisberg test for heteroskedasticity

$Chi^2(1)=1.43$; Prob> $Chi^2 = 0.2314$

Source: Using Stata 14, the author's own estimation

Table 3: Test of multicollinearity

Mean VIF=2.27

Source: Using Stata 14, the author's own estimation

Table 4: Wooldridge test for autocorrelation in panel data

Ho: No first order autocorrelation; F(1,14)=10.132; Prob>F = 0.0066

Source: Using Stata 14, the author's own estimation

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Table 5: Summary result of Random effect model

Random-effects GLS regression — Number of obs = 165
Group variable: bankid — Number of groups = 15

R-sq:
within = 0.2501
between = 0.4552
overall = 0.3700

Obs per group:
min = 11
avg = 11.0
max = 11

Wald chi2(7) = 60.25
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

stockpricevolatilitypv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dividendpayoutprt	-.0027205	.010839	-0.25	0.802	-.0239647	.0185236
firmsize	-.0639628	.0117433	-5.45	0.000	-.0869793	-.0409463
profitabilityeps	-.0034774	.0015199	-2.29	0.022	-.0064563	-.0004985
nplratio	-.0947157	.197323	-0.48	0.631	-.4814617	.2920302
gdpgrowthrate	-.4550465	.2136643	-2.13	0.033	-.8738208	-.0362723
inflation	-1.421423	.333503	-4.26	0.000	-2.075077	-.7677691
weightedaveragelendingrate	.0291659	.2375452	0.12	0.902	-.4364141	.494746
_cons	1.959965	.3341209	5.87	0.000	1.3051	2.61483
sigma_u	.02271915					
sigma_e	.02650248					
rho	.42358828	(fraction of variance due to u_i)				

Source: Using Stata 14, the author's own estimation

Table 6: Breusch and Pagan Lagrangian multiplier test for random effects

Chibar2(01) =109.39; Prob>Chibar2 =0.0000

Source: Using Stata 14, the author's own estimation

Table:7 Summary result of Fixed Effect Model

Fixed-effects (within) regression — Number of obs = 165
Group variable: bankid — Number of groups = 15

R-sq:
within = 0.2555
between = 0.3987
overall = 0.3358

Obs per group:
min = 11
avg = 11.0
max = 11

F(7,143) = 7.01
corr(u_i, Xb) = -0.2069 — Prob > F = 0.0000

stockpricevolatilitypv	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dividendpayoutprt	.0017996	.0112142	0.16	0.873	-.0203674	.0239666
firmsize	-.0739578	.0160805	-4.60	0.000	-.105744	-.0421715
profitabilityeps	-.0023325	.0017862	-1.31	0.194	-.0058632	.0011983
nplratio	-.1227993	.1991655	-0.62	0.538	-.5164883	.2708897
gdpgrowthrate	-.460329	.2115873	-2.18	0.031	-.878572	-.0420859
inflation	-1.523543	.351921	-4.33	0.000	-2.219182	-.8279033
weightedaveragelendingrate	-.0829322	.2697196	-0.31	0.759	-.6160848	.4502204
_cons	2.237509	.4575271	4.89	0.000	1.333119	3.141899
sigma_u	.02835212					
sigma_e	.02650248					
rho	.53368078	(fraction of variance due to u_i)				

F test that all u_i=0: F(14, 143) = 9.43 — Prob > F = 0.0000

Source: Using Stata 14, the author's own estimation

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Table:8 Pesaran's test of cross-sectional independence

Pesaran's test of cross-sectional independence = 2.804, Pr = 0.0050

Null: No contemporaneous correlation exists

Source: Using Stata 14, the author's own estimation

Table:9 Group-wise heteroskedasticity test((Modified Wald Test)

Modified Wald test for group-wise heteroskedasticity in fixed effect regression model

chi2 (15) = 91.92

Prob > chi2 = 0.0000; Null: No group-wise heteroskedasticity exists

Source: Using Stata 14, the author's own estimation

Table:10 Wooldridge test for autocorrelation

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

F(1,14) = 10.132 Prob > F = 0.0066

Source: Using Stata 14, the author's own estimation

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