DIU Journal of Business and Entrepreneurship Volume 16, No. 01, 2023
https://doi.org/10.36481/diujbe.v016i1.73pw9g94

The Effect of Meteorological Conditions on the Stock Market: Demonstration from a Developing Economy

Shoun Sarker, Jatiya Kabi Kazi Nazrul Islam University
E-mail: ssjkkniufab@gmail.com

Abstract: *This paper tries to explore the consequence of meteorological conditions on the stock market of Bangladesh by using several econometric techniques like the Ordinary Least Squares (OLS) model, General Autoregressive Conditional Heteroskedastic (GARCH) model, and Cross-correlation analysis of daily data for the period of 2018-2021. Exploration from the OLS model, the temperature is positively related to daily returns, daily turnover value, and daily market cap value; humidity is positively related to turnover value only. From cross-correlation analysis, the positive association among daily returns, humidity, and temperature; positive association between market cap and temperature; positive association among turnover value, humidity, and temperature. From the GARCH model, statistically significant positive relationship between temperature and returns from the stock market; a statistically significant positive relationship among temperature, humidity, and turnover value from the stock market, and a statistically insignificant relationship among temperature, humidity, and market cap value from the stock market. This is the first attempt to analyze the effect of meteorological conditions (humidity and temperature) on the stock market of developing nations like Bangladesh with different econometric tools. By using the results of this paper, traders will think about their moods before trading onto the stock market; the regulatory body of the stock market will modify the trading system according to investors' moods and meteorological conditions.*

Keywords: Meteorological conditions, Stock market, OLS, GARCH, Turnover value, Market capitalization.

1. Introduction

Stock market returns tends to be the prime indicators from which one can get a crystal-clear view of an economy. These returns are affected by several internal and external factors. Numerous researchers have examined these factors in previous research.

Classical Finance Theories like Portfolio Theory (Markowitz, 1952) and Capital Asset Pricing Model (CAPM) emphasized the oscillation of share price and micro or macroeconomic indicators as the prime contributing factors of the returns from the stock market. Investor choice of trading securities is largely affected by all publicly available information and a perfect market incorporates all of this information into their security prices (Chang et al., 2006). Meteorological conditions affect individuals' mood and behavior in a massive way and can also have a tremendous effect on an investment decision, mainly on stock market return (Keef & Roush, 2002; Cao & Wei, 2005; Floros, 2011). Daily stock returns are largely affected by meteorological conditions of a certain day by affecting the behavior of certain investors (Saunders, 1993; Hirshleifer & Shumway, 2003).

Pardo and Valor (2003) investigated the relationship between meteorological conditions and market index returns and explored whether meteorological conditions have no influence on returns from the stock market. Kramer and Runde (1997) explored short-term stock market returns are insensitive to meteorological conditions. Kamstra et al. (2000) explored the negative influence of daylight-saving time on asset prices, and two years later, they explored that winter daylight, lower in this season, has a positive influence on stock market returns. Kang et al. (2010) examined the relationship between meteorological conditions and Hong Kong stock market (HKSM) return and the Shenzhen index and explored that meteorological conditions have no influence on HKSM returns but have a positive relationship with the Shenzhen index.

Keef and Roush (2007, 2009) examined the influence of weather on the returns from financial securities of New Zealand by using three meteorological conditions like, cloud cover, temperature, and wind speed. They identified a negative correlation between temperature and returns from financial securities. Chang et al. (2006) investigated the relationship between cloud cover and the Taiwan stock market and explored a negative correlation between them. Yoon and Kang et al. (2010) reconnoitered the effect of metrological conditions on the Korean Stock Market (KSM) based on temperature, humidity, and cloud cover. Kang et al. (2010) recced the inauguration of the Shanghai B-share index to local traders and scrutinized

the effect of meteorological conditions in the pre-inauguration and post-inauguration periods. They explored; local investors are mostly triggered by meteorological conditions in post-inauguration periods. Cao and Wei (2005) probed the relationship between meteorological conditions and stock market returns of Shanghai and Shenzhen stock markets on the ground of temperature, cloud cover, wind speed, and sunshine duration. They recced a cross-correlation between meteorological conditions and market returns. Goetzmann and Zhu (2002) insinuated no correlation between stock market trading and local weather. Worthington (2009) examined the effect of vaporization, humidity, volatile temperature, the extent of sunny days, and windy storm on the Australian Stock Market Index (ASM) and explored no relationship between them. Floros (2011) observed the consequence of meteorological conditions (temperature) on stock market returns of developed countries like Austria, Belgium, France, Greece, and the United Kingdom and explored the inverse correlation between them in the case of Austria, Belgium, and France stock markets and a positive correlation between them in the case of Greece and United Kingdom's stock markets.

Numerous researchers have examined meteorological condition effect on stock market returns over the years. But the majority of them examined the context of developed countries' stock markets. There are few researchers who analyzed the effect of meteorological conditions on the stock market returns of emerging or developing countries. This study here analyzed the effect of meteorological conditions on stock market returns of a developing nation like Bangladesh as it is the first growing economy with a rapid increase in the market capitalization value of the stock market in recent days. This study here analyzed the effect of meteorological conditions (humidity, temperature) on daily stock market returns, daily market capitalization, and daily turnover value, respectively, to suggest how this emerging stock market can modify their principles of trading amidst meteorological conditions to get high returns from the stock market.

2. Theoretical Confab and Development of Hypotheses

2.1 Background of the Study

Meteorological conditions like humidity, rain, temperature, cloud cover, wind speed, and hours of sunshine have a direct impact on individuals' performance in a massive way. Modern financial theorists explored that these meteorological conditions have a massive impact on the returns from the stock market. To analyze the effect of the meteorological conditions on stock market returns, these modern theorists have used the inferences of behavioral finance, which observed the psychological aspect of investors and the psychological aspect of investors are motivated by meteorological conditions of a certain day. They explored those meteorological conditions that maintain a positive relationship with returns from the stock market. Generally, the meteorological condition is not a prime indicator of the stock market return. But these anomalies have a massive impact on investor mood. Sometimes sunny morning induce traders to trade massively, and sometimes rainy day makes those investors dull and inhibit them from trading. So, these weather factors indirectly set the market capitalization and turnover value of the stock market on a certain day. That's why researchers around the world investigated these factors engrossed and tried to suggest some ways to deal with these anomalies. While analyzing the sunshine factors, some of the researchers explored that these factors are not correlated with returns from the stock market (Hirshleifer & Shumway, 2003).

2.2 Daily Level of Humidity and Daily Stock Market Returns, Daily Market Capitalization Value and Daily Turnover Value

Numerous researchers have analyzed the impact of the relative humidity of a certain day on the returns from the stock market. This study here mentioned their notable work briefly. Humid weather and individuals' mood are correlated with each other. As the weather became humid, individuals started to lose their zeal to work under pressure situation and started to feel sloth. According to the theory of behavioral finance, investor moods are motivated by the psychological aspects of the investor. So, in case of extreme meteorological conditions like humid weather, trading in the stock market drops, which has a negative impact on the returns, market cap value, and

turnover value in the short term. Pardo and Valor (2003) examined the effect of meteorological conditions on index returns of the Spanish stock market and they explored humidity can't explain the variability of the index returns with the help of the simple Ordinary Least Squares (OLS) regression. Yoon and Kang (2009) examined the short-term effect of humidity on the returns from the Korean stock market and explored a positive correlation between them. Cao and Wei (2005) examined meteorological conditions like humidity effect on the Chinese Stock Market and explored a significant association between them for a limited time scale with cross-correlation analysis. Vlady et al. (2011) recced a strong variation in returns from the stock market due to variability in relative humidity.

Based on the above discussion, this study suggests the following hypotheses;

H1: Relative humidity is positively related to daily stock market returns.
H2: Relative humidity is positively related to daily market capitalization value.
H3: Relative humidity is positively related to daily turnover value.

2.3 Daily Temperature and Daily Stock Market Returns, Daily Market Capitalization Value and Daily Turnover Value

Modern financial theorists emphasized the effect of behavioral finance on stock market performance. Behavioral finance works with an investor's psychological perspective. To analyze the psychological perspective of a certain investor, researchers used numerous variables. Meteorological conditions are one of them. The temperature of a certain day is the most used variable to study the effect of meteorological conditions on the returns from the stock market. Cao and Wei (2005) recced the consequences of high and low temperature on people's mood and they explored that high temperature kills individuals' zeal to work which result in laziness and low temperature motivates people to work, which works similarly for the stock market as well. Worthington (2009) explored a negative association between temperature and stock market returns who investigated Australian, Karachi, and Islamabad Stock Market, respectively. Keep and Roush (2007) explored that normal temperatures have a strong influence on the returns from the

Australian Stock Market. Floros (2011) inspected that low temperature triggered the stock market return aggressively by studying Lisbon Stock Market. Chang et al. (2006) have shared the same opinion by studying Taiwan Stock Markets.

Considering this above argument, the study suggests the following hypotheses;

H4: Temperature is positively related to daily stock market returns.
H5: Temperature is positively related to daily market capitalization value.
H6: Temperature is positively related to daily turnover value.

3. Data and Methodology

3.1 Sources of Data and Variable Description

The study conducted here is based on secondary data, which are collected from- the website of the Dhaka Stock Exchange (DSE) and time and date for the daily time frame of 2018-2021. Daily returns from the stock market are calculated using the daily index value of DSEx, which is collected from the DSE website. Daily turnover and market capitalization value are also collected from the DSE website for the same time frame. Daily relative humidity and temperature value are collected from the time and date website for the same time frame. The study involved total of 903 observations ensconcing the period of 2018 to 2021. The researcher here excluded data ensconcing the period between April 2020 and May 2020 because of the pandemic-related shutdown of the capital market of Bangladesh. The researcher here uses DSEx broad index value because it represents the market as a whole. This DSEx index value is used to calculate the daily market returns from the stock market by using this formula $r_i=\ln (P_t/P_{(t-1)})$ (Pardo & Valor, 2003).

Over the years, numerous analysts have analyzed the effect of meteorological conditions on the returns from the stock market. To analyze the effect of meteorological events, they have used weather conditions like temperature, sunshine hours, cloud cover, wind speed, humidity, storm

effect, daylight, and sunny morning for developed economies (Keef & Roush, 2002; Cao & Wei, 2005; Floros, 2011). But temperature and humidity are positively related to stock market returns in most of the analyses (Floros, 2011; Worthington, 2009; Vlady et al., 2011). That's why the study here makes an effort to analyze the effect of temperature and humidity levels on the returns from the stock market for a developing economy like Bangladesh.

Table 1: Variable Description

Variables	Acronym	Scales of Measurement
Dependent Variables (Individual effect will be measured)		
Daily returns	R_i	Daily index value is used to calculate daily returns by taking the log values of the current index value divided by the previous day's index value.
Daily turnover value	DTV	Daily turnover value from Dhaka stock exchange.
Daily market capitalization value	DMCV	Daily market capitalization value from Dhaka stock exchange.
Independent variables		
Daily Humidity	DH	Daily level of humidity is measured in percentage form.
Daily Temperature	DT	Daily temperature is measured in Celsius degree form.

Source: Author's Compilation

Table 1 shows a description of the variables. In the introduction section, this study shows that numerous scholars have shown a relationship between returns from the stock market and meteorological conditions. But none of them covers the effect of meteorological conditions on the market cap value and turnover value. That's why this study here runs a three-regression (OLS) model in which each of the dependent variable's outcomes by the effect of

the independent variable will be measured.

However, researchers like Keep and Roush (2007); Cao and Wei (2005); Floros (2011) have shown a positive association between temperature and stock market returns by analyzing their respective stock markets. Meanwhile, Yoon and Kang (2009) examined the short-term effect of humidity on the returns from the Korean stock market and explored a positive correlation between them. Cao and Wei (2005) examined meteorological conditions like humidity effect on the Chinese Stock Market and explored a significant association between them for a limited time scale with cross-correlation analysis.

3.2 Descriptive Statistics

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Minimum	Maximum	Std. deviation	JB test (Pr.)	Q-test (Pr.)
R_i	903	7.68	-0.0674	0.0980	0.0097	10339 (0.00) *	14.5 (0.00) *
DMCV	903	4130565	2873826	5863190	666951.8	138.45 (0.00) *	21.44 (0.00) *
DTV	903	7922.234	386.22	29539.27	5859.70	593.11 (0.00) *	21.86 (0.00) *
DT	903	30.91	17	44	3.73	77.75 (0.00) *	23.97 (0.00) *
DH	903	0.6522	0.28	1	0.14	15.37 (0.00) *	31.36 (0.00) *
*Indicates 1% level of significance							

Source: Author's Computation

Table 2 shows a summary of statistics. From that table, the researcher shows the maximum value of market capitalization value and minimum value of daily returns. This happens because as the pandemic hit countries' stock

markets, DMCV falls dramatically with the returns (in negative value). But when the economy started to flourish, returns started to flourish as well, but not proportionate to DMCV. The lowest DT from that table is 170 Celsius which denotes low temperature, and when it is 440 DMCV, DT and Ri improve. So, from that table, the study denotes that as temperature improves, it will have a positive impact on returns, market cap value, and turnover value. The same inference can be brought for humidity as well. The highest standard deviation is brought from DMCV due to variability in daily market cap value. From Jarque Bera's test, the study explored the non-normality of the data. From Q-statistics of 36 lags, the study concluded that no serial correlation in the residual is rejected, which means a strong dependence among the residuals exists. However, the study here conducts residual diagnostics before performing any form of examination of data. As this study is based on time series data, a unit root test is a must to check the stationarity of the dataset. The result from the unit root test by using Augmented Dicky Fuller (ADF) test is demonstrated below in a table.

Table 3: Unit Root Test

Variables	Pr.
R_t	0.0000*
DMCV	0.0130*
DTV	0.0218*
DT	0.0002*
DH	0.0000*
*Indicates 5% level of significance	

Source: Author's Computation

Table 3 represents the unit root test of respective variables using the ADF test. From the table, the study recced all the variables are stationary in nature at a 5% level of significance.

Table 4: Correlation Matrix

Variables	1	2	3	4	5
1) R_i	1				
2) DH	0.0059*	1			
3) DMCV	0.0600***	0.0504**	1		
4) DT	0.0908***	-0.0302*	0.0790***	1	
5) DTV	0.1348	0.1891	0.7925	0.0903***	1
Notes: *, **, ***Indicates 1%, 5% and 10% level of significant respectively					

Source: Author's Computation

Table 4 represents the correlation matrix. It recced that humidity, market cap value, and temperature are significantly correlated with daily returns at 5% and 10% levels of significance. Daily humidity is also significantly correlated with daily turnover value at a 1% level of significance. Daily humidity also significantly correlated with daily market cap value at a 5% level of significance.

3.3 Econometric Models

To analyze the consequence of meteorological conditions (DT and DH), the researcher here uses three OLS models. In the first model, Ri serves the role of the dependent variable, and DT and DH serve the role of independent variables (Keep & Roush, 2007); Cao & Wei, 2005; Floros, 2011; Yoon & Kang, 2009). In the second model, DMCV was included as the dependent variable, and DT and DH were included as independent variables. In the third model, DTV was included as the dependent variable, and DT and DH were included as independent variables.

Considering this argument, the study develops the following regression model;

$R_t = a + \beta_1 DT + \beta_2 DH + \varepsilon_t$ (Model 1)

$DMCV_t = a + \beta_1 DT + \beta_2 DH + \varepsilon_t$ (Model 2)

$DTV_t = a + \beta_1 DT + \beta_2 DH + \varepsilon_t$ (Model 3)

*Notes: Where subscripts "t" represents daily time frame. " ε_t" represents the standard error term

This research paper analyzes the consequences of meteorological conditions on the returns from the stock market by using three OLS regression models (Cao & Wei, 2005), GARCH models (Kang et al., 2010) and cross-correlation between the variables (Cao & Wei, 2005).

The study here then analyzes the effect of meteorological conditions by using the following GARCH (1, 1) model;

$$r_t = \alpha_0 + \sum_{t=1}^{p} \alpha_t \varepsilon^2 - i + \sum_{t=1}^{p} \beta_t r_t - i + \theta_1 DT + \theta_2 DH$$

(Model 1)

$$DMCV_t = \alpha_0 + \sum_{t=1}^{p} \alpha_t \varepsilon^2 - i + \sum_{t=1}^{p} \beta_t DMCV_t - i + \theta_1 DT + \theta_2 DH$$

(Model 2)

$$DTV_t = \alpha_0 + \sum_{t=1}^{p} \alpha_t \varepsilon^2 - i + \sum_{t=1}^{p} \beta_t DTVr_t - i + \theta_1 DT + \theta_2 DH$$

(Model 3)

Where "$\beta_t r_t$" denotes the effect of temperature and humidity on stock returns from the first model. "$\beta_t DMCV_t$" denotes the effect of temperature and humidity on market cap value from the second model. "$\beta_t DTVr_t$" denotes the effect of temperature and humidity on turnover value from the third model (Keef et al., 2009).

4. Results and Discussion

Table 5: Regression Output (Model 1)

Variables	t-value	β (p- value)
Dependent variable (R_t)		
Independent variables		
DH	0.2634	0.000593 (0.7923)
DT	2.74	0.0002 (0.006) *
F Statistic (p-value)	3.78 (0.023) **	
*, **Indicates 1% and 5% level of significance respectively.		

Source: Author's Computation

Table 5 provides the results of the OLS estimates by using model 1. Findings from the regression suggest that DT demonstrates a strong positive significance ($p<0.05$) with respect to Rt at a 1% level of significance. Moreover, DH shows a weak but positive significance in this respect. This implies that daily temperature has a substantial influence on the level of returns from the stock market. All the results are robust to autocorrelation and heteroskedasticity. Therefore, it can be claimed that hypothesis H4 is significant and follow our prediction (Afrina et al., 2020).

Table 6: Regression Output (Model 2)

Variables	t-value	β (p-value)
Dependent variable ($DMCV_t$)		
Independent variables		
DH	1.59	245225.1 (0.1117)
DT	2.43	5925.97 (0.0154) *
F Statistic (p-value)	4.10 (0.01) *	
*Indicates 1% level of significance.		

Source: Author's Computation

Table 6 provides the results of the OLS estimates by using model 2. Findings from the regression suggest that DT demonstrates a strong positive significance ($p<0.05$) with respect to DMCV at a 1% level of significance. Moreover, DH shows a weak but positive significance in this respect. This implies that daily temperature has a substantial influence on market capitalization value from the stock market. All the results are robust to autocorrelation and heteroskedasticity. Therefore, it can be claimed that hypothesis H5 is significant and follow our prediction.

Table 7: Regression Output (Model 3)

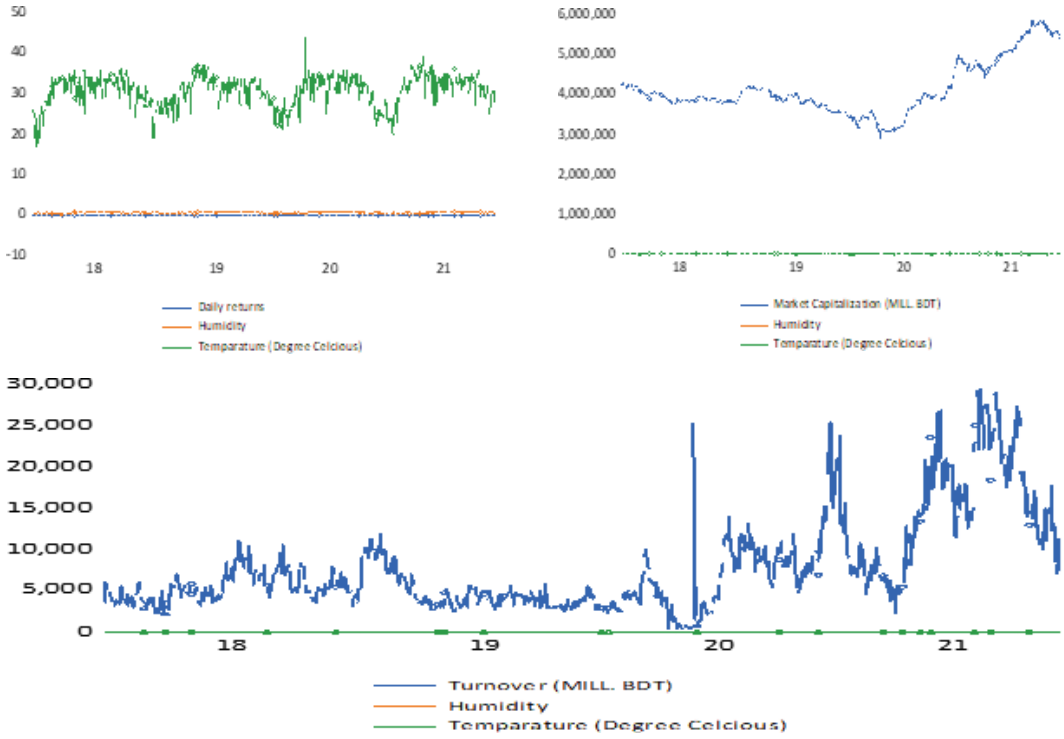
Variables	t-value	β (p-value)
Dependent variable (DTV_t)		
Independent variables		
DH	5.89	7828.010 (0.00) *
DT	2.95	150.84 (0.0032) *
F Statistic (p-value)	21.20 (0.00) *	
*Indicates 1% level of significance.		

Source: Author's Computation

Table 7 provides the results of the OLS estimates by using model 3. Findings from the regression suggest that DH and DT demonstrate a strong positive significance ($p<0.05$) with respect to DTV at a 1% level of significance. This implies that daily temperature and daily humidity have a substantial influence on the daily turnover from the stock market. All the results are robust to autocorrelation and heteroskedasticity. Therefore, it can be claimed that hypothesis H3 and H6 are significant and follow our prediction (Rubi et al., 2022).

ISSN 2664-3413 (Print) 2664-3421 (Online)
Daffodil International University Journal of Business and Entrepreneurship, Vol. 16, No. 1, PP. 58-78 June 2023

Figure 1 Cross Correlation Graph



Source: DSE Website and the Weather Channel

Figure 1: provides the result of cross-correlation between the variables using a cross-correlation graph. 1st graph demonstrates the association between daily returns, humidity, and temperature.

From the graphical analysis, the researcher explores positive associations among them. That means, as the temperature rises, daily returns will rise too. However, 2nd graph shows the association between daily market cap value with daily humidity and temperature. From the graphical analysis, the researcher recced a positive association between temperature and daily market cap value.

Humidity maintains a negative association with daily market cap value. Meanwhile, 3rd graph shows the association between daily turnover value with daily humidity and temperature. From the graphical analysis, the researcher recced a positive association among temperature, humidity, and daily turnover value (Zayed et al., 2020a; Zayed et al., 2020b; Zayed et al., 2021).

Table 8: Standard Guesstimate of GARCH Model (1)

Mean Equation			
Variables	Q	Z-stat.	Pr.
DH	0.0009	0.5540	0.5796
DT	0.0002	3.6585	0.0003 *
Variance equation			
Variables	Q	Z-stat.	Pr.
α	0.3827	0.0376	0.0000 *
β	0.5729	3.6585	0.0000 *
Diagnostics			
Log likelihood	3089.946		
Q-stat (1)	42.437 (0.000) *		
Q-stat (15)	90.485 (0.000) *		
Q-stat (36)	103.98 (0.000) *		
ARCH LM (1)	0.064 (0.8091)		
ARCH LM (15)	20.8463 (0.14)		
ARCH LM (36)	45.2477 (0.1388)		
*Indicates 5% level of significance () values denotes p-values by analyzing 903 observations.			

Source: Author's Computation

Table 8 represents the result of the GARCH (1, 1) model. The 1st column shows the variables list. 2nd column shows the estimated coefficient result. 3rd column shows the result of the z-stat, and the final 4th column shows the result of p-values. From the p-values in the mean equation, it is clear that temperature has a positive influence on the returns from the stock market, which is statistically significant at 1%.

Table 9: Standard Guesstimate of GARCH Model (2)

Mean Equation			
Variables	Q	Z-stat.	Pr.
DH	82790	3.2784	0.0010 *
DT	11301.85	11.46	0.0000 *
Variance equation			
Variables	Q	Z-stat.	Pr.
α	0.2550	5.1597	0.0000 *
β	0.5299	5.5668	0.0000 *
Diagnostics			
Log likelihood	-12573.00		
Q-stat (1)	816.27 (0.000) *		
Q-stat (15)	9398 (0.000) *		
Q-stat (36)	18198 (0.000) *		
ARCH LM (1)	276.02 (0.00) *		
ARCH LM (15)	305.2223 (0.00) *		
ARCH LM (36)	317.1884 (0.00) *		
*Indicates 5% level of significance () values denotes p-values by analyzing 903 observations.			

Source: Author's Computation

Table 9 represents the result of the GARCH (1, 1) model. From the p-values in the mean equation, it is clear that temperature and humidity have a positive influence on the market cap value of the stock market, which is statistically significant at 1%. However, in the variance equation, it is clear that the summation of ARCH (α) and GARCH (β) are not close to 1, which denotes that shocks of volatility are not persistent. But the result is statistically significant at a 1% level of significance in both cases. Meanwhile, the robustness of the data is also checked in the table in below part. The Ljung–Box Q-statistics are estimated at different lags, which explores null of no autocorrelation can't be rejected, which means results are free from autocorrelation. ARCH-LM at different lags explores null of no ARCH effects can be rejected, denotes residuals aren't free from ARCH effects which make an inference that temperature and humidity don't maintain a statistically significant relationship with market cap value.

Table 10: Standard Guesstimate of GARCH Model (3)

Mean Equation			
Variables	Q	Z-stat.	Pr.
DH	-106.8320	-0.3817	0.7026
DT	14.315	1.1678	0.2429
Variance equation			
Variables	Q	Z-stat.	Pr.
α	0.8745	8.2925	0.0000 *
β	0.1720	2.06	0.0388 *
Diagnostics			
Log likelihood	-8388.75		
Q-stat (1)	401.40 (0.000) *		
Q-stat (15)	3561.6 (0.000) *		
Q-stat (36)	5776.4 (0.000) *		
ARCH LM (1)	6871 (0.4071)		
ARCH LM (15)	5.8089 (0.9828)		
*Indicates 5% level of significance () values denotes p-values by analyzing 903 observations.			

Source: Author's Compilation

Table 10 represents the result of the GARCH (1,1) model. From the p-values in the mean equation, it is clear that temperature and humidity have a positive influence on turnover value from the stock market, which is statistically significant at 5%. However, in the variance equation, it is clear that the summation of ARCH (α) and GARCH (β) is very close to 1, which denotes that shocks of volatility are persistent. Meanwhile, the robustness of the data is also checked in the table in below part. The Ljung–Box Q-statistics are estimated at different lags, which explores null of no autocorrelation can't be rejected, which means results are free from autocorrelation. ARCH-LM at different lags explores null of no ARCH effects can't be rejected, denotes residuals are free from ARCH effects which make an inference that temperature and humidity maintain a statistically significant relationship with turnover value.

5. Conclusion

Empirical research on the consequences of meteorological conditions on the stock market is a hot topic for researchers around the world. Numerous studies have been published in well-known journals about that. But the majority of them cover the interest of developed countries' stock markets to fulfill their interest. None of them make an effort to analyze the effect of meteorological conditions on the stock market. The study here analyzes the effect of meteorological conditions on developing economies' stock markets like Bangladesh. In the prior studies, the majority of them cover several meteorological conditions (temperature, rain, storms, humidity, wind speed, sunshine hours, and day effect) that affect the stock market. But temperature and humidity have shown an influence on the stock market. That's why the study here analyzes the effect of these two meteorological conditions effect on stock market returns, turnover value, and market cap value for the period of 2018-2021 with 903 observations. This paper here uses several econometric methods to explore the relationship between those variables like OLS, cross-correlation, and GARCH model.

From the OLS model, this paper explores whether the temperature is positively related to stock market returns, market cap value, and turnover value up to a certain 0 Celsius. Humidity has a positive influence only on the turnover value because as humidity rises in the air, it creates suffocation which deters investors from trading. The cross-correlation graph explores a positive association among daily returns, humidity, and temperature; a positive association between market cap and temperature; a positive association among turnover value, humidity, and temperature. The GARCH model explores a statistically significant positive relationship between temperature and returns from the stock market, a statistically significant positive relationship between temperature, humidity, and turnover value from the stock market, and a statistically insignificant relationship among temperature, humidity, and market cap value from the stock market. Finally, this paper likes to suggest that the regulatory body analyze the effect of meteorological conditions at the time of making any value-added decision for the stock market of Bangladesh. Because this part of behavioral finance largely affects investor mood toward trading in the stock market.

References

1. Afrina, T., Beg, T. H., Zayed, N. M., Hossain, M. S. & Shahi, S. K. (2020). An Analysis of the Effects of Corona Virus (COVID-19) on International Financial Derivatives Market, 2020. Indian *Journal of Finance & Banking.* 4(2), 93-98.
2. Cao, M. & Wei, J. (2005). Stock market returns: a note on temperature anomaly. *Journal of Banking and Finance,* 29, 1559-1573.
3. Chang, T., Nieh, C. C., Yang, M. J. & Yang, T. Y. (2006). Are stock market returns related to the weather effects? Empirical evidence from Taiwan. *Physica A: Statistical Mechanics and Its Applications,* 364, 343-354.
4. Floros, C. (2011). On the relationship between weather and stock market returns. *Studies in Economics and Finance*, 28, 5-13.
5. Goetzmann, W. N. & Zhu, N. (2002). Rain or shine: where is the weather effect?. *Working Paper,* No. 02-27.
6. Hirshleifer, D. & Shumway, T. (2003). Good day sunshine: stock returns and the weather. *The Journal of Finance,* 58, 1009-1032.
7. Kamstra, M. J., Kramer, L. A. & Levi, M. D. (2000). Losing sleep at

the market: the daylight savings anomaly. *American Economic Review,* 90, 1005–1012.

8. Kramer, W. & Runde, R. (1997). Stocks and the weather: an exercise in data mining or yet another capital market anomaly? *Empirical Economics,* 11, 637–641.
9. Kang, S. H., Jiang, Z., Lee, Y. & Yoon, S. M. (2010). Weather effects on the returns and volatility of the Shanghai stock market. *Physica A: Statistical Mechanics and Its Applications,* 389, 91-99.
10. Keef, S. P. & Roush, M. L. (2002). The weather and stock returns in New Zealand. *Quarterly Journal of Business and Economics,* 61-79.
11. Keef, S. P. & Roush, M. L. (2007). Daily weather effects on the returns of Australian stock indices. *Applied Financial Economics*, 17, 173-184.
12. Keef, S. P., Khaled, M. & Zhu, H. (2009). The dynamics of the Monday effect in international stock indices, *International Review of Financial Analysis*, 18, 125-133.
13. Markowitz, M. (1952). Portfolio Selection. *Journal of Finance,* 1, 77-91.
14. Pardo, A. & Valor, E. (2003). Spanish stock returns: where is the weather effect?, *European Financial Management,* 9, 117-126.
15. Rubi, M. A., Chowdhury, S., Rahman, A. A. A., Meero, A., Zayed, N. M. & Islam, K.M.A. (2022). Fitting Multi-Layer Feed Forward Neural Network and Autoregressive Integrated Moving Average for Dhaka Stock Exchange Price Predicting. *Emerging Science Journal (ESJ).* 6(5), 1046-1061.
16. Saunders, E. M. (1993). Stock prices and Wall Street weather, *The American Economic Review,* 83, 1337-1345.
17. Vlady, S., Tufan, E. & Hamarat, B. (2011). Causality of Weather Conditions in Australian Stock Equity Returns. *Revista Tinerilor Economiti (The Young Economists Journal)*, 194-187.
18. Worthington, A. (2009). An Empirical Note on Weather Effects in the Australian Stock Market. *Economic Papers: A journal of applied economics and policy*, 28(2), 148–154.
19. Yoon, S. M. & Kang, S. H. (2009). Weather effects on returns: evidence from the Korean stock market. *Physica A: Statistical Mechanics and Its Applications*, 388, 682-690.
20. Zayed, N. M., Shahi, S. K., Neloy, A. H., Afrin, M. & Haque, T. (2020a). Effects of Coronavirus (COVID-19) on International Financial Market:

A Conceptual Analysis. *Journal of Accounting Research, Business and Finance Management.* 1(1), 13-19.

21. Zayed, N. M., Shahi, S. K., Neloy, A. H. & Haque, T. (2020b). Effects of Coronavirus (COVID-19) on International Capital Market: A Conceptual Analysis. *European Journal of Accounting, Finance and Investment.* 6(4), 13-20.
22. Zayed, N. M., Islam, K. M. A., Shahi, S. K., Rahman, M. S., & Raisa, T. S. (2021). An Analysis on the Effects of Coronavirus (Covid-19) on the Financial Management of Multinational Corporations. *Australian Finance & Banking Review*. *5*(1), 43-53.