CHAPTER V

CONCLUSION

This chapter provides the conclusion of the research study, managerial implication, suggestion for further research, and also gives the research limitations. The purpose in this research is to investigate the dynamics and causal relationship between stock market volatility and trading volume in Indonesian stock market from period February 2013 to February 2018.

5.1 Conclusion

From the data analysis in chapter IV about the dynamic and causal relationship between stock market volatility and trading volume in Indonesian stock market, it can be concluded as follows:

1. Based on the data analysis conducted in chapter IV about the dynamic and causal relationship between stock market volatility and trading volume in Indonesian stock market, the result of EGARCH Model may be summarized as follows. First, there is leverage effect in the model. It means that effects of negative return shocks are higher than that of positive return shocks. Second, trading volume has a positive and statistically significant impact on equity return volatility. It means that trading volume may be one of the important factors in explaining volatility.
2. Granger Causality test indicates the relationship is bidirectional, unidirectional, or there is no causality relationship, the result of Granger Causality test shown that there is bidirectional (causality) relationship between stock return and trading volume in Indonesian stock market. Which concludes that Detrended Volume does Granger-cause Return in Indonesian stock market (H1 Rejected), and Return does Granger-cause Detrended Volume in Indonesian stock market (H2 Rejected).

5.2 Managerial Implication

This research is expected to help the party that is involved in the stock market such as the investor. Based on the research result, the researcher hope that the investor can use the information from this research to help them in understanding the behavior of the Indonesian stock market.

Based on the research result, there is leverage effect. Which means that bad news has more impact on the volatility of the stock return than the good news in Indonesian stock market. Then, investor can predict future return by using the change of trading volume because the movement of trading volume is a useful information to predict future return in Indonesian stock market. Last, there is Granger Cause between stock return and trading volume in Indonesian stock market. Return move because of trading volume change, and trading volume move because of return change.
5.3 Research Limitation

There are some limitation of analysis of this research study. It can be from variables, length period, the research method, and so on. Those limitation are as follows:

1. The period of the research is only within 5 year which is from 2013-2018. The short period of this research can produce different result with the research using longer period.

2. This research only analyze the role of trading volume. Trading volume is one of information which has ability to predict future return and volatility. There are many indicators that can be used as proxy of information.

3. The findings from this research are only based on the available daily data.

4. This research only uses one component in the trading volume that is the number of trades (number of transactions / trading frequency / frequency of trade).

5.4 Suggestion for Further Research

Below is the suggestion that the researcher can give as a reference for future research that will be done, they are:

1. The future research are suggested to use longer period. Longer period in analysis can provide result more accurate.
2. The future research are suggested to not only analyze the role of trading volume, but also other predictors of volatility of the Indonesian economy involving both domestic and foreign macroeconomic and financial variables. There is some useful information in predicting future return and volatility, besides trading volume.

3. The future research are suggested to consider the high frequency intraday or minute-to-minute data by employing some of the recently developed volatility models so as to provide more in-depth conclusions.

4. The future research are suggested to not only use one component in the trading volume which is the number of trades (number of transactions / trading frequency / frequency of trade), but also uses the average size of each trades (size of trades / trade size) because this two components in the trading volume can be used to predict the return volatility.
REFERENCES


# APPENDIX 1

## DESCRIPTIVE STATISTIC

Descriptive Statistic From 2013-2018:

<table>
<thead>
<tr>
<th></th>
<th>CLOSING PRICE</th>
<th>TRADING VOLUME</th>
<th>RETURN</th>
<th>DETRENDED VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>9369.186</td>
<td>31259804</td>
<td>0.000374</td>
<td>0.200774</td>
</tr>
<tr>
<td>Median</td>
<td>5600.000</td>
<td>14505300</td>
<td>0.000000</td>
<td>-0.010663</td>
</tr>
<tr>
<td>Maximum</td>
<td>85275.00</td>
<td>1.23E+09</td>
<td>0.255319</td>
<td>27.01162</td>
</tr>
<tr>
<td>Minimum</td>
<td>437.0000</td>
<td>150700.0</td>
<td>-0.501894</td>
<td>-0.925159</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>12621.09</td>
<td>46984614</td>
<td>0.023244</td>
<td>0.920606</td>
</tr>
<tr>
<td>Skewness</td>
<td>3.151505</td>
<td>4.501192</td>
<td>-0.398859</td>
<td>5.931087</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>14.16028</td>
<td>47.27073</td>
<td>23.94340</td>
<td>88.93822</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>171056.4</td>
<td>2125129.</td>
<td>457381.7</td>
<td>7836539</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Sum</td>
<td>2.34E+08</td>
<td>7.81E+11</td>
<td>9.352071</td>
<td>5017.336</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
<td>3.98E+12</td>
<td>5.52E+19</td>
<td>13.50059</td>
<td>21178.57</td>
</tr>
<tr>
<td>Observations</td>
<td>24990</td>
<td>24990</td>
<td>24990</td>
<td>24990</td>
</tr>
</tbody>
</table>
APPENDIX 2

AUGMENTED DICKEY-FULLER (ADF) TEST

1. Return
Null Hypothesis: RETURN has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=47)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-71.56406</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.430441
- 5% level: -2.861464
- 10% level: -2.566770


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RETURN)
Method: Least Squares
Date: 05/21/18   Time: 21:32
Sample (adjusted): 7,24990
Included observations: 24984 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETURN(-1)</td>
<td>-1.174459</td>
<td>0.016411</td>
<td>-71.56406</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(RETURN(-1))</td>
<td>0.188913</td>
<td>0.014757</td>
<td>12.80157</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(RETURN(-2))</td>
<td>0.134537</td>
<td>0.012995</td>
<td>10.35309</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(RETURN(-3))</td>
<td>0.082112</td>
<td>0.011037</td>
<td>7.439644</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(RETURN(-4))</td>
<td>0.053291</td>
<td>0.008876</td>
<td>6.003875</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(RETURN(-5))</td>
<td>0.026363</td>
<td>0.006325</td>
<td>4.167896</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.000441</td>
<td>0.000147</td>
<td>3.005435</td>
<td>0.0027</td>
</tr>
</tbody>
</table>

R-squared 0.494282  Mean dependent var -1.09E-06
Adjusted R-squared 0.494160  S.D. dependent var 0.032558
S.E. of regression 0.023156  Akaike info criterion -4.692820
Sum squared resid 13.39302  Schwarz criterion -4.690543
Log likelihood 58629.70  Hannan-Quinn criter. -4.692083
F-statistic 4068.692  Durbin-Watson stat 1.999670
Prob(F-statistic) 0.000000
2. Detrended Volume

Null Hypothesis: DETRENDED VOLUME has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=47)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-92.56425</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.430441
- 5% level: -2.861464
- 10% level: -2.566770


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DETRENDED VOLUME)
Method: Least Squares
Date: 05/21/18   Time: 21:34
Sample (adjusted): 5 24990
Included observations: 24986 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DETRENDED VOLUME(-1)</td>
<td>-1.464415</td>
<td>0.015821</td>
<td>-92.56425</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(DETRENDED VOLUME(-1))</td>
<td>0.211088</td>
<td>0.013263</td>
<td>15.91549</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(DETRENDED VOLUME(-2))</td>
<td>0.094294</td>
<td>0.010126</td>
<td>9.311909</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(DETRENDED VOLUME(-3))</td>
<td>0.024377</td>
<td>0.006325</td>
<td>3.853851</td>
<td>0.0001</td>
</tr>
<tr>
<td>C</td>
<td>0.294019</td>
<td>0.006470</td>
<td>45.44415</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared                 0.617298  Mean dependent var 3.66E-05
Adjusted R-squared        0.617237  S.D. dependent var 1.440171
S.E. of regression        0.891003  Akaike info criterion 2.607262
Sum squared resid         19832.07  Schwarz criterion 2.608888
Log likelihood            -32567.53  Hannan-Quinn criter. 2.607789
F-statistic               10073.59  Durbin-Watson stat 2.000232
Prob(F-statistic)         0.000000
### APPENDIX 3

### ARCH TEST

Heteroskedasticity Test: ARCH

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.000522</td>
<td>0.000522</td>
<td>31.24248</td>
<td>0.0000</td>
</tr>
<tr>
<td>RESID^2(-1)</td>
<td>0.030705</td>
<td>0.006323</td>
<td>4.855963</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/22/18 Time: 17:44
Sample (adjusted): 224990
Included observations: 24989 after adjustments

R-squared: 0.000943
Mean dependent var 0.000539
S.D. dependent var 0.002587
Akaike info criterion -9.077631
Schwarz criterion -9.076980
Hannan-Quinn criterion -9.077420
Durbin-Watson stat 2.001463
### APPENDIX 4

**EGARCH MODEL**

Dependent Variable: RETURN  
Method: ML - ARCH (Marquardt) - Normal distribution  
Date: 07/22/18 Time: 14:49  
Sample (adjusted): 1 24990  
Included observations: 24990 after adjustments  
Convergence achieved after 381 iterations  
Presample variance: backcast (parameter = 0.7)

$$ \text{LOG(GARCH)} = C(3) + C(4) \cdot \text{ABS(RESID(-1)/@SQRT(GARCH(-1)))} + C(5) \cdot \text{RESID(-1)/@SQRT(GARCH(-1))} + C(6) \cdot \text{LOG(GARCH(-1))} + C(7) \cdot \text{DETRENDEDVOLUME} $$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.000573</td>
<td>0.000127</td>
<td>-4.522830</td>
<td>0.0000</td>
</tr>
<tr>
<td>DETRENDEDVOLUME</td>
<td>0.001672</td>
<td>0.000216</td>
<td>7.750415</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Variance Equation**

| C(3)         | -2.401574     | 0.046158   | -52.02917     | 0.0000 |
| C(4)         | 0.378897      | 0.006747   | 56.15589      | 0.0000 |
| C(5)         | -0.035534     | 0.005429   | -6.544807     | 0.0000 |
| C(6)         | 0.741686      | 0.005604   | 132.3492      | 0.0000 |
| C(7)         | 0.600382      | 0.007861   | 76.37094      | 0.0000 |

R-squared 0.002472  Mean dependent var 0.000374  
Adjusted R-squared 0.002432  S.D. dependent var 0.023244  
S.E. of regression 0.023215  Akaike info criterion -4.930946  
Sum squared resid 13.46721  Schwarz criterion -4.928670  
Log likelihood 61619.17  Hannan-Quinn criter. -4.930209  
Durbin-Watson stat 1.956492  

Substituted Coefficients:

\[
\text{RETURN} = -0.000573092601349 + 0.00167163375091 \times \text{DETRENDEDVOLUME}
\]

\[
\text{LOG(GARCH)} = -2.40157369584 + 0.378897348619 \times \text{ABS(RESID(-1)/@SQRT(GARCH(-1)))} - 0.0355339130632 \times \text{RESID(-1)/@SQRT(GARCH(-1))} + 0.741686284774 \times \text{LOG(GARCH(-1))} + 0.600381863763 \times \text{DETRENDEDVOLUME}
\]
APPENDIX 5

ARCH-LM TEST

Heteroskedasticity Test: ARCH

<table>
<thead>
<tr>
<th>Test Equation:</th>
<th>Dependent Variable: WGT_RESID^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method: Least Squares</td>
<td></td>
</tr>
<tr>
<td>Date: 07/23/18  Time: 15:47</td>
<td></td>
</tr>
<tr>
<td>Sample (adjusted): 2 24990</td>
<td></td>
</tr>
<tr>
<td>Included observations: 24989 after adjustments</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1.000174</td>
<td>0.061140</td>
<td>16.35880</td>
<td>0.0000</td>
</tr>
<tr>
<td>WGT_RESID^2(-1)</td>
<td>-0.001245</td>
<td>0.006526</td>
<td>-0.196858</td>
<td>0.8439</td>
</tr>
</tbody>
</table>

R-squared 0.000002  Mean dependent var 0.998930
Adjusted R-squared -0.000038  S.D. dependent var 9.612984
S.E. of regression 9.613169  Akaike info criterion 7.364225
Sum squared resid 2309124.  Schwarz criterion 7.364875
Log likelihood -92010.31  Hannan-Quinn criter. 7.364435
F-statistic 0.038753  Durbin-Watson stat 1.999990
Prob(F-statistic) 0.843940
APPENDIX 6

NORMALITY TEST

Series: Standardized Residuals
Sample 1 24990
Observations 24990

Mean 0.015503
Median 0.038133
Maximum 5.344314
Minimum -37.56312
Std. Dev. 0.999346
Skewness -2.585367
Kurtosis 93.81101
Jarque-Bera 8614652.
Probability 0.000000
APPENDIX 7

DETERMINING OPTIMAL LAG

VAR Lag Order Selection Criteria
Endogenous variables: RETURN DETRENDEDVOLUME
Exogenous variables: C
Date: 05/27/18   Time: 17:29
Sample: 1 25011
Included observations: 24985

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25189.36</td>
<td>NA</td>
<td>0.000456</td>
<td>-2.016198</td>
<td>-2.015548</td>
<td>-2.015988</td>
</tr>
<tr>
<td>1</td>
<td>25875.90</td>
<td>1372.927</td>
<td>0.000432</td>
<td>-2.070835</td>
<td>-2.068883</td>
<td>-2.070203</td>
</tr>
<tr>
<td>2</td>
<td>26042.90</td>
<td>333.9198</td>
<td>0.000427</td>
<td>-2.083882</td>
<td>-2.080630</td>
<td>-2.082829</td>
</tr>
<tr>
<td>3</td>
<td>26128.75</td>
<td>171.6540</td>
<td>0.000424</td>
<td>-2.090434</td>
<td>-2.085881*</td>
<td>-2.088960</td>
</tr>
<tr>
<td>4</td>
<td>26147.13</td>
<td>36.75720</td>
<td>0.000423</td>
<td>-2.091585</td>
<td>-2.085731</td>
<td>-2.089691</td>
</tr>
<tr>
<td>5</td>
<td>26163.68</td>
<td>33.07359*</td>
<td>0.000423*</td>
<td>-2.092590*</td>
<td>-2.085434</td>
<td>-2.090274*</td>
</tr>
</tbody>
</table>

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

65
APPENDIX 8

GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 05/27/18   Time: 17:44
Sample: 1 25011
Lags: 5

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DETRENDEDVOLUME does not Granger Cause RETURN</td>
<td>24985</td>
<td>3.34487</td>
<td>0.0051</td>
</tr>
<tr>
<td>RETURN does not Granger Cause DETRENDEDVOLUME</td>
<td>19.6055</td>
<td>2.E-19</td>
<td></td>
</tr>
</tbody>
</table>