

Assessing Stock Market Volatility for Different Sectors in Malaysia

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ABSTRACT

The study of stock market volatility has been the focus of market participants primarily because most of the applications in financial economics are concerned with volatility. The economic structure in Malaysia is divided into three sectors: primary, secondary and tertiary. As the stability of the stock market is important for businesses, this paper carefully reviews the concept of volatility and analyses how different business sectors in Malaysia are affected by stock market volatility.

Keywords: Historical volatility, stock market volatility, business sector, Malaysia

INTRODUCTION

Volatility estimation is important for financial practitioners, researchers and market participants for several reasons. The unexpected conditions such as changes in economic policy, political shocks, competitors and business rivals affect stock prices resulting in stock market volatility. Greater changes in stock prices indicate a high level of volatility. Commonly, higher volatility means more uncertainty in the stock market and this phenomenon has an impact on the financial stability of businesses.

According to Sill (1993), stock market volatility may affect the economy in terms of how people spend and save money, stock and option price and how investors may hedge against investment risks.

There are variety of methods that can be used to measure volatility such as equally weighted average, an exponentially weighted moving average (EWMA), and sophisticated models such as ARCH and GARCH (Cuthbertson & Nitzsche, 2001; Chang, 2014).

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Volatility is commonly used in estimating market risks (Ladokhin, 2009) in addition to valuing financial derivatives. Another important application can be seen in pricing the option since volatility is one of the parameters involved in estimating the option value.

Given the important role of volatility forecasting in the context of finance, this paper analyses volatility on different sectors of business in Malaysia. Economic theories divide economic sectors based on their activity. The main sector, primary sector, refers to industries engaged in the extraction of raw materials. Secondary or manufacturing sector uses raw materials sourced from the primary sector, processes them and produce finished goods. The tertiary sector offers or provides services to customers.

The remaining sections of this paper are organised as follows: Section 2 discusses historical and implied volatility. Definition of preliminary concepts related to volatility and their application in finance are also discussed in this section. Section 3 presents the methodology including data and steps used in measuring volatility. Section 4 provides the result on different sectors' volatility. Section 5 discusses and summarises the paper.

LITERATURE REVIEW

This section provides a brief discussion of approaches involved in estimating volatility which are historical and implied volatility. It also discusses the application of volatility estimation in the finance sector.

Measuring volatility

In most cases, the volatility value cannot be observed directly, thus the estimation of its value depends on the judgment by the analyst. There are two approaches in estimating the volatility value. Volatility value extracted from stock market returns is called historical volatility while the volatility value derived from option pricing model is called implied volatility (Koopman, Jungbacker & Hol, 2005). The difference between historical and implied volatility is discussed below.

Historical volatility

Historical volatility is usually referred to as backward looking volatility and uses past data over some period to estimate the volatility value. The standard and easiest way is by taking the standard deviation σ of the stock price return as below (Chang, 2014):

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (R_i - \bar{R})^2}{n-1}} \quad (1)$$

where R_i is a continuous return at time i , \bar{R} equals to mean daily return and n is the number of observations. R_i and \bar{R} are computed using formula

$$R_i = \ln \left[\frac{S_i}{S_{i-1}} \right] \quad (2)$$

and

$$\bar{R} = \frac{\sum_{i=1}^n R_i}{n}. \quad (3)$$

The variable S_i in (2) denotes the stock price at time i .

Using historical standard deviation, the only important information is past returns and other information is ignored although it might move the markets (Ederington & Guan, 2006). One may predict the movement of stock in the future since its value is based on how fast it has been moving in recent past.

Implied volatility

Implied volatility or forward looking volatility shows what the market “implies” about the future stock’s volatility. It is derived by solving the option pricing model e.g. Black Scholes formula for a call option as the equation below (Anoniemi, 2006):

$$C = SN(d_1) - Ke^{-r(T-t)}N(d_2) \quad (4)$$

where

$$d_1 = \frac{\ln \left(\frac{S}{K} \right) + \left(r + \frac{\sigma^2}{2} \right) T}{\sigma \sqrt{T-t}}$$

and

$$d_2 = d_1 - \sigma \sqrt{T-t}.$$

In the equation above, C is defined as call option value, S is underlying asset, $N(\cdot)$ is cumulative standard normal distribution, K is strike price, r equals to risk-free interest rate, $T-t$ is the time to maturity where T is the date at maturity and t is the current time, and σ is volatility. In order to compute the volatility value, all other inputs required by Black Scholes formula are known except the volatility value.

The implication of volatility in finance

In the field of finance, volatility is referred to as risk and can be measured as standard deviation (Poon & Granger, 2003). Essentially, standard deviation is used to measure the amount of dispersion of a set of data values. The data points tend to be very close to the expected value or mean if the value of standard deviation approaches zero. The large value of standard deviation means that the data points are far from mean. Another way to measure volatility is by using variance since variance and standard deviation are connected by a simple relationship (Ladokhin, 2009). However, this approach is less common compared with estimation using standard deviation.

Groud, Levy and Lubochinsky (2003) state that the most widely used concept for representing risk is the volatility of returns. However, Poon and Granger (2003) and Ladokhin (2009) do not agree. They believe that volatility is not the same as risk although it is related to it. This is because risk refers to negative outcomes of some event and volatility is about the spread of outcomes which can be positive or negative.

An important factor in valuing the option value using Black Scholes Merton model is volatility of stock prices (Rotkowski, 2011). Modelling volatility is crucial to option pricing model since it is the only variable that is unobservable (Mitra, 2011). The option value relates to the asset's volatility value. Higher volatility leads to higher option value as the probability of the option to be valuable is higher.

METHODOLOGY

This section provides a detailed analysis of stock market volatility of 867 companies from different business sub-sectors in Malaysia. Data was taken from *Datastream*. The companies are grouped together based on their main business activity. There are 40 different sub-sectors which are furthered categorised into three main sectors - primary, secondary and tertiary. Table 1 shows the distribution of sub-sectors according to the main sector.

Data

Stock market prices are the source of volatility forecasts. The most common used price for estimating volatility is closing price. In this paper, the closing price is observed every day for 246 trading days. Data used in this paper was taken from the UiTM *Datastream* for the period of January 2014 to December 2014.

Table 1
Distribution of the sub-sector

| Primary sector | Secondary sector | Tertiary sector |
|--------------------------|-------------------------------------|-----------------------------------|
| Mining & quarrying | Chemicals | Water, gas & multiutilities |
| Oil equipment & services | Tobacco | Non-life insurance |
| | Pharmaceuticals & biotechnology | Industrial transportation |
| | Technology hardware & equipment | Healthcare equipment & services |
| | Personal goods | Real estate investment & services |
| | Beverages | Financial services |
| | Food producers | Software & computer services |
| | Leisure goods | Real estate investment trusts |
| | General industrials | Life insurance |
| | Forestry & papers | Travel & leisure |
| | Construction & material | Food & drug retailers |
| | Electronic & electrical equipment | Fixed line telecommunication |
| | General industrials | Banks |
| | Automobiles & parts | Mobile telecommunication |
| | Household goods & home construction | Media |
| | Aerospace & defence | General retailers |
| | Industrial metal & mining | Non-equity investment instrument |
| | Industrial engineering | |
| | Support services | |

Measuring Stock Market Volatility from Historical Data

This sub-section briefly explains in detail the procedure involved in the calculation of stock market volatility. The steps are as follows:

- Calculate the stock market return of each company involved by using the standard logarithmic method as in (2).
- Compute the standard deviation σ of the continuously stock market return by using formula in (1).
- Calculate the annualised volatility $\hat{\sigma}$ by:

$$\hat{\sigma} = \sigma\sqrt{\tau} \quad (5)$$

where τ represents the trading days per year. For this study τ is assumed equal to 246 days. Compute the volatility of each sub-sector by taking the average standard deviation of the companies with similar business activities.

The following section discusses the results based on the calculation above.

RESULT AND DISCUSSION

This section presents the result and discusses the volatility estimation for each sector, starting with the primary sector followed by secondary and tertiary sectors.

For the primary sector, there are only 2 sub-sectors with 24 companies (see Table 2).

Table 2
Distribution of the companies in primary sector

| Sub-sector | Number of Companies |
|--------------------------|---------------------|
| Mining & quarrying | 2 |
| Oil equipment & services | 22 |
| Total | 24 |

Figure 1 shows the volatility in primary sector by sub-sectors.

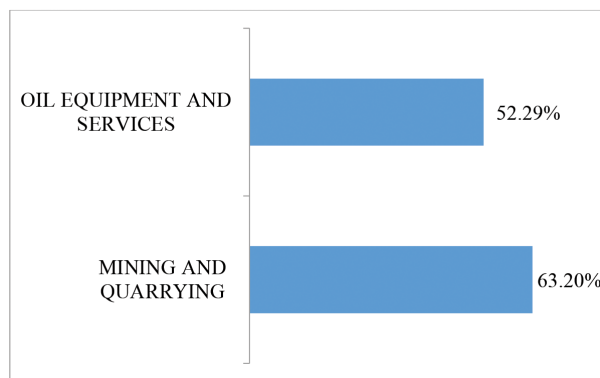


Figure 1. Volatility in primary sector by sub-sector

The volatility of mining and quarrying is 63.20% which is higher than oil equipment and services which is 52.29%. This means the mining and quarrying sub sector is more volatile compared with oil equipment and services. Appendix A presents the volatility value for mining and quarrying sector.

Table 3 shows the distribution of companies based on their sub-sectors. There are 20 sub-sectors with 559 companies.

Table 3
Distribution of companies in secondary sector

| Sub-sector | Number of Companies |
|-------------------------------------|---------------------|
| Chemicals | 31 |
| Tobacco | 1 |
| Pharmaceuticals & biotechnology | 8 |
| Technology hardware & equipment | 25 |
| Personal goods | 21 |
| Beverages | 9 |
| Food producers | 77 |
| General industrials | 3 |
| Forestry & papers | 14 |
| Construction & material | 106 |
| Leisure goods | 6 |
| Electronic & electrical equipment | 40 |
| General industrials | 32 |
| Automobiles & parts | 19 |
| Household goods & home construction | 39 |
| Aerospace & defence | 1 |
| Industrial metal & mining | 33 |
| Oil & gas producers | 8 |
| Industrial engineering | 53 |
| Support services | 33 |
| Total | 559 |

The volatility for secondary sector is presented in Figure 2. The highest volatility is seen in the technology hardware and equipment sub sector, 63.72% and the lowest volatility in the tobacco sub sector, 20.33%. From the result, it is known that technology hardware and equipment sub sector is more volatile compared with the tobacco sub sector – about three times as volatile.

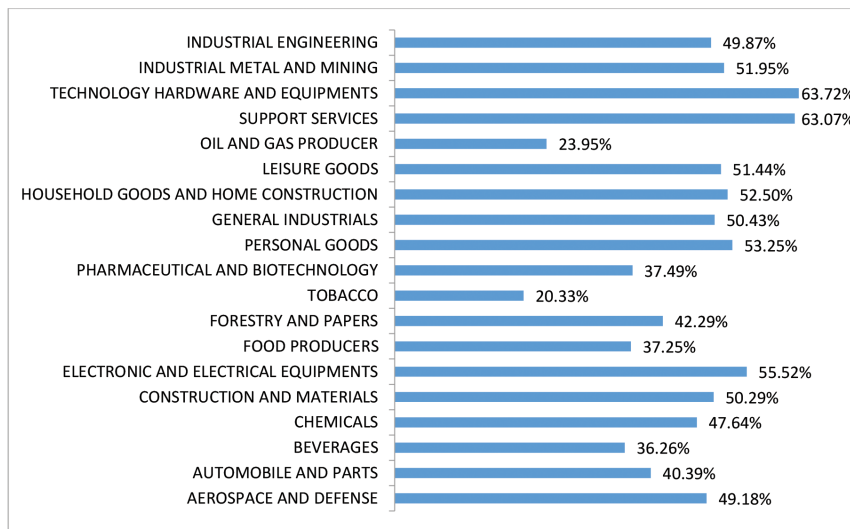


Figure 2. Volatility in secondary sector by sub-sector

The last sector is tertiary which has 18 sub-sectors with 324 companies. Table 4 shows the distribution of companies according to their sub-sectors.

Table 4
Distribution of companies in tertiary sector

| Sub-sector | Number of Companies |
|----------------------------------|---------------------|
| Water, gas & multiutilities | 9 |
| Non-life insurance | 8 |
| Industrial transportation | 32 |
| Healthcare equipment & services | 13 |
| Real estate invest & services | 79 |
| Financial services | 16 |
| Software & computer services | 57 |
| Real estate investment trusts | 15 |
| Life insurance | 1 |
| Travel & leisure | 29 |
| Food & drug retailers | 2 |
| Fixed line telecommunication | 4 |
| Banks | 10 |
| Mobile telecommunication | 8 |
| Media | 11 |
| General retailers | 23 |
| Non-equity investment instrument | 6 |
| Equity investment instrument | 1 |
| Total | 324 |

Volatility for the tertiary sector is shown in Figure 3. The fixed line telecommunications industry has the highest volatility, 86.49%, which is about 10 times more volatile than the lowest volatility which is non-equity investment instrument, 8.90%.

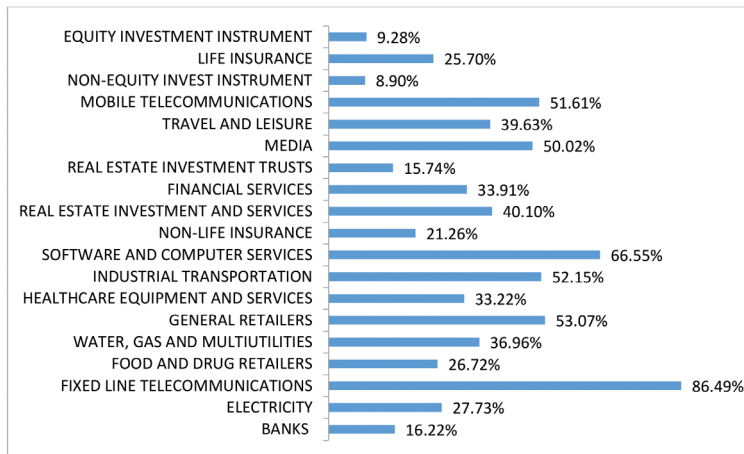


Figure 3. Volatility in tertiary sector by sub-sector

Based on the results, five sectors - mining and quarrying, support services, technology hardware and equipment, fixed line telecommunication, and software and computer services - have a volatility value of more than 60%. Sectors such as equity investment instrument, non-equity investment instrument, banks and real estate investment trusts have a volatility value of less than 20%. The annualised volatility of stocks normally lies between 20% and 60% (Hull, 2006).

The 35 sub-sector have more than 3 companies operating in similar industries except tobacco, aerospace and defence, life insurance, food and drug retailers, and equity investment instrument.

RESULT AND DISCUSSION

According to the results, the volatility values in different sub-sectors vary substantially. This implies the riskiness of individual company in each sub-sector. The greater the risk, the greater the potential for profits. Thus, investors with different risk portfolios can use these findings in re-creating their portfolio. Researchers may access the volatility of their countries' stock market by using the formula and methods used in this study.

The number of companies in each sub-sector should also be considered. For a meaningful comparison, the number of companies should be between 3 and 10 (Rotkowsky, 2011). Future research may examine company returns in each sector.

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APPENDIX A

| 1 MINETECH RESOURCES | | | | 2 SINO HUA-AN INTL. | | | |
|----------------------|-----------|---------------|-----------|---------------------|-----------|---------------|----------|
| Day | Date | Closing price | Return | Day | Date | Closing price | Return |
| 1 | 31-Dec-14 | 0.12 | 23.3615% | 1 | 31-Dec-14 | 0.11 | 0.0000% |
| 2 | 30-Dec-14 | 0.095 | 0.0000% | 2 | 30-Dec-14 | 0.11 | 4.6520% |
| 3 | 29-Dec-14 | 0.095 | 0.0000% | 3 | 29-Dec-14 | 0.105 | -4.6520% |
| 4 | 26-Dec-14 | 0.095 | 0.0000% | 4 | 26-Dec-14 | 0.11 | 9.5310% |
| 5 | 24-Dec-14 | 0.095 | 0.0000% | 5 | 24-Dec-14 | 0.1 | -4.8790% |
| 6 | 23-Dec-14 | 0.095 | 0.0000% | 6 | 23-Dec-14 | 0.105 | 0.0000% |
| 7 | 22-Dec-14 | 0.095 | -5.1293% | 7 | 22-Dec-14 | 0.105 | 0.0000% |
| 8 | 19-Dec-14 | 0.1 | 10.5361% | 8 | 19-Dec-14 | 0.105 | 0.0000% |
| 9 | 18-Dec-14 | 0.09 | 0.0000% | 9 | 18-Dec-14 | 0.105 | 4.8790% |
| 10 | 17-Dec-14 | 0.09 | 5.7158% | 10 | 17-Dec-14 | 0.1 | -4.8790% |
| 11 | 16-Dec-14 | 0.085 | 0.0000% | 11 | 16-Dec-14 | 0.105 | -4.6520% |
| 12 | 15-Dec-14 | 0.085 | -5.7158% | 12 | 15-Dec-14 | 0.11 | -8.7011% |
| 13 | 12-Dec-14 | 0.09 | -5.4067% | 13 | 12-Dec-14 | 0.12 | 0.0000% |
| 14 | 11-Dec-14 | 0.095 | 5.4067% | 14 | 11-Dec-14 | 0.12 | 0.0000% |
| 15 | 10-Dec-14 | 0.09 | 0.0000% | 15 | 10-Dec-14 | 0.12 | 0.0000% |
| 16 | 9-Dec-14 | 0.09 | 0.0000% | 16 | 9-Dec-14 | 0.12 | -4.0822% |
| 17 | 8-Dec-14 | 0.09 | -5.4067% | 17 | 8-Dec-14 | 0.125 | 0.0000% |
| 18 | 5-Dec-14 | 0.095 | 0.0000% | 18 | 5-Dec-14 | 0.125 | 4.0822% |
| 19 | 4-Dec-14 | 0.095 | -14.6603% | 19 | 4-Dec-14 | 0.12 | -4.0822% |
| 20 | 3-Dec-14 | 0.11 | 0.0000% | 20 | 3-Dec-14 | 0.125 | 0.0000% |
| 21 | 2-Dec-14 | 0.11 | -16.7054% | 21 | 2-Dec-14 | 0.125 | 0.0000% |
| 22 | 1-Dec-14 | 0.13 | 0.0000% | 22 | 1-Dec-14 | 0.125 | -3.9221% |
| 23 | 28-Nov-14 | 0.13 | -3.7740% | 23 | 28-Nov-14 | 0.13 | 0.0000% |
| 24 | 27-Nov-14 | 0.135 | 0.0000% | 24 | 27-Nov-14 | 0.13 | 0.0000% |
| 25 | 26-Nov-14 | 0.135 | -7.1459% | 25 | 26-Nov-14 | 0.13 | 0.0000% |
| 26 | 25-Nov-14 | 0.145 | -9.8440% | 26 | 25-Nov-14 | 0.13 | 0.0000% |
| 27 | 24-Nov-14 | 0.16 | -3.0772% | 27 | 24-Nov-14 | 0.13 | 0.0000% |
| 28 | 21-Nov-14 | 0.165 | -2.9853% | 28 | 21-Nov-14 | 0.13 | -3.7740% |
| 29 | 20-Nov-14 | 0.17 | 2.9853% | 29 | 20-Nov-14 | 0.135 | 3.7740% |
| 30 | 19-Nov-14 | 0.165 | 3.0772% | 30 | 19-Nov-14 | 0.13 | -3.7740% |
| 31 | 18-Nov-14 | 0.16 | 6.4539% | 31 | 18-Nov-14 | 0.135 | 0.0000% |
| 32 | 17-Nov-14 | 0.15 | -6.4539% | 32 | 17-Nov-14 | 0.135 | -3.6368% |
| 33 | 14-Nov-14 | 0.16 | -3.0772% | 33 | 14-Nov-14 | 0.14 | 0.0000% |
| 34 | 13-Nov-14 | 0.165 | 3.0772% | 34 | 13-Nov-14 | 0.14 | 0.0000% |
| 35 | 12-Nov-14 | 0.16 | 6.4539% | 35 | 12-Nov-14 | 0.14 | 0.0000% |

| | | | | | | | | |
|----|-----------|-------|-----------|--|----|-----------|-------|----------|
| 36 | 11-Nov-14 | 0.15 | 6.8993% | | 36 | 11-Nov-14 | 0.14 | 0.0000% |
| 37 | 10-Nov-14 | 0.14 | 0.0000% | | 37 | 10-Nov-14 | 0.14 | 0.0000% |
| 38 | 7-Nov-14 | 0.14 | 3.6368% | | 38 | 7-Nov-14 | 0.14 | 3.6368% |
| 39 | 6-Nov-14 | 0.135 | 3.7740% | | 39 | 6-Nov-14 | 0.135 | 0.0000% |
| 40 | 5-Nov-14 | 0.13 | -20.7639% | | 40 | 5-Nov-14 | 0.135 | 0.0000% |
| 41 | 4-Nov-14 | 0.16 | 6.4539% | | 41 | 4-Nov-14 | 0.135 | 0.0000% |
| 42 | 3-Nov-14 | 0.15 | 0.0000% | | 42 | 3-Nov-14 | 0.135 | 0.0000% |
| 43 | 31-Oct-14 | 0.15 | 3.3902% | | 43 | 31-Oct-14 | 0.135 | 0.0000% |
| 44 | 30-Oct-14 | 0.145 | -3.3902% | | 44 | 30-Oct-14 | 0.135 | 0.0000% |
| 45 | 29-Oct-14 | 0.15 | 0.0000% | | 45 | 29-Oct-14 | 0.135 | 0.0000% |
| 46 | 28-Oct-14 | 0.15 | 3.3902% | | 46 | 28-Oct-14 | 0.135 | 0.0000% |
| 47 | 27-Oct-14 | 0.145 | 0.0000% | | 47 | 27-Oct-14 | 0.135 | 0.0000% |
| 48 | 24-Oct-14 | 0.145 | 0.0000% | | 48 | 24-Oct-14 | 0.135 | -3.6368% |
| 49 | 23-Oct-14 | 0.145 | 0.0000% | | 49 | 23-Oct-14 | 0.14 | 3.6368% |
| 50 | 21-Oct-14 | 0.145 | 3.5091% | | 50 | 21-Oct-14 | 0.135 | 0.0000% |
| 51 | 20-Oct-14 | 0.14 | -3.5091% | | 51 | 20-Oct-14 | 0.135 | 0.0000% |
| 52 | 17-Oct-14 | 0.145 | 0.0000% | | 52 | 17-Oct-14 | 0.135 | 3.7740% |
| 53 | 16-Oct-14 | 0.145 | 0.0000% | | 53 | 16-Oct-14 | 0.13 | -3.7740% |
| 54 | 15-Oct-14 | 0.145 | -3.3902% | | 54 | 15-Oct-14 | 0.135 | 0.0000% |
| 55 | 14-Oct-14 | 0.15 | 3.3902% | | 55 | 14-Oct-14 | 0.135 | -3.6368% |
| 56 | 13-Oct-14 | 0.145 | 0.0000% | | 56 | 13-Oct-14 | 0.14 | 0.0000% |
| 57 | 10-Oct-14 | 0.145 | -3.3902% | | 57 | 10-Oct-14 | 0.14 | -3.5091% |
| 58 | 9-Oct-14 | 0.15 | 3.3902% | | 58 | 9-Oct-14 | 0.145 | 0.0000% |
| 59 | 8-Oct-14 | 0.145 | 0.0000% | | 59 | 8-Oct-14 | 0.145 | -3.3902% |
| 60 | 7-Oct-14 | 0.145 | 0.0000% | | 60 | 7-Oct-14 | 0.15 | 0.0000% |
| 61 | 3-Oct-14 | 0.145 | 0.0000% | | 61 | 3-Oct-14 | 0.15 | 0.0000% |
| 62 | 2-Oct-14 | 0.145 | 0.0000% | | 62 | 2-Oct-14 | 0.15 | 0.0000% |
| 63 | 1-Oct-14 | 0.145 | 0.0000% | | 63 | 1-Oct-14 | 0.15 | -3.2790% |
| 64 | 30-Sep-14 | 0.145 | 0.0000% | | 64 | 30-Sep-14 | 0.155 | 0.0000% |
| 65 | 29-Sep-14 | 0.145 | 0.0000% | | 65 | 29-Sep-14 | 0.155 | 3.2790% |
| 66 | 26-Sep-14 | 0.145 | 0.0000% | | 66 | 26-Sep-14 | 0.15 | -3.2790% |
| 67 | 25-Sep-14 | 0.145 | -3.3902% | | 67 | 25-Sep-14 | 0.155 | 3.2790% |
| 68 | 24-Sep-14 | 0.15 | 0.0000% | | 68 | 24-Sep-14 | 0.15 | 0.0000% |
| 69 | 23-Sep-14 | 0.15 | 0.0000% | | 69 | 23-Sep-14 | 0.15 | 0.0000% |
| 70 | 22-Sep-14 | 0.15 | 3.3902% | | 70 | 22-Sep-14 | 0.15 | -3.2790% |
| 71 | 19-Sep-14 | 0.145 | -3.3902% | | 71 | 19-Sep-14 | 0.155 | 3.2790% |
| 72 | 18-Sep-14 | 0.15 | 3.3902% | | 72 | 18-Sep-14 | 0.15 | -3.2790% |
| 73 | 17-Sep-14 | 0.145 | 0.0000% | | 73 | 17-Sep-14 | 0.155 | 3.2790% |
| 74 | 15-Sep-14 | 0.145 | 0.0000% | | 74 | 15-Sep-14 | 0.15 | 0.0000% |

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| | | | | | | | |
|-----|-----------|-------|----------|-----|-----------|-------|----------|
| 75 | 12-Sep-14 | 0.145 | -3.3902% | 75 | 12-Sep-14 | 0.15 | -3.2790% |
| 76 | 11-Sep-14 | 0.15 | 3.3902% | 76 | 11-Sep-14 | 0.155 | 3.2790% |
| 77 | 10-Sep-14 | 0.145 | -3.3902% | 77 | 10-Sep-14 | 0.15 | 0.0000% |
| 78 | 9-Sep-14 | 0.15 | 0.0000% | 78 | 9-Sep-14 | 0.15 | 0.0000% |
| 79 | 8-Sep-14 | 0.15 | 0.0000% | 79 | 8-Sep-14 | 0.15 | 0.0000% |
| 80 | 5-Sep-14 | 0.15 | 3.3902% | 80 | 5-Sep-14 | 0.15 | 0.0000% |
| 81 | 4-Sep-14 | 0.145 | 0.0000% | 81 | 4-Sep-14 | 0.15 | -3.2790% |
| 82 | 3-Sep-14 | 0.145 | 0.0000% | 82 | 3-Sep-14 | 0.155 | 0.0000% |
| 83 | 2-Sep-14 | 0.145 | 0.0000% | 83 | 2-Sep-14 | 0.155 | 3.2790% |
| 84 | 29-Aug-14 | 0.145 | -3.3902% | 84 | 29-Aug-14 | 0.15 | -6.4539% |
| 85 | 28-Aug-14 | 0.15 | 3.3902% | 85 | 28-Aug-14 | 0.16 | 3.1749% |
| 86 | 27-Aug-14 | 0.145 | 0.0000% | 86 | 27-Aug-14 | 0.155 | 3.2790% |
| 87 | 26-Aug-14 | 0.145 | 0.0000% | 87 | 26-Aug-14 | 0.15 | 0.0000% |
| 88 | 25-Aug-14 | 0.145 | 0.0000% | 88 | 25-Aug-14 | 0.15 | -6.4539% |
| 89 | 22-Aug-14 | 0.145 | 0.0000% | 89 | 22-Aug-14 | 0.16 | 0.0000% |
| 90 | 21-Aug-14 | 0.145 | 3.5091% | 90 | 21-Aug-14 | 0.16 | 3.1749% |
| 91 | 20-Aug-14 | 0.14 | -6.8993% | 91 | 20-Aug-14 | 0.155 | 0.0000% |
| 92 | 19-Aug-14 | 0.15 | 6.8993% | 92 | 19-Aug-14 | 0.155 | 0.0000% |
| 93 | 18-Aug-14 | 0.14 | 0.0000% | 93 | 18-Aug-14 | 0.155 | 0.0000% |
| 94 | 15-Aug-14 | 0.14 | 0.0000% | 94 | 15-Aug-14 | 0.155 | 0.0000% |
| 95 | 14-Aug-14 | 0.14 | -3.5091% | 95 | 14-Aug-14 | 0.155 | 0.0000% |
| 96 | 13-Aug-14 | 0.145 | 3.5091% | 96 | 13-Aug-14 | 0.155 | 3.2790% |
| 97 | 12-Aug-14 | 0.14 | 0.0000% | 97 | 12-Aug-14 | 0.15 | -3.2790% |
| 98 | 11-Aug-14 | 0.14 | 0.0000% | 98 | 11-Aug-14 | 0.155 | 3.2790% |
| 99 | 8-Aug-14 | 0.14 | -6.8993% | 99 | 8-Aug-14 | 0.15 | -3.2790% |
| 100 | 7-Aug-14 | 0.15 | 0.0000% | 100 | 7-Aug-14 | 0.155 | -3.1749% |
| 101 | 6-Aug-14 | 0.15 | 6.8993% | 101 | 6-Aug-14 | 0.16 | 3.1749% |
| 102 | 5-Aug-14 | 0.14 | 0.0000% | 102 | 5-Aug-14 | 0.155 | 0.0000% |
| 103 | 4-Aug-14 | 0.14 | -3.5091% | 103 | 4-Aug-14 | 0.155 | 3.2790% |
| 104 | 1-Aug-14 | 0.145 | 0.0000% | 104 | 1-Aug-14 | 0.15 | 0.0000% |
| 105 | 31-Jul-14 | 0.145 | -3.3902% | 105 | 31-Jul-14 | 0.15 | 0.0000% |
| 106 | 30-Jul-14 | 0.15 | 3.3902% | 106 | 30-Jul-14 | 0.15 | 0.0000% |
| 107 | 25-Jul-14 | 0.145 | 3.5091% | 107 | 25-Jul-14 | 0.15 | 3.3902% |
| 108 | 24-Jul-14 | 0.14 | -3.5091% | 108 | 24-Jul-14 | 0.145 | -3.3902% |
| 109 | 23-Jul-14 | 0.145 | -3.3902% | 109 | 23-Jul-14 | 0.15 | 3.3902% |
| 110 | 22-Jul-14 | 0.15 | 0.0000% | 110 | 22-Jul-14 | 0.145 | 0.0000% |
| 111 | 21-Jul-14 | 0.15 | 0.0000% | 111 | 21-Jul-14 | 0.145 | 0.0000% |
| 112 | 18-Jul-14 | 0.15 | 14.3101% | 112 | 18-Jul-14 | 0.145 | 0.0000% |
| 113 | 17-Jul-14 | 0.13 | 0.0000% | 113 | 17-Jul-14 | 0.145 | 0.0000% |

| | | | | | | | | |
|-----|-----------|-------|-----------|--|-----|-----------|-------|----------|
| 114 | 16-Jul-14 | 0.13 | -3.7740% | | 114 | 16-Jul-14 | 0.145 | 0.0000% |
| 115 | 14-Jul-14 | 0.135 | 0.0000% | | 115 | 14-Jul-14 | 0.145 | 0.0000% |
| 116 | 11-Jul-14 | 0.135 | 0.0000% | | 116 | 11-Jul-14 | 0.145 | -3.3902% |
| 117 | 10-Jul-14 | 0.135 | 3.7740% | | 117 | 10-Jul-14 | 0.15 | 0.0000% |
| 118 | 9-Jul-14 | 0.13 | 0.0000% | | 118 | 9-Jul-14 | 0.15 | 3.3902% |
| 119 | 8-Jul-14 | 0.13 | -7.4108% | | 119 | 8-Jul-14 | 0.145 | -6.6691% |
| 120 | 7-Jul-14 | 0.14 | 3.6368% | | 120 | 7-Jul-14 | 0.155 | 3.2790% |
| 121 | 4-Jul-14 | 0.135 | -10.5361% | | 121 | 4-Jul-14 | 0.15 | 0.0000% |
| 122 | 3-Jul-14 | 0.15 | 0.0000% | | 122 | 3-Jul-14 | 0.15 | 0.0000% |
| 123 | 2-Jul-14 | 0.15 | 0.0000% | | 123 | 2-Jul-14 | 0.15 | 0.0000% |
| 124 | 1-Jul-14 | 0.15 | 0.0000% | | 124 | 1-Jul-14 | 0.15 | 3.3902% |
| 125 | 30-Jun-14 | 0.15 | -3.2790% | | 125 | 30-Jun-14 | 0.145 | 0.0000% |
| 126 | 27-Jun-14 | 0.155 | 0.0000% | | 126 | 27-Jun-14 | 0.145 | -3.3902% |
| 127 | 26-Jun-14 | 0.155 | 0.0000% | | 127 | 26-Jun-14 | 0.15 | 0.0000% |
| 128 | 25-Jun-14 | 0.155 | 3.2790% | | 128 | 25-Jun-14 | 0.15 | 0.0000% |
| 129 | 24-Jun-14 | 0.15 | 6.8993% | | 129 | 24-Jun-14 | 0.15 | 0.0000% |
| 130 | 23-Jun-14 | 0.14 | 0.0000% | | 130 | 23-Jun-14 | 0.15 | 0.0000% |
| 131 | 20-Jun-14 | 0.14 | -3.5091% | | 131 | 20-Jun-14 | 0.15 | 0.0000% |
| 132 | 19-Jun-14 | 0.145 | -3.3902% | | 132 | 19-Jun-14 | 0.15 | 0.0000% |
| 133 | 18-Jun-14 | 0.15 | 0.0000% | | 133 | 18-Jun-14 | 0.15 | 0.0000% |
| 134 | 17-Jun-14 | 0.15 | 0.0000% | | 134 | 17-Jun-14 | 0.15 | 3.3902% |
| 135 | 16-Jun-14 | 0.15 | 14.3101% | | 135 | 16-Jun-14 | 0.145 | 0.0000% |
| 136 | 13-Jun-14 | 0.13 | 0.0000% | | 136 | 13-Jun-14 | 0.145 | 0.0000% |
| 137 | 12-Jun-14 | 0.13 | -3.7740% | | 137 | 12-Jun-14 | 0.145 | 0.0000% |
| 138 | 11-Jun-14 | 0.135 | 0.0000% | | 138 | 11-Jun-14 | 0.145 | 0.0000% |
| 139 | 10-Jun-14 | 0.135 | 7.6961% | | 139 | 10-Jun-14 | 0.145 | 0.0000% |
| 140 | 9-Jun-14 | 0.125 | -3.9221% | | 140 | 9-Jun-14 | 0.145 | 0.0000% |
| 141 | 6-Jun-14 | 0.13 | 3.9221% | | 141 | 6-Jun-14 | 0.145 | 0.0000% |
| 142 | 5-Jun-14 | 0.125 | -3.9221% | | 142 | 5-Jun-14 | 0.145 | -3.3902% |
| 143 | 4-Jun-14 | 0.13 | 3.9221% | | 143 | 4-Jun-14 | 0.15 | 0.0000% |
| 144 | 3-Jun-14 | 0.125 | 0.0000% | | 144 | 3-Jun-14 | 0.15 | 3.3902% |
| 145 | 2-Jun-14 | 0.125 | -3.9221% | | 145 | 2-Jun-14 | 0.145 | 0.0000% |
| 146 | 30-May-14 | 0.13 | 0.0000% | | 146 | 30-May-14 | 0.145 | 0.0000% |
| 147 | 29-May-14 | 0.13 | 3.9221% | | 147 | 29-May-14 | 0.145 | 0.0000% |
| 148 | 28-May-14 | 0.125 | -3.9221% | | 148 | 28-May-14 | 0.145 | -3.3902% |
| 149 | 27-May-14 | 0.13 | 3.9221% | | 149 | 27-May-14 | 0.15 | 6.8993% |
| 150 | 26-May-14 | 0.125 | -3.9221% | | 150 | 26-May-14 | 0.14 | 0.0000% |
| 151 | 23-May-14 | 0.13 | 0.0000% | | 151 | 23-May-14 | 0.14 | -3.5091% |
| 152 | 22-May-14 | 0.13 | -3.7740% | | 152 | 22-May-14 | 0.145 | 0.0000% |

Assessing Stock Market Volatility for Different Sectors in Malaysia

| | | | | | | | | |
|-----|-----------|-------|----------|--|-----|-----------|-------|----------|
| 153 | 21-May-14 | 0.135 | 0.0000% | | 153 | 21-May-14 | 0.145 | 0.0000% |
| 154 | 20-May-14 | 0.135 | 0.0000% | | 154 | 20-May-14 | 0.145 | 0.0000% |
| 155 | 19-May-14 | 0.135 | 0.0000% | | 155 | 19-May-14 | 0.145 | 3.5091% |
| 156 | 16-May-14 | 0.135 | 0.0000% | | 156 | 16-May-14 | 0.14 | -3.5091% |
| 157 | 15-May-14 | 0.135 | -3.6368% | | 157 | 15-May-14 | 0.145 | -3.3902% |
| 158 | 14-May-14 | 0.14 | 0.0000% | | 158 | 14-May-14 | 0.15 | 6.8993% |
| 159 | 12-May-14 | 0.14 | 0.0000% | | 159 | 12-May-14 | 0.14 | 0.0000% |
| 160 | 9-May-14 | 0.14 | -3.5091% | | 160 | 9-May-14 | 0.14 | -3.5091% |
| 161 | 8-May-14 | 0.145 | 0.0000% | | 161 | 8-May-14 | 0.145 | 3.5091% |
| 162 | 7-May-14 | 0.145 | 7.1459% | | 162 | 7-May-14 | 0.14 | -6.8993% |
| 163 | 6-May-14 | 0.135 | 0.0000% | | 163 | 6-May-14 | 0.15 | 3.3902% |
| 164 | 5-May-14 | 0.135 | -3.6368% | | 164 | 5-May-14 | 0.145 | -3.3902% |
| 165 | 2-May-14 | 0.14 | -3.5091% | | 165 | 2-May-14 | 0.15 | 0.0000% |
| 166 | 30-Apr-14 | 0.145 | 3.5091% | | 166 | 30-Apr-14 | 0.15 | 0.0000% |
| 167 | 29-Apr-14 | 0.14 | -3.5091% | | 167 | 29-Apr-14 | 0.15 | -3.2790% |
| 168 | 28-Apr-14 | 0.145 | -3.3902% | | 168 | 28-Apr-14 | 0.155 | -3.1749% |
| 169 | 25-Apr-14 | 0.15 | 0.0000% | | 169 | 25-Apr-14 | 0.16 | 6.4539% |
| 170 | 24-Apr-14 | 0.15 | 0.0000% | | 170 | 24-Apr-14 | 0.15 | -6.4539% |
| 171 | 23-Apr-14 | 0.15 | 3.3902% | | 171 | 23-Apr-14 | 0.16 | 9.8440% |
| 172 | 22-Apr-14 | 0.145 | -3.3902% | | 172 | 22-Apr-14 | 0.145 | 0.0000% |
| 173 | 21-Apr-14 | 0.15 | 0.0000% | | 173 | 21-Apr-14 | 0.145 | -3.3902% |
| 174 | 18-Apr-14 | 0.15 | 0.0000% | | 174 | 18-Apr-14 | 0.15 | 3.3902% |
| 175 | 17-Apr-14 | 0.15 | 6.8993% | | 175 | 17-Apr-14 | 0.145 | 0.0000% |
| 176 | 16-Apr-14 | 0.14 | -6.8993% | | 176 | 16-Apr-14 | 0.145 | -3.3902% |
| 177 | 15-Apr-14 | 0.15 | -3.2790% | | 177 | 15-Apr-14 | 0.15 | 3.3902% |
| 178 | 14-Apr-14 | 0.155 | 0.0000% | | 178 | 14-Apr-14 | 0.145 | 0.0000% |
| 179 | 11-Apr-14 | 0.155 | 3.2790% | | 179 | 11-Apr-14 | 0.145 | 0.0000% |
| 180 | 10-Apr-14 | 0.15 | 6.8993% | | 180 | 10-Apr-14 | 0.145 | -3.3902% |
| 181 | 9-Apr-14 | 0.14 | 7.4108% | | 181 | 9-Apr-14 | 0.15 | 6.8993% |
| 182 | 8-Apr-14 | 0.13 | 0.0000% | | 182 | 8-Apr-14 | 0.14 | -3.5091% |
| 183 | 7-Apr-14 | 0.13 | -3.7740% | | 183 | 7-Apr-14 | 0.145 | 0.0000% |
| 184 | 4-Apr-14 | 0.135 | -3.6368% | | 184 | 4-Apr-14 | 0.145 | 0.0000% |
| 185 | 3-Apr-14 | 0.14 | 0.0000% | | 185 | 3-Apr-14 | 0.145 | -3.3902% |
| 186 | 2-Apr-14 | 0.14 | 0.0000% | | 186 | 2-Apr-14 | 0.15 | 3.3902% |
| 187 | 1-Apr-14 | 0.14 | 0.0000% | | 187 | 1-Apr-14 | 0.145 | 0.0000% |
| 188 | 31-Mar-14 | 0.14 | -3.5091% | | 188 | 31-Mar-14 | 0.145 | 0.0000% |
| 189 | 28-Mar-14 | 0.145 | -3.3902% | | 189 | 28-Mar-14 | 0.145 | 0.0000% |
| 190 | 27-Mar-14 | 0.15 | 3.3902% | | 190 | 27-Mar-14 | 0.145 | 0.0000% |
| 191 | 26-Mar-14 | 0.145 | -3.3902% | | 191 | 26-Mar-14 | 0.145 | 0.0000% |

| | | | | | | | | |
|-----|-----------|-------|-----------|--|-----|-----------|-------|----------|
| 192 | 25-Mar-14 | 0.15 | 0.0000% | | 192 | 25-Mar-14 | 0.145 | -3.3902% |
| 193 | 24-Mar-14 | 0.15 | -3.2790% | | 193 | 24-Mar-14 | 0.15 | 3.3902% |
| 194 | 21-Mar-14 | 0.155 | 3.2790% | | 194 | 21-Mar-14 | 0.145 | 0.0000% |
| 195 | 20-Mar-14 | 0.15 | 0.0000% | | 195 | 20-Mar-14 | 0.145 | 0.0000% |
| 196 | 19-Mar-14 | 0.15 | 3.3902% | | 196 | 19-Mar-14 | 0.145 | 0.0000% |
| 197 | 18-Mar-14 | 0.145 | 0.0000% | | 197 | 18-Mar-14 | 0.145 | 3.5091% |
| 198 | 17-Mar-14 | 0.145 | 0.0000% | | 198 | 17-Mar-14 | 0.14 | -3.5091% |
| 199 | 14-Mar-14 | 0.145 | -3.3902% | | 199 | 14-Mar-14 | 0.145 | 0.0000% |
| 200 | 13-Mar-14 | 0.15 | 0.0000% | | 200 | 13-Mar-14 | 0.145 | 0.0000% |
| 201 | 12-Mar-14 | 0.15 | -6.4539% | | 201 | 12-Mar-14 | 0.145 | -6.6691% |
| 202 | 11-Mar-14 | 0.16 | -3.0772% | | 202 | 11-Mar-14 | 0.155 | 3.2790% |
| 203 | 10-Mar-14 | 0.165 | 0.0000% | | 203 | 10-Mar-14 | 0.15 | 3.3902% |
| 204 | 7-Mar-14 | 0.165 | -2.9853% | | 204 | 7-Mar-14 | 0.145 | -3.3902% |
| 205 | 6-Mar-14 | 0.17 | -2.8988% | | 205 | 6-Mar-14 | 0.15 | 3.3902% |
| 206 | 5-Mar-14 | 0.175 | 2.8988% | | 206 | 5-Mar-14 | 0.145 | 3.5091% |
| 207 | 4-Mar-14 | 0.17 | -5.7158% | | 207 | 4-Mar-14 | 0.14 | 0.0000% |
| 208 | 3-Mar-14 | 0.18 | 0.0000% | | 208 | 3-Mar-14 | 0.14 | 0.0000% |
| 209 | 28-Feb-14 | 0.18 | -2.7399% | | 209 | 28-Feb-14 | 0.14 | -6.8993% |
| 210 | 27-Feb-14 | 0.185 | -2.6668% | | 210 | 27-Feb-14 | 0.15 | 3.3902% |
| 211 | 26-Feb-14 | 0.19 | -7.5986% | | 211 | 26-Feb-14 | 0.145 | 0.0000% |
| 212 | 25-Feb-14 | 0.205 | 0.0000% | | 212 | 25-Feb-14 | 0.145 | 3.5091% |
| 213 | 24-Feb-14 | 0.205 | 2.4693% | | 213 | 24-Feb-14 | 0.14 | -6.8993% |
| 214 | 21-Feb-14 | 0.2 | -7.2321% | | 214 | 21-Feb-14 | 0.15 | 0.0000% |
| 215 | 20-Feb-14 | 0.215 | -24.6133% | | 215 | 20-Feb-14 | 0.15 | 0.0000% |
| 216 | 19-Feb-14 | 0.275 | -5.3110% | | 216 | 19-Feb-14 | 0.15 | 3.3902% |
| 217 | 18-Feb-14 | 0.29 | -8.2692% | | 217 | 18-Feb-14 | 0.145 | -3.3902% |
| 218 | 17-Feb-14 | 0.315 | 3.2261% | | 218 | 17-Feb-14 | 0.15 | 0.0000% |
| 219 | 14-Feb-14 | 0.305 | 5.0431% | | 219 | 14-Feb-14 | 0.15 | 3.3902% |
| 220 | 13-Feb-14 | 0.29 | -5.0431% | | 220 | 13-Feb-14 | 0.145 | -3.3902% |
| 221 | 12-Feb-14 | 0.305 | -3.2261% | | 221 | 12-Feb-14 | 0.15 | 3.3902% |
| 222 | 11-Feb-14 | 0.315 | 6.5597% | | 222 | 11-Feb-14 | 0.145 | 3.5091% |
| 223 | 10-Feb-14 | 0.295 | 14.5712% | | 223 | 10-Feb-14 | 0.14 | 0.0000% |
| 224 | 7-Feb-14 | 0.255 | 0.0000% | | 224 | 7-Feb-14 | 0.14 | 7.4108% |
| 225 | 6-Feb-14 | 0.255 | 10.3184% | | 225 | 6-Feb-14 | 0.13 | 0.0000% |
| 226 | 5-Feb-14 | 0.23 | 6.7441% | | 226 | 5-Feb-14 | 0.13 | 0.0000% |
| 227 | 4-Feb-14 | 0.215 | 17.7681% | | 227 | 4-Feb-14 | 0.13 | -3.7740% |
| 228 | 30-Jan-14 | 0.18 | 0.0000% | | 228 | 30-Jan-14 | 0.135 | 0.0000% |
| 229 | 29-Jan-14 | 0.18 | 0.0000% | | 229 | 29-Jan-14 | 0.135 | 0.0000% |
| 230 | 28-Jan-14 | 0.18 | 2.8171% | | 230 | 28-Jan-14 | 0.135 | -3.6368% |

Assessing Stock Market Volatility for Different Sectors in Malaysia

| | | | | | | | | |
|-----|-----------------------|-------|----------|--|--------|-----------------------|-------|----------|
| 231 | 27-Jan-14 | 0.175 | -2.8171% | | 231 | 27-Jan-14 | 0.14 | 0.0000% |
| 232 | 24-Jan-14 | 0.18 | 5.7158% | | 232 | 24-Jan-14 | 0.14 | 3.6368% |
| 233 | 23-Jan-14 | 0.17 | -5.7158% | | 233 | 23-Jan-14 | 0.135 | -3.6368% |
| 234 | 22-Jan-14 | 0.18 | -8.0043% | | 234 | 22-Jan-14 | 0.14 | 3.6368% |
| 235 | 21-Jan-14 | 0.195 | 8.0043% | | 235 | 21-Jan-14 | 0.135 | -3.6368% |
| 236 | 20-Jan-14 | 0.18 | -8.0043% | | 236 | 20-Jan-14 | 0.14 | 0.0000% |
| 237 | 16-Jan-14 | 0.195 | -2.5318% | | 237 | 16-Jan-14 | 0.14 | 0.0000% |
| 238 | 15-Jan-14 | 0.2 | -9.5310% | | 238 | 15-Jan-14 | 0.14 | 0.0000% |
| 239 | 13-Jan-14 | 0.22 | 4.6520% | | 239 | 13-Jan-14 | 0.14 | -3.5091% |
| 240 | 10-Jan-14 | 0.21 | 10.0083% | | 240 | 10-Jan-14 | 0.145 | 3.5091% |
| 241 | 9-Jan-14 | 0.19 | 0.0000% | | 241 | 9-Jan-14 | 0.14 | 0.0000% |
| 242 | 8-Jan-14 | 0.19 | 2.6668% | | 242 | 8-Jan-14 | 0.14 | 0.0000% |
| 243 | 7-Jan-14 | 0.185 | 0.0000% | | 243 | 7-Jan-14 | 0.14 | 3.6368% |
| 244 | 6-Jan-14 | 0.185 | -2.6668% | | 244 | 6-Jan-14 | 0.135 | 0.0000% |
| 245 | 3-Jan-14 | 0.19 | 2.6668% | | 245 | 3-Jan-14 | 0.135 | 0.0000% |
| 246 | 2-Jan-14 | 0.185 | | | 246 | 2-Jan-14 | 0.135 | |
| | | | | | | | | |
| | Volatility (day) | | 5.12% | | | Volatility (day) | | 2.94% |
| | Volatility (annually) | | 80.28% | | | Volatility (annually) | | 46.12% |
| | | | | | | | | |
| | Average (volatility) | | | | 63.20% | | | |

