

**A STUDY OF DIFFERENT STATISTICAL ANALYSIS METHODS TO  
MONITOR THE STOCK PRICES**

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**A project report submitted in partial fulfilment of the  
requirements for the award of Master of Mathematics**

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**April 2019**

**DECLARATION**

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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**APPROVAL FOR SUBMISSION**

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## ABSTRACT

The stock exchange is a regulated financial market and it reflect a country's growth and performance. The stock market is essential as it can directly affect the economy of a country. In this project, seven stocks in Malaysia are picked and studied by applying Shewhart  $\bar{X}$ ,  $R$  and Candlestick Charts. The opening, low, high, closing and average prices are used in this study. The main concern of this study is to determine which statistical methods are useful to monitor stocks. Among the seven stocks, Top Glove Stock is responsive to Shewhart  $\bar{X}$  Chart. All the seven stocks are alert to  $R$  Chart and Candlestick Chart is used to study the behaviour of the stock based on the data collected. In the nutshell, Shewhart  $\bar{X}$  and  $R$  Charts provided limited information for decision making. However, Candlestick Chart is able to support the decision making for a short term trading.

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**LIST OF SYMBOLS / ABBREVIATIONS**

$\bar{X}$	average of measurements
$\bar{\bar{X}}$	average of averages
$\sigma$	standard deviation
$\bar{R}$	average of ranges
$R$	range
$k$	total number of range
$D_3, D_4$	factors used to calculate control limits for $R$ Chart
$UCL_{\bar{X}}$	upper control limit for $\bar{X}$
$CL_{\bar{X}}$	lower control limit for $\bar{X}$
$LCL_{\bar{X}}$	control limit for $\bar{X}$
$UCL_R$	upper control limit for $R$
$CL_R$	lower control limit for $R$
$LCL_R$	control limit for $R$

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## CHAPTER 1

### INTRODUCTION

#### 1.1 General Introduction

Stock market is reflecting a country's economy development, financial status and growth. A stock market is a very complex and sophisticated place. Therefore, Stapley (1986) said that it plays a main role in structural transformations in economy i.e. from insecure bank based to a more secure and more elastic economy that safe from fluctuations, shocks and confidence of the investors. It is crucial for the development of a competitive and solid economy. Stock traders always intend to obtain a broad picture on the behaviour of the stock market. It is crucial for stock trader to identify an upward or downward price trend before making any trading decision.

#### 1.2 Importance of the Study

A stock is a type of security that indicates ownership in an organization and represents a claim on part of the organization's earnings and assets. The word stock means equity or possession. In organisations these stocks are traded in a market called the "stock exchange" said by Tweles and Bradly (1987). Meanwhile, a stock market is also known as equity market. It plays a vital role in free-market economy. It is actually a place accumulated with stocks and equities of visibly held companies, bonds and other types of securities.

The existing theoretical and empirical literature related to finance and economic growth suggests that the financial sector has significant positive influence on the long run economic growth (King and Levine, 1993). Generally, there are many channels through which the financial sector affects economic growth. Stock market is included as one of the financial sectors. It is some of the most important parts of today's global economy. Tachiwou (2010) believes that the stock market is closely related to an economy's financial condition. In this study, he successfully showed that the stock market growth absolutely influence the economic development. Caporale et al. (2004) collected a sample from seven different countries have concluded that a well- developed stock market has a great impact on economic growth in the long run, better resource allocation and faster capital accumulation.

The history for the formation of stock exchange in Malaysia was dated back to 1930s. However, it was formerly formed in 1960s as Malayan Stock Exchange (MSE) (Arshad & Yahya, 2016). The name of the stock changed to Stock Exchange of Malaysia (SEM) in 1963s and Kuala Lumpur Stock Exchange (KLSE) in 1973. It renamed again in 2004 as Bursa Malaysia. Bursa Malaysia offers three markets for companies to be listed which are main market, ACE market and LEAP market. In the main market, stocks are grouped together among categories such as plantations include Chintek and Far East, Construction include AZRB and Gamuda and others.

Most of the stock traders used statistical analysis methods and tools to decide their trading strategy. There are ‘magnificent seven’ techniques used to enhance the statistical process control which are check sheet, control chart, defect concentration diagram, pareto chart, histogram, cause-and-effect diagram and scatter diagram. By definition, the statistical process control (SPC) is a technique that can control, observe and improve a process through statistical analysis. Dr. Kaoru Ishikawa in 1968 was the first who proposed these seven basic tools by publishing a book named “Gemba no QC Shuho”. It was focused on managing quality through techniques and practices for Japanese firms (Neyestani, 2017).

Among all the seven tools the most popular is control chart. The control chart is used to measure the sequential or time-related process performance and variability. It is probably the best known, most useful and most difficult to understand tool (Duffy, 2013). In essence, a control chart is a line chart (run chart) with control limits added. These control limits are mathematically constructed at three standard deviations above and below average. Control chart is a unique form of run chart. It illustrates the amount and nature of variation in the process over a period of time. Besides, it can describe what has been happening throughout the whole process (Neyestani, 2017). Advanced control charts also being introduced which are cumulative sum (CUSUM) control charts and the exponentially weighted moving average (EWMA) control charts. These two charts used to determine the small shifts in the process.

Robert (1959) was the pioneer who suggest the application of control chart in studying the marker levels and changes. Dumičić and Žmuk (2015) applied CUSUM and EWMA control chart to study the performances of short term stock trading. However, the presence of non-normality and autocorrelation has impact on statistical control chart performances. Control chart can be used in stock trading and monitoring as it able to measure a period of process. The advanced tools such as CUSUM and

EWMA can be used to gain the small shift of trade signals. Other than that, the stock traders used statistical analysis methods such as boxplot, histogram, candle stick, relative strength index, moving average convergence divergence etc to decide their trading strategy.

### **1.3 Problem Statement**

The main questions in this research are which chosen statistical methods are capable in giving signals for buying, holding and selling stocks, and how is the usage of statistical process control (SPC) method in supporting the stock trading. Also, it is unknown whether an investor can beat the market and achieve better financial results than other investors by applying the existing statistical methods.

### **1.4 Aims and Objectives**

The main objective of this research is to investigate which statistical methods are useful to give signals for buying, holding and selling stocks. The tasks could be broken down to the following sub-tasks:

- i) To study Shewhart  $\bar{X}$ ,  $R$  and Candlestick Charts in monitoring the stock prices.
- ii) To understand the behaviour of the stock based on the historical data.
- iii) To identify which method can signal the upward and downward trend in the stock prices.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Robert (1959) believed that the history of the market contains “patterns” that give clues to the future if these patterns can be properly studied and understood. There are several major crashes throughout history. In the 1929 Great Crash, the frantic equity collapse lasted for 8 days, with approximate 70.8 million shares were traded (Klein, 2001). On October 19, 1987, Dow Jones Industrial Average fell 508 points, a drop of 22.6% in one day (Shiller, 1987). Stock market crash refers to a sudden dramatic decline of stock prices within a stock market, resulting in a tremendous decline of monetary value of stock share (WebFinance Inc, 2018).

#### 2.2 Literature Review

Robert (1959) was first to propose the application of control chart in studying the market price levels and changes. Control charts were first introduced by Shewhart in 1924 (Best and Neuhauser, 2006). He identified two categories of variation which are “assignable-cause” and “chance-cause” variation. He came out with the control chart as a tool for differentiating between the two variations. Shewhart declared that only “chance-cause” variation can be brought into statistical control and it needed to be kept in control in order to enhance the quality (Best and Neuhauser, 2006). Meanwhile, a process that is operating in the presence of the “assignable-cause” variation is said to be out of the control.

Hubbard (1967) used logarithmic monthly values to determine the price trend and compare with the gross national product and personal income trends. According to Hubbard (1967), small price fluctuates between the centre line have no recognizable pattern and do not give any buy or sell signals to the stock traders. Meanwhile, significant departures from the centre line signals stock price overvaluation or undervaluation. The greatest achievement of Hubbard (1967) was pointed out the methods to distinguish signs for holding and buying stocks.

Alexander (1961, 1964) was first to introduce the filter trading rules. His work on the filter trading rules was the first academic works focused on the study of stock



prices trends using statistical rules (Venkataramani, 2003). This rule is defined as a sequence of buying and selling signals where these signals are given by a mechanical rule. Alexander work was then continued by Fama and Blume (1966). Fama and Blume (1966) averaged the filter profits over the stocks to alter for random successes.

The stock indices of Asian equity market of year 1975 to year 1991 are collected and the trading rules of Brock, Lakonishok and LeBaron (1992) are applied by Bessembinder and Chan (1995) on their study. Besides, the emerging market such as Malaysia, Taiwan and Thailand were found to have stronger predictive power. Meanwhile, the daily stock prices of Kuala Lumpur Stock Exchange (KLSE) of year 1977 to year 1999 are used to apply on the predictive power of the technical trading rules by Lai, Balachandler and Nor (2007). They concluded that the buy and hold strategy produce lesser profits than the moving average. Furthermore, they found out that profit can be yielded even in the presence of transaction costs by technical analysis.

Efficient Market Theory (EMT) suggested that stock is always efficiently priced while The Random Walk Theory suggested that price behaviour is never based on anything predictable and it is completed random (Thomsett, 2013). For Dow Theory which is developed by Charles Dow, the father of the modern technical analysis in the West, expressed his ideas on the price actions in the stock market. His theory is made up of six tenets and all traders who decide to use technical analysis should know these six tenets for them to better know how the markets work. According to Thomsett (2013), the Dow Theory is not perfect and is said to be outdated but it does provide framework for managing short-term market chaos and determining long-term trends.

Frankel and Froot (1990) found that the market professionals tend to include technical analysis in forecasting the market. Besides, various factors have to take into accounts such as political and social events, company performance, financial crisis and so on said by Chitra (2011). Sudheer (2015) studied the Indian Stock Market by applying the Moving Average Convergence Divergence (MACD) technique. He concluded that the technical analysis used provides unbiased solutions in a biased world and he believed that his study on technical analysis will be able to help investors' in analysing the stock.

Candlestick chart used by fund managers on their short-term forecasts of stock said by Menhoff (2010). It is commonly used by investors together with other technical indicators. The candlestick chart originated in Japan and it is credited to Munehisa Homma whose applied it to the rice market in 1750 (Marshall, Young and Rose, 2007).

Tharavanji, Siraprapasiri and Rajchamaha (2017) used candlestick trading strategies to test the profitability with technical filtering and without technical filtering for the selective stock in Thailand. According to Tharavanji, Siraprapasiri and Rajchamaha (2017), there is little use of candlestick as the mean return for most of the patterns are not statistically from zero and generally does not increase profitability of candlestick patterns.

Dumičić and Žmuk (2015) claimed that the control charts are not widely used in stock trading and portfolio analysis. They also claim that stock prices are not normal distributed and auto correlated. However, Žmuk (2016) introduced and develop additional statistical tools to support the decision-making process in stock trading. Žmuk (2016) overcomes the autocorrelation problem and show that the control charts approach resulted higher portfolio profit in stock trading compare to pick and hold strategy. Žmuk (2016) determined the stock trading in two different periods which were short run (1 year) and long run (more than one year). He concluded that the higher portfolio profit obtained when residual-based CUSUM control chart used in the short run and EWMA control chart used in the long run when average prices considered.

Control charts and other statistical control process methods have found their use in many different fields not only in mass production over these years. However, Gandy (2012) declared that the statistical control charts are seldom applied in portfolio analysis and stock trading. One of the key reasons for rarely using statistical control charts in portfolio analysis and stock trading is the managers' mindset of thinking that control charts are not suitable to apply on their work (McNeese and Wilson, 2002). This is because the managers are adapted to use the financial reports as their decision maker. Some of the investigators tried to apply the control chart in other portfolio analyses even though it was not used in financial data analysis.

Nevertheless, Gandy (2012) who studied the performance of a credit portfolio applied CUSUM chart to his model. Kovarik and Sarga (2014) applied Exponentially weighted moving average (EWMA) and Cumulative Sum (CUSUM) control charts on corporate cash flow control and included six companies in their study. Kovarik and Sarga (2014) concluded that the control charts can be applied in corporate financial management not only in manufacturing processes.

James (1968), the pioneer for the application of moving average, declared that the theory behind the moving average is simple. Moving average is one of the simplest and broadly used tools in the technical analysis as the downward and upward price

trend can be initiated and well observed. The cumulative sum (CUSUM) chart was first introduced by Page (1954) while the exponentially weighted moving average (EWMA) chart was introduced by Roberts (1959). The CUSUM and EWMA charts have been broadly used for monitoring a process mean. This is because they are good in detecting the small mean shifts. Moreover, they have been applied to discrete processes for attribute data (Montgomery, 2012).

Djauhari and Gan (2014) used applied statistical methods (ASM) to carry out Bursa Malaysia Stocks Market Analysis. They considered all the four prices, namely opening, highest, lowest and closing prices in their study by applying multivariate time series and generalization of univariate time series. They showed that the approach that they proposed which is multivariate approach can better determine the real situation of Bursa Malaysia's 30 most capitalised stocks. Based on the work of Yamashita and Yodahisa (2012), they considered only multivariate time series with all four prices and proved that using four prices will provide more information instead of using only closing price.

Ling and Chia (2016) analysed the Malaysia Stock Market by adopting generalized autoregressive conditional heteroskedasticity (GARCH) model. They studied the Malaysia stock market volatility and the crisis years by applying portfolio diversification strategy. Markowitz (1953, 1959) was the first who introduced the Modern Portfolio Theory and the mean-variance approach on stock market to optimize the expected return of portfolio diversification. Diversification defined as a portfolio strategy that intend to reduce the overall risk exposure by putting different types of assets in a basket such as stocks, bonds and others (Drake and Fabozzi, 2010).

Wang, Fan, and Wang (2008) used the statistical analysis on Chinese stock market by applying the contact model and voter model which are continuous time Markov processes. They found that the new approach is useful to study the statistical properties of a stock market. Men, Wang and Shao (2008) studied the stock prices and trading volumes for Chinese stock market by using the method of Zipf plot. Zipf plot is a mathematical statistics used to study the market fluctuations. Furthermore, Kerby, Mi and Lawrence (2003) used multivariate statistical analysis to predict the stock trend. The multivariate statistical methods used are component analysis and discriminant analysis. They believed that multivariate analysis can be used to analyse a company's performance in the stock market.

Alraddadi (2015) studied the general behaviour of John Wiley stock prices and possible reasons for sudden fluctuations by applying descriptive statistics, five number summary, box-plot, time series analysis and others. These tools were used by Alraddadi (2015) to forecast and predict the price trend for better decision making. In his study, he concluded that these methods are not adequate for long term decision making. However, he believed that time series analysis is the best tool used to forecast and predict the trend.

## CHAPTER 3

### METHODOLOGY

#### 3.1 Introduction

The daily open, high, low, closing and average price per book ratio stock prices of Malaysia are collected using Bloomberg. The data collected for 1-year period (short run) which is from December 1, 2017 to November 30, 2018. Dumičić and Žmuk (2015) studied 10 stocks in Croatia and considered the short run as a year.

7 stocks from different sectors are collected which are Public Bank (PBK MK), Tenaga National (TNB), Petronas Gas (PTG MK), Nestle (NESZ MK), Petronas Dagangan (PETD MK), Hap Seng (HAP MK) and Top Glove (TOPG MK) stocks. Different sectors are picked as to determine which sector is actually responsive to the control chart. These stocks are chosen based on the Bursa Malaysia's market capitalization as there are top performing stocks for the past few years.

Public Bank is the second largest company on Bursa Malaysia in term of market capitalization with RM96.74bil and the founder, Tan Sri Te Hong Piow, pointed out the higher profit are driven by growth in its own loan and deposit of business. For Tenaga National Berhad, it has been consistently remained among the top five largest companies by market capitalization for its giant utility over the last decade with RM80.98bil. Petronas Gas with RM37.48bil and Nestle Bhd with RM35.03bil. The food and bevarages manufacturer is one of the best performers among the blue chips on Bursa Malaysia and Nestle is included as one of them. Petronas Dagangan with RM25.63bil and Hap Seng Consolidated Bhd with RM24.52bil. Hap Seng has grown to have six core businesses such as plantations, property investment and development, and building materials. Top Glove with RM15.26bil market capitalization has consistently awarded its shareholders with annual dividends of not less than 50% of its net profit and is known as the world's largest manufacturer of gloves.

The term of open price is the price at which a stock first trades upon the opening of an exchange on a trading day. Meanwhile, closing price is defined as the last price as which a stock trades during a regular trading session. For the term low and high price simply means the lowest price and highest price throughout the trading session. The price per book ratio is a financial ratio used to compare a company's current

market price to its book value. This ratio denotes how much equity investors are paying for each dollar in net assets.

### 3.2 Models

Three different models are used to study the stock performance as per below subsections.

#### 3.2.1 Xbar ( $\bar{X}$ ) Chart

The formula of Xbar ( $\bar{X}$ ) Chart is as follows:

$$UCL_{\bar{X}} = \bar{\bar{X}} + 3\sigma \quad (3.1)$$

$$CL_{\bar{X}} = \bar{\bar{X}} \quad (3.2)$$

$$LCL_{\bar{X}} = \bar{\bar{X}} - 3\sigma \quad (3.3)$$

where  $UCL_{\bar{X}}$  is the upper control limit for  $\bar{X}$ ,  $LCL_{\bar{X}}$  is the lower control limit for  $\bar{X}$ ,  $CL_{\bar{X}}$  is the centre line of  $\bar{X}$ ,  $\bar{\bar{X}}$  is the average of averages and  $\sigma$  is the standard deviation of  $\bar{X}$ .

#### 3.2.2 R Chart

The formula of R Chart is as follows:

$$\text{Range, } R = \text{High Price} - \text{Low Price} \quad (3.4)$$

$$UCL_R = \bar{R} \cdot D_4 \quad (3.5)$$

$$CL_R = \bar{R} = \sum R_i / k \quad (3.6)$$

$$LCL_R = \bar{R} \cdot D_3 \quad (3.7)$$

where  $UCL_R$  is the upper control limit for R,  $CL_R$  is the centre line of R,  $LCL_R$  is the lower control limit for R,  $\bar{R}$  is the average of ranges,  $D_3$  and  $D_4$  are factors used to calculate control limits (Table A-8) and k is total number of range.

#### 3.2.3 Candlestick Chart

Candlestick Chart is useful for daily trading and short-term trading. It comprises of open, high, low and closing price.

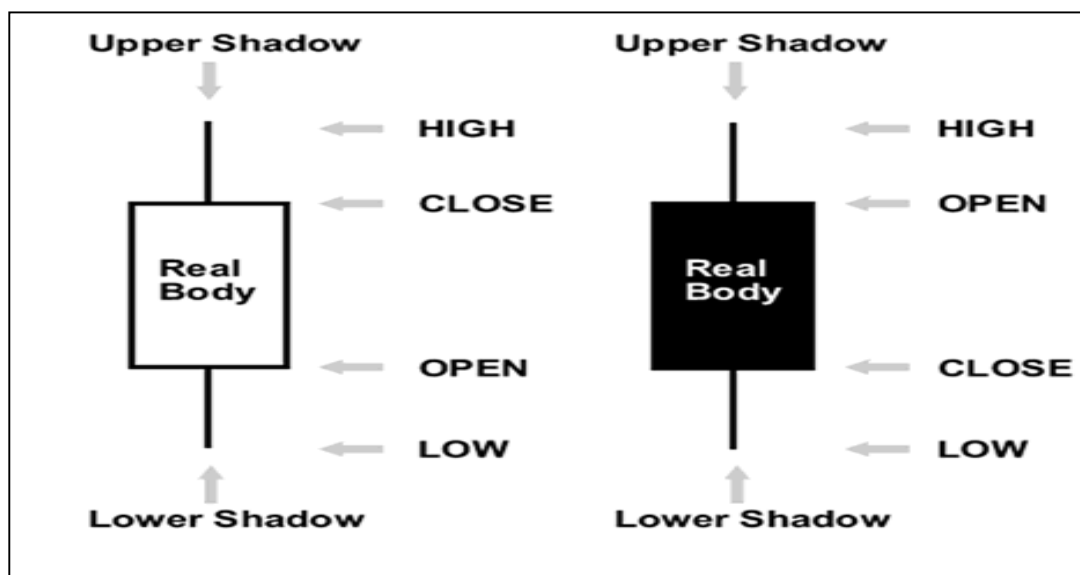


Figure 3.1 : White candlestick and Black candlestick

Figure 3.1 showed the sample of white candlestick and black candlestick. The white candlestick indicates the closing price is higher than opening price which means that the bulls is in control. However, opening price is higher than the closing price for black candlestick. Candlestick reveals the trading pattern for a selected period of time.

The candlestick chart is a style of bar chart used to describe the price movements of a security or currency over time. It is a combination of a line chart and a bar chart. It is often used to study the price patterns. The points are plotted based on the daily open, high, low and closing prices.

The thick part of the candlestick is called the real body and it shows the interval between opening and closing prices. It is presented as an empty or full shape which means that the closing price is lower than the opening price while the empty shape is the other way round.

## CHAPTER 4

### RESULTS AND DISCUSSIONS

#### 4.1 Introduction

In this project, Shewhart  $\bar{X}$ ,  $R$  and Candlestick Charts are used to monitor the stock performance. The average price to book ratio is recorded and plotted in  $\bar{X}$  Control Chart. Here, the average price to book ratio is used to determine whether the stock is undervalued or overvalued as compared to the rest of the stock listed on the exchanges. For  $R$  Control Chart, the range of daily stock price is plotted. In this case, every point is precious, and no point can be considered as outlier as they give crucial information for the traders or investors who would like to invest in the stock and for decision making (Dumičić and Žmuk, 2015). For Candlestick Chart, each candlestick represents one day's worth of price of a stock and it consists of 4 pieces of information which are opening, high, low and closing prices. It is useful for short term trading. Thus, in this project, 1-year period of data is used to perform candlestick chart and the breakdown chart for respective months is also plotted and studied.

#### 4.2 $\bar{X}$ Chart

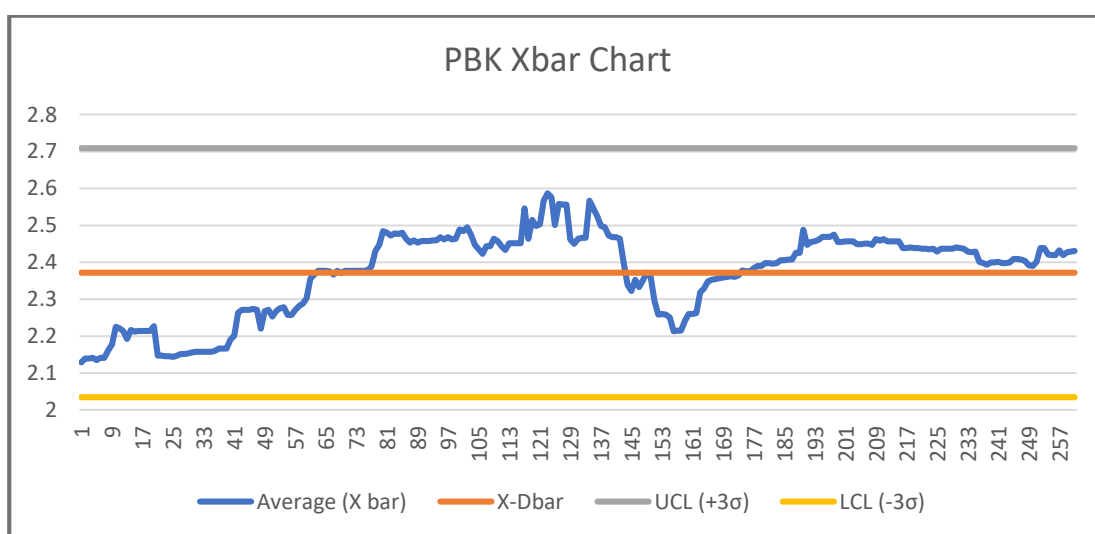


Figure 4.1 :  $\bar{X}$  Control Chart on Public Bank Stock

Figure 4.1 showed  $\bar{X}$  Control Chart used to monitor the Public Bank stock price with centre line, CL = 2.37, upper control limit, UCL = 2.71 and lower control limit, LCL



= 2.03. Figure 4.1 reveals that all the points are fall inside the control limit suggesting that the  $\bar{X}$  chart is not sensitive in detecting the signs for investors to perform buy or sell stocks actions for Public Bank Stock even though there is an upward trend observed from 41<sup>st</sup> to 129<sup>th</sup> points plotted in the  $\bar{X}$  chart. From the early June on 7<sup>th</sup> June 2018, the price starts to decline and bounced back on 9<sup>th</sup> July 2018. There is not much fluctuation at the last quarter of the year. In the nutshell, the observed process is not response to the  $\bar{X}$  Control Chart for Public bank stock.

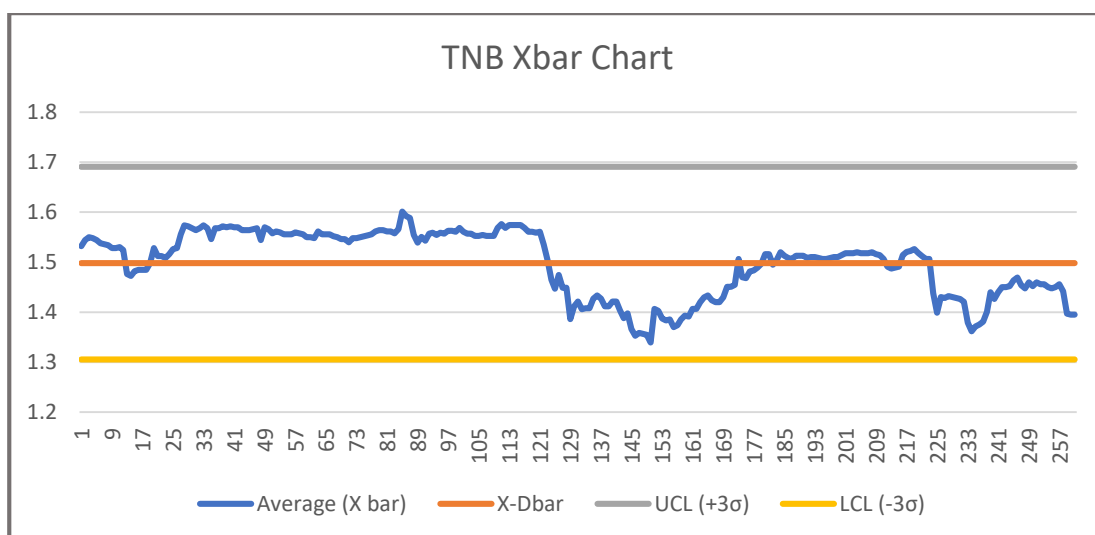


Figure 4.2 :  $\bar{X}$  Control Chart on Tenaga National Stock

Figure 4.2 displayed the  $\bar{X}$  Control Chart with CL = 1.50, UCL = 1.69 and LCL = 1.31 constructed based on the Tenaga National Stock price in 2018. The stock price is considerably stable for the first half year and all those points lay slightly above the CL. From 122<sup>nd</sup> point onwards, it shows a downward trend and the lowest point at 150<sup>th</sup>. The price bounced back after the 150<sup>th</sup>. As the selling pressure increase caused the price to rise again. Overall, all the points for the Tenaga National Stock are fall inside the statistical control limit. It simply means that the  $\bar{X}$  Control Chart is not sensitive to detect buy or sell signals for the investors who would like to invest in Tenaga National Stock.

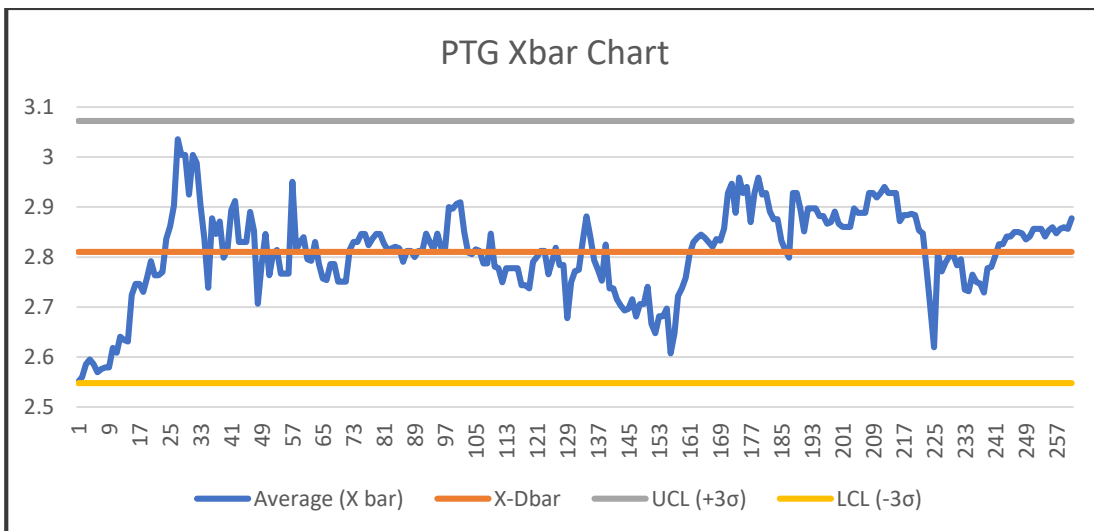


Figure 4.3 :  $\bar{X}$  Control Chart on Petronas Gas Stock

Figure 4.3 illustrated the  $\bar{X}$  Control Chart on Petronas Gas Stock with CL = 2.81, UCL = 3.07 and LCL = 2.55. The prices for the Petronas Gas stock fluctuate more dramatically as compared to all the other 6 stocks. However, all the points still fall within UCL and LCL even though upward shifts are observed from the 5<sup>th</sup> to 25<sup>th</sup> points and 158<sup>th</sup> to 177<sup>th</sup> points while downward shift is observed from 217<sup>th</sup> to 225<sup>th</sup> points. It simply means that Petronas Gas Stock has a higher as the prices vary from day to day. Therefore, Petronas Gas stock is categorized under the high risk investment. Since no point fall outside the control limit,  $\bar{X}$  Control Chart fail to provide buy or sell signal for Petronas Gas Stock.

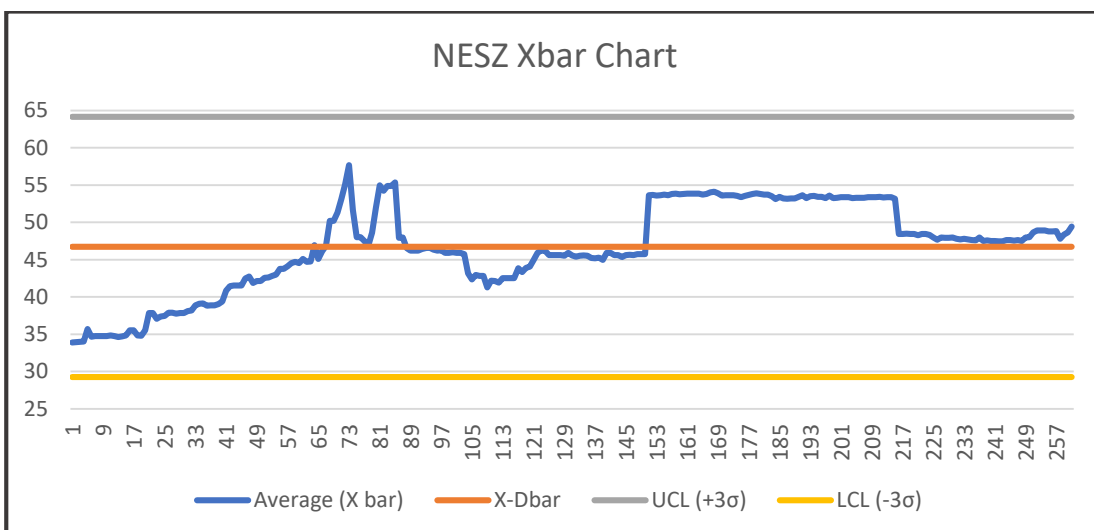


Figure 4.4 :  $\bar{X}$  Control Chart on Nestle Stock

Figure 4.4 demonstrated the  $\bar{X}$  Control Chart on Nestle Stock with CL = 46.70, UCL = 64.14 and LCL = 29.27. Among all the 10 stocks, the Nestle Stock has the highest unit price and average prices per book ratio. However, the average price per book ratio for Nestle Stock are comparatively stable as compared to Petronas Gas Stock. The prices increase consistently until it hits 57.68 at 73<sup>rd</sup> on 13<sup>th</sup> March 2018. The prices remains stable from point 151<sup>st</sup> to 215<sup>th</sup> which is from 29<sup>th</sup> June 2018 till 27<sup>th</sup> September 2018. Again, all the points are within the statistical control limit for  $\bar{X}$  Control Chart on Nestle Stock. An upward shift is observed from the 18<sup>th</sup> to 73<sup>rd</sup> points.

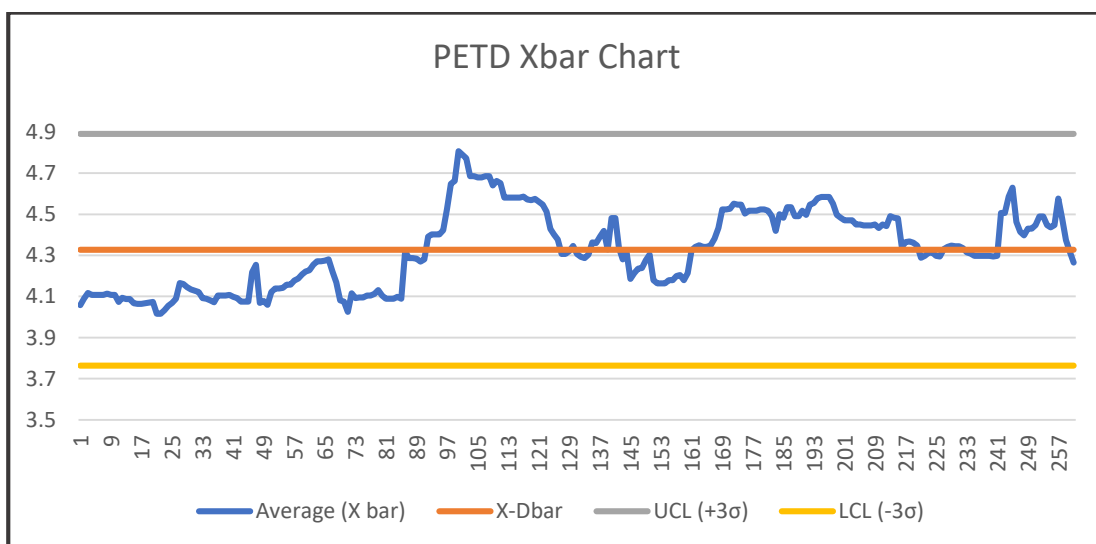


Figure 4.5 :  $\bar{X}$  Control Chart on Petronas Dagangan Stock

Figure 4.5 illustrated  $\bar{X}$  Control Chart on Petronas Dagangan Stock with CL = 4.33, UCL = 4.89 and LCL = 3.76. The highest point is the 100<sup>th</sup> on 19<sup>th</sup> April 2018 and all the points fall within the UCL and LCL. The price for Petronas Dagangan Stock start to elevate from the 85<sup>th</sup> which is on 29<sup>th</sup> March 2018. After all, all the points are still lay in between UCL and LCL.  $\bar{X}$  Control Chart is said to be unresponsive to Petronas Dagangan Stock.

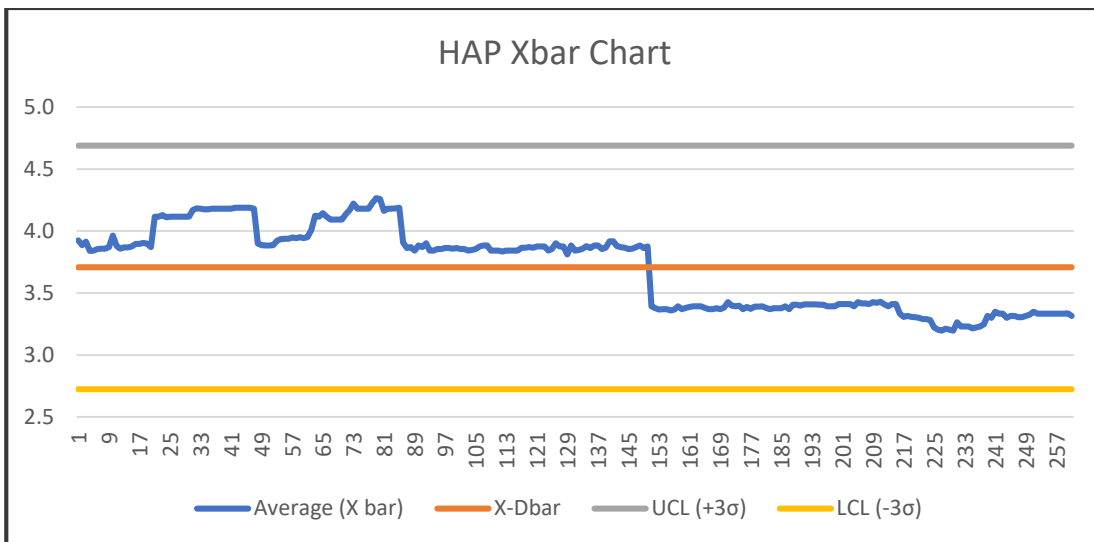


Figure 4.6 :  $\bar{X}$  Control Chart on Hap Seng Stock

Figure 4.6 illustrated  $\bar{X}$  Control Chart on Hap Seng Stock with  $CL = 3.71$ ,  $UCL = 4.69$  and  $LCL = 2.72$ . The 1<sup>st</sup> point till the 150<sup>th</sup> point fall above the CL but below UCL which mean that the points for the first half year are laid above average unit price. Meanwhile, the 151<sup>st</sup> point till 261<sup>st</sup> point fall below average but stay within the statistical control. Overall, all the points of Hap Seng Stock fall within the statistical control limit which indicates that  $\bar{X}$  Control Chart is not alert to the price change for Hap Seng Stock.

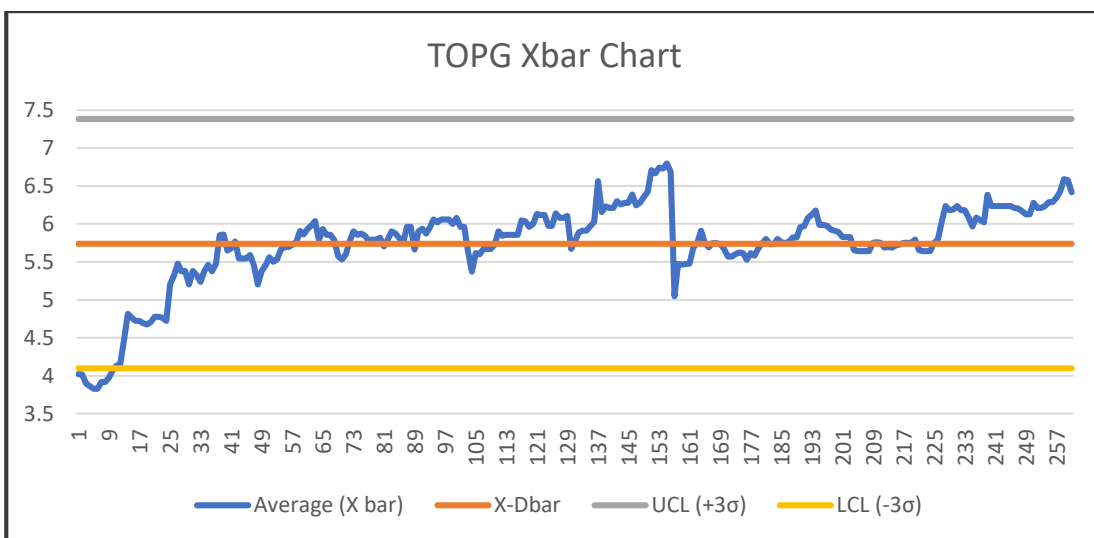


Figure 4.7 :  $\bar{X}$  Control Chart on Top Glove Stock

Figure 4.7 showed  $\bar{X}$  Control Chart on Press Metal Stock with  $CL = 5.74$ ,  $UCL = 7.38$

and  $LCL = 4.10$ . The first 15 points are fallen below the LCL and the other points remain in the statistical control between LCL and UCL. These 15 points suggest that the  $\bar{X}$  Control Chart is sensitive in detecting the signs for traders or investors to perform buy and sell actions for Top Glove Stock. Generally, the Top Glove Stock is performing better and better day by day as per Figure 4.7.

### 4.3 R Control Chart

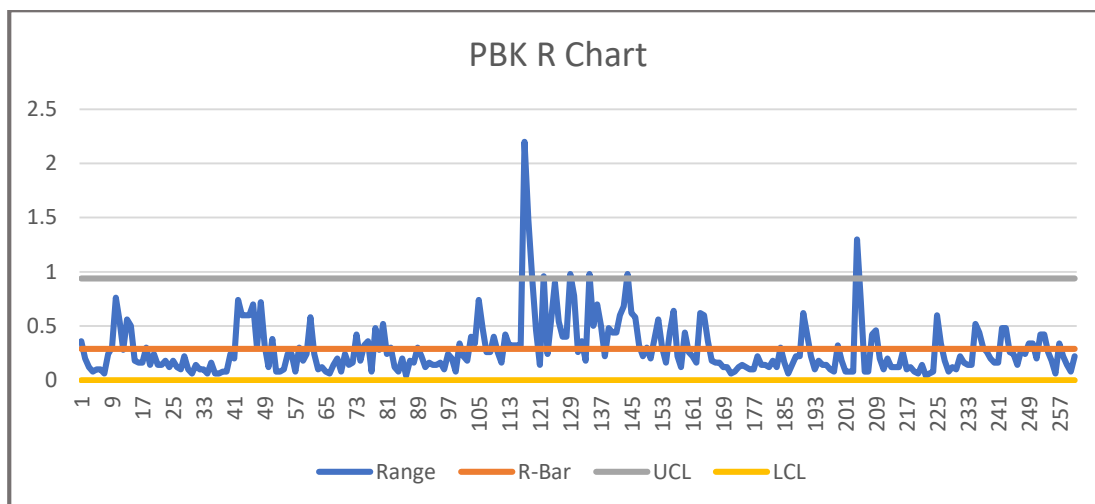


Figure 4.8 : R Control Chart on Public Bank Stock

Figure 4.8 demonstrated the  $R$  control chart on the Public Bank Stock with  $CL = 0.29$ ,  $UCL = 0.93$  and  $LCL = 0$ . From the chart, it is clearly seen that the observation points assigned to be 117<sup>th</sup>, 118<sup>th</sup>, 119<sup>th</sup>, 122<sup>nd</sup>, 129<sup>th</sup>, 134<sup>th</sup>, 144<sup>th</sup> and 204<sup>th</sup> fall above the upper control limit. The 7 points detected are in the month of May and the last point detected is on the 12<sup>th</sup> September 2018. These points reveal that the prices in those days are having huge fluctuation. It indicates that  $R$  Control Chart is more sensitive than  $\bar{X}$  Control Chart on Public Bank Stock and able to give the buy and sell signals to the investors who would like to invest in the Public Bank stock.

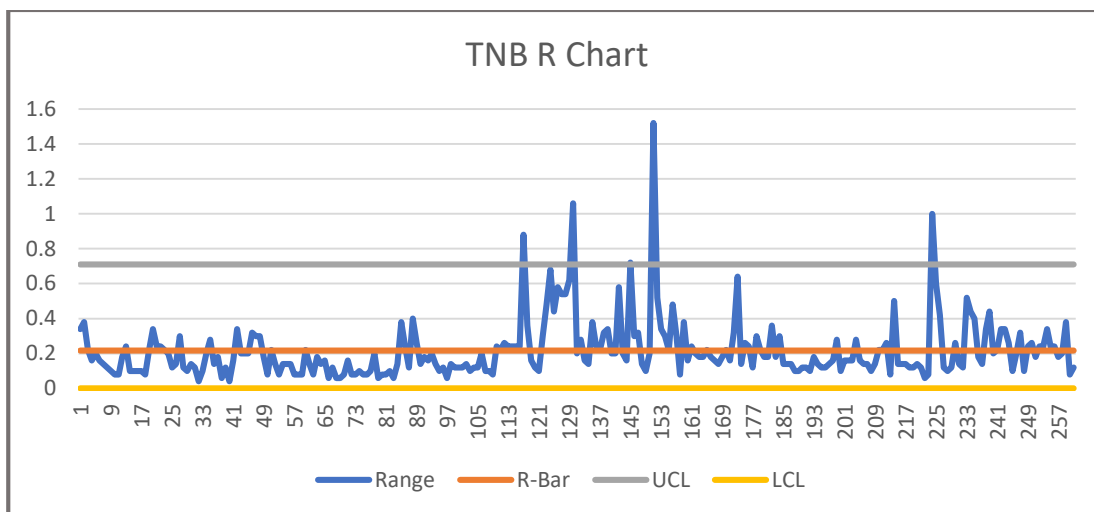


Figure 4.9 : *R* Control Chart on Tenaga National Stock

Figure 4.9 demonstrated *R* Control Chart applied on the Tenaga National Stock. From the Figure 4.9, the  $CL = 0.22$ ,  $UCL = 0.71$  and  $LCL = 0$ . There are 5 observation points laid above the UCL and the points assigned to be 117<sup>th</sup>, 130<sup>th</sup>, 145<sup>th</sup>, 151<sup>st</sup> and 224<sup>th</sup>. Among the 5 points, the 151<sup>st</sup> which is on 29<sup>th</sup> June 2018 has the highest range. These could be the signs for investor to perform buy and sell actions on Tenaga National Stock. Most of the points fall below the average and the prices are said to be unpredictable as the volume is too small to detect any changes.

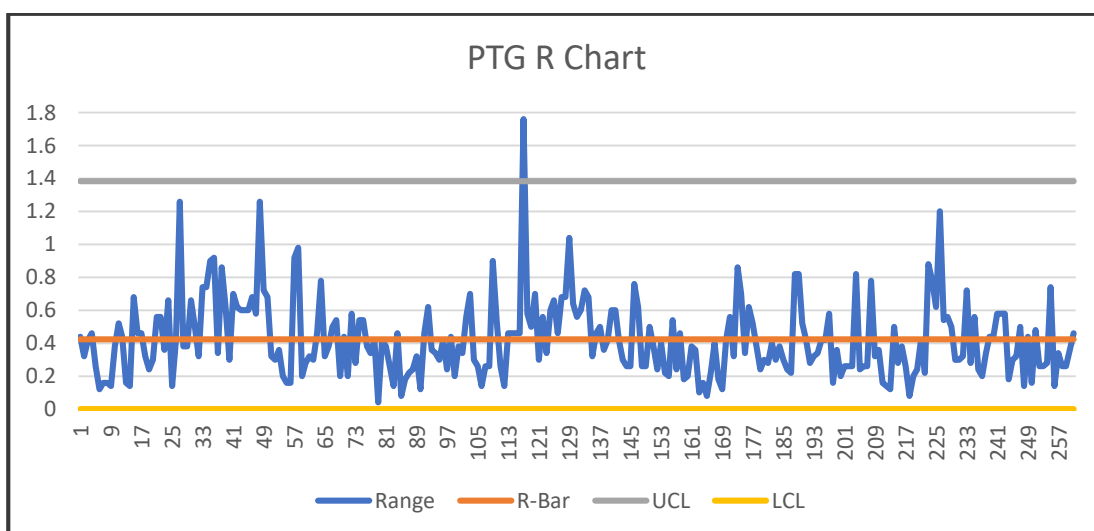


Figure 4.10 : *R* Control Chart on Petronas Gas Stock

Figure 4.10 displayed the *R* Control Chart with  $CL = 0.42$ ,  $UCL = 1.38$  and  $LCL = 0$ . The day to day trading price for Petronas Gas Stock fluctuates indicates the prices are

unstable. However, there is only one point detected to be out-of-statistical control which is 117<sup>th</sup> on 14<sup>th</sup> May 2018. Meanwhile, all the other points fall within the UCL and LCL.

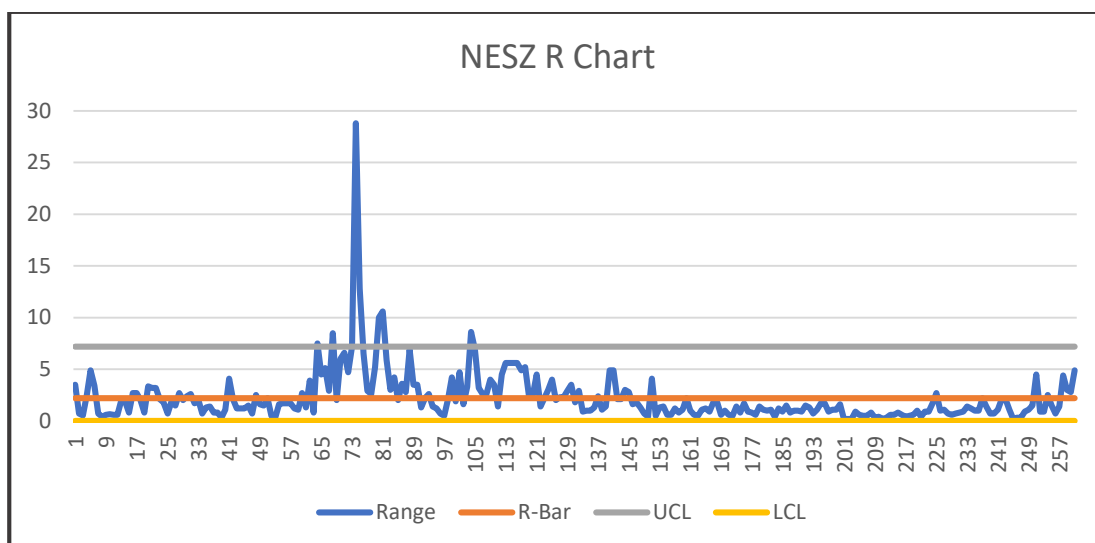


Figure 4.11 : *R* Control Chart on Nestle Stock

Figure 4.11 showed *R* Control Chart on Nestle Stock with  $CL = 2.20$ ,  $ULC = 7.19$  and  $LCL = 0$ . There are 8 observation points laid above the UCL and they are assigned to be the 64<sup>th</sup>, 68<sup>th</sup>, 73<sup>rd</sup>, 74<sup>th</sup>, 75<sup>th</sup>, 80<sup>th</sup>, 81<sup>st</sup> and 104<sup>th</sup>. Among the all points, the highest average price per book ratio is the 74<sup>th</sup> which is on 14<sup>th</sup> March 2018. It is said to be more sensitive in detecting the buy and sell signal than the  $\bar{X}$  Control Chart on Nestle Stock. No point can be considered as an outlier and cannot be simply omitted as each data point is valuable for the investor to make decision (Dumičić and Žmuk, 2015).

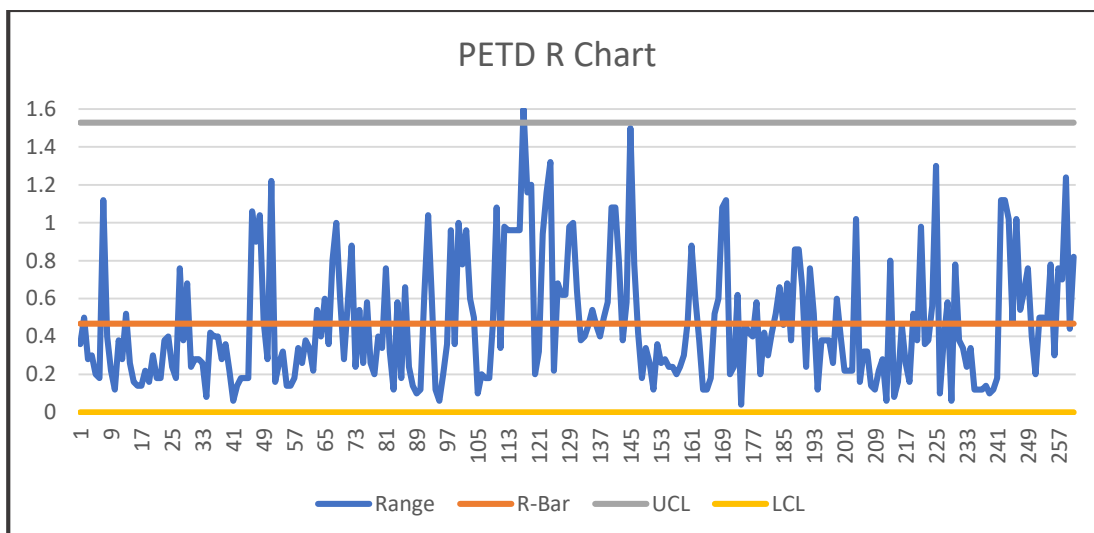


Figure 4.12 : *R* Control Chart on Petronas Dagangan Stock

Figure 4.12 illustrated *R* Control Chart on Petronas Dagangan Stock with  $CL = 0.47$ ,  $UCL = 1.53$  and  $LCL = 0$ . There is only one observation fall above  $UCL$  which is 117<sup>th</sup> on 14<sup>th</sup> May 2018 while all the other points fluctuate within the  $UCL$  and  $LCL$ . The 146<sup>th</sup> point is approaching  $UCL$ . The prices for Petronas Dagangan Stock is said to be volatile and no trend can be seen.

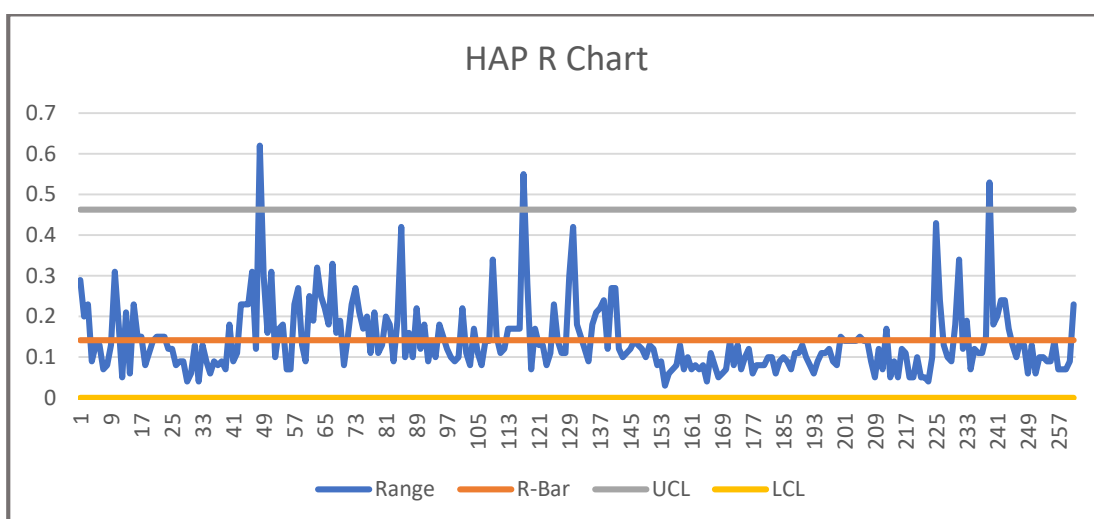


Figure 4.13 : *R* Control Chart on Hap Seng Stock

Figure 4.13 showed *R* Control Chart on Hap Seng Stock with  $CL = 0.14$ ,  $UCL = 0.46$  and  $LCL = 0$ . Three outliers were detected, i.e. 48<sup>th</sup> on 6<sup>th</sup> February 2018, 117<sup>th</sup> on 14<sup>th</sup> May 2018 and 239<sup>th</sup> on 31<sup>st</sup> October 2018. All the other points are scattered within the statistical control. The 85<sup>th</sup>, 130<sup>th</sup> and 225<sup>th</sup> are the warning points which merely reach



the UCL. Therefore, *R* Control Chart is more sensitive in detecting the buy or sell signals compared to the  $\bar{X}$  Control Chart on Hap Seng Stock.

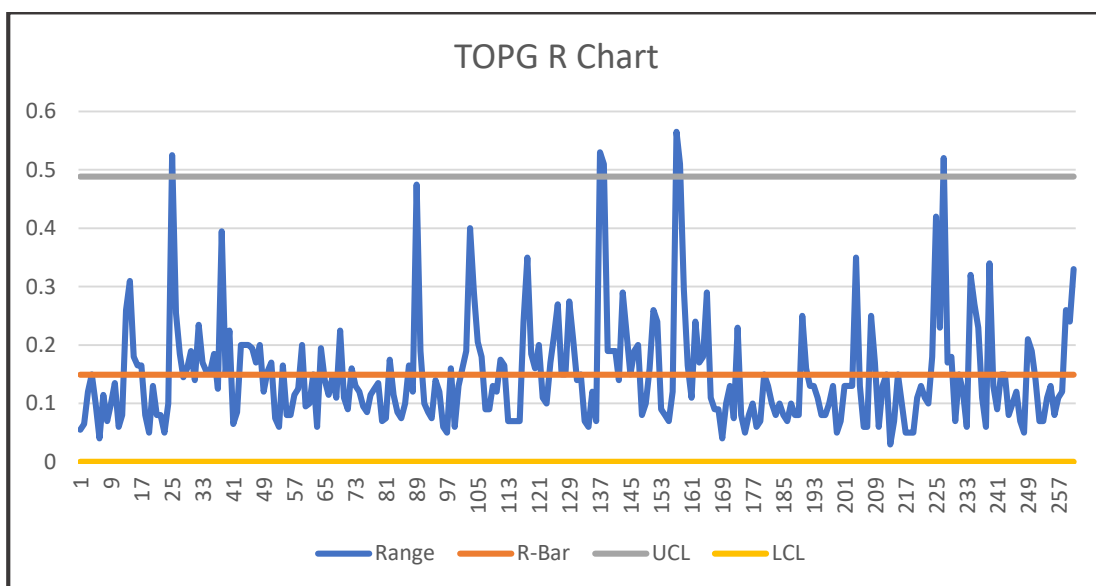


Figure 4.14 : *R* Control Chart on Top Glove Stock

*R* Control Chart is applied on Top Glove Stock as shown in Figure 4.14 with  $CL = 0.15$ ,  $UCL = 0.49$  and  $LCL = 0$ . The 25<sup>th</sup>, 138<sup>th</sup>, 139<sup>th</sup>, 157<sup>th</sup>, 158<sup>th</sup> and 227<sup>th</sup> observation points fall above UCL and all the other points scattered within the LCL and UCL. The price range is large and unpredictable. However, the 6 observation points give signals for the investors who would like to invest in Top Glove Stock.

#### 4.4 Candlestick Chart

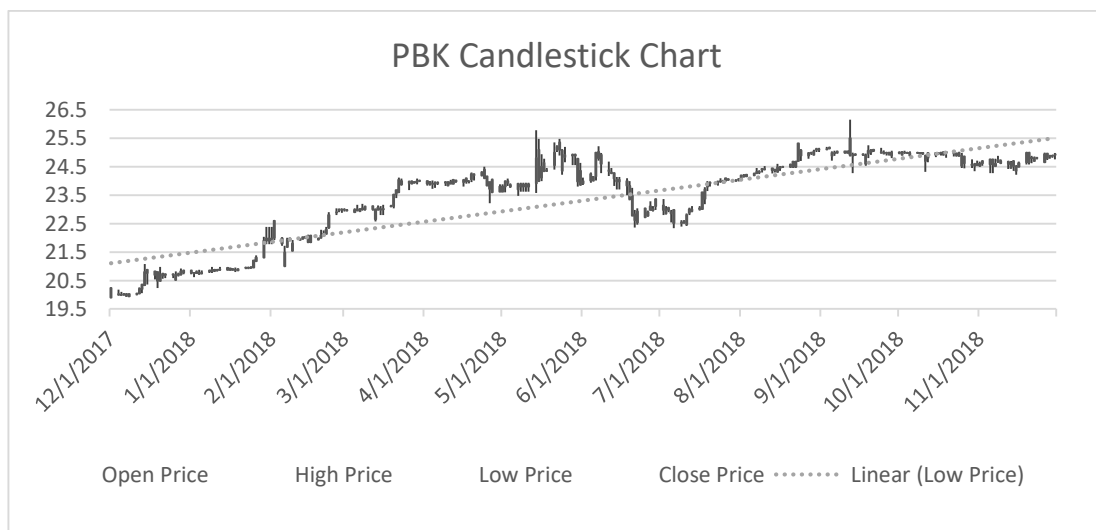


Figure 4.15 : Candlestick Chart on Public Bank Stock

Figure 4.15 showed the candlestick chart on Public Bank Stock for 1 year period. The linear line is the trendline which is a visual representation of support and resistance. A trendline is used to determine the direction and speed of the price changes. From Figure 4.15, an uptrend is observed. In this case, the traders or investors may choose to enter into a long position as price is expected to go up. However, those price action that breaches the trendline on the downside indicates as the signal to close the position as the trend starts to weaken. The linear trendline is used instead of polynomial or other model as it shows the increasing and decreasing of the price from a steady rate and it is commonly used in candlestick stock trading.

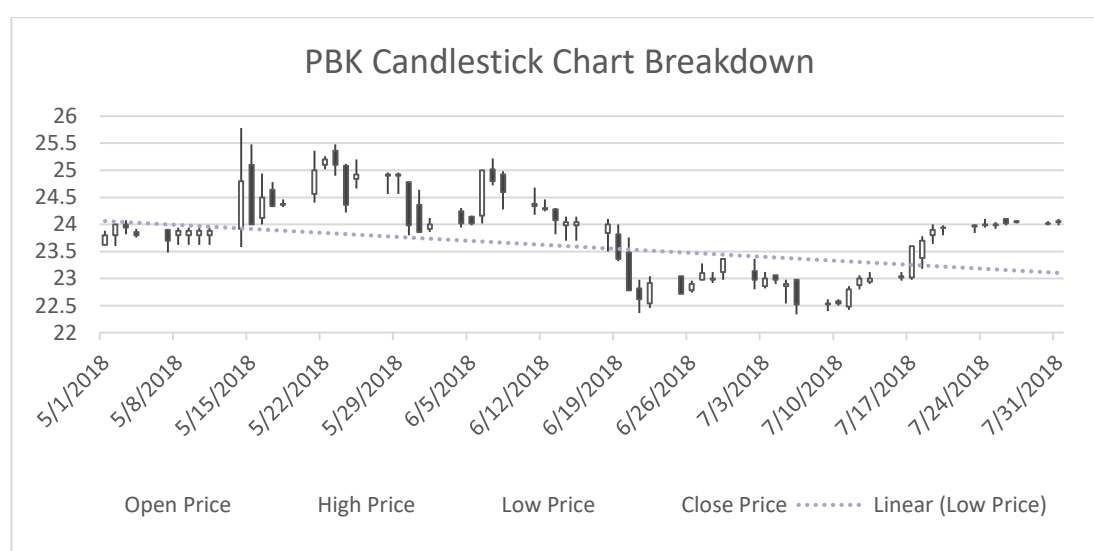


Figure 4.16 : Candlestick Chart on Public Bank Stock for May, June and July

Figure 4.16 displayed the candlestick chart on Public Bank Stock for May, June and July. These 3 months are further investigated as it shows the downward trend in Figure 4.15. Before 15<sup>th</sup> May, the prices do not vary much. On 15<sup>th</sup> of May, there is a long white candlestick and in this case indicates that the bulls in control which means that closing price is higher than opening price. It shows strong buying power. However, it has a long upper shadow which shows that the bulls will take control after this. The white candle will lose control by the end and the bears will make an impressive comeback. This is shown on the next candlestick which is a long black candlestick. A retracement is found in these 3 months breakdown chart. Three white soldiers are found around 17<sup>th</sup> July which is a reversal pattern. Three white soldiers is a bullish patterns which formed by three white candlestick and it suggests a strong change in

the market. It creates a temporary overbought conditions and consolidation occurs. Thus, there is a doji forms after three white soldiers. A doji means the difference between the opening price and the closing price is small. It conveys a sense of indecision and causes no net gain. Overall, the prices showed upwards trend for 1 year period and it is considerably stable for Public Bank Stock.

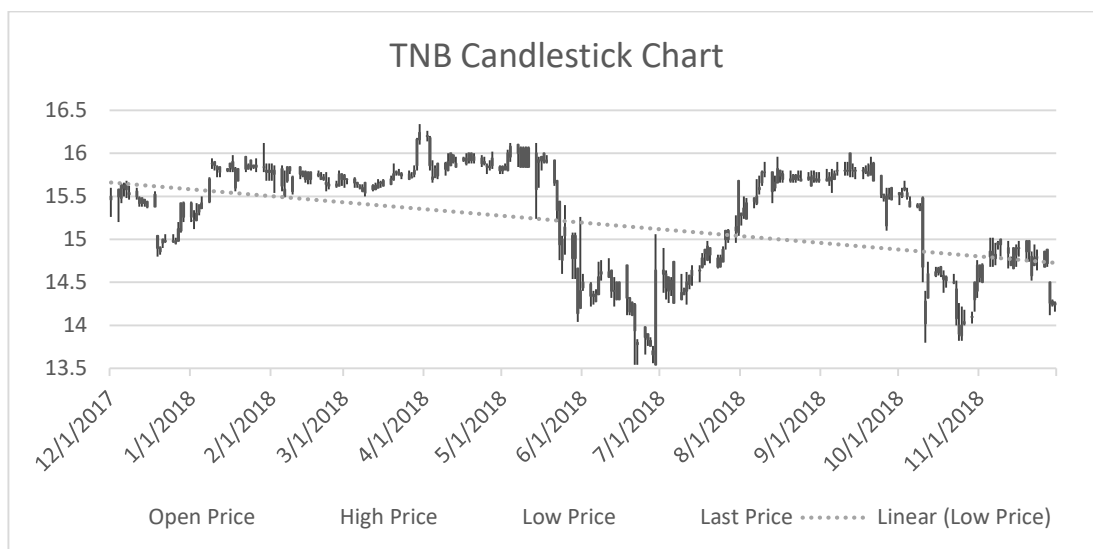


Figure 4.17 : Candlestick Chart on Tenaga National Stock

Figure 4.17 illustrated the candlestick chart on Tenaga National Stock for 1 year period. The chart shows a downward trendline. Most of the points are laid above the trendline except for the beginning of January, June until August and October. The points are unpredictable as they are not consistent. Therefore, the month of June, July and August are zoomed in for further investigation in Figure 4.18.

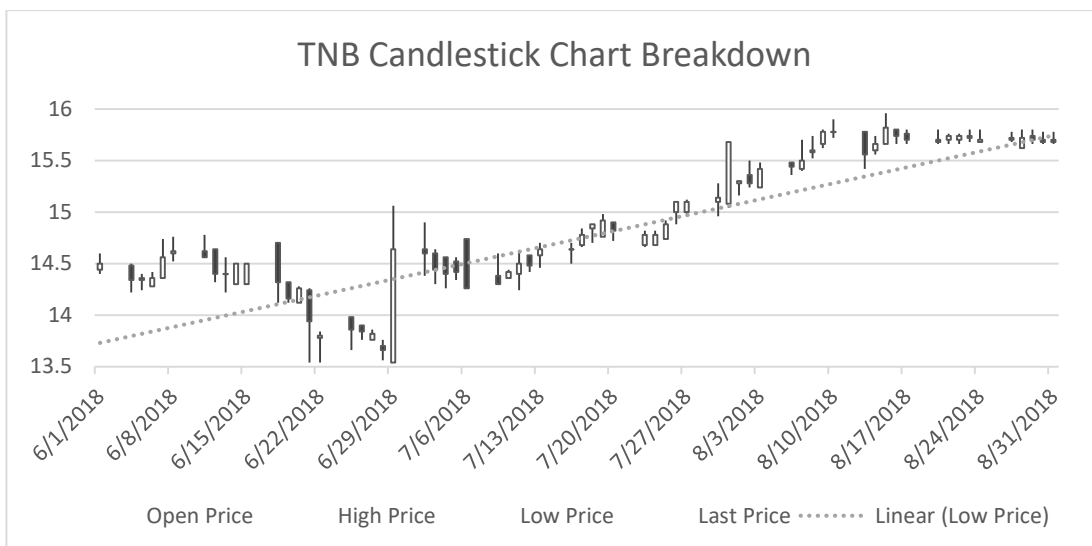


Figure 4.18 : Candlestick Chart on Tenaga National Stock for June, July and August  
 Figure 4.18 showed Candlestick Chart on Tenaga National Stock for June, July and August. When the candlestick chart is zoomed in, it shows uptrend. The most outstanding point is on the 29<sup>th</sup> of June, which has a long white bar with longer upper shadow. This indicates the buying pressure is higher and the buyers dominated this session, but the sellers will ultimately force the price to go down. Thus, the next bar shows a black candlestick. There is a black candlestick on 6<sup>th</sup> of July which is a Marubozu means that the sellers is in control of the price action on Tenaga National Stock on this day from the first trade to the last trade on this day. Most of the candlesticks are short indicates neither buying nor selling pressure is showed here. The opening price and closing price are almost the same.

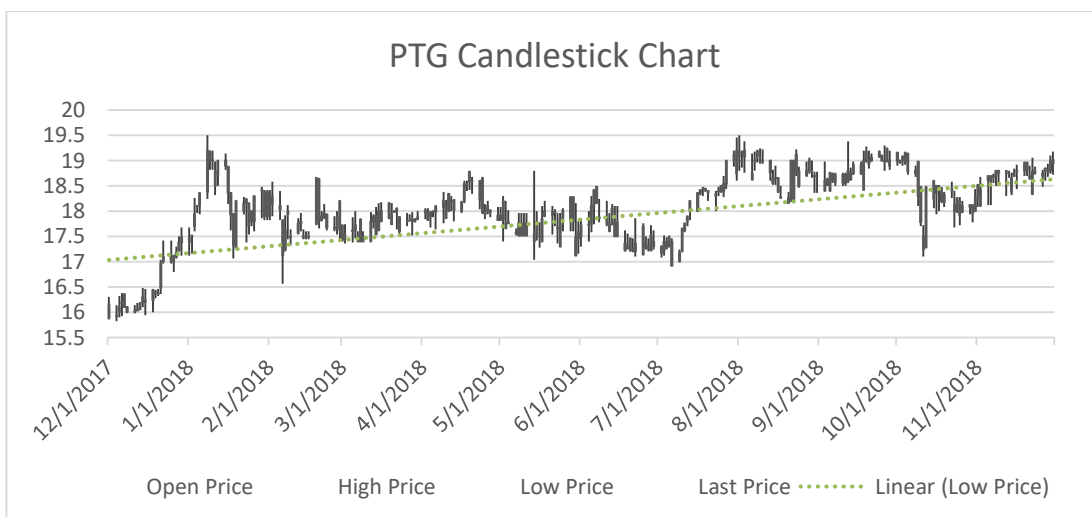


Figure 4.19 : Candlestick Chart on Petronas Gas Stock

Figure 4.19 demonstrated the candlestick chart on Petronas Gas Stock for 1 year period. Most of the bars are wide ranging bars which means that a lot of volatility. The gap of opening and closing price is big. For white candlesticks with big range shows buying pressure (bulls) while black candlesticks with big range shows selling pressure. It shows an upwards trendline for Petronas Gas Stock.

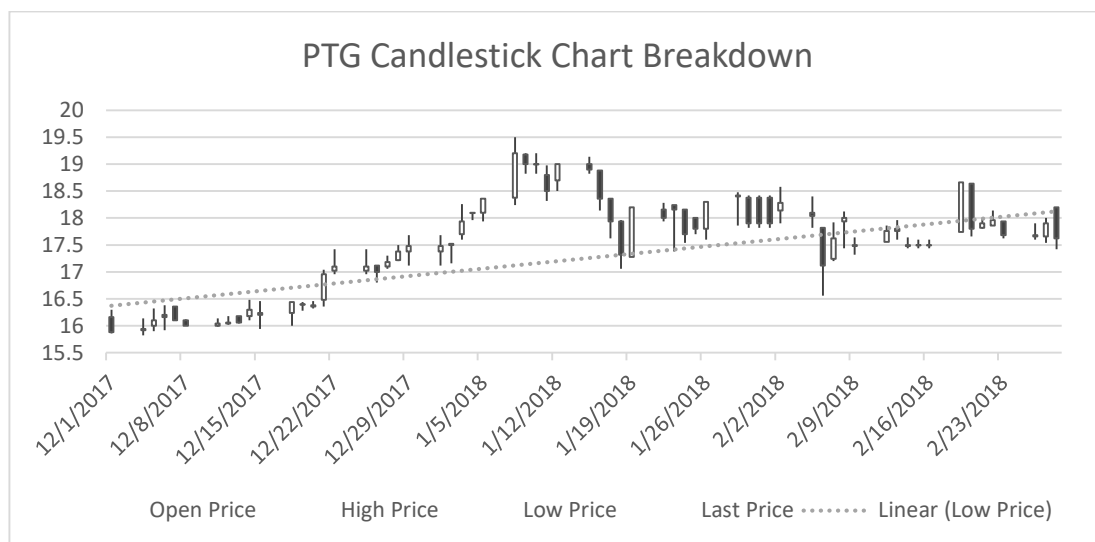


Figure 4.20 : Candlestick Chart on Petronas Gas Stock for December 2017, January 2018 and February 2018

Figure 4.20 showed the breakdown of Candlestick Chart for Petronas Gas Stock. Three black crows are found on 19<sup>th</sup> January for 3 consecutive trading session. Three black crows shows the bears taking control of bulls. The prices shows downtrend. The traders would have to alert the bears overstretched themselves and the stock will be push to oversold territory. Three even black candlesticks at the beginning of February indicates the opening prices are higher than closing prices for 3 consecutive sessions. Overall, the stock shows upwards trend means the stock is actually performing for the specific period.

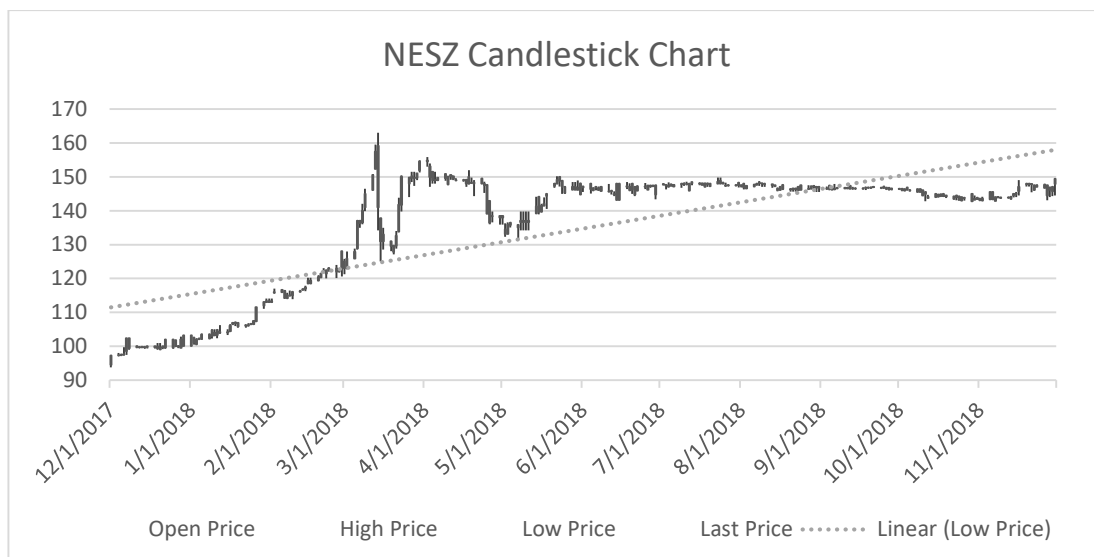


Figure 4.21 : Candlestick Chart on Nestle Stock

Figure 4.21 illustrated candlestick chart on Nestle Stock for 1 year period. The trendline shows increasing trend for Nestle Stock. For the beginning of the period, the prices increase gradually and a sharp increase can be seen on March and April which means that the prices is in high volatility. After the month of June, the prices are stable and remain in 140 to 150, less fluctuation. Therefore, month February, March and April are further studied as per Figure 4.22.

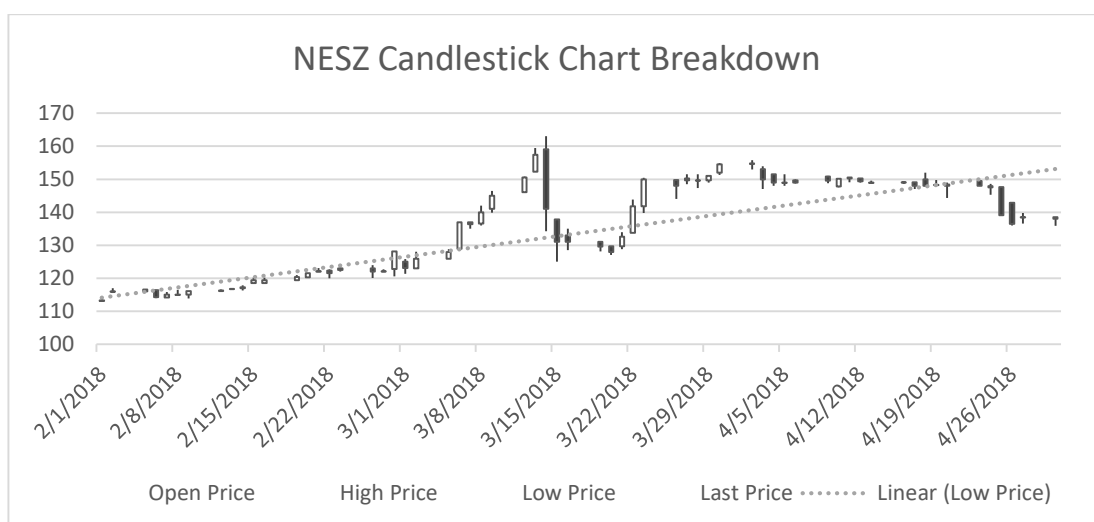


Figure 4.22 : Candlestick Chart on Nestle Stock for month February, March and April

Figure 4.22 showed the candlestick chart applied on Nestle Stock for month February, March and April. The trendline shows increasing trend as well. A long black candlestick is detected on the 15<sup>th</sup> of March which indicates that the bear is taken

control and the price declined significantly from the open. Around 15<sup>th</sup> of March, the dark cloud cover is identified. The dark cloud cover pattern involves a large black candlestick and forms a “dark cloud” over the preceding bullish trend which can be seen in Figure 4.22. In this case, a bearish engulfing pattern is shown as the bulls push the price higher at the open. However, the bears take over the following process and push the price abruptly lower. The patterns of the first 2 candlesticks suggest that the traders actually look for a confirmation that a bearish candle formed on the 3<sup>rd</sup> candlestick. These patterns reveals that a trader look for a breakdown from a support level which is buy the stock at lower price in order to sell higher later. The three white soldiers are found on 22<sup>nd</sup> March which convey a bullish pattern occurred and could probably create temporary overbought conditions.

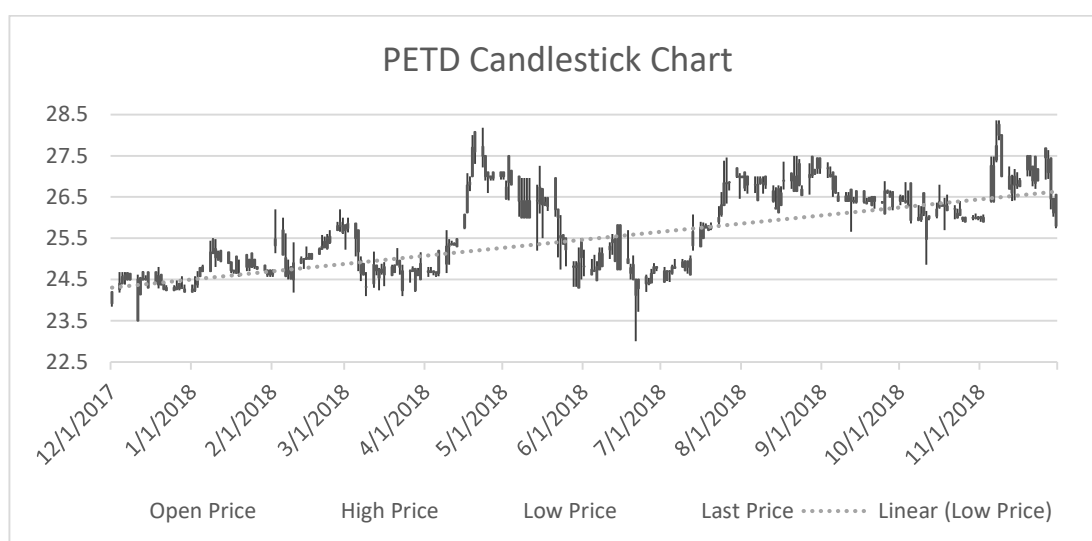


Figure 4.23 : Candlestick Chart on Petronas Dagangan Stock

Figure 4.23 displayed the candlestick chart on Petronas Dagangan Stock for 1 year period. The trendline shows the uptrend in Petronas Dagangan Stock and it can be considered as support when the traders would like to enter into a position. The prices rise consistently until 16<sup>th</sup> of April and the prices jack up to reach 18.18 on 19<sup>th</sup> April. The lowest point is detected on 21<sup>st</sup> of June at 23.72. Hence, April, May and June are further investigated for Petronas Dagangan Stock.

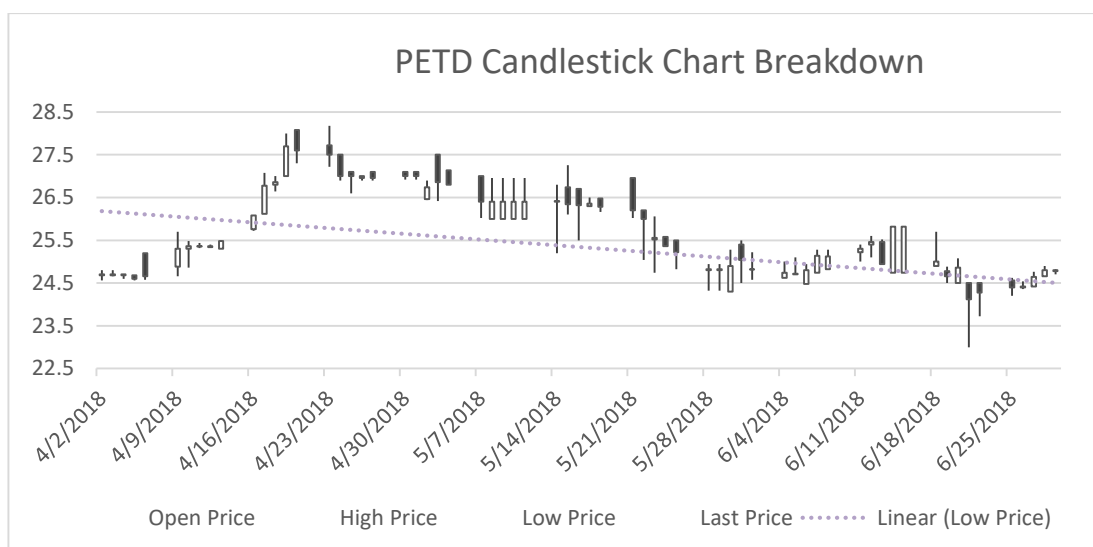


Figure 4.24 : Candlestick Chart on Petronas Dagangan Stock for month April, May and June

From the Figure 4.24, the trendline of candlestick chart on Petronas Dagangan Stock for month April, May and June shows a downward trend. However, most of the candlesticks fall above the trendline which means that the price is expected to go up even though it shows downwards trend for these three months. Four white candlesticks with same body length and no tail are found around 7<sup>th</sup> of May which indicate that the bulls take place for 4 consecutive days with closing price higher than opening price. These candlesticks follow by a dragonfly doji which means that the candlestick has a long lower shadow with small real body suggest an aggressive selling. Since the closing price and opening price near to each other, the buyers can absorb the selling pressure and force the price go up again. A black candlestick with long lower shadow is detected on 21<sup>st</sup> of June which show that the sellers dominate the market and can lead to continuous bear in prices as seen in the next bar.



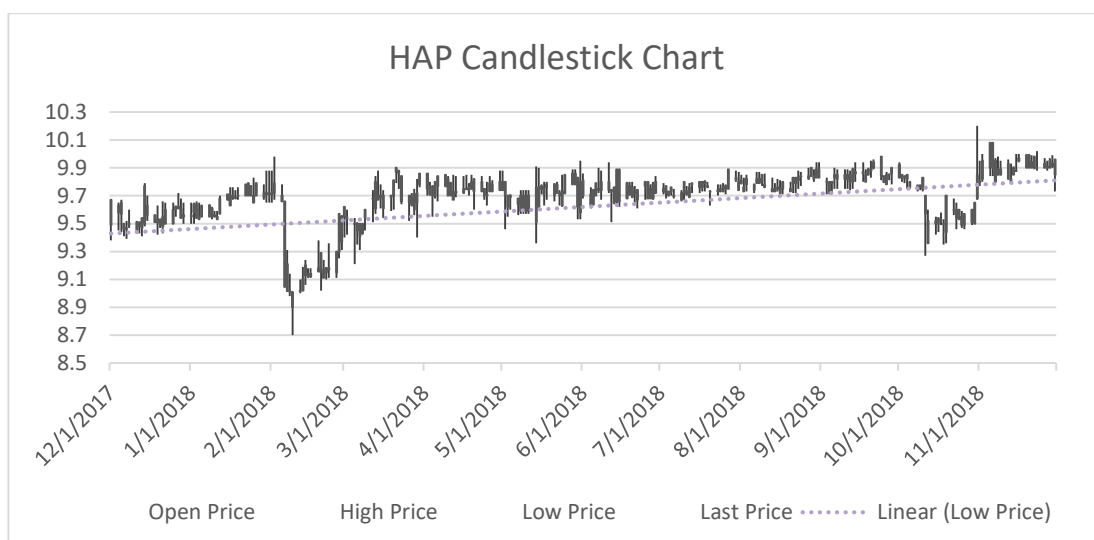


Figure 4.25 : Candlestick Chart on Hap Seng Stock

Figure 4.25 demonstrated candlestick chart on Hap Seng Stock in 1 year period. The stock are stationary except for February, March and October. The prices fall below the trendline in these 3 months. Besides, the stable prices in Hap Seng Stock merely lead to horizontal trend. The dramatically decline in the price for month February are further studied in Figure 4.26.

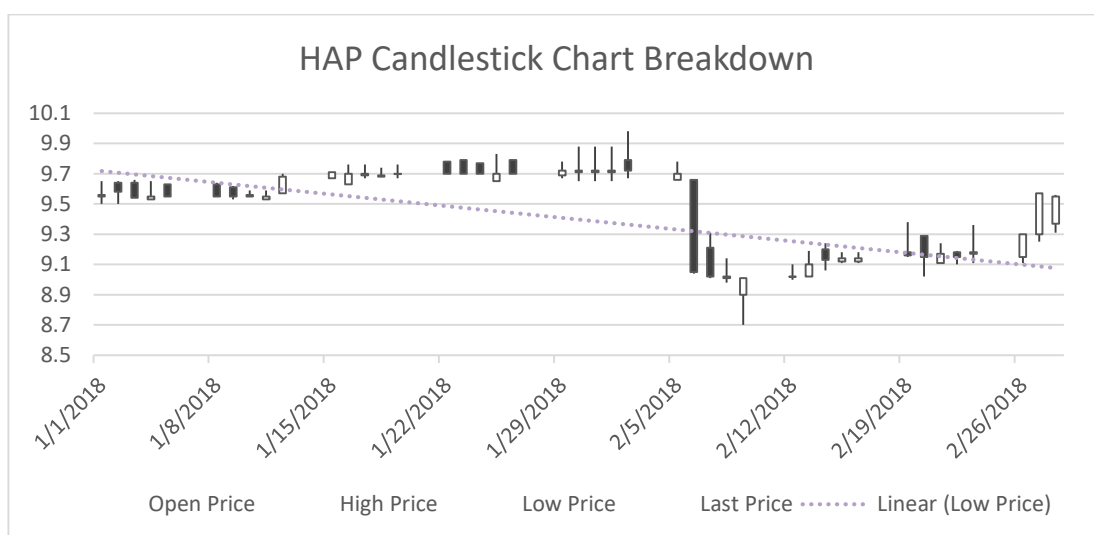


Figure 4.26 : Candlestick Chart on Hap Seng Stock for month January and February

Figure 4.26 showed candlestick chart for month January and February with downward trend. The candlesticks for the month of January are even which indicates that not much fluctuation in the price. Three doji with longer upper shadow are found on 30<sup>th</sup> of January, 31<sup>st</sup> of January and 1<sup>st</sup> of February. These patterns also known as

gravestone doji and it can be used as a sign to take profits on the bulls or enter into a bearish trade. It simply means that the buyers dominate the market. A long black candle on 6<sup>th</sup> of February is a reversal pattern that indicate the price decline. The long black candle without shadow indicates that the opening price equal to the highest price and the closing price equal to the lowest price of that day. The range of the price decreases on the next day and the lowest price is found to be on 9<sup>th</sup> of February.

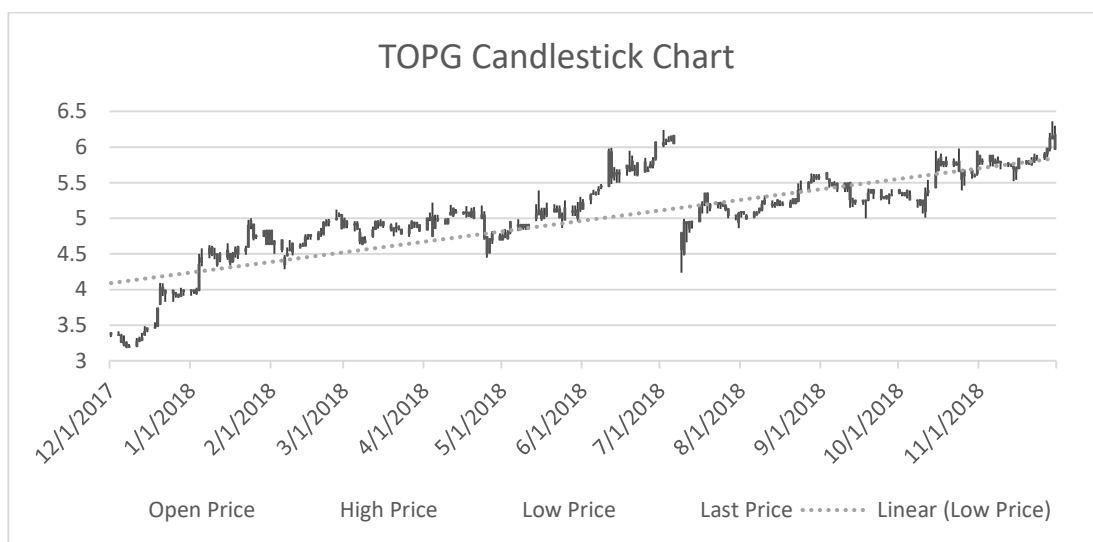


Figure 4.27 : Candlestick Chart on Top Glove Stock

Figure 4.27 displayed 1 year candlestick chart on Top Glove Stock. The trendline shows an upward trend for Top Glove Stock. The Top Glove Stock increase persistently and the highest price reaches 6.24 on 2<sup>nd</sup> of July. The price drops sharply on 6<sup>th</sup> July and wide range and be seen on Figure 4.27. Thus, the breakdown chart is plotted on Figure 4.28 to further study the price change.

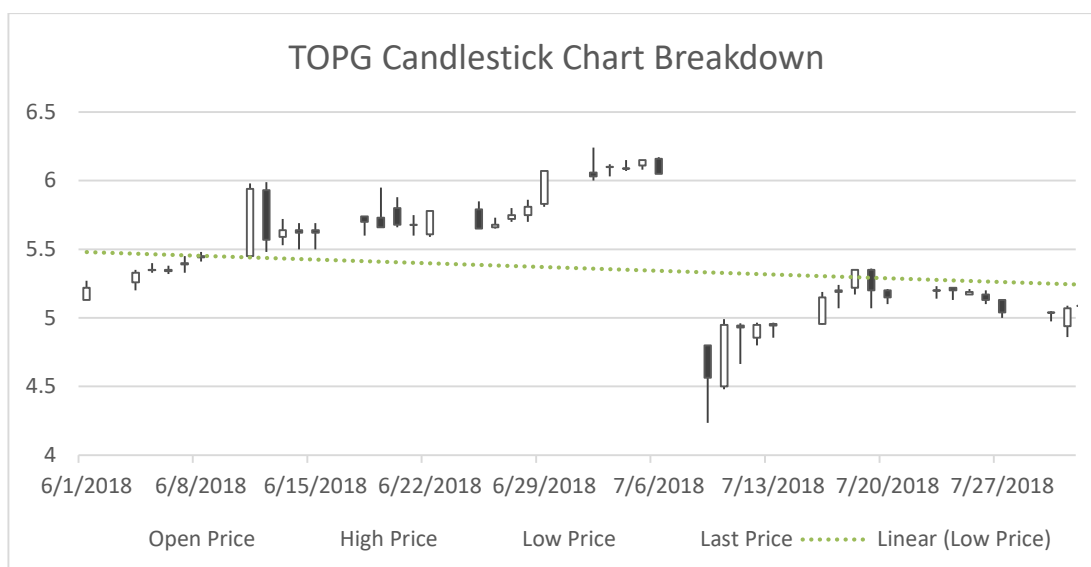


Figure 4.28 : Candlestick Chart on Top Glove Stock for month June and July

Figure 4.28 showed the breakdown of Top Glove Stock for June and July. There is a huge gap on 6<sup>th</sup> of June and 7<sup>th</sup> of June. It simply means that a huge decline in price and the stock performance drop. A white candlestick on 11<sup>th</sup> June follows by a black candlestick on 12<sup>th</sup> June are shown. These patterns indicate that the closing price on 11<sup>th</sup> June is the opening price on the following day, 12<sup>th</sup> June. The long white candlestick shows buying pressure and the black candlestick shows selling pressure. The short candlestick on 6<sup>th</sup> June indicates the price range is small. Meanwhile, the following 2 bars show a bullish engulfing which is a reversal pattern. On the second day, the price opens lower than the previous low, and yet the buying pressure manages to shove the price up to another higher level. This culminate in an obvious win for the buyers. The price increases gradually after 10<sup>th</sup> July.

## CHAPTER 5

### CONCLUSIONS

#### 5.1 Conclusions

This project studied the different statistical methods used to monitor the stock performance for 1 year period. Therefore, three methods are used to study the stock prices which are Shewhart  $\bar{X}$ ,  $R$  and Candlestick Charts. Seven stocks are collected based on the top performing stocks of Bursa Malaysia as per the market capitalization.

Among the seven stocks, only Top Glove Stock is responsive to  $\bar{X}$  Control Chart where 15 points are detected to fall below the lower control limit (LCL). Average price per book ratio are used to plot  $\bar{X}$  Control Chart as the average price per book ratio able to determine whether the stock is overestimated or underestimated.

All the seven stocks are alert to  $R$  Control Chart. The daily price range are used to plot the  $R$  Control Chart. It gives signals to the investors and traders who would like to invest in those seven stocks. These seven stocks should be considered independently as all these stocks have different nature of business.

Last but not least, candlestick chart is studied. Candlestick chart includes open, high, low and close price and 2 different colours are used to represent the price change. The patterns of each stocks are investigated and studied. Each stock has its own pattern and able to help investors or traders to make short term trading decision.

For further study, other control chart such as CUSUM and EWMA control chart can be used to study the stock prices as  $\bar{X}$  Control Chart and  $R$  Control Chart provide limited information for decision making. Furthermore, the candlestick do not reflect the sequence of the events. We only know the relationship of open and close prices but we do not know the sequence of the open and close prices.

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## APPENDICES

### APPENDIX A: Tables

Table A-1: PBK MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	19.9	20.26	20.24	19.9	2.1286
12/4/2017	19.98	20.18	20.02	20	2.1393
12/5/2017	19.98	20.1	20	20	2.1393
12/6/2017	19.98	20.06	20	20.02	2.1414
12/7/2017	19.96	20.06	20.02	19.96	2.135
12/8/2017	19.94	20.04	19.94	20.02	2.1414
12/11/2017	19.98	20.04	20.04	20.02	2.1414
12/12/2017	20.02	20.26	20.04	20.2	2.1607
12/13/2017	20.06	20.36	20.2	20.36	2.1778
12/14/2017	20.32	21.08	20.34	20.8	2.2248
12/15/2017	20.36	20.9	20.88	20.76	2.2206
12/18/2017	20.54	20.82	20.82	20.7	2.2141
12/19/2017	20.24	20.8	20.8	20.5	2.1927
12/20/2017	20.48	20.98	20.48	20.72	2.2163
12/21/2017	20.56	20.74	20.74	20.68	2.212
12/22/2017	20.58	20.74	20.72	20.7	2.2141
12/25/2017	20.58	20.74	20.72	20.7	2.2141
12/26/2017	20.52	20.82	20.52	20.7	2.2141
12/27/2017	20.64	20.78	20.72	20.7	2.2141
12/28/2017	20.68	20.92	20.72	20.82	2.227
12/29/2017	20.72	20.86	20.86	20.78	2.1475
1/1/2018	20.72	20.86	20.86	20.78	2.1475
1/2/2018	20.62	20.8	20.76	20.76	2.1455
1/3/2018	20.74	20.86	20.8	20.76	2.1455
1/4/2018	20.7	20.88	20.76	20.74	2.1434
1/5/2018	20.74	20.86	20.74	20.78	2.1475
1/8/2018	20.76	20.86	20.86	20.82	2.1517
1/9/2018	20.76	20.98	20.88	20.82	2.1517
1/10/2018	20.8	20.9	20.88	20.84	2.1537
1/11/2018	20.82	20.88	20.88	20.86	2.1558
1/12/2018	20.84	20.98	20.9	20.88	2.1579
1/15/2018	20.86	20.96	20.94	20.88	2.1579
1/16/2018	20.84	20.94	20.92	20.88	2.1579
1/17/2018	20.86	20.92	20.9	20.88	2.1579
1/18/2018	20.8	20.96	20.88	20.88	2.1579
1/19/2018	20.86	20.92	20.86	20.9	2.1599

1/22/2018	20.9	20.96	20.96	20.96	2.1661
1/23/2018	20.9	20.98	20.94	20.96	2.1661
1/24/2018	20.92	21	20.94	20.96	2.1661
1/25/2018	20.96	21.2	20.96	21.2	2.1909
1/26/2018	21.18	21.38	21.18	21.3	2.2013
1/29/2018	21.3	22.04	21.3	21.9	2.2633
1/30/2018	21.78	22.38	21.9	21.98	2.2715
1/31/2018	21.78	22.38	21.9	21.98	2.2715
2/1/2018	21.78	22.38	21.9	21.98	2.2715
2/2/2018	21.92	22.62	22.6	22	2.2736
2/5/2018	21.72	22.02	21.8	21.98	2.2715
2/6/2018	21	21.72	21	21.48	2.2199
2/7/2018	21.68	22	21.68	21.94	2.2674
2/8/2018	21.88	22	21.94	21.98	2.2715
2/9/2018	21.54	21.92	21.54	21.8	2.2529
2/12/2018	21.9	21.98	21.96	21.94	2.2674
2/13/2018	21.94	22.02	21.98	22.02	2.2757
2/14/2018	21.96	22.06	22.04	22.04	2.2777
2/15/2018	21.84	22.08	22.08	21.84	2.2571
2/16/2018	21.84	22.08	22.08	21.84	2.2571
2/19/2018	21.92	22	21.94	21.98	2.2715
2/20/2018	21.98	22.28	22	22.08	2.2819
2/21/2018	22.08	22.26	22.08	22.14	2.2881
2/22/2018	22.14	22.38	22.14	22.28	2.3025
2/23/2018	22.32	22.9	22.36	22.8	2.3563
2/26/2018	22.8	23.04	22.9	22.9	2.3666
2/27/2018	22.9	23	22.96	23	2.377
2/28/2018	22.88	23	23	23	2.377
3/1/2018	22.92	23	23	23	2.377
3/2/2018	22.94	23	22.96	22.98	2.3749
3/5/2018	22.9	23.04	22.98	22.9	2.3666
3/6/2018	22.96	23.16	22.96	23	2.377
3/7/2018	22.94	23.02	23.02	22.94	2.3708
3/8/2018	22.96	23.2	23.04	23	2.377
3/9/2018	22.96	23.1	23.1	23	2.377
3/12/2018	22.96	23.12	23.12	23	2.377
3/13/2018	22.58	23	22.66	23	2.377
3/14/2018	22.96	23.14	23.06	23	2.377
3/15/2018	22.8	23.12	23	23	2.377
3/16/2018	22.8	23.16	23	23.02	2.379
3/19/2018	23.08	23.16	23.12	23.12	2.3894
3/20/2018	23.04	23.52	23.12	23.52	2.4307
3/21/2018	23.4	23.68	23.54	23.68	2.4472
3/22/2018	23.6	24.12	23.6	24.04	2.4844

3/23/2018	23.84	24.08	23.88	24	2.4803
3/26/2018	23.68	23.98	23.98	23.92	2.472
3/27/2018	23.9	24.02	23.9	23.98	2.4782
3/28/2018	23.92	24	23.94	23.96	2.4762
3/29/2018	23.88	24.08	23.96	24	2.4803
3/30/2018	23.98	24.02	24.02	24	2.4638
4/2/2018	23.84	24.02	24	23.9	2.4535
4/3/2018	23.84	24	23.9	23.96	2.4597
4/4/2018	23.72	24.02	23.9	23.9	2.4535
4/5/2018	23.76	23.98	23.9	23.94	2.4576
4/6/2018	23.86	23.98	23.94	23.94	2.4576
4/9/2018	23.82	23.98	23.96	23.94	2.4576
4/10/2018	23.84	23.98	23.84	23.96	2.4597
4/11/2018	23.9	24.04	23.9	23.96	2.4597
4/12/2018	23.88	24.04	23.9	24.04	2.4679
4/13/2018	23.94	24.04	24.02	23.98	2.4617
4/16/2018	23.8	24.04	23.96	24.04	2.4679
4/17/2018	23.9	24.1	24.1	23.98	2.4617
4/18/2018	23.92	24	24	24	2.4638
4/19/2018	23.96	24.3	24.06	24.24	2.4884
4/20/2018	24.02	24.24	24.24	24.2	2.4843
4/23/2018	24.16	24.34	24.2	24.3	2.4946
4/24/2018	24.1	24.5	24.4	24.1	2.4741
4/25/2018	23.82	24.16	24.16	23.84	2.4474
4/26/2018	23.22	23.96	23.96	23.72	2.4351
4/27/2018	23.6	24.08	24.04	23.6	2.4227
4/30/2018	23.62	23.88	23.62	23.8	2.4433
5/1/2018	23.62	23.88	23.62	23.8	2.4433
5/2/2018	23.6	24	23.8	24	2.4638
5/3/2018	23.82	24.08	24	23.94	2.4576
5/4/2018	23.76	23.92	23.86	23.8	2.4433
5/7/2018	23.48	23.9	23.9	23.7	2.433
5/8/2018	23.62	23.94	23.8	23.88	2.4515
5/9/2018	23.62	23.94	23.8	23.88	2.4515
5/10/2018	23.62	23.94	23.8	23.88	2.4515
5/11/2018	23.62	23.94	23.8	23.88	2.4515
5/14/2018	23.58	25.78	23.92	24.8	2.5459
5/15/2018	24	25.48	25.1	24	2.4638
5/16/2018	24	24.94	24.12	24.5	2.5151
5/17/2018	24.32	24.78	24.64	24.34	2.4987
5/18/2018	24.32	24.46	24.36	24.38	2.5028
5/21/2018	24.4	25.36	24.56	25	2.5665
5/22/2018	25.02	25.26	25.1	25.2	2.587
5/23/2018	24.9	25.48	25.36	25.1	2.5767

5/24/2018	24.22	25.12	25.08	24.36	2.5008
5/25/2018	24.66	25.2	24.84	24.92	2.5582
5/28/2018	24.56	24.96	24.92	24.9	2.5562
5/29/2018	24.56	24.96	24.92	24.9	2.5562
5/30/2018	23.8	24.78	24.78	23.98	2.4617
5/31/2018	23.86	24.64	24.36	23.86	2.4494
6/1/2018	23.86	24.12	23.92	24	2.4638
6/4/2018	23.94	24.3	24.24	24.02	2.4659
6/5/2018	23.98	24.16	24.14	24.02	2.4659
6/6/2018	24.02	25	24.16	25	2.5665
6/7/2018	24.72	25.22	25.02	24.8	2.5459
6/8/2018	24.28	24.98	24.92	24.6	2.5254
6/11/2018	24.18	24.68	24.38	24.34	2.4987
6/12/2018	24.24	24.46	24.28	24.3	2.4946
6/13/2018	23.82	24.3	24.28	24.08	2.472
6/14/2018	23.7	24.14	23.98	24.04	2.4679
6/15/2018	23.7	24.14	23.98	24.04	2.4679
6/18/2018	23.5	24.1	23.84	24	2.4638
6/19/2018	23.32	24	23.82	23.36	2.3981
6/20/2018	22.78	23.76	23.48	22.78	2.3386
6/21/2018	22.36	22.98	22.82	22.62	2.3221
6/22/2018	22.46	23.04	22.54	22.92	2.3529
6/25/2018	22.72	23.04	23.04	22.72	2.3324
6/26/2018	22.74	22.96	22.78	22.9	2.3509
6/27/2018	22.98	23.28	22.98	23.1	2.3714
6/28/2018	22.92	23.12	22.98	23	2.3611
6/29/2018	22.98	23.36	23.12	23.36	2.2956
7/2/2018	22.8	23.36	23.14	22.98	2.2583
7/3/2018	22.82	23.12	22.86	23	2.2602
7/4/2018	22.9	23.06	23.06	22.98	2.2583
7/5/2018	22.54	22.98	22.86	22.9	2.2504
7/6/2018	22.34	22.98	22.98	22.52	2.2131
7/9/2018	22.4	22.62	22.52	22.54	2.215
7/10/2018	22.5	22.62	22.58	22.54	2.215
7/11/2018	22.42	22.86	22.48	22.8	2.2406
7/12/2018	22.8	23.06	22.88	23	2.2602
7/13/2018	22.9	23.12	22.94	23	2.2602
7/16/2018	22.96	23.12	23.04	23.02	2.2622
7/17/2018	22.98	23.6	23.02	23.6	2.3192
7/18/2018	23.18	23.78	23.38	23.7	2.329
7/19/2018	23.64	24	23.8	23.9	2.3487
7/20/2018	23.8	23.98	23.94	23.94	2.3526
7/23/2018	23.84	24	23.98	23.96	2.3546
7/24/2018	23.94	24.1	24	23.98	2.3566

7/25/2018	23.92	24.04	23.98	24	2.3585
7/26/2018	23.98	24.1	24.1	24.02	2.3605
7/27/2018	24.02	24.08	24.06	24.04	2.3624
7/30/2018	23.98	24.06	24.02	24.02	2.3605
7/31/2018	23.98	24.1	24.04	24.06	2.3644
8/1/2018	24.06	24.2	24.06	24.2	2.3782
8/2/2018	24.12	24.24	24.2	24.18	2.3762
8/3/2018	24.14	24.24	24.22	24.16	2.3742
8/6/2018	24.18	24.28	24.2	24.26	2.3841
8/7/2018	24.24	24.46	24.28	24.32	2.39
8/8/2018	24.24	24.38	24.32	24.32	2.39
8/9/2018	24.3	24.44	24.42	24.4	2.3978
8/10/2018	24.4	24.52	24.42	24.4	2.3978
8/13/2018	24.26	24.44	24.44	24.38	2.3959
8/14/2018	24.3	24.42	24.38	24.4	2.3978
8/15/2018	24.3	24.6	24.32	24.48	2.4057
8/16/2018	24.36	24.52	24.46	24.48	2.4057
8/17/2018	24.46	24.52	24.5	24.5	2.4077
8/20/2018	24.46	24.6	24.58	24.5	2.4077
8/21/2018	24.46	24.68	24.5	24.68	2.4253
8/22/2018	24.46	24.68	24.5	24.68	2.4253
8/23/2018	24.7	25.32	24.7	25.32	2.4882
8/24/2018	24.7	25.12	25.08	24.9	2.447
8/27/2018	24.78	25	24.9	24.98	2.4548
8/28/2018	24.92	25.02	25	25	2.4568
8/29/2018	24.92	25.1	24.92	25.04	2.4607
8/30/2018	25.02	25.16	25.1	25.12	2.4686
8/31/2018	25.02	25.16	25.1	25.12	2.4686
9/3/2018	25.1	25.2	25.12	25.12	2.4686
9/4/2018	25.12	25.2	25.14	25.18	2.4745
9/5/2018	24.72	25.04	24.88	24.98	2.4548
9/6/2018	24.88	25.06	24.98	24.98	2.4548
9/7/2018	24.96	25.04	25.04	25	2.4568
9/10/2018	24.96	25.04	25.04	25	2.4568
9/11/2018	24.96	25.04	25.04	25	2.4568
9/12/2018	24.86	26.16	25.5	24.92	2.4489
9/13/2018	24.28	25	24.88	24.92	2.4489
9/14/2018	24.88	24.96	24.92	24.94	2.4509
9/17/2018	24.88	24.96	24.92	24.94	2.4509
9/18/2018	24.54	24.96	24.6	24.9	2.447
9/19/2018	24.8	25.26	24.96	25.06	2.4627
9/20/2018	24.92	25.12	25.08	25.02	2.4588
9/21/2018	25.02	25.12	25.1	25.06	2.4627
9/24/2018	24.96	25.16	25.02	25	2.4568

9/25/2018	24.96	25.08	24.96	25	2.4568
9/26/2018	24.9	25.02	25	25	2.4568
9/27/2018	24.9	25.02	24.94	25	2.4568
9/28/2018	24.8	25.06	24.9	25	2.4385
10/1/2018	24.94	25.04	25	25	2.4385
10/2/2018	24.92	25.04	24.92	25.02	2.4405
10/3/2018	24.98	25.06	25	25	2.4385
10/4/2018	24.96	25.02	24.98	25	2.4385
10/5/2018	24.9	25.04	24.9	24.98	2.4366
10/8/2018	24.96	25	25	24.98	2.4366
10/9/2018	24.94	25	24.98	24.96	2.4346
10/10/2018	24.92	25	24.98	24.98	2.4366
10/11/2018	24.32	24.92	24.7	24.9	2.4288
10/12/2018	24.66	25	24.82	24.98	2.4366
10/15/2018	24.84	25.02	24.92	24.98	2.4366
10/16/2018	24.92	25	24.96	24.98	2.4366
10/17/2018	24.9	25.02	25	24.98	2.4366
10/18/2018	24.92	25.02	24.92	25.02	2.4405
10/19/2018	24.82	25.04	25.02	25	2.4385
10/22/2018	24.86	25.02	24.96	24.98	2.4366
10/23/2018	24.86	25	24.96	24.9	2.4288
10/24/2018	24.86	25	25	24.88	2.4268
10/25/2018	24.46	24.98	24.54	24.9	2.4288
10/26/2018	24.44	24.88	24.86	24.62	2.4015
10/29/2018	24.46	24.76	24.56	24.58	2.3976
10/30/2018	24.34	24.6	24.6	24.54	2.3937
10/31/2018	24.52	24.72	24.56	24.6	2.3995
11/1/2018	24.52	24.68	24.52	24.6	2.3995
11/2/2018	24.54	24.7	24.7	24.62	2.4015
11/5/2018	24.28	24.76	24.76	24.58	2.3976
11/6/2018	24.28	24.76	24.76	24.58	2.3976
11/7/2018	24.52	24.78	24.52	24.6	2.3995
11/8/2018	24.64	24.88	24.74	24.7	2.4093
11/9/2018	24.62	24.76	24.62	24.7	2.4093
11/12/2018	24.42	24.7	24.6	24.68	2.4073
11/13/2018	24.46	24.7	24.46	24.64	2.4034
11/14/2018	24.36	24.7	24.7	24.52	2.3917
11/15/2018	24.22	24.56	24.36	24.5	2.3898
11/16/2018	24.48	24.68	24.5	24.62	2.4015
11/19/2018	24.58	25	24.66	25	2.4385
11/20/2018	24.58	25	24.66	25	2.4385
11/21/2018	24.62	24.88	24.8	24.82	2.421
11/22/2018	24.68	24.86	24.7	24.8	2.419
11/23/2018	24.76	24.82	24.82	24.8	2.419

11/26/2018	24.66	25	24.66	24.94	2.4327
11/27/2018	24.74	24.96	24.96	24.8	2.419
11/28/2018	24.78	24.92	24.86	24.88	2.4268
11/29/2018	24.82	24.9	24.88	24.9	2.4288
11/30/2018	24.76	24.98	24.94	24.92	2.4307

Table A-2: TNB MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	15.26	15.6	15.5	15.46	1.5319
12/4/2017	15.2	15.58	15.5	15.58	1.5438
12/5/2017	15.42	15.64	15.48	15.64	1.5497
12/6/2017	15.5	15.66	15.6	15.62	1.5477
12/7/2017	15.48	15.68	15.64	15.58	1.5438
12/8/2017	15.46	15.62	15.54	15.52	1.5378
12/11/2017	15.46	15.6	15.56	15.5	1.5358
12/12/2017	15.38	15.5	15.42	15.48	1.5339
12/13/2017	15.38	15.48	15.48	15.42	1.5279
12/14/2017	15.38	15.46	15.46	15.42	1.5279
12/15/2017	15.36	15.44	15.38	15.44	1.5299
12/18/2017	15.38	15.56	15.52	15.38	1.524
12/19/2017	14.8	15.04	15.04	14.9	1.4764
12/20/2017	14.82	14.92	14.9	14.86	1.4724
12/21/2017	14.9	15	15	14.96	1.4823
12/22/2017	14.96	15.06	14.98	14.98	1.4843
12/25/2017	14.96	15.06	14.98	14.98	1.4843
12/26/2017	14.94	15.02	14.96	14.98	1.4843
12/27/2017	14.98	15.2	14.98	15.12	1.4982
12/28/2017	15.08	15.42	15.1	15.42	1.5279
12/29/2017	15.2	15.44	15.42	15.26	1.5121
1/1/2018	15.2	15.44	15.42	15.26	1.5121
1/2/2018	15.12	15.34	15.22	15.22	1.5081
1/3/2018	15.22	15.42	15.22	15.3	1.516
1/4/2018	15.28	15.4	15.32	15.4	1.5259
1/5/2018	15.36	15.5	15.36	15.42	1.5279
1/8/2018	15.42	15.72	15.44	15.7	1.5557
1/9/2018	15.82	15.94	15.88	15.88	1.5735
1/10/2018	15.8	15.9	15.9	15.86	1.5715
1/11/2018	15.72	15.86	15.84	15.82	1.5676
1/12/2018	15.72	15.84	15.84	15.78	1.5636
1/15/2018	15.78	15.82	15.8	15.82	1.5676
1/16/2018	15.78	15.88	15.84	15.88	1.5735
1/17/2018	15.78	15.98	15.9	15.82	1.5676
1/18/2018	15.56	15.84	15.82	15.6	1.5458

1/19/2018	15.68	15.82	15.68	15.82	1.5676
1/22/2018	15.78	15.96	15.96	15.82	1.5676
1/23/2018	15.82	15.88	15.82	15.86	1.5715
1/24/2018	15.8	15.92	15.92	15.84	1.5695
1/25/2018	15.82	15.86	15.84	15.86	1.5715
1/26/2018	15.78	15.94	15.86	15.84	1.5695
1/29/2018	15.78	16.12	15.84	15.84	1.5695
1/30/2018	15.68	15.88	15.8	15.78	1.5636
1/31/2018	15.68	15.88	15.8	15.78	1.5636
2/1/2018	15.68	15.88	15.8	15.78	1.5636
2/2/2018	15.54	15.86	15.76	15.8	1.5656
2/5/2018	15.56	15.86	15.62	15.82	1.5676
2/6/2018	15.5	15.8	15.5	15.58	1.5438
2/7/2018	15.66	15.84	15.68	15.84	1.5695
2/8/2018	15.76	15.84	15.84	15.8	1.5656
2/9/2018	15.52	15.74	15.56	15.72	1.5576
2/12/2018	15.7	15.84	15.84	15.76	1.5616
2/13/2018	15.72	15.8	15.78	15.74	1.5596
2/14/2018	15.66	15.8	15.78	15.7	1.5557
2/15/2018	15.64	15.78	15.78	15.7	1.5557
2/16/2018	15.64	15.78	15.78	15.7	1.5557
2/19/2018	15.72	15.8	15.76	15.74	1.5596
2/20/2018	15.7	15.78	15.7	15.72	1.5576
2/21/2018	15.68	15.76	15.72	15.7	1.5557
2/22/2018	15.56	15.78	15.66	15.64	1.5497
2/23/2018	15.58	15.72	15.62	15.64	1.5497
2/26/2018	15.6	15.68	15.64	15.62	1.5477
2/27/2018	15.62	15.8	15.62	15.76	1.5616
2/28/2018	15.62	15.76	15.76	15.7	1.5557
3/1/2018	15.6	15.76	15.74	15.7	1.5557
3/2/2018	15.64	15.7	15.7	15.7	1.5557
3/5/2018	15.6	15.72	15.7	15.66	1.5517
3/6/2018	15.6	15.66	15.66	15.64	1.5497
3/7/2018	15.58	15.64	15.62	15.6	1.5458
3/8/2018	15.56	15.64	15.56	15.6	1.5458
3/9/2018	15.5	15.66	15.66	15.54	1.5398
3/12/2018	15.56	15.64	15.58	15.62	1.5477
3/13/2018	15.58	15.66	15.58	15.62	1.5477
3/14/2018	15.6	15.7	15.6	15.64	1.5497
3/15/2018	15.6	15.68	15.66	15.66	1.5517
3/16/2018	15.62	15.7	15.62	15.68	1.5537
3/19/2018	15.64	15.74	15.64	15.7	1.5557
3/20/2018	15.68	15.88	15.7	15.76	1.5616
3/21/2018	15.74	15.8	15.78	15.78	1.5636



3/22/2018	15.74	15.82	15.76	15.78	1.5636
3/23/2018	15.7	15.78	15.74	15.76	1.5616
3/26/2018	15.7	15.8	15.7	15.76	1.5616
3/27/2018	15.72	15.78	15.72	15.72	1.5576
3/28/2018	15.72	15.86	15.76	15.8	1.5656
3/29/2018	15.8	16.18	15.86	16.16	1.6012
3/30/2018	16.1	16.34	16.16	16.24	1.5919
4/2/2018	16.14	16.26	16.2	16.2	1.588
4/3/2018	15.8	16.2	16.18	15.86	1.5546
4/4/2018	15.66	15.92	15.72	15.7	1.5389
4/5/2018	15.72	15.86	15.72	15.82	1.5507
4/6/2018	15.7	15.88	15.88	15.74	1.5429
4/9/2018	15.74	15.9	15.82	15.88	1.5566
4/10/2018	15.8	16	15.8	15.9	1.5585
4/11/2018	15.86	16	16	15.86	1.5546
4/12/2018	15.88	15.98	15.98	15.9	1.5585
4/13/2018	15.84	15.96	15.84	15.88	1.5566
4/16/2018	15.9	15.96	15.92	15.94	1.5625
4/17/2018	15.86	16	15.88	15.94	1.5625
4/18/2018	15.88	16	16	15.92	1.5605
4/19/2018	15.88	16	15.92	16	1.5683
4/20/2018	15.88	16	15.96	15.92	1.5605
4/23/2018	15.84	15.98	15.94	15.88	1.5566
4/24/2018	15.86	15.96	15.9	15.88	1.5566
4/25/2018	15.76	15.88	15.86	15.84	1.5527
4/26/2018	15.8	15.92	15.84	15.84	1.5527
4/27/2018	15.82	16.02	15.94	15.86	1.5546
4/30/2018	15.76	15.86	15.8	15.84	1.5527
5/1/2018	15.76	15.86	15.8	15.84	1.5527
5/2/2018	15.8	15.88	15.82	15.84	1.5527
5/3/2018	15.8	16.04	15.8	16	1.5683
5/4/2018	15.9	16.12	15.96	16.08	1.5762
5/7/2018	15.84	16.1	16.1	16	1.5683
5/8/2018	15.84	16.08	15.84	16.06	1.5742
5/9/2018	15.84	16.08	15.84	16.06	1.5742
5/10/2018	15.84	16.08	15.84	16.06	1.5742
5/11/2018	15.84	16.08	15.84	16.06	1.5742
5/14/2018	15.24	16.12	15.58	16	1.5683
5/15/2018	15.6	15.96	15.9	15.92	1.5605
5/16/2018	15.8	15.96	15.96	15.92	1.5605
5/17/2018	15.88	16	16	15.9	1.5585
5/18/2018	15.88	15.98	15.9	15.92	1.5605
5/21/2018	15.62	15.92	15.92	15.66	1.535
5/22/2018	15.2	15.68	15.68	15.34	1.5037

5/23/2018	14.76	15.44	15.44	14.94	1.4644
5/24/2018	14.6	15.04	15	14.76	1.4468
5/25/2018	14.82	15.4	15.14	15.04	1.4742
5/28/2018	14.54	15.08	15.04	14.78	1.4488
5/29/2018	14.54	15.08	15.04	14.78	1.4488
5/30/2018	14.04	14.66	14.66	14.14	1.386
5/31/2018	14.2	15.26	14.2	14.4	1.4115
6/1/2018	14.4	14.6	14.44	14.5	1.4213
6/4/2018	14.22	14.5	14.48	14.34	1.4056
6/5/2018	14.24	14.4	14.34	14.36	1.4076
6/6/2018	14.28	14.42	14.28	14.36	1.4076
6/7/2018	14.36	14.74	14.36	14.56	1.4272
6/8/2018	14.52	14.76	14.6	14.62	1.4331
6/11/2018	14.56	14.78	14.62	14.56	1.4272
6/12/2018	14.32	14.64	14.64	14.4	1.4115
6/13/2018	14.22	14.56	14.4	14.4	1.4115
6/14/2018	14.3	14.5	14.3	14.5	1.4213
6/15/2018	14.3	14.5	14.3	14.5	1.4213
6/18/2018	14.12	14.7	14.7	14.32	1.4037
6/19/2018	14.12	14.32	14.32	14.16	1.388
6/20/2018	14.12	14.28	14.12	14.26	1.3978
6/21/2018	13.54	14.26	14.24	13.94	1.3664
6/22/2018	13.54	13.84	13.78	13.8	1.3527
6/25/2018	13.66	13.98	13.98	13.86	1.3586
6/26/2018	13.76	13.9	13.9	13.84	1.3566
6/27/2018	13.76	13.86	13.76	13.82	1.3547
6/28/2018	13.56	13.76	13.7	13.66	1.339
6/29/2018	13.54	15.06	13.54	14.64	1.4067
7/2/2018	14.38	14.9	14.64	14.6	1.4028
7/3/2018	14.3	14.64	14.6	14.44	1.3874
7/4/2018	14.26	14.56	14.56	14.4	1.3836
7/5/2018	14.34	14.56	14.52	14.42	1.3855
7/6/2018	14.26	14.74	14.74	14.26	1.3702
7/9/2018	14.3	14.6	14.38	14.3	1.374
7/10/2018	14.36	14.44	14.36	14.42	1.3855
7/11/2018	14.24	14.62	14.4	14.5	1.3932
7/12/2018	14.42	14.58	14.58	14.48	1.3913
7/13/2018	14.46	14.7	14.58	14.64	1.4067
7/16/2018	14.5	14.7	14.64	14.64	1.4067
7/17/2018	14.66	14.84	14.68	14.78	1.4201
7/18/2018	14.7	14.88	14.84	14.88	1.4297
7/19/2018	14.76	14.98	14.76	14.92	1.4336
7/20/2018	14.72	14.9	14.9	14.82	1.424
7/23/2018	14.66	14.82	14.68	14.78	1.4201

7/24/2018	14.68	14.82	14.68	14.78	1.4201
7/25/2018	14.74	14.92	14.74	14.88	1.4297
7/26/2018	14.88	15.1	15	15.1	1.4509
7/27/2018	14.96	15.12	15	15.1	1.4509
7/30/2018	14.96	15.28	15.1	15.14	1.4547
7/31/2018	15.04	15.68	15.08	15.68	1.5066
8/1/2018	15.16	15.3	15.28	15.3	1.4701
8/2/2018	15.24	15.5	15.36	15.28	1.4682
8/3/2018	15.24	15.48	15.24	15.42	1.4816
8/6/2018	15.36	15.48	15.48	15.44	1.4835
8/7/2018	15.4	15.7	15.42	15.5	1.4893
8/8/2018	15.52	15.74	15.6	15.58	1.497
8/9/2018	15.62	15.8	15.66	15.78	1.5162
8/10/2018	15.72	15.9	15.78	15.78	1.5162
8/13/2018	15.42	15.78	15.78	15.56	1.4951
8/14/2018	15.56	15.74	15.6	15.66	1.5047
8/15/2018	15.66	15.96	15.66	15.82	1.52
8/16/2018	15.66	15.8	15.8	15.74	1.5124
8/17/2018	15.66	15.8	15.76	15.7	1.5085
8/20/2018	15.66	15.8	15.7	15.68	1.5066
8/21/2018	15.66	15.76	15.7	15.74	1.5124
8/22/2018	15.66	15.76	15.7	15.74	1.5124
8/23/2018	15.68	15.8	15.72	15.74	1.5124
8/24/2018	15.68	15.8	15.68	15.7	1.5085
8/27/2018	15.68	15.78	15.7	15.72	1.5104
8/28/2018	15.62	15.8	15.62	15.72	1.5104
8/29/2018	15.66	15.8	15.74	15.7	1.5085
8/30/2018	15.66	15.78	15.7	15.68	1.5066
8/31/2018	15.66	15.78	15.7	15.68	1.5066
9/3/2018	15.68	15.82	15.68	15.7	1.5085
9/4/2018	15.62	15.78	15.68	15.72	1.5104
9/5/2018	15.54	15.82	15.7	15.72	1.5104
9/6/2018	15.7	15.8	15.7	15.76	1.5143
9/7/2018	15.74	15.9	15.8	15.8	1.5181
9/10/2018	15.74	15.9	15.8	15.8	1.5181
9/11/2018	15.74	15.9	15.8	15.8	1.5181
9/12/2018	15.72	16	16	15.82	1.52
9/13/2018	15.72	15.88	15.8	15.8	1.5181
9/14/2018	15.7	15.84	15.8	15.8	1.5181
9/17/2018	15.7	15.84	15.8	15.8	1.5181
9/18/2018	15.76	15.86	15.78	15.82	1.52
9/19/2018	15.74	15.88	15.74	15.78	1.5162
9/20/2018	15.74	15.96	15.86	15.76	1.5143
9/21/2018	15.68	15.9	15.88	15.68	1.5066

9/24/2018	15.48	15.74	15.74	15.52	1.4912
9/25/2018	15.44	15.52	15.52	15.48	1.4874
9/26/2018	15.1	15.6	15.16	15.5	1.4893
9/27/2018	15.46	15.6	15.5	15.52	1.4912
9/28/2018	15.46	15.6	15.6	15.46	1.5143
10/1/2018	15.4	15.54	15.54	15.52	1.5202
10/2/2018	15.48	15.6	15.5	15.54	1.5221
10/3/2018	15.56	15.68	15.6	15.58	1.5261
10/4/2018	15.46	15.6	15.54	15.5	1.5182
10/5/2018	15.38	15.5	15.38	15.44	1.5123
10/8/2018	15.36	15.42	15.4	15.38	1.5065
10/9/2018	15.34	15.42	15.34	15.38	1.5065
10/10/2018	14.5	15.5	15.48	14.68	1.4379
10/11/2018	13.8	14.4	14.02	14.28	1.3987
10/12/2018	14.32	14.74	14.32	14.6	1.4301
10/15/2018	14.56	14.68	14.62	14.58	1.4281
10/16/2018	14.58	14.68	14.66	14.62	1.432
10/17/2018	14.56	14.68	14.68	14.6	1.4301
10/18/2018	14.38	14.64	14.54	14.58	1.4281
10/19/2018	14.44	14.58	14.52	14.56	1.4262
10/22/2018	14.48	14.6	14.5	14.5	1.4203
10/23/2018	14	14.52	14.42	14.08	1.3791
10/24/2018	13.82	14.26	14	13.9	1.3615
10/25/2018	13.82	14.22	13.88	14	1.3713
10/26/2018	14	14.18	14.02	14.04	1.3752
10/29/2018	14.02	14.16	14.1	14.1	1.3811
10/30/2018	14.16	14.5	14.5	14.3	1.4007
10/31/2018	14.32	14.76	14.4	14.7	1.4399
11/1/2018	14.5	14.7	14.7	14.56	1.4262
11/2/2018	14.5	14.72	14.5	14.7	1.4399
11/5/2018	14.68	15.02	14.86	14.8	1.4497
11/6/2018	14.68	15.02	14.86	14.8	1.4497
11/7/2018	14.7	14.96	14.78	14.82	1.4516
11/8/2018	14.88	14.98	14.96	14.94	1.4634
11/9/2018	14.8	15	14.94	15	1.4692
11/12/2018	14.66	14.98	14.9	14.84	1.4536
11/13/2018	14.7	14.8	14.7	14.78	1.4477
11/14/2018	14.66	14.9	14.66	14.9	1.4595
11/15/2018	14.68	14.94	14.9	14.82	1.4516
11/16/2018	14.8	14.98	14.9	14.9	1.4595
11/19/2018	14.74	14.98	14.98	14.86	1.4555
11/20/2018	14.74	14.98	14.98	14.86	1.4555
11/21/2018	14.52	14.86	14.58	14.8	1.4497
11/22/2018	14.7	14.94	14.7	14.78	1.4477

11/23/2018	14.64	14.88	14.78	14.8	1.4497
11/26/2018	14.68	14.86	14.68	14.86	1.4555
11/27/2018	14.68	14.88	14.88	14.72	1.4418
11/28/2018	14.12	14.5	14.5	14.26	1.3968
11/29/2018	14.22	14.3	14.28	14.24	1.3948
11/30/2018	14.16	14.28	14.26	14.24	1.3948

Table A-3: PTG MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	15.86	16.3	16.16	15.88	2.5506
12/4/2017	15.82	16.14	15.92	15.94	2.5602
12/5/2017	15.9	16.32	16	16.1	2.5859
12/6/2017	15.92	16.38	16.2	16.16	2.5955
12/7/2017	16.1	16.36	16.36	16.1	2.5859
12/8/2017	16	16.12	16.1	16	2.5698
12/11/2017	15.98	16.14	16	16.04	2.5763
12/12/2017	16.02	16.18	16.04	16.06	2.5795
12/13/2017	16.04	16.18	16.18	16.06	2.5795
12/14/2017	16.1	16.48	16.18	16.3	2.618
12/15/2017	15.94	16.46	16.2	16.24	2.6084
12/18/2017	16	16.44	16.24	16.44	2.6405
12/19/2017	16.28	16.44	16.4	16.4	2.6341
12/20/2017	16.32	16.46	16.36	16.38	2.6309
12/21/2017	16.36	17.04	16.48	16.96	2.724
12/22/2017	16.96	17.42	17.02	17.1	2.7465
12/25/2017	16.96	17.42	17.02	17.1	2.7465
12/26/2017	16.8	17.12	17.12	17	2.7304
12/27/2017	17.06	17.3	17.1	17.18	2.7594
12/28/2017	17.2	17.5	17.22	17.38	2.7915
12/29/2017	17.12	17.68	17.38	17.48	2.7637
1/1/2018	17.12	17.68	17.38	17.48	2.7637
1/2/2018	17.16	17.52	17.5	17.52	2.7701
1/3/2018	17.6	18.26	17.7	17.94	2.8365
1/4/2018	17.96	18.1	18.1	18.1	2.8618
1/5/2018	17.94	18.36	18.1	18.36	2.9029
1/8/2018	18.24	19.5	18.38	19.2	3.0357
1/9/2018	18.82	19.2	19.18	19	3.0041
1/10/2018	18.82	19.2	19	19	3.0041
1/11/2018	18.32	18.98	18.8	18.5	2.925
1/12/2018	18.5	19	18.7	19	3.0041
1/15/2018	18.82	19.14	19	18.9	2.9883
1/16/2018	18.14	18.88	18.88	18.36	2.9029
1/17/2018	17.62	18.36	18.36	17.94	2.8365

1/18/2018	17.06	17.96	17.94	17.32	2.7384
1/19/2018	17.28	18.2	17.28	18.2	2.8776
1/22/2018	17.94	18.28	18.16	18	2.846
1/23/2018	17.38	18.24	18.24	18.16	2.8713
1/24/2018	17.54	18.16	18.16	17.7	2.7985
1/25/2018	17.7	18	18	17.8	2.8143
1/26/2018	17.6	18.3	17.8	18.3	2.8934
1/29/2018	17.86	18.48	18.4	18.42	2.9124
1/30/2018	17.82	18.42	18.38	17.9	2.8301
1/31/2018	17.82	18.42	18.38	17.9	2.8301
2/1/2018	17.82	18.42	18.38	17.9	2.8301
2/2/2018	17.9	18.58	18.14	18.28	2.8902
2/5/2018	17.82	18.4	18.1	18.04	2.8523
2/6/2018	16.56	17.82	17.82	17.12	2.7068
2/7/2018	17.2	17.92	17.24	17.62	2.7859
2/8/2018	17.44	18.12	17.94	18	2.846
2/9/2018	17.32	17.64	17.5	17.48	2.7637
2/12/2018	17.56	17.86	17.56	17.76	2.808
2/13/2018	17.6	17.96	17.76	17.8	2.8143
2/14/2018	17.44	17.64	17.48	17.5	2.7669
2/15/2018	17.44	17.6	17.5	17.5	2.7669
2/16/2018	17.44	17.6	17.5	17.5	2.7669
2/19/2018	17.74	18.66	17.74	18.66	2.9503
2/20/2018	17.66	18.64	18.64	17.8	2.8143
2/21/2018	17.8	18	17.82	17.9	2.8301
2/22/2018	17.86	18.14	17.86	17.96	2.8396
2/23/2018	17.62	17.94	17.94	17.68	2.7954
2/26/2018	17.6	17.9	17.68	17.66	2.7922
2/27/2018	17.54	18	17.66	17.9	2.8301
2/28/2018	17.42	18.2	18.2	17.62	2.7859
3/1/2018	17.4	17.72	17.72	17.44	2.7574
3/2/2018	17.36	17.74	17.54	17.42	2.7543
3/5/2018	17.38	17.88	17.6	17.62	2.7859
3/6/2018	17.46	18	17.72	17.62	2.7859
3/7/2018	17.4	17.6	17.5	17.4	2.7511
3/8/2018	17.4	17.84	17.84	17.4	2.7511
3/9/2018	17.4	17.6	17.5	17.4	2.7511
3/12/2018	17.4	17.98	17.4	17.8	2.8143
3/13/2018	17.66	17.94	17.8	17.9	2.8301
3/14/2018	17.54	18.08	17.54	17.9	2.8301
3/15/2018	17.62	18.16	17.62	18	2.846
3/16/2018	17.8	18.18	17.8	18	2.846
3/19/2018	17.84	18.18	18.16	17.86	2.8238
3/20/2018	17.74	18.16	17.74	17.94	2.8365

3/21/2018	17.96	18	18	18	2.846
3/22/2018	17.64	18.06	18.06	18	2.846
3/23/2018	17.52	17.9	17.6	17.88	2.827
3/26/2018	17.7	17.96	17.8	17.8	2.8143
3/27/2018	17.8	17.94	17.82	17.82	2.8175
3/28/2018	17.52	17.98	17.8	17.84	2.8207
3/29/2018	17.78	17.86	17.8	17.82	2.8175
3/30/2018	17.82	18	17.88	17.84	2.7905
4/2/2018	17.84	18.06	18	17.98	2.8124
4/3/2018	17.82	18.06	17.82	17.98	2.8124
4/4/2018	17.68	18	17.98	17.9	2.7998
4/5/2018	17.88	18	18	17.98	2.8124
4/6/2018	17.64	18.1	18.1	17.98	2.8124
4/9/2018	17.76	18.38	18.08	18.2	2.8468
4/10/2018	17.86	18.22	17.86	18.1	2.8311
4/11/2018	18	18.34	18.34	18	2.8155
4/12/2018	18	18.3	18.2	18.2	2.8468
4/13/2018	17.8	18.22	18.22	18.02	2.8186
4/16/2018	17.96	18.2	18.18	18	2.8155
4/17/2018	18.16	18.6	18.2	18.54	2.9
4/18/2018	18.4	18.6	18.5	18.52	2.8968
4/19/2018	18.42	18.8	18.78	18.58	2.9062
4/20/2018	18.34	18.68	18.58	18.6	2.9093
4/23/2018	18.04	18.6	18.6	18.22	2.8499
4/24/2018	17.96	18.66	18.66	17.96	2.8092
4/25/2018	17.84	18.14	18	17.94	2.8061
4/26/2018	17.94	18.2	18.1	18	2.8155
4/27/2018	17.88	18.02	18.02	17.98	2.8124
4/30/2018	17.82	18.08	17.92	17.82	2.7873
5/1/2018	17.82	18.08	17.92	17.82	2.7873
5/2/2018	17.4	18.3	17.82	18.2	2.8468
5/3/2018	17.66	18.2	17.66	17.78	2.7811
5/4/2018	17.76	18.02	17.78	17.76	2.7779
5/7/2018	17.52	17.66	17.56	17.58	2.7498
5/8/2018	17.5	17.96	17.52	17.76	2.7779
5/9/2018	17.5	17.96	17.52	17.76	2.7779
5/10/2018	17.5	17.96	17.52	17.76	2.7779
5/11/2018	17.5	17.96	17.52	17.76	2.7779
5/14/2018	17.04	18.8	17.4	17.54	2.7435
5/15/2018	17.42	18	17.8	17.54	2.7435
5/16/2018	17.28	17.78	17.5	17.5	2.7373
5/17/2018	17.4	18.1	17.4	17.84	2.7905
5/18/2018	17.9	18.2	18	17.9	2.7998
5/21/2018	17.54	18.1	17.92	17.98	2.8124

5/22/2018	17.7	18.04	17.98	17.98	2.8124
5/23/2018	17.36	17.96	17.66	17.68	2.7654
5/24/2018	17.3	17.96	17.3	17.84	2.7905
5/25/2018	17.6	18.06	17.86	18.02	2.8186
5/28/2018	17.6	18.28	18.28	17.8	2.7842
5/29/2018	17.6	18.28	18.28	17.8	2.7842
5/30/2018	17.12	18.16	17.48	17.12	2.6778
5/31/2018	17.16	17.8	17.46	17.58	2.7498
6/1/2018	17.3	17.86	17.5	17.72	2.7717
6/4/2018	17.4	18	17.72	17.74	2.7748
6/5/2018	17.58	18.3	17.74	18.1	2.8311
6/6/2018	17.74	18.42	18.1	18.42	2.8812
6/7/2018	18.16	18.48	18.48	18.16	2.8405
6/8/2018	17.78	18.24	17.88	17.86	2.7936
6/11/2018	17.7	18.2	17.86	17.74	2.7748
6/12/2018	17.6	17.96	17.74	17.6	2.7529
6/13/2018	17.72	18.14	17.74	18.06	2.8249
6/14/2018	17.5	18.1	17.78	17.5	2.7373
6/15/2018	17.5	18.1	17.78	17.5	2.7373
6/18/2018	17.2	17.62	17.22	17.36	2.7154
6/19/2018	17.26	17.56	17.26	17.28	2.7029
6/20/2018	17.2	17.46	17.46	17.22	2.6935
6/21/2018	17.2	17.46	17.2	17.24	2.6966
6/22/2018	17.1	17.86	17.2	17.36	2.7154
6/25/2018	17.14	17.76	17.7	17.14	2.681
6/26/2018	17.24	17.5	17.36	17.3	2.706
6/27/2018	17.2	17.46	17.26	17.3	2.706
6/28/2018	17.22	17.72	17.22	17.52	2.7404
6/29/2018	17.24	17.62	17.4	17.3	2.6662
7/2/2018	17.08	17.32	17.3	17.18	2.6477
7/3/2018	17.12	17.52	17.2	17.4	2.6816
7/4/2018	17.26	17.48	17.26	17.4	2.6816
7/5/2018	17.3	17.5	17.3	17.5	2.697
7/6/2018	16.92	17.46	17.4	16.92	2.6076
7/9/2018	17	17.24	17	17.18	2.6477
7/10/2018	17.2	17.66	17.2	17.66	2.7217
7/11/2018	17.58	17.76	17.62	17.76	2.7371
7/12/2018	17.7	17.9	17.8	17.9	2.7586
7/13/2018	17.82	18.2	18	18.2	2.8049
7/16/2018	18	18.36	18	18.36	2.8295
7/17/2018	18.32	18.42	18.36	18.42	2.8388
7/18/2018	18.3	18.46	18.46	18.46	2.8449
7/19/2018	18.38	18.46	18.44	18.42	2.8388
7/20/2018	18.2	18.42	18.4	18.36	2.8295



7/23/2018	18	18.4	18.34	18.3	2.8203
7/24/2018	18.3	18.48	18.4	18.4	2.8357
7/25/2018	18.38	18.5	18.5	18.38	2.8326
7/26/2018	18.28	18.7	18.4	18.54	2.8573
7/27/2018	18.44	19	18.54	19	2.9282
7/30/2018	18.88	19.2	19	19.12	2.9467
7/31/2018	18.6	19.46	19.2	18.74	2.8881
8/1/2018	18.8	19.5	19.08	19.2	2.959
8/2/2018	18.86	19.2	19	19	2.9282
8/3/2018	18.76	19.38	19.2	19.08	2.9405
8/6/2018	18.62	19.14	18.74	18.62	2.8696
8/7/2018	18.8	19.18	19	19	2.9282
8/8/2018	18.96	19.2	19.08	19.2	2.959
8/9/2018	18.94	19.24	19.04	18.98	2.9251
8/10/2018	18.94	19.22	18.98	19	2.9282
8/13/2018	18.6	19	19	18.76	2.8912
8/14/2018	18.52	18.82	18.56	18.66	2.8758
8/15/2018	18.52	18.9	18.66	18.66	2.8758
8/16/2018	18.36	18.66	18.66	18.38	2.8326
8/17/2018	18.26	18.5	18.28	18.26	2.8141
8/20/2018	18.16	18.38	18.26	18.16	2.7987
8/21/2018	18.18	19	18.22	19	2.9282
8/22/2018	18.18	19	18.22	19	2.9282
8/23/2018	18.7	19.22	19.12	18.8	2.8973
8/24/2018	18.46	18.88	18.8	18.5	2.8511
8/27/2018	18.7	18.98	18.7	18.8	2.8973
8/28/2018	18.74	19.06	19	18.8	2.8973
8/29/2018	18.66	19	18.78	18.8	2.8973
8/30/2018	18.36	18.78	18.7	18.7	2.8819
8/31/2018	18.36	18.78	18.7	18.7	2.8819
9/3/2018	18.4	18.98	18.4	18.6	2.8665
9/4/2018	18.5	18.66	18.52	18.62	2.8696
9/5/2018	18.4	18.76	18.4	18.76	2.8912
9/6/2018	18.56	18.76	18.74	18.6	2.8665
9/7/2018	18.5	18.76	18.72	18.56	2.8604
9/10/2018	18.5	18.76	18.72	18.56	2.8604
9/11/2018	18.5	18.76	18.72	18.56	2.8604
9/12/2018	18.56	19.38	18.6	18.8	2.8973
9/13/2018	18.62	18.86	18.62	18.74	2.8881
9/14/2018	18.72	18.98	18.92	18.74	2.8881
9/17/2018	18.72	18.98	18.92	18.74	2.8881
9/18/2018	18.42	19.2	18.42	19	2.9282
9/19/2018	18.96	19.28	19.18	19	2.9282
9/20/2018	18.84	19.2	19	18.94	2.9189

9/21/2018	18.98	19.14	19.06	19	2.9282
9/24/2018	19.06	19.2	19.18	19.08	2.9405
9/25/2018	18.98	19.1	19.1	19	2.9282
9/26/2018	18.8	19.3	18.98	19	2.9282
9/27/2018	18.96	19.24	19.24	19	2.9282
9/28/2018	18.82	19.2	19	18.9	2.8716
10/1/2018	18.9	19.16	19.16	18.98	2.8837
10/2/2018	18.94	19.02	18.98	18.98	2.8837
10/3/2018	18.9	19.1	19.08	19	2.8868
10/4/2018	18.92	19.16	19.16	18.98	2.8837
10/5/2018	18.72	19.14	19.14	18.78	2.8534
10/8/2018	18.68	18.9	18.8	18.74	2.8473
10/9/2018	18.1	18.98	18.98	18.3	2.7804
10/10/2018	17.7	18.48	18.48	17.78	2.7014
10/11/2018	17.1	17.72	17.5	17.24	2.6194
10/12/2018	17.28	18.48	17.28	18.48	2.8078
10/15/2018	18.06	18.6	18.6	18.24	2.7713
10/16/2018	17.94	18.5	18.5	18.36	2.7895
10/17/2018	18	18.5	18.5	18.44	2.8017
10/18/2018	18.16	18.46	18.2	18.46	2.8047
10/19/2018	18.08	18.38	18.18	18.32	2.7835
10/22/2018	18.26	18.58	18.44	18.4	2.7956
10/23/2018	17.68	18.4	18.12	18	2.7348
10/24/2018	17.98	18.26	18.26	17.98	2.7318
10/25/2018	17.72	18.28	17.92	18.2	2.7652
10/26/2018	17.96	18.2	17.98	18.1	2.75
10/29/2018	17.94	18.14	18.12	18.08	2.747
10/30/2018	17.78	18.12	18.12	17.96	2.7288
10/31/2018	18	18.44	18	18.28	2.7774
11/1/2018	18.08	18.52	18.52	18.3	2.7804
11/2/2018	18.1	18.68	18.1	18.44	2.8017
11/5/2018	18.12	18.7	18.7	18.6	2.826
11/6/2018	18.12	18.7	18.7	18.6	2.826
11/7/2018	18.56	18.74	18.68	18.7	2.8412
11/8/2018	18.5	18.8	18.8	18.7	2.8412
11/9/2018	18.5	18.82	18.8	18.76	2.8503
11/12/2018	18.3	18.8	18.8	18.76	2.8503
11/13/2018	18.66	18.8	18.74	18.74	2.8473
11/14/2018	18.32	18.76	18.38	18.66	2.8351
11/15/2018	18.68	18.84	18.76	18.7	2.8412
11/16/2018	18.44	18.92	18.8	18.8	2.8564
11/19/2018	18.7	18.96	18.96	18.8	2.8564
11/20/2018	18.7	18.96	18.96	18.8	2.8564
11/21/2018	18.62	18.9	18.66	18.7	2.8412

11/22/2018	18.32	19.06	18.34	18.78	2.8534
11/23/2018	18.74	18.88	18.74	18.82	2.8594
11/26/2018	18.48	18.82	18.7	18.74	2.8473
11/27/2018	18.6	18.86	18.84	18.8	2.8564
11/28/2018	18.68	18.94	18.8	18.82	2.8594
11/29/2018	18.74	19.1	19	18.8	2.8564
11/30/2018	18.72	19.18	19.02	18.94	2.8777

Table A-4: NESZ MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	93.8	97.3	94.5	97.3	33.8944
12/4/2017	97.28	98	97.3	97.4	33.9292
12/5/2017	97.3	97.82	97.34	97.48	33.9571
12/6/2017	97.32	99.78	97.6	97.7	34.0337
12/7/2017	97.5	102.4	98.6	102.4	35.671
12/8/2017	99	102.4	102.4	99.46	34.6468
12/11/2017	99.48	100.2	100	99.74	34.7444
12/12/2017	99.6	100	99.74	99.72	34.7374
12/13/2017	99.5	100.1	99.84	99.8	34.7653
12/14/2017	99.24	99.9	99.8	99.8	34.7653
12/15/2017	99.4	100	99.8	100	34.8349
12/18/2017	99.4	100	100	99.7	34.7304
12/19/2017	99.02	101	99.9	99.42	34.6329
12/20/2017	99.1	101	99.1	99.6	34.6956
12/21/2017	99.18	100	99.6	100	34.8349
12/22/2017	99.3	102	99.64	102	35.5316
12/25/2017	99.3	102	99.64	102	35.5316
12/26/2017	99.8	101.8	101.8	100	34.8349
12/27/2017	99.5	100.3	100	99.9	34.8001
12/28/2017	99.56	102.9	99.56	102	35.5316
12/29/2017	100	103.2	100.1	103.2	37.8174
1/1/2018	100	103.2	100.1	103.2	37.8174
1/2/2018	100.5	102.6	102.6	101.1	37.0478
1/3/2018	100.6	102.4	100.6	102	37.3776
1/4/2018	101.9	102.6	102.2	102.2	37.4509
1/5/2018	101.9	103.8	102.2	103.4	37.8907
1/8/2018	102.3	103.8	102.3	103.4	37.8907
1/9/2018	102.3	105	104.7	103	37.7441
1/10/2018	103	105	104	103.2	37.8174
1/11/2018	102.4	104.8	104.8	103.3	37.854
1/12/2018	103.7	106.3	104.3	104	38.1105
1/15/2018	103.3	105	104.1	104.2	38.1838
1/16/2018	104.5	106.5	104.5	106.1	38.8801

1/17/2018	106.3	107	106.9	106.6	39.0633
1/18/2018	106	107.3	107	106.8	39.1366
1/19/2018	105.5	106.9	106.9	105.9	38.8068
1/22/2018	105.5	106.3	106.3	106.1	38.8801
1/23/2018	106	106.8	106.3	106.1	38.8801
1/24/2018	106.3	106.6	106.6	106.5	39.0267
1/25/2018	106.4	107.5	106.5	107.5	39.3931
1/26/2018	107.4	111.5	107.4	111.5	40.8589
1/29/2018	111.1	113.2	112	113.1	41.4452
1/30/2018	112.9	114.1	113.1	113.3	41.5185
1/31/2018	112.9	114.1	113.1	113.3	41.5185
2/1/2018	112.9	114.1	113.1	113.3	41.5185
2/2/2018	115.5	117	116	115.9	42.4713
2/5/2018	115.9	116.6	116	116.6	42.7278
2/6/2018	114	116.5	116.4	114.3	41.8849
2/7/2018	114.2	115.8	114.2	115	42.1415
2/8/2018	115	116.5	115	115	42.1415
2/9/2018	113.9	116.1	115	116.1	42.5446
2/12/2018	116.1	116.6	116.1	116.3	42.6178
2/13/2018	116.5	116.8	116.7	116.8	42.8011
2/14/2018	116.3	117.9	117	117.3	42.9843
2/15/2018	118.5	120.2	118.5	119.4	43.7538
2/16/2018	118.5	120.2	118.5	119.4	43.7538
2/19/2018	119.3	121	119.4	120.4	44.1203
2/20/2018	120.3	121.5	120.3	121.5	44.5234
2/21/2018	122	123.1	122.1	122	44.7066
2/22/2018	120	122.7	122.3	121.5	44.5234
2/23/2018	122	123.3	122.5	123	45.073
2/26/2018	120.1	124	123	122	44.7066
2/27/2018	121.9	122.7	122.1	122.1	44.7432
2/28/2018	120.6	128.1	122.8	128.1	46.9419
3/1/2018	121.3	125.8	125	123.1	45.1097
3/2/2018	122.9	128	123	125.9	46.1357
3/5/2018	125.9	128.8	125.9	127.9	46.8686
3/6/2018	128.5	137	128.9	137	50.2033
3/7/2018	135	137	136.4	137	50.2033
3/8/2018	136	142	136.6	140	51.3026
3/9/2018	139.9	146.5	141	145	53.1349
3/12/2018	146.1	150.8	146.1	150.5	55.1503
3/13/2018	152.3	159.5	152.3	157.4	57.6788
3/14/2018	134.2	163	159.1	141	51.6691
3/15/2018	125	137.8	137.8	131	48.0046
3/16/2018	128.5	135	133	131	48.0046
3/19/2018	128.1	131	131	129.6	47.4916

3/20/2018	127.1	129.7	129.7	127.9	46.8686
3/21/2018	128.8	134	129.7	132.6	48.5909
3/22/2018	133.8	143.8	133.8	141.8	51.9623
3/23/2018	139.8	150.4	141.8	150	54.9671
3/26/2018	144	149.9	149.8	148	54.2342
3/27/2018	148.5	151.5	150.2	149.7	54.8572
3/28/2018	147.3	151.5	149.6	149.7	54.8572
3/29/2018	149	151	149.7	151	55.3336
3/30/2018	151.3	154.9	152	154.5	47.9234
4/2/2018	153	155.8	154.8	154.6	47.9545
4/3/2018	147	153.9	153.1	150	46.5276
4/4/2018	148	151.5	151.5	149	46.2174
4/5/2018	148	151.5	149	149	46.2174
4/6/2018	148.7	150	149.7	149	46.2174
4/9/2018	148.8	151	150.8	149.6	46.4035
4/10/2018	147.5	150.1	147.8	150.1	46.5586
4/11/2018	149.1	150.5	150.5	150.2	46.5897
4/12/2018	149	150.2	150.2	149.4	46.3415
4/13/2018	148.9	149.6	148.9	149	46.2174
4/16/2018	148.6	149.1	149	149.1	46.2485
4/17/2018	147	149.1	149.1	148	45.9073
4/18/2018	147.8	152	150	148	45.9073
4/19/2018	147.9	149.8	148.2	148.3	46.0003
4/20/2018	144.3	149	148.4	148	45.9073
4/23/2018	147.9	149.5	149.5	148	45.9073
4/24/2018	145.3	148.6	147.9	147.5	45.7522
4/25/2018	139	147.6	147.6	139.1	43.1466
4/26/2018	136	142.9	142.9	136.5	42.3401
4/27/2018	136.6	139.8	138.5	138.4	42.9295
4/30/2018	135.9	138.5	138.5	138	42.8054
5/1/2018	135.9	138.5	138.5	138	42.8054
5/2/2018	132.3	136.3	134.5	133.1	41.2855
5/3/2018	133.1	136.6	133.2	135.9	42.154
5/4/2018	135.1	136.5	136.5	135.8	42.123
5/7/2018	131.4	135.9	135.8	135.1	41.9059
5/8/2018	134.2	139.8	136.7	137	42.4952
5/9/2018	134.2	139.8	136.7	137	42.4952
5/10/2018	134.2	139.8	136.7	137	42.4952
5/11/2018	134.2	139.8	136.7	137	42.4952
5/14/2018	139.2	144.1	139.2	141.3	43.829
5/15/2018	138.9	144.1	144.1	139.7	43.3327
5/16/2018	139.6	142	139.7	141.5	43.8911
5/17/2018	141.4	143.9	141.5	142	44.0461
5/18/2018	140.5	145	144.4	145	44.9767

5/21/2018	146.8	148.2	147.3	148	45.9073
5/22/2018	148	150.2	148	149.1	46.2485
5/23/2018	147.1	150.1	150	148.8	46.1554
5/24/2018	145	149	148.8	147	45.5971
5/25/2018	145	147	145.3	147	45.5971
5/28/2018	146.2	148.5	146.2	147	45.5971
5/29/2018	146.2	148.5	146.2	147	45.5971
5/30/2018	146	148.9	146.2	146.8	45.535
5/31/2018	144.8	148.3	144.8	148	45.9073
6/1/2018	145.5	147.3	147.1	146.9	45.566
6/4/2018	145.1	148	148	146.4	45.411
6/5/2018	146	146.9	146	146.7	45.504
6/6/2018	146	147	147	146.9	45.566
6/7/2018	146.1	147.1	146.1	146.7	45.504
6/8/2018	145.8	147.1	147	145.8	45.2248
6/11/2018	145.5	147.9	145.7	145.7	45.1938
6/12/2018	144.8	145.9	145.7	145.9	45.2559
6/13/2018	144.3	145.7	144.8	144.9	44.9457
6/14/2018	143.1	148	143.2	148	45.9073
6/15/2018	143.1	148	143.2	148	45.9073
6/18/2018	146.4	148.5	147.2	147	45.5971
6/19/2018	146	148.1	146	147	45.5971
6/20/2018	145	148	148	146.2	45.3489
6/21/2018	144.3	147.1	144.8	147	45.5971
6/22/2018	145.9	147.5	145.9	147.1	45.6281
6/25/2018	146.4	148.2	147.1	147	45.5971
6/26/2018	146.2	147.5	146.2	147.4	45.7211
6/27/2018	146.8	147.5	147.3	147.4	45.7211
6/28/2018	147.2	147.6	147.2	147.4	45.7211
6/29/2018	143.4	147.5	144.8	147.5	53.6119
7/2/2018	147.5	148	147.9	147.7	53.6846
7/3/2018	146.3	147.6	147.6	147.4	53.5756
7/4/2018	147	148.4	147	147.5	53.6119
7/5/2018	147.3	147.9	147.3	147.8	53.721
7/6/2018	147.1	147.7	147.1	147.6	53.6483
7/9/2018	146.8	148	147.8	148	53.7937
7/10/2018	147.3	148.1	148	148.1	53.83
7/11/2018	147.5	148.6	147.9	147.9	53.7573
7/12/2018	145.9	148.1	145.9	148	53.7937
7/13/2018	147.5	148.5	148.5	148.1	53.83
7/16/2018	147.5	148.1	148.1	148.1	53.83
7/17/2018	147.6	148.1	147.6	148.1	53.83
7/18/2018	147	148.1	147	148.1	53.83
7/19/2018	147	148.2	148.1	147.8	53.721

7/20/2018	147.1	148	147.2	148	53.7937
7/23/2018	148	149.8	148	148.6	54.0118
7/24/2018	148	149.8	148	148.8	54.0845
7/25/2018	148	148.6	148	148.2	53.8664
7/26/2018	147.3	148.3	147.4	147.4	53.5756
7/27/2018	147.2	147.8	147.4	147.5	53.6119
7/30/2018	147.3	147.8	147.5	147.5	53.6119
7/31/2018	146.9	148.3	148.3	147.6	53.6483
8/1/2018	146.9	147.7	147.5	147.3	53.5393
8/2/2018	146.3	148	148	146.9	53.3939
8/3/2018	146.6	147.5	146.6	147.3	53.5393
8/6/2018	147.1	147.9	147.1	147.7	53.6846
8/7/2018	147.4	148	147.7	148	53.7937
8/8/2018	147.3	148.7	148.3	148.2	53.8664
8/9/2018	147	148.1	148.1	148	53.7937
8/10/2018	147	148	148	147.8	53.721
8/13/2018	146.8	147.9	147.5	147.8	53.721
8/14/2018	147.1	147.5	147.5	147.2	53.5029
8/15/2018	145.7	146.9	146.5	146.1	53.1031
8/16/2018	146.1	147	146.1	147	53.4302
8/17/2018	146.1	147.6	147.6	146.4	53.2121
8/20/2018	145.6	146.4	146.4	146.3	53.1758
8/21/2018	145.6	146.6	146.6	146.4	53.2121
8/22/2018	145.6	146.6	146.6	146.4	53.2121
8/23/2018	146.1	147	146.1	147	53.4302
8/24/2018	146	147.5	146.2	147.5	53.6119
8/27/2018	146.2	147.5	146.4	146.5	53.2485
8/28/2018	146.5	147.2	146.5	147.2	53.5029
8/29/2018	146.2	147.3	147.1	147.3	53.5393
8/30/2018	145.5	147.2	146.8	147	53.4302
8/31/2018	145.5	147.2	146.8	147	53.4302
9/3/2018	146.2	147.1	146.6	146.5	53.2485
9/4/2018	146.3	147.4	146.3	147.4	53.5756
9/5/2018	146.2	147.3	146.2	146.5	53.2485
9/6/2018	146.3	147.9	146.3	146.6	53.2848
9/7/2018	146.6	146.8	146.6	146.8	53.3575
9/10/2018	146.6	146.8	146.6	146.8	53.3575
9/11/2018	146.6	146.8	146.6	146.8	53.3575
9/12/2018	146.4	147.3	147.3	146.5	53.2485
9/13/2018	146.4	147	146.5	146.6	53.2848
9/14/2018	146.4	146.9	146.5	146.6	53.2848
9/17/2018	146.4	146.9	146.5	146.6	53.2848
9/18/2018	146.1	146.9	146.9	146.8	53.3575
9/19/2018	146.6	146.9	146.8	146.9	53.3939

9/20/2018	146.6	147	146.9	146.9	53.3939
9/21/2018	146.8	147	147	147	53.4302
9/24/2018	146.7	147	146.8	146.7	53.3212
9/25/2018	146.5	147.1	147.1	146.8	53.3575
9/26/2018	146.4	147	146.4	146.8	53.3575
9/27/2018	146	146.8	146.8	146.3	53.1758
9/28/2018	146	146.6	146.6	146.4	48.4367
10/1/2018	146.2	146.6	146.5	146.4	48.4367
10/2/2018	146	146.5	146	146.5	48.4698
10/3/2018	145.9	146.5	145.9	146.4	48.4367
10/4/2018	145.9	146.9	146.9	146.4	48.4367
10/5/2018	145.7	146.1	146.1	145.9	48.2713
10/8/2018	145.5	146.4	145.5	146.4	48.4367
10/9/2018	145.5	146.4	145.5	146.4	48.4367
10/10/2018	144.5	146.2	144.5	146	48.3044
10/11/2018	142.8	145.5	145.5	145	47.9735
10/12/2018	143.7	144.7	143.7	144.1	47.6758
10/15/2018	143.9	145	144	145	47.9735
10/16/2018	144.1	144.8	144.1	144.8	47.9074
10/17/2018	144.3	144.9	144.3	144.9	47.9405
10/18/2018	144.3	145	144.3	145	47.9735
10/19/2018	143.7	144.5	144.2	144.5	47.8081
10/22/2018	143.5	144.4	143.5	144.2	47.7089
10/23/2018	143.1	144.5	144	144.5	47.8081
10/24/2018	143.2	144.4	143.2	144.2	47.7089
10/25/2018	143	144	143	144	47.6427
10/26/2018	143	144	143.7	143.8	47.5765
10/29/2018	142.8	145	142.8	145	47.9735
10/30/2018	143.1	144.5	143.3	143.5	47.4773
10/31/2018	143.3	144	143.5	143.8	47.5765
11/1/2018	143.1	143.8	143.1	143.5	47.4773
11/2/2018	143	144.1	143	143.6	47.5104
11/5/2018	143.4	145.5	145.5	143.4	47.4442
11/6/2018	143.4	145.5	145.5	143.4	47.4442
11/7/2018	142.9	144	142.9	144	47.6427
11/8/2018	143.9	144.1	144	143.9	47.6096
11/9/2018	143.6	143.9	143.9	143.7	47.5434
11/12/2018	143.7	144	143.9	143.9	47.6096
11/13/2018	143.3	144.2	144.1	143.6	47.5104
11/14/2018	143.9	145	144.5	145	47.9735
11/15/2018	144	145.5	145	145.1	48.0066
11/16/2018	144.5	149	145.8	147	48.6353
11/19/2018	147.1	148	148	147.8	48.8999
11/20/2018	147.1	148	148	147.8	48.8999



11/21/2018	145.4	147.9	147.9	147.8	48.8999
11/22/2018	146.1	147.6	146.1	147.5	48.8007
11/23/2018	147	147.7	147	147.5	48.8007
11/26/2018	146.6	148	146.8	147.6	48.8338
11/27/2018	143.1	147.5	147.5	144.5	47.8081
11/28/2018	144	147	146.9	146.2	48.3706
11/29/2018	144.3	147.1	145.7	147	48.6353
11/30/2018	144.5	149.4	147.9	149.4	49.4293

Table A-5: PETD MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	23.84	24.2	23.92	24.2	4.0572
12/4/2017	24.18	24.68	24.26	24.4	4.0907
12/5/2017	24.4	24.68	24.4	24.56	4.1175
12/6/2017	24.38	24.68	24.6	24.5	4.1074
12/7/2017	24.48	24.68	24.66	24.5	4.1074
12/8/2017	24.48	24.66	24.64	24.5	4.1074
12/11/2017	23.5	24.62	23.5	24.5	4.1074
12/12/2017	24.14	24.54	24.14	24.54	4.1142
12/13/2017	24.48	24.7	24.68	24.5	4.1074
12/14/2017	24.48	24.6	24.52	24.5	4.1074
12/15/2017	24.3	24.68	24.68	24.3	4.0739
12/18/2017	24.4	24.68	24.68	24.42	4.094
12/19/2017	24.28	24.8	24.58	24.38	4.0873
12/20/2017	24.36	24.62	24.62	24.38	4.0873
12/21/2017	24.26	24.42	24.42	24.26	4.0672
12/22/2017	24.22	24.36	24.3	24.24	4.0639
12/25/2017	24.22	24.36	24.3	24.24	4.0639
12/26/2017	24.26	24.48	24.32	24.26	4.0672
12/27/2017	24.24	24.4	24.4	24.28	4.0706
12/28/2017	24.28	24.58	24.3	24.3	4.0739
12/29/2017	24.2	24.38	24.2	24.26	4.0158
1/1/2018	24.2	24.38	24.2	24.26	4.0158
1/2/2018	24.2	24.58	24.24	24.36	4.0323
1/3/2018	24.3	24.7	24.38	24.5	4.0555
1/4/2018	24.56	24.8	24.78	24.58	4.0687
1/5/2018	24.68	24.86	24.8	24.7	4.0886
1/8/2018	24.68	25.44	24.7	25.16	4.1647
1/9/2018	25.12	25.5	25.46	25.14	4.1614
1/10/2018	24.8	25.48	25.24	25.04	4.1449
1/11/2018	24.96	25.2	25.16	24.98	4.1349
1/12/2018	24.92	25.2	25.2	24.94	4.1283
1/15/2018	24.88	25.16	25.16	24.9	4.1217

1/16/2018	24.66	24.92	24.92	24.72	4.0919
1/17/2018	24.64	24.72	24.72	24.7	4.0886
1/18/2018	24.64	25.06	25.06	24.66	4.082
1/19/2018	24.58	24.98	24.6	24.6	4.072
1/22/2018	24.7	25.1	25.1	24.8	4.1051
1/23/2018	24.7	24.98	24.98	24.8	4.1051
1/24/2018	24.78	25.14	25.14	24.8	4.1051
1/25/2018	24.76	24.98	24.98	24.82	4.1085
1/26/2018	24.74	24.8	24.8	24.76	4.0985
1/29/2018	24.7	24.84	24.84	24.72	4.0919
1/30/2018	24.56	24.74	24.72	24.62	4.0753
1/31/2018	24.56	24.74	24.72	24.62	4.0753
2/1/2018	24.56	24.74	24.72	24.62	4.0753
2/2/2018	25.14	26.2	25.32	25.48	4.2177
2/5/2018	25.1	26	25.1	25.7	4.2541
2/6/2018	24.58	25.62	25.02	24.58	4.0687
2/7/2018	24.5	24.98	24.72	24.64	4.0787
2/8/2018	24.52	24.8	24.8	24.52	4.0588
2/9/2018	24.18	25.4	24.5	24.9	4.1217
2/12/2018	24.9	25.06	24.9	25	4.1382
2/13/2018	24.76	25.02	25	25	4.1382
2/14/2018	24.98	25.3	25	25.02	4.1416
2/15/2018	25	25.14	25	25.12	4.1581
2/16/2018	25	25.14	25	25.12	4.1581
2/19/2018	25.1	25.28	25.12	25.24	4.178
2/20/2018	25.24	25.58	25.24	25.3	4.1879
2/21/2018	25.28	25.54	25.28	25.42	4.2078
2/22/2018	25.22	25.6	25.26	25.5	4.221
2/23/2018	25.36	25.7	25.4	25.54	4.2276
2/26/2018	25.68	25.9	25.8	25.7	4.2541
2/27/2018	25.66	26.2	25.88	25.8	4.2707
2/28/2018	25.6	26	25.64	25.8	4.2707
3/1/2018	25.22	25.82	25.7	25.82	4.274
3/2/2018	25.64	26	25.74	25.86	4.2806
3/5/2018	25.06	25.86	25.86	25.5	4.221
3/6/2018	24.7	25.7	25.7	25.18	4.168
3/7/2018	24.46	25.06	24.96	24.66	4.082
3/8/2018	24.6	24.88	24.88	24.62	4.0753
3/9/2018	24.1	24.68	24.32	24.32	4.0257
3/12/2018	24.3	25.18	24.4	24.86	4.1151
3/13/2018	24.6	24.84	24.84	24.72	4.0919
3/14/2018	24.24	24.78	24.54	24.74	4.0952
3/15/2018	24.62	24.88	24.68	24.74	4.0952
3/16/2018	24.34	24.92	24.62	24.8	4.1051

3/19/2018	24.6	24.86	24.6	24.8	4.1051
3/20/2018	24.66	24.86	24.68	24.84	4.1118
3/21/2018	24.86	25.26	24.86	24.96	4.1316
3/22/2018	24.62	24.96	24.96	24.8	4.1051
3/23/2018	24.1	24.86	24.24	24.7	4.0886
3/26/2018	24.42	24.74	24.7	24.7	4.0886
3/27/2018	24.7	24.82	24.76	24.7	4.0886
3/28/2018	24.2	24.78	24.24	24.76	4.0985
3/29/2018	24.6	24.78	24.6	24.7	4.0886
3/30/2018	24.5	25.16	24.5	24.88	4.3181
4/2/2018	24.56	24.8	24.68	24.7	4.2868
4/3/2018	24.66	24.8	24.68	24.7	4.2868
4/4/2018	24.6	24.7	24.7	24.68	4.2834
4/5/2018	24.56	24.68	24.68	24.6	4.2695
4/6/2018	24.58	25.2	25.2	24.66	4.2799
4/9/2018	24.66	25.7	24.88	25.3	4.391
4/10/2018	24.86	25.48	25.3	25.36	4.4014
4/11/2018	25.32	25.44	25.36	25.36	4.4014
4/12/2018	25.34	25.4	25.34	25.36	4.4014
4/13/2018	25.3	25.5	25.3	25.48	4.4222
4/16/2018	25.72	26.08	25.76	26.08	4.5263
4/17/2018	26.12	27.08	26.12	26.78	4.6478
4/18/2018	26.64	27	26.8	26.86	4.6617
4/19/2018	27	28	27	27.7	4.8075
4/20/2018	27.3	28.08	28.08	27.6	4.7901
4/23/2018	27.22	28.18	27.72	27.5	4.7728
4/24/2018	26.9	27.5	27.5	27	4.686
4/25/2018	26.6	27.1	27.1	27	4.686
4/26/2018	26.9	27	27	26.96	4.6791
4/27/2018	26.9	27.1	27.1	26.96	4.6791
4/30/2018	26.92	27.1	27.1	27	4.686
5/1/2018	26.92	27.1	27.1	27	4.686
5/2/2018	26.44	26.9	26.46	26.74	4.6409
5/3/2018	26.42	27.5	27.5	26.86	4.6617
5/4/2018	26.8	27.14	27.14	26.8	4.6513
5/7/2018	26.02	27	27	26.4	4.5819
5/8/2018	26	26.96	26	26.4	4.5819
5/9/2018	26	26.96	26	26.4	4.5819
5/10/2018	26	26.96	26	26.4	4.5819
5/11/2018	26	26.96	26	26.4	4.5819
5/14/2018	25.2	26.8	26.4	26.42	4.5853
5/15/2018	26.1	27.26	26.74	26.34	4.5715
5/16/2018	25.5	26.7	26.7	26.32	4.568
5/17/2018	26.3	26.5	26.3	26.36	4.5749

5/18/2018	26.16	26.48	26.48	26.28	4.5611
5/21/2018	26.02	26.96	26.96	26.2	4.5472
5/22/2018	25.04	26.2	26.2	26	4.5125
5/23/2018	24.74	26.06	25.56	25.52	4.4291
5/24/2018	25.36	25.58	25.58	25.36	4.4014
5/25/2018	24.82	25.5	25.5	25.22	4.3771
5/28/2018	24.32	24.94	24.8	24.82	4.3077
5/29/2018	24.32	24.94	24.8	24.82	4.3077
5/30/2018	24.3	25.28	24.3	24.9	4.3215
5/31/2018	24.5	25.5	25.4	25.04	4.3458
6/1/2018	24.58	25.22	24.82	24.82	4.3077
6/4/2018	24.62	25	24.62	24.74	4.2938
6/5/2018	24.7	25.1	24.72	24.7	4.2868
6/6/2018	24.48	24.94	24.48	24.8	4.3042
6/7/2018	24.74	25.28	24.74	25.14	4.3632
6/8/2018	24.82	25.28	24.82	25.12	4.3597
6/11/2018	25	25.4	25.22	25.3	4.391
6/12/2018	25.1	25.6	25.4	25.46	4.4187
6/13/2018	24.94	25.52	25.46	24.94	4.3285
6/14/2018	24.74	25.82	24.74	25.82	4.4812
6/15/2018	24.74	25.82	24.74	25.82	4.4812
6/18/2018	24.9	25.7	24.9	25	4.3389
6/19/2018	24.5	24.88	24.78	24.66	4.2799
6/20/2018	24.5	25.08	24.5	24.86	4.3146
6/21/2018	23	24.5	24.5	24.12	4.1862
6/22/2018	23.72	24.5	24.5	24.28	4.2139
6/25/2018	24.2	24.62	24.56	24.4	4.2348
6/26/2018	24.36	24.54	24.4	24.42	4.2382
6/27/2018	24.42	24.76	24.42	24.64	4.2764
6/28/2018	24.64	24.9	24.66	24.8	4.3042
6/29/2018	24.7	24.82	24.78	24.8	4.18
7/2/2018	24.44	24.8	24.44	24.7	4.1631
7/3/2018	24.46	24.72	24.5	24.7	4.1631
7/4/2018	24.44	24.72	24.7	24.7	4.1631
7/5/2018	24.62	24.86	24.66	24.8	4.18
7/6/2018	24.76	25	24.78	24.8	4.18
7/9/2018	24.8	25	24.8	24.92	4.2002
7/10/2018	24.72	24.96	24.72	24.94	4.2036
7/11/2018	24.64	24.94	24.94	24.8	4.18
7/12/2018	24.6	25.08	24.62	25	4.2137
7/13/2018	25.2	26.08	25.32	25.66	4.3249
7/16/2018	25.3	25.9	25.3	25.76	4.3418
7/17/2018	25.5	25.88	25.5	25.8	4.3485
7/18/2018	25.74	25.86	25.8	25.76	4.3418

7/19/2018	25.7	25.82	25.7	25.76	4.3418
7/20/2018	25.7	25.88	25.74	25.8	4.3485
7/23/2018	25.76	26.28	25.9	26	4.3822
7/24/2018	26.02	26.62	26.08	26.3	4.4328
7/25/2018	26.3	27.38	26.3	26.84	4.5238
7/26/2018	26.34	27.46	26.84	26.84	4.5238
7/27/2018	26.66	26.86	26.86	26.86	4.5272
7/30/2018	26.96	27.2	27.2	27	4.5508
7/31/2018	26.46	27.08	27	26.98	4.5474
8/1/2018	26.96	27	27	26.98	4.5474
8/2/2018	26.64	27.1	27.1	26.72	4.5036
8/3/2018	26.58	27	27	26.8	4.5171
8/6/2018	26.6	27	26.8	26.8	4.5171
8/7/2018	26.42	27	26.42	26.8	4.5171
8/8/2018	26.8	27	26.94	26.84	4.5238
8/9/2018	26.58	27	26.82	26.84	4.5238
8/10/2018	26.7	27	27	26.8	4.5171
8/13/2018	26.36	26.78	26.4	26.64	4.4901
8/14/2018	26.22	26.74	26.24	26.22	4.4193
8/15/2018	26.12	26.78	26.12	26.7	4.5002
8/16/2018	26.3	26.76	26.3	26.6	4.4833
8/17/2018	26.68	27.36	26.9	26.9	4.5339
8/20/2018	26.7	27.08	27.08	26.9	4.5339
8/21/2018	26.64	27.5	27	26.64	4.4901
8/22/2018	26.64	27.5	27	26.64	4.4901
8/23/2018	26.76	27.42	27.3	26.8	4.5171
8/24/2018	26.54	26.78	26.54	26.68	4.4968
8/27/2018	26.56	27.32	27.04	26.98	4.5474
8/28/2018	26.96	27.48	27.48	27.02	4.5541
8/29/2018	27.04	27.16	27.06	27.16	4.5777
8/30/2018	27.06	27.44	27.44	27.2	4.5845
8/31/2018	27.06	27.44	27.44	27.2	4.5845
9/3/2018	26.96	27.34	27.2	27.2	4.5845
9/4/2018	26.98	27.24	27.04	27	4.5508
9/5/2018	26.5	27.1	27.1	26.68	4.4968
9/6/2018	26.6	27	27	26.6	4.4833
9/7/2018	26.4	26.62	26.4	26.52	4.4699
9/10/2018	26.4	26.62	26.4	26.52	4.4699
9/11/2018	26.4	26.62	26.4	26.52	4.4699
9/12/2018	25.66	26.68	26.68	26.4	4.4496
9/13/2018	26.34	26.5	26.4	26.4	4.4496
9/14/2018	26.34	26.66	26.64	26.38	4.4463
9/17/2018	26.34	26.66	26.64	26.38	4.4463
9/18/2018	26.34	26.48	26.34	26.38	4.4463

9/19/2018	26.38	26.5	26.48	26.4	4.4496
9/20/2018	26.28	26.5	26.5	26.3	4.4328
9/21/2018	26.22	26.5	26.5	26.4	4.4496
9/24/2018	26.34	26.4	26.38	26.36	4.4429
9/25/2018	26.08	26.88	26.1	26.64	4.4901
9/26/2018	26.6	26.68	26.64	26.6	4.4833
9/27/2018	26.5	26.66	26.5	26.58	4.48
9/28/2018	26.18	26.64	26.62	26.26	4.3411
10/1/2018	26.3	26.56	26.5	26.4	4.3643
10/2/2018	26.38	26.54	26.4	26.42	4.3676
10/3/2018	26.34	26.86	26.4	26.38	4.361
10/4/2018	26.28	26.66	26.3	26.3	4.3477
10/5/2018	25.86	26.84	26.84	25.94	4.2882
10/8/2018	25.94	26.3	25.94	26	4.2982
10/9/2018	25.9	26.28	25.96	26.08	4.3114
10/10/2018	26.04	26.6	26.6	26.1	4.3147
10/11/2018	24.86	26.16	25.48	26	4.2982
10/12/2018	25.94	26.04	26.04	25.98	4.2948
10/15/2018	25.98	26.36	26.04	26.2	4.3312
10/16/2018	26.22	26.8	26.38	26.26	4.3411
10/17/2018	26.26	26.32	26.32	26.3	4.3477
10/18/2018	25.7	26.48	26.3	26.28	4.3444
10/19/2018	26.18	26.56	26.18	26.28	4.3444
10/22/2018	25.96	26.3	26.22	26.22	4.3345
10/23/2018	25.98	26.22	26	26.1	4.3147
10/24/2018	26.06	26.4	26.2	26.06	4.3081
10/25/2018	25.9	26.02	25.96	26	4.2982
10/26/2018	25.9	26.02	25.9	26	4.2982
10/29/2018	25.94	26.06	26	26	4.2982
10/30/2018	25.96	26.1	25.98	26	4.2982
10/31/2018	25.94	26.04	26	26	4.2982
11/1/2018	25.9	26.02	26.02	25.98	4.2948
11/2/2018	25.9	26.08	25.9	26	4.2982
11/5/2018	26.36	27.48	26.4	27.26	4.5064
11/6/2018	26.36	27.48	26.4	27.26	4.5064
11/7/2018	27.34	28.36	27.4	27.74	4.5858
11/8/2018	27.88	28.36	28.26	28	4.6288
11/9/2018	27	28.02	28	27	4.4635
11/12/2018	26.7	27.24	27	26.7	4.4139
11/13/2018	26.4	27.04	26.78	26.6	4.3973
11/14/2018	26.42	27.18	27	26.8	4.4304
11/15/2018	26.7	27.1	26.78	26.8	4.4304
11/16/2018	26.76	26.96	26.76	26.9	4.4469
11/19/2018	27	27.5	27.5	27.16	4.4899

11/20/2018	27	27.5	27.5	27.16	4.4899
11/21/2018	26.76	27.24	27.24	26.9	4.4469
11/22/2018	26.7	27.48	27.48	26.84	4.437
11/23/2018	26.88	27.18	27.18	26.9	4.4469
11/26/2018	26.92	27.68	27.46	27.68	4.5759
11/27/2018	26.94	27.64	27.4	27.1	4.48
11/28/2018	26.2	27.44	27.44	26.46	4.3742
11/29/2018	26.02	26.46	26.46	26.12	4.318
11/30/2018	25.74	26.56	26.56	25.8	4.2651

Table A-6: HAP MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	9.38	9.67	9.49	9.67	3.9233
12/4/2017	9.45	9.65	9.63	9.58	3.8868
12/5/2017	9.44	9.67	9.57	9.65	3.9152
12/6/2017	9.41	9.5	9.5	9.46	3.8381
12/7/2017	9.39	9.52	9.46	9.47	3.8422
12/8/2017	9.47	9.6	9.5	9.5	3.8543
12/11/2017	9.45	9.52	9.45	9.51	3.8584
12/12/2017	9.43	9.51	9.48	9.51	3.8584
12/13/2017	9.41	9.54	9.47	9.54	3.8706
12/14/2017	9.48	9.79	9.5	9.77	3.9639
12/15/2017	9.52	9.7	9.63	9.56	3.8787
12/18/2017	9.51	9.56	9.56	9.51	3.8584
12/19/2017	9.42	9.63	9.51	9.53	3.8665
12/20/2017	9.47	9.53	9.49	9.53	3.8665
12/21/2017	9.43	9.66	9.48	9.55	3.8746
12/22/2017	9.5	9.65	9.5	9.6	3.8949
12/25/2017	9.5	9.65	9.5	9.6	3.8949
12/26/2017	9.55	9.63	9.6	9.62	3.903
12/27/2017	9.61	9.72	9.62	9.61	3.899
12/28/2017	9.54	9.68	9.61	9.54	3.8706
12/29/2017	9.5	9.65	9.56	9.55	4.1148
1/1/2018	9.5	9.65	9.56	9.55	4.1148
1/2/2018	9.5	9.65	9.64	9.58	4.1277
1/3/2018	9.54	9.66	9.64	9.54	4.1105
1/4/2018	9.53	9.65	9.53	9.55	4.1148
1/5/2018	9.55	9.63	9.63	9.55	4.1148
1/8/2018	9.55	9.64	9.63	9.55	4.1148
1/9/2018	9.53	9.62	9.61	9.55	4.1148
1/10/2018	9.55	9.59	9.56	9.55	4.1148
1/11/2018	9.53	9.59	9.53	9.55	4.1148
1/12/2018	9.57	9.7	9.57	9.68	4.1708

1/15/2018	9.67	9.71	9.67	9.71	4.1838
1/16/2018	9.63	9.76	9.63	9.7	4.1794
1/17/2018	9.67	9.76	9.7	9.69	4.1751
1/18/2018	9.68	9.74	9.68	9.69	4.1751
1/19/2018	9.67	9.76	9.7	9.7	4.1794
1/22/2018	9.7	9.78	9.78	9.7	4.1794
1/23/2018	9.7	9.79	9.79	9.7	4.1794
1/24/2018	9.7	9.77	9.77	9.7	4.1794
1/25/2018	9.65	9.83	9.65	9.7	4.1794
1/26/2018	9.7	9.79	9.79	9.7	4.1794
1/29/2018	9.67	9.78	9.69	9.72	4.1881
1/30/2018	9.65	9.88	9.71	9.72	4.1881
1/31/2018	9.65	9.88	9.71	9.72	4.1881
2/1/2018	9.65	9.88	9.71	9.72	4.1881
2/2/2018	9.67	9.98	9.79	9.72	4.1881
2/5/2018	9.66	9.78	9.66	9.7	4.1794
2/6/2018	9.04	9.66	9.66	9.05	3.8994
2/7/2018	9.01	9.31	9.21	9.02	3.8865
2/8/2018	8.98	9.14	9.02	9.01	3.8821
2/9/2018	8.7	9.01	8.9	9.01	3.8821
2/12/2018	9	9.1	9.02	9.02	3.8865
2/13/2018	9.02	9.19	9.02	9.1	3.9209
2/14/2018	9.06	9.24	9.2	9.13	3.9339
2/15/2018	9.11	9.18	9.12	9.14	3.9382
2/16/2018	9.11	9.18	9.12	9.14	3.9382
2/19/2018	9.15	9.38	9.18	9.16	3.9468
2/20/2018	9.02	9.29	9.29	9.15	3.9425
2/21/2018	9.11	9.24	9.11	9.17	3.9511
2/22/2018	9.1	9.19	9.18	9.15	3.9425
2/23/2018	9.11	9.36	9.18	9.17	3.9511
2/26/2018	9.11	9.3	9.15	9.3	4.0071
2/27/2018	9.25	9.57	9.3	9.57	4.1234
2/28/2018	9.31	9.56	9.37	9.55	4.1148
3/1/2018	9.4	9.62	9.55	9.62	4.145
3/2/2018	9.42	9.6	9.53	9.55	4.1148
3/5/2018	9.21	9.54	9.5	9.5	4.0933
3/6/2018	9.35	9.51	9.45	9.5	4.0933
3/7/2018	9.31	9.5	9.41	9.5	4.0933
3/8/2018	9.42	9.5	9.43	9.5	4.0933
3/9/2018	9.45	9.6	9.54	9.6	4.1364
3/12/2018	9.51	9.74	9.68	9.68	4.1708
3/13/2018	9.57	9.84	9.61	9.8	4.2225
3/14/2018	9.67	9.88	9.67	9.7	4.1794
3/15/2018	9.61	9.78	9.69	9.7	4.1794



3/16/2018	9.54	9.74	9.61	9.7	4.1794
3/19/2018	9.59	9.7	9.69	9.7	4.1794
3/20/2018	9.6	9.81	9.7	9.81	4.2268
3/21/2018	9.79	9.9	9.87	9.9	4.2656
3/22/2018	9.75	9.88	9.86	9.88	4.257
3/23/2018	9.64	9.84	9.84	9.66	4.1622
3/26/2018	9.52	9.7	9.65	9.7	4.1794
3/27/2018	9.63	9.72	9.63	9.7	4.1794
3/28/2018	9.56	9.75	9.6	9.71	4.1838
3/29/2018	9.4	9.82	9.65	9.72	4.1881
3/30/2018	9.76	9.86	9.78	9.86	3.9058
4/2/2018	9.7	9.86	9.86	9.75	3.8622
4/3/2018	9.7	9.8	9.71	9.77	3.8701
4/4/2018	9.55	9.77	9.77	9.7	3.8424
4/5/2018	9.68	9.8	9.7	9.8	3.882
4/6/2018	9.66	9.84	9.84	9.77	3.8701
4/9/2018	9.76	9.85	9.77	9.85	3.9018
4/10/2018	9.7	9.84	9.82	9.7	3.8424
4/11/2018	9.7	9.8	9.79	9.7	3.8424
4/12/2018	9.67	9.85	9.67	9.73	3.8543
4/13/2018	9.69	9.84	9.72	9.73	3.8543
4/16/2018	9.72	9.84	9.72	9.75	3.8622
4/17/2018	9.75	9.85	9.75	9.75	3.8622
4/18/2018	9.7	9.79	9.76	9.74	3.8582
4/19/2018	9.75	9.85	9.8	9.75	3.8622
4/20/2018	9.6	9.82	9.82	9.73	3.8543
4/23/2018	9.73	9.84	9.8	9.73	3.8543
4/24/2018	9.67	9.75	9.75	9.7	3.8424
4/25/2018	9.63	9.8	9.7	9.71	3.8463
4/26/2018	9.73	9.84	9.79	9.73	3.8543
4/27/2018	9.73	9.81	9.73	9.78	3.8741
4/30/2018	9.74	9.88	9.74	9.8	3.882
5/1/2018	9.74	9.88	9.74	9.8	3.882
5/2/2018	9.46	9.8	9.8	9.7	3.8424
5/3/2018	9.55	9.7	9.62	9.7	3.8424
5/4/2018	9.6	9.71	9.69	9.7	3.8424
5/7/2018	9.56	9.68	9.64	9.68	3.8345
5/8/2018	9.57	9.74	9.59	9.7	3.8424
5/9/2018	9.57	9.74	9.59	9.7	3.8424
5/10/2018	9.57	9.74	9.59	9.7	3.8424
5/11/2018	9.57	9.74	9.59	9.7	3.8424
5/14/2018	9.36	9.91	9.51	9.76	3.8662
5/15/2018	9.62	9.9	9.62	9.76	3.8662
5/16/2018	9.71	9.78	9.75	9.77	3.8701

5/17/2018	9.63	9.8	9.71	9.76	3.8662
5/18/2018	9.67	9.8	9.76	9.78	3.8741
5/21/2018	9.66	9.79	9.7	9.78	3.8741
5/22/2018	9.72	9.8	9.72	9.78	3.8741
5/23/2018	9.63	9.74	9.72	9.7	3.8424
5/24/2018	9.62	9.85	9.63	9.73	3.8543
5/25/2018	9.71	9.85	9.72	9.85	3.9018
5/28/2018	9.78	9.89	9.86	9.78	3.8741
5/29/2018	9.78	9.89	9.86	9.78	3.8741
5/30/2018	9.53	9.83	9.83	9.62	3.8107
5/31/2018	9.53	9.95	9.58	9.8	3.882
6/1/2018	9.68	9.86	9.81	9.7	3.8424
6/4/2018	9.61	9.76	9.63	9.71	3.8463
6/5/2018	9.63	9.75	9.64	9.74	3.8582
6/6/2018	9.7	9.79	9.7	9.79	3.878
6/7/2018	9.72	9.9	9.74	9.75	3.8622
6/8/2018	9.67	9.88	9.74	9.8	3.882
6/11/2018	9.72	9.94	9.74	9.8	3.882
6/12/2018	9.51	9.75	9.74	9.73	3.8543
6/13/2018	9.64	9.76	9.65	9.76	3.8662
6/14/2018	9.62	9.89	9.66	9.89	3.9177
6/15/2018	9.62	9.89	9.66	9.89	3.9177
6/18/2018	9.68	9.8	9.68	9.79	3.878
6/19/2018	9.7	9.8	9.71	9.77	3.8701
6/20/2018	9.69	9.8	9.69	9.76	3.8662
6/21/2018	9.65	9.77	9.72	9.73	3.8543
6/22/2018	9.61	9.75	9.67	9.74	3.8582
6/25/2018	9.67	9.8	9.8	9.77	3.8701
6/26/2018	9.68	9.8	9.68	9.8	3.882
6/27/2018	9.68	9.78	9.68	9.75	3.8622
6/28/2018	9.67	9.8	9.68	9.78	3.8741
6/29/2018	9.72	9.84	9.72	9.8	3.3938
7/2/2018	9.71	9.79	9.73	9.75	3.3765
7/3/2018	9.68	9.77	9.77	9.72	3.3661
7/4/2018	9.7	9.73	9.7	9.73	3.3696
7/5/2018	9.7	9.76	9.76	9.73	3.3696
7/6/2018	9.68	9.75	9.7	9.7	3.3592
7/9/2018	9.66	9.74	9.67	9.72	3.3661
7/10/2018	9.67	9.8	9.72	9.8	3.3938
7/11/2018	9.7	9.77	9.71	9.73	3.3696
7/12/2018	9.69	9.79	9.69	9.76	3.38
7/13/2018	9.72	9.79	9.79	9.78	3.3869
7/16/2018	9.72	9.8	9.76	9.8	3.3938
7/17/2018	9.73	9.8	9.76	9.8	3.3938

7/18/2018	9.73	9.81	9.79	9.8	3.3938
7/19/2018	9.76	9.8	9.77	9.76	3.38
7/20/2018	9.63	9.74	9.73	9.73	3.3696
7/23/2018	9.7	9.78	9.74	9.73	3.3696
7/24/2018	9.73	9.78	9.73	9.75	3.3765
7/25/2018	9.73	9.79	9.76	9.73	3.3696
7/26/2018	9.71	9.78	9.75	9.77	3.3834
7/27/2018	9.75	9.89	9.75	9.89	3.425
7/30/2018	9.8	9.88	9.83	9.81	3.3973
7/31/2018	9.74	9.87	9.74	9.8	3.3938
8/1/2018	9.78	9.85	9.79	9.81	3.3973
8/2/2018	9.73	9.83	9.76	9.73	3.3696
8/3/2018	9.73	9.85	9.82	9.78	3.3869
8/6/2018	9.72	9.78	9.78	9.74	3.373
8/7/2018	9.79	9.87	9.82	9.79	3.3903
8/8/2018	9.79	9.87	9.82	9.79	3.3903
8/9/2018	9.77	9.85	9.85	9.8	3.3938
8/10/2018	9.76	9.86	9.78	9.76	3.38
8/13/2018	9.73	9.83	9.75	9.73	3.3696
8/14/2018	9.73	9.79	9.73	9.75	3.3765
8/15/2018	9.73	9.82	9.76	9.75	3.3765
8/16/2018	9.71	9.81	9.72	9.75	3.3765
8/17/2018	9.71	9.8	9.75	9.8	3.3938
8/20/2018	9.73	9.8	9.75	9.73	3.3696
8/21/2018	9.72	9.83	9.79	9.83	3.4042
8/22/2018	9.72	9.83	9.79	9.83	3.4042
8/23/2018	9.75	9.88	9.83	9.81	3.3973
8/24/2018	9.77	9.87	9.84	9.84	3.4077
8/27/2018	9.82	9.9	9.82	9.84	3.4077
8/28/2018	9.84	9.9	9.9	9.84	3.4077
8/29/2018	9.8	9.89	9.82	9.84	3.4077
8/30/2018	9.83	9.94	9.89	9.83	3.4042
8/31/2018	9.83	9.94	9.89	9.83	3.4042
9/3/2018	9.71	9.83	9.8	9.8	3.3938
9/4/2018	9.71	9.8	9.73	9.8	3.3938
9/5/2018	9.72	9.8	9.79	9.8	3.3938
9/6/2018	9.75	9.9	9.83	9.85	3.4111
9/7/2018	9.75	9.89	9.82	9.85	3.4111
9/10/2018	9.75	9.89	9.82	9.85	3.4111
9/11/2018	9.75	9.89	9.82	9.85	3.4111
9/12/2018	9.74	9.88	9.85	9.8	3.3938
9/13/2018	9.75	9.9	9.8	9.89	3.425
9/14/2018	9.8	9.94	9.87	9.86	3.4146
9/17/2018	9.8	9.94	9.87	9.86	3.4146

9/18/2018	9.8	9.89	9.8	9.85	3.4111
9/19/2018	9.85	9.9	9.85	9.89	3.425
9/20/2018	9.83	9.95	9.89	9.88	3.4215
9/21/2018	9.89	9.96	9.94	9.9	3.4284
9/24/2018	9.81	9.98	9.98	9.84	3.4077
9/25/2018	9.79	9.84	9.84	9.8	3.3938
9/26/2018	9.78	9.87	9.78	9.85	3.4111
9/27/2018	9.81	9.86	9.85	9.85	3.4111
9/28/2018	9.78	9.9	9.86	9.9	3.3319
10/1/2018	9.83	9.94	9.92	9.83	3.3084
10/2/2018	9.8	9.85	9.82	9.85	3.3151
10/3/2018	9.79	9.84	9.84	9.83	3.3084
10/4/2018	9.75	9.85	9.85	9.82	3.305
10/5/2018	9.75	9.8	9.76	9.8	3.2983
10/8/2018	9.73	9.78	9.75	9.77	3.2882
10/9/2018	9.74	9.78	9.77	9.77	3.2882
10/10/2018	9.73	9.83	9.83	9.75	3.2815
10/11/2018	9.27	9.7	9.7	9.57	3.2209
10/12/2018	9.36	9.6	9.36	9.52	3.2041
10/15/2018	9.42	9.55	9.52	9.5	3.1973
10/16/2018	9.44	9.54	9.5	9.54	3.2108
10/17/2018	9.49	9.58	9.53	9.52	3.2041
10/18/2018	9.35	9.53	9.5	9.5	3.1973
10/19/2018	9.36	9.7	9.44	9.7	3.2646
10/22/2018	9.56	9.68	9.6	9.6	3.231
10/23/2018	9.46	9.65	9.54	9.6	3.231
10/24/2018	9.53	9.6	9.53	9.6	3.231
10/25/2018	9.47	9.59	9.49	9.55	3.2141
10/26/2018	9.46	9.57	9.49	9.57	3.2209
10/29/2018	9.49	9.6	9.51	9.6	3.231
10/30/2018	9.5	9.65	9.5	9.65	3.2478
10/31/2018	9.67	10.2	9.68	9.85	3.3151
11/1/2018	9.77	9.95	9.8	9.8	3.2983
11/2/2018	9.8	10	9.82	9.95	3.3488
11/5/2018	9.84	10.08	10.08	9.9	3.3319
11/6/2018	9.84	10.08	10.08	9.9	3.3319
11/7/2018	9.8	9.97	9.95	9.8	3.2983
11/8/2018	9.85	9.98	9.89	9.85	3.3151
11/9/2018	9.85	9.95	9.89	9.85	3.3151
11/12/2018	9.82	9.96	9.93	9.82	3.305
11/13/2018	9.8	9.93	9.8	9.82	3.305
11/14/2018	9.85	9.91	9.9	9.85	3.3151
11/15/2018	9.87	10	9.88	9.88	3.3252
11/16/2018	9.94	10	9.97	9.95	3.3488

11/19/2018	9.9	10	9.99	9.9	3.3319
11/20/2018	9.9	10	9.99	9.9	3.3319
11/21/2018	9.9	9.99	9.94	9.9	3.3319
11/22/2018	9.89	9.98	9.98	9.9	3.3319
11/23/2018	9.88	10.02	9.9	9.9	3.3319
11/26/2018	9.9	9.97	9.93	9.9	3.3319
11/27/2018	9.88	9.95	9.91	9.9	3.3319
11/28/2018	9.9	9.97	9.95	9.9	3.3319
11/29/2018	9.9	9.99	9.93	9.91	3.3353
11/30/2018	9.73	9.96	9.96	9.85	3.3151

Table A-7: TOPG MK Equity

Dates	Low Price	High Price	Open Price	Last Price	Average Price to Book Ratio
12/1/2017	3.335	3.39	3.39	3.365	4.0235
12/4/2017	3.35	3.415	3.365	3.36	4.0176
12/5/2017	3.26	3.38	3.35	3.26	3.898
12/6/2017	3.205	3.355	3.265	3.23	3.8621
12/7/2017	3.175	3.275	3.25	3.2	3.8262
12/8/2017	3.195	3.235	3.195	3.2	3.8262
12/11/2017	3.205	3.32	3.205	3.275	3.9159
12/12/2017	3.27	3.34	3.3	3.275	3.9159
12/13/2017	3.29	3.39	3.29	3.325	3.9757
12/14/2017	3.35	3.485	3.365	3.41	4.0773
12/15/2017	3.4	3.46	3.435	3.46	4.1371
12/18/2017	3.46	3.54	3.465	3.47	4.1491
12/19/2017	3.48	3.74	3.485	3.74	4.4719
12/20/2017	3.785	4.095	3.795	4.025	4.8127
12/21/2017	3.91	4.09	4.025	3.985	4.7649
12/22/2017	3.83	3.995	3.99	3.95	4.723
12/25/2017	3.83	3.995	3.99	3.95	4.723
12/26/2017	3.885	3.965	3.95	3.925	4.6931
12/27/2017	3.88	3.93	3.93	3.91	4.6752
12/28/2017	3.895	4.025	3.91	3.94	4.7111
12/29/2017	3.915	3.995	3.975	3.995	4.7768
1/1/2018	3.915	3.995	3.975	3.995	4.7768
1/2/2018	3.94	3.99	3.99	3.985	4.7649
1/3/2018	3.925	4.025	4	3.95	4.723
1/4/2018	3.975	4.5	3.995	4.355	5.2073
1/5/2018	4.325	4.58	4.38	4.45	5.3209
1/8/2018	4.44	4.625	4.5	4.58	5.4763
1/9/2018	4.47	4.615	4.59	4.495	5.3747
1/10/2018	4.425	4.585	4.495	4.5	5.3807
1/11/2018	4.32	4.51	4.49	4.35	5.2013

1/12/2018	4.385	4.525	4.41	4.5	5.3807
1/15/2018	4.415	4.65	4.55	4.455	5.3269
1/16/2018	4.335	4.505	4.5	4.38	5.2372
1/17/2018	4.375	4.53	4.4	4.5	5.3807
1/18/2018	4.45	4.605	4.5	4.565	5.4584
1/19/2018	4.43	4.615	4.6	4.495	5.3747
1/22/2018	4.49	4.615	4.54	4.575	5.4703
1/23/2018	4.585	4.98	4.6	4.895	5.853
1/24/2018	4.85	5	4.975	4.9	5.8589
1/25/2018	4.69	4.915	4.915	4.725	5.6497
1/26/2018	4.71	4.775	4.745	4.75	5.6796
1/29/2018	4.74	4.825	4.75	4.825	5.7693
1/30/2018	4.63	4.83	4.83	4.635	5.5421
1/31/2018	4.63	4.83	4.83	4.635	5.5421
2/1/2018	4.63	4.83	4.83	4.635	5.5421
2/2/2018	4.5	4.695	4.63	4.675	5.5899
2/5/2018	4.525	4.695	4.695	4.56	5.4524
2/6/2018	4.285	4.485	4.45	4.35	5.2013
2/7/2018	4.47	4.59	4.475	4.5	5.3807
2/8/2018	4.54	4.695	4.55	4.56	5.4524
2/9/2018	4.48	4.65	4.535	4.65	5.56
2/12/2018	4.575	4.65	4.605	4.6	5.5002
2/13/2018	4.6	4.66	4.625	4.625	5.5301
2/14/2018	4.61	4.775	4.615	4.735	5.6617
2/15/2018	4.7	4.78	4.75	4.765	5.6975
2/16/2018	4.7	4.78	4.75	4.765	5.6975
2/19/2018	4.705	4.82	4.705	4.79	5.7274
2/20/2018	4.74	4.865	4.805	4.815	5.7573
2/21/2018	4.76	4.96	4.78	4.94	5.9068
2/22/2018	4.89	4.985	4.93	4.9	5.8589
2/23/2018	4.89	4.99	4.945	4.96	5.9307
2/26/2018	4.97	5.12	4.985	5	5.9785
2/27/2018	5.02	5.08	5.05	5.05	6.0383
2/28/2018	4.855	5.05	5.05	4.855	5.7889
3/1/2018	4.87	5.01	4.87	4.975	5.932
3/2/2018	4.86	4.975	4.95	4.91	5.8545
3/5/2018	4.815	4.96	4.92	4.91	5.8545
3/6/2018	4.85	4.96	4.925	4.85	5.7829
3/7/2018	4.635	4.86	4.8	4.675	5.5743
3/8/2018	4.625	4.735	4.73	4.64	5.5325
3/9/2018	4.66	4.75	4.66	4.695	5.5981
3/12/2018	4.725	4.885	4.75	4.84	5.771
3/13/2018	4.84	4.97	4.85	4.95	5.9022
3/14/2018	4.855	4.975	4.95	4.91	5.8545

3/15/2018	4.89	4.985	4.9	4.925	5.8723
3/16/2018	4.865	4.95	4.95	4.9	5.8425
3/19/2018	4.815	4.93	4.9	4.85	5.7829
3/20/2018	4.75	4.875	4.825	4.86	5.7948
3/21/2018	4.805	4.94	4.875	4.86	5.7948
3/22/2018	4.83	4.9	4.86	4.88	5.8187
3/23/2018	4.77	4.845	4.845	4.785	5.7054
3/26/2018	4.74	4.915	4.785	4.86	5.7948
3/27/2018	4.86	4.975	4.86	4.95	5.9022
3/28/2018	4.865	4.95	4.94	4.925	5.8723
3/29/2018	4.875	4.95	4.925	4.875	5.8127
3/30/2018	4.82	4.92	4.9	4.82	5.7471
4/2/2018	4.835	5	4.84	5	5.9618
4/3/2018	4.96	5.08	4.99	5	5.9618
4/4/2018	4.745	5.22	5.02	4.75	5.6637
4/5/2018	4.86	5.05	4.86	4.95	5.9022
4/6/2018	4.95	5.05	4.99	4.98	5.9379
4/9/2018	4.915	5	4.98	4.925	5.8723
4/10/2018	4.925	5	4.925	4.99	5.9498
4/11/2018	5.05	5.19	5.05	5.08	6.0572
4/12/2018	5.02	5.14	5.14	5.05	6.0214
4/13/2018	5.07	5.13	5.09	5.08	6.0572
4/16/2018	5.05	5.1	5.07	5.08	6.0572
4/17/2018	5.01	5.17	5.09	5.08	6.0572
4/18/2018	5.03	5.09	5.08	5.03	5.9975
4/19/2018	5.02	5.15	5.02	5.1	6.081
4/20/2018	5	5.16	5.1	5	5.9618
4/23/2018	4.99	5.18	5.05	5	5.9618
4/24/2018	4.7	5.1	5.04	4.725	5.6339
4/25/2018	4.45	4.74	4.74	4.505	5.3716
4/26/2018	4.515	4.72	4.515	4.71	5.616
4/27/2018	4.64	4.82	4.79	4.695	5.5981
4/30/2018	4.7	4.79	4.7	4.755	5.6696
5/1/2018	4.7	4.79	4.7	4.755	5.6696
5/2/2018	4.72	4.85	4.755	4.755	5.6696
5/3/2018	4.715	4.835	4.715	4.8	5.7233
5/4/2018	4.775	4.95	4.81	4.95	5.9022
5/7/2018	4.82	4.985	4.9	4.9	5.8425
5/8/2018	4.84	4.91	4.875	4.91	5.8545
5/9/2018	4.84	4.91	4.875	4.91	5.8545
5/10/2018	4.84	4.91	4.875	4.91	5.8545
5/11/2018	4.84	4.91	4.875	4.91	5.8545
5/14/2018	4.96	5.2	5	5.07	6.0452
5/15/2018	5.04	5.39	5.12	5.06	6.0333

5/16/2018	4.965	5.15	5.1	5	5.9618
5/17/2018	4.99	5.15	5	5.03	5.9975
5/18/2018	5.02	5.22	5.05	5.14	6.1287
5/21/2018	5.09	5.2	5.09	5.13	6.1168
5/22/2018	5.08	5.18	5.12	5.13	6.1168
5/23/2018	5.01	5.18	5.13	5.01	5.9737
5/24/2018	4.865	5.08	5.03	5.01	5.9737
5/25/2018	4.98	5.25	4.98	5.15	6.1406
5/28/2018	5.03	5.18	5.09	5.1	6.081
5/29/2018	5.03	5.18	5.09	5.1	6.081
5/30/2018	4.955	5.23	5.01	5.12	6.1049
5/31/2018	5.09	5.3	5.22	5.13	5.6696
6/1/2018	5.13	5.27	5.13	5.22	5.7691
6/4/2018	5.2	5.35	5.26	5.33	5.8907
6/5/2018	5.33	5.4	5.35	5.35	5.9128
6/6/2018	5.32	5.38	5.34	5.35	5.9128
6/7/2018	5.33	5.45	5.39	5.4	5.968
6/8/2018	5.41	5.48	5.44	5.45	6.0233
6/11/2018	5.45	5.98	5.45	5.94	6.5648
6/12/2018	5.48	5.99	5.93	5.57	6.1559
6/13/2018	5.53	5.72	5.59	5.64	6.2333
6/14/2018	5.5	5.69	5.64	5.62	6.2112
6/15/2018	5.5	5.69	5.64	5.62	6.2112
6/18/2018	5.6	5.74	5.74	5.7	6.2996
6/19/2018	5.66	5.95	5.73	5.66	6.2554
6/20/2018	5.66	5.88	5.8	5.68	6.2775
6/21/2018	5.6	5.75	5.68	5.68	6.2775
6/22/2018	5.59	5.78	5.61	5.78	6.388
6/25/2018	5.65	5.85	5.79	5.65	6.2443
6/26/2018	5.65	5.73	5.66	5.68	6.2775
6/27/2018	5.7	5.8	5.72	5.75	6.3549
6/28/2018	5.7	5.86	5.75	5.81	6.4212
6/29/2018	5.81	6.07	5.83	6.07	6.7085
7/2/2018	6	6.24	6.06	6.03	6.6643
7/3/2018	6.03	6.12	6.1	6.1	6.7417
7/4/2018	6.07	6.15	6.09	6.09	6.7306
7/5/2018	6.08	6.15	6.11	6.15	6.7969
7/6/2018	6.05	6.17	6.16	6.05	6.6864
7/9/2018	4.235	4.8	4.8	4.565	5.0452
7/10/2018	4.48	4.99	4.5	4.95	5.4707
7/11/2018	4.665	4.96	4.93	4.945	5.4652
7/12/2018	4.8	4.965	4.855	4.95	5.4707
7/13/2018	4.855	4.965	4.945	4.955	5.4762
7/16/2018	4.95	5.19	4.955	5.15	5.6917



7/17/2018	5.07	5.24	5.19	5.2	5.747
7/18/2018	5.17	5.35	5.22	5.35	5.9128
7/19/2018	5.07	5.36	5.35	5.2	5.747
7/20/2018	5.1	5.21	5.2	5.15	5.6917
7/23/2018	5.14	5.23	5.2	5.2	5.747
7/24/2018	5.13	5.22	5.22	5.2	5.747
7/25/2018	5.17	5.21	5.17	5.19	5.7359
7/26/2018	5.1	5.2	5.17	5.13	5.6696
7/27/2018	5	5.13	5.13	5.04	5.5702
7/30/2018	4.975	5.05	5.04	5.04	5.5702
7/31/2018	4.86	5.09	4.94	5.07	5.6033
8/1/2018	5.01	5.09	5.09	5.09	5.6254
8/2/2018	5.05	5.1	5.09	5.08	5.6144
8/3/2018	4.98	5.06	5.03	5	5.526
8/6/2018	5	5.1	5.02	5.08	5.6144
8/7/2018	5.04	5.1	5.08	5.05	5.5812
8/8/2018	5.07	5.14	5.1	5.14	5.6807
8/9/2018	5.1	5.25	5.12	5.2	5.747
8/10/2018	5.19	5.32	5.21	5.25	5.8023
8/13/2018	5.15	5.25	5.2	5.19	5.7359
8/14/2018	5.15	5.23	5.19	5.19	5.7359
8/15/2018	5.17	5.27	5.19	5.25	5.8023
8/16/2018	5.17	5.25	5.22	5.21	5.7581
8/17/2018	5.17	5.24	5.2	5.2	5.747
8/20/2018	5.16	5.26	5.16	5.22	5.7691
8/21/2018	5.2	5.28	5.21	5.27	5.8244
8/22/2018	5.2	5.28	5.21	5.27	5.8244
8/23/2018	5.24	5.49	5.24	5.39	5.957
8/24/2018	5.37	5.53	5.37	5.4	5.968
8/27/2018	5.39	5.52	5.4	5.5	6.0786
8/28/2018	5.5	5.63	5.5	5.54	6.1228
8/29/2018	5.51	5.62	5.55	5.59	6.178
8/30/2018	5.54	5.62	5.59	5.57	5.9865
8/31/2018	5.54	5.62	5.59	5.57	5.9865
9/3/2018	5.54	5.64	5.64	5.56	5.9757
9/4/2018	5.43	5.56	5.55	5.51	5.922
9/5/2018	5.46	5.51	5.46	5.5	5.9112
9/6/2018	5.45	5.52	5.46	5.48	5.8897
9/7/2018	5.37	5.5	5.49	5.42	5.8252
9/10/2018	5.37	5.5	5.49	5.42	5.8252
9/11/2018	5.37	5.5	5.49	5.42	5.8252
9/12/2018	5.15	5.5	5.5	5.26	5.6533
9/13/2018	5.16	5.29	5.22	5.25	5.6425
9/14/2018	5.19	5.25	5.23	5.25	5.6425

9/17/2018	5.19	5.25	5.23	5.25	5.6425
9/18/2018	5	5.25	5.25	5.25	5.6425
9/19/2018	5.25	5.42	5.25	5.35	5.75
9/20/2018	5.35	5.41	5.4	5.36	5.7608
9/21/2018	5.27	5.4	5.4	5.35	5.75
9/24/2018	5.25	5.4	5.4	5.29	5.6855
9/25/2018	5.28	5.31	5.28	5.3	5.6963
9/26/2018	5.26	5.33	5.31	5.29	5.6855
9/27/2018	5.2	5.35	5.28	5.32	5.7178
9/28/2018	5.31	5.41	5.33	5.33	5.7285
10/1/2018	5.35	5.4	5.4	5.35	5.75
10/2/2018	5.31	5.36	5.36	5.35	5.75
10/3/2018	5.32	5.37	5.32	5.35	5.75
10/4/2018	5.28	5.39	5.32	5.39	5.793
10/5/2018	5.26	5.39	5.33	5.26	5.6533
10/8/2018	5.15	5.26	5.25	5.25	5.6425
10/9/2018	5.17	5.27	5.2	5.25	5.6425
10/10/2018	5.07	5.25	5.19	5.25	5.6425
10/11/2018	5.01	5.43	5.1	5.35	5.75
10/12/2018	5.31	5.54	5.36	5.39	5.793
10/15/2018	5.43	5.95	5.43	5.61	6.0295
10/16/2018	5.67	5.84	5.67	5.8	6.2337
10/17/2018	5.73	5.91	5.86	5.75	6.1799
10/18/2018	5.72	5.79	5.79	5.76	6.1907
10/19/2018	5.72	5.87	5.75	5.8	6.2337
10/22/2018	5.72	5.84	5.8	5.75	6.1799
10/23/2018	5.74	5.8	5.77	5.75	6.1799
10/24/2018	5.66	5.98	5.8	5.66	6.0832
10/25/2018	5.39	5.66	5.66	5.55	5.965
10/26/2018	5.46	5.69	5.6	5.66	6.0832
10/29/2018	5.56	5.67	5.67	5.63	6.0509
10/30/2018	5.57	5.63	5.6	5.6	6.0187
10/31/2018	5.6	5.94	5.63	5.94	6.3841
11/1/2018	5.75	5.88	5.88	5.8	6.2337
11/2/2018	5.75	5.84	5.8	5.8	6.2337
11/5/2018	5.73	5.88	5.88	5.8	6.2337
11/6/2018	5.73	5.88	5.88	5.8	6.2337
11/7/2018	5.76	5.84	5.78	5.8	6.2337
11/8/2018	5.77	5.87	5.81	5.8	6.2337
11/9/2018	5.69	5.81	5.79	5.78	6.2122
11/12/2018	5.72	5.79	5.77	5.77	6.2014
11/13/2018	5.72	5.77	5.75	5.74	6.1692
11/14/2018	5.52	5.73	5.73	5.7	6.1262
11/15/2018	5.54	5.73	5.66	5.7	6.1262

11/16/2018	5.7	5.84	5.7	5.84	6.2766
11/19/2018	5.75	5.82	5.8	5.78	6.2122
11/20/2018	5.75	5.82	5.8	5.78	6.2122
11/21/2018	5.75	5.86	5.75	5.8	6.2337
11/22/2018	5.78	5.91	5.81	5.85	6.2874
11/23/2018	5.81	5.89	5.86	5.85	6.2874
11/26/2018	5.82	5.93	5.85	5.9	6.3411
11/27/2018	5.86	5.98	5.91	5.98	6.4271
11/28/2018	5.94	6.2	5.98	6.13	6.5883
11/29/2018	6.12	6.36	6.15	6.12	6.5776
11/30/2018	5.97	6.3	6.18	5.97	6.4164

Table A-8: Table of Control Chart Constants

Sample Size = $m$	$A_2$	$A_3$	$d_2$	$D_3$	$D_4$	$B_3$	$B_4$
2	1.880	2.659	1.128	0	3.267	0	3.267
3	1.023	1.954	1.693	0	2.574	0	2.568
4	0.729	1.628	2.059	0	2.282	0	2.266
5	0.577	1.427	2.326	0	2.114	0	2.089
6	0.483	1.287	2.534	0	2.004	0.030	1.970
7	0.419	1.182	2.704	0.076	1.924	0.118	1.882
8	0.373	1.099	2.847	0.136	1.864	0.185	1.815
9	0.337	1.032	2.970	0.184	1.816	0.239	1.761
10	0.308	0.975	3.078	0.223	1.777	0.284	1.716
11	0.285	0.927	3.173	0.256	1.744	0.321	1.679
12	0.266	0.886	3.258	0.283	1.717	0.354	1.646
13	0.249	0.850	3.336	0.307	1.693	0.382	1.618
14	0.235	0.817	3.407	0.328	1.672	0.406	1.594
15	0.223	0.789	3.472	0.347	1.653	0.428	1.572
16	0.212	0.763	3.532	0.363	1.637	0.448	1.552
17	0.203	0.739	3.588	0.378	1.622	0.466	1.534
18	0.194	0.718	3.640	0.391	1.608	0.482	1.518
19	0.187	0.698	3.689	0.403	1.597	0.497	1.503
20	0.180	0.680	3.735	0.415	1.585	0.510	1.490
21	0.173	0.663	3.778	0.425	1.575	0.523	1.477
22	0.167	0.647	3.819	0.434	1.566	0.534	1.466
23	0.162	0.633	3.858	0.443	1.557	0.545	1.455
24	0.157	0.619	3.895	0.451	1.548	0.555	1.445
25	0.153	0.606	3.931	0.459	1.541	0.565	1.435