

**STOCK PRICE FORECASTING ACCURACY ANALYSIS USING MEAN ABSOLUT DEVIATION (MAD) AND  
MEAN ABSOLUTE PERCENTAGE ERROR (MAPE) ON SMOOTHING MOVING AVERAGE AND  
EXPONENTIAL MOVING AVERAGE INDIKATOR ( EMPIRICAL STUDY 10 LQ45 STOCK WITH LARGEST  
CAPITALIZATION FROM PERIOD FEB-JUL 2013)**

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*Abstract-- Indonesia stock market crash of 2008, in general the majority due to external factors. The recovery of the world economy had a positive impact on economic growth in Indonesia. LQ 45 stock is a stock that has a market capitalization of 45 stocks are the most liquid and capitalized great. Based on data obtained from sources (www.idx.co.id), the condition of the development of the stock price index LQ 45 from the fourth quarter of 2009 until the third quarter of 2010 increased by 99.75%. The situation above can be analyzed through technical analysis. Moving Average indicator provides information signal sale or purchase, as the determinant of the ongoing trend., Knowing the trend reversal (reversal), and Moving Average can be used to gain support and resistance. In general, there are several indicators to measure the accuracy of forecasting, the Mean Absolute Deviation (MAD), Mean Square Error (MSE) and Mean Absolute Error Percentage Error (MAPE). The samples used were the stocks that fall into the category LQ 45 in the period February 2013 - July 2013. The Result of Measurement showed that method with the smallest MAD and MAPE is the best method chosen to determine how much the stock price forecasting in a single month, the Exponential Moving Average method recommended by the company and the investors.*

*Keyword: Smoothing Moving Average, Exponential Moving Average, Mean Absolute Deviation (MAD), Mean Absolute Percentage Error (MAPE), LQ 45)*

## **1. Introduction**

LQ 45 stock is a stock that has a market capitalization of 45 stocks are the most liquid and capitalized great. LQ 45 index using the 45 stocks selected based on the liquidity of trading in shares and adjusted every six months (at the beginning of February and August). As such stocks contained in the index will always change. It can be influenced by various factors such as the onset of recovery in the economy, improving the condition of the issuer, etc. Framework of my research used technical analysis approach in analyzing the stock using Smoothing Moving Average and Exponential Moving Average. In technical analysis, this approach will utilize stock charts historical data that can help market participants in making investment decisions such as buy, sell, or hold. It can be knowing how the comparison of the accuracy of the analysis results LQ 45 stock price using the Smoothing Moving Average and Exponential Moving Average and Understanding how to use in technical analysis of Stock

### *A. Conceptual Framework*

Conceptual framework determines adjusted close stock price of historical data from LQ 45 and then take 10 stocks with the largest capitalization stocks from each LQ 45. From this, my research explain analysis of Stock Price Forecasting Accuracy using the Mean Absolute Deviation (MAD) and Mean Absolute Percentage Error (MAPE) on Smoothing Moving Average and Exponential Moving Average Indikator. it is an estimate of how much error to expect with a forecast

My research used SMA Method 3 d, SMA Method 5 d, EMA Method 3d, and EMA Method 5d. The study explains for independent normal distribution between 0.4 to 0.2.

#### *B. Method of Data Collection and Analysis*

Technical analysis used Smoothing Moving Average and Exponential Moving Average for 1 month on 1 April 2013 - May 1 2013 by long periods of 3 days and 5 days. It starts calculatr forecast 5 days and foresat 3 days and then calculate Deviation, RSFE, Abs Deviation, and the result can get calculate MAD to get tracking signal untuil find MAPE from MAD

#### *C. Analysis of Component Method*

##### *1) LQ 45*

LQ 45 index was created to provide the market with an index representing the 45 most liquid stocks. Currently, LQ 45 covers at least 70% of stock market capitalization and value of transactions in the regular market (IDX Fact Book, 2009). Historically calculation LQ 45 launch on July 13, 1994, with a base value of 100. Index consists of 45 stocks that have surpassed the selection liquidity and market capitalization. Step-by-step stock selection to be included as LQ 45 is as follows:

1. The first step, of shares worth included in LQ 45 is a stock that has been registered (listed) in the IDX least 3 months.
2. Furthermore, stocks are ranked based on the average value of regular market transactions over a period of 12 months earlier. Sixty (60) best stock in the rankings above are representative of the overall stock which will draft LQ 45.
3. Stocks that are in the best position 30 of the list based on the total value of the transaction will directly meet as a representative of LQ 45.
4. Of the remaining 30 stocks representing the whole, the election will be made to determine the 15 stocks that compose the index needed to LQ 45. Selection process based on:
  - a. Choose 25 stocks based on the number of active trading days in
    - i. regular market.
    - ii. Of the remaining 25 stocks, 20 stocks selected based on the frequency
  - b. transactions in the regular market.
  - c. Of the remaining 20 stocks, 15 stocks selected based on market capitalization.
  - d. In addition to the criteria of liquidity and market capitalization, stock selection LQ 45 is also based on the financial condition and growth prospects of the company.

##### *2) Moving Average*

*Moving Average, MA is often called, is one indicator that is quite popular among traders. Function of Moving averege used to soften the "noise" of short-term price fluctuations so that more readable to identify and explain the importance of a healthy underlying trend .*

So the outline moving Average used as:

- a. As a determinant of the ongoing trend.

To determine the ongoing trend trader can use one or more of the moving Average. For example, when the MA-5 is above the MA-20, the ongoing trend is bullish and vice versa when the MA-5 under the MA-20, the ongoing trend is bearish.



Figure 1. Moving Average for Buy and Sells signals (1)

b. Knowing the trend reversal (reversal)

To determine the direction of the trend reversal of the stock price movement takes at least two lines Moving Average.



Figure 2.10. Moving Average For Buy and Sell Signals

c. Moving average as support and resistance

Other uses of Moving Average is as support and resistance.



Figure 2 .Moving Average as Support and Resistance

Moving Average (MA) is divided into three types:

1. SMA (Simple Moving Average)
2. WMA (weighted moving Average)
3. EMA (Exponential Moving Average)

1. SMA (Simple Moving Average)

Simple Moving Average reflects the average price movement of a stock's value within a certain time frame is simple. The most commonly used is between 5, 10, 20, 30, 50, 100, and 200 days. The shorter the period of time used it will generate a signal that the senstif. On the negative side there will be more whipsaws.

Example calculation of Moving Average 5 (MA5) General formula is:  $((P1 + P2 + P3 + P4 + P5)) / 5$

Where in:

P1 = first day closing price

P2 = second day closing price

P3 = third day's closing price

P4 = fourth day's closing price

P5 = the closing price of the fifth day

The values of these calculations appear to be a "line" in the charts which may provide a signal to traders. The signal can be a buy signal or sell signal depends on the movement of the stock price crosses the SMA line.



Figure 3. Example of MA5 and MA-20

## 2. Exponential Moving Average

To reduce delays in the movement of Simple Moving Average, analysts sometimes use Exponential Moving Average. For example: a 10 period Moving Average exponential weighing the most recent price 18.18% and moving and moving Average 20 period exponential weighing the most recent price 9.52%. Method to calculate Exponential Moving Average is very complicated. But the most important thing to remember is that the Exponential Moving Average is more focused on the latest prices. He will react / change more rapidly with the recent price compared to the simple moving Average. .

Exponential Moving Average Calculation

Formula for an Exponential Moving Average is:

$$X = (K \times (C - P)) + P$$

X = EMA last

C = last price

\* P = EMA previous period

K = Value constant

(\* SMA is calculated prior to the beginning of the period)

Constant values used in the relative price to the previous exponential moving Average, formula for the value of the constant is:

$$K = 2 / (1 + N)$$

N = Number of periods for EMA



Figure 4. Example of Exponential Moving Average

### 3) Descriptive Statistics

#### 3) Dimensions Forecasting Accuracy Results

##### 1. Average Absolute Deviation (MAD = Mean Absolute Deviation)

MAD is the mean absolute error for a specific period, regardless of whether the results of forecasting bigger or smaller than reality. Mathematically, MAD is formulated as follows:

$$MAD = \sum \left| \frac{A_t - F_t}{n} \right|$$

Where:

A = Actual demand in period - t

F<sub>t</sub> = Forecasting Demand in period-t

n = Total Period Forecasting involved

##### 3. Mean Absolute Percentage Error (Mean Absolute Percentage Error = MAPE).

MAPE is a measure of the relative error. MAPE is usually more significant than MAD because MAPE stated percentage error of the forecasting result of actual demand for a certain period that will provide information about the percentage error is too high or too low. Mathematically, MAPE is expressed as follows:

$$MAPE = \left( \frac{100}{n} \right) \sum \left| A_t - \frac{F_t}{A_t} \right|$$

Based on the results of descriptive statistics, Method with the smallest MAD and MAPE is the best method chosen to determine how much the stock price forecasting in a single month, the Exponential Moving Average method recommended by the company and the investors by the author as having an average MAD and MAPE smaller than Smoothing moving average which indicates that the Exponential Moving Average has Measurement of Error smaller.

## 2. Method Solution

### D. Alternatives of Method Solution

Theoretically, there are many technical method solutions that can be applied in LQ 45 stock. Due to the limitation of data availability and Moving Average indikator is very famous and very popular in Indonesia because Moving Average can be used to calculate high volatility and low volatility of stock. So my research can be focus in types of Moving Average

### E. Analysis of Method Solution

In this study, the data used is the daily closing price of the shares included in the LQ 45 within the period from February 2013 to July 2013. For ease of calculation and comparison, the authors divided into several steps:

1. Preparing the price history LQ 45 period February-July 2013 that its share price has been in adjusted every time there is a distribution of dividends, stock splits, and rights issues.
2. Sort LQ 45 by Leading Market Capitalization and only take 10 The market capitalization of shares Largest

Table 1 Here are 10 LQ 45 with the largest market capitalization period February to July 2013

No	Kode Saham	Nama saham LQ 45	Kapitalisasi Pasar
1	ASII	PT Astra International Tbk	321,844,247,463,000
2	BBCA	PT Bank Central Asia Tbk	268,493,050,320,000
3	BMRI	PT Bank Mandiri (Persero) Tbk	232,154,999,989,950
4	BBRI	PT Bank Rakyat Indonesia Tbk	230,792,345,091,000
5	GRM	PT Gudang Garam Tbk	92,933,450,400,000
6	BBNI	PT Bank Negara Indonesia Tbk	84,925,981,507,800
7	INTP	Indocement Tunggul Prakasa Tbk	80,803,035,793,050
8	CPIN	Charoen Pokphand Indonesia Tbk	72,151,200,000,000
9	KLBF	PT Kalbe Farma Tbk	65,506,293,021,900
10	INDF	Indofood Sukses Makmur Tbk	64,097,113,450,000

3. Daily Price Adj Close take from each stock within one month from 1 April 2013-1 May 2013. Technical analysis has a close relationship with the price and volume. In relation to the price of some of the terms contained in a price that is often used in a graph, namely:

- Open: the market price at the time of opening a trading period
- High: the highest price traded in a stock during the trading period.
- Low: The lowest price for a stock traded in a trading period
- Close: closing price or the final price in a trade.
- Value: number of shares traded in a trading period.

In my research calculation, it can be shown in Appendix.

4. Calculate MAD and MAPE of each stock.

Accuracy values in this study were measured using the Mean Absolute Deviation (MAD) and Mean Absolute Percentage Error (MAPE). The author uses indicators MAD and MAPE Because by Mc Graw Hills, MAD has Obtaining simplicity and usefulness in tracking signals. MAD, like the standard deviation, measures the dispersion of some observed values from some expected value. And an additional measure of error that is Often useful is the mean absolute percent error (MAPE). This measure gauges the error relative to the average price. This is a useful measure Because it is an estimate of how much error to expect with a forecast. So if the MAD were 10 and average price of 200, the MAPE would be 5%. It can be shown in Appendix

Table 2. Summary Calculation MAD and MAPE in 3 days

	3 days		3 days	
	Simple Moving Average		Exponential Moving Average	
	MAD	MAPE	MAD	MAPE
ASII	44.925	0.006	50.902	0.007
BBCA	115.479	0.011	110.290	0.010
BMRI	73.654	0.007	111.333	0.011
BBRI	63.433	0.007	91.020	0.011
GGRM	916.133	0.018	897.653	0.017
BBNI	94.964	0.018	104.387	0.021
INTP	235.381	0.009	244.613	0.010
CPIN	37.810	0.008	50.755	0.011
KLBF	11.737	0.009	15.049	0.012
INDF	63.977	0.009	51.624	0.007
Average	165.749	0.010	172.763	0.012

### 3. Conclusion and Implementation Plan

Results of the implementation and evaluation of prediction system using Moving Average Smoothing and compare the results with the predictions Exponential Smoothing method it can be concluded Method with the smallest MAD and MAPE is the best method chosen to determine how much the stock price forecasting in a single month, the Exponential Moving Average method recommended by the company and the investors by the author as having an average MAD and MAPE smaller than Smoothing moving average which indicates that the Exponential Moving Average has Measurement of Error smaller. Through forecasting analysis using the MAD and MAPE in this study we can see how the possibility of future stock price, so the company can make budget forecasting as a reference to plan the right investment in the future.

It is also recommended that Companies should periodically perform forecasting, with the company forecasting will be easier to set targets both in sales and other targets that would boost the company's profits. Forecasting are increasingly being carried out by the company, the results that will be obtained will be better, because other variables are the factors that reduce the income would be circumvented with the right financial measures when the company knows how many achievements that may be achieved. Companies should conduct a survey to find out what kind of product the product more desirable by the consumer in terms of price, capacity, and form more consumers demand increasing in the share price of the company itself. Finally, Forecasting stock price with short-term technical analysis can be used as an alternative for investors especially for traders and the general public who want to try to buy a given stock share prices always fluctuate in the short term.

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**Appendix A. List of Stocks LQ45 Period February until July 2013 as follows:**

NO	KODE	NAMA EMITEN	KAPITALISASI PASAR PER 28-FEB-2013
1	<a href="#">AALI</a>	PT Astra Agro Lestari Tbk	29,054,045,250,000
2	<a href="#">ADRO</a>	PT Adaro Energy Tbk	50,217,960,340,000
3	<a href="#">AKRA</a>	PT AKR Corporindo Tbk	17,235,209,662,500
4	<a href="#">ANTM</a>	PT Aneka Tambang (Persero) Tbk	12,304,613,077,500
5	<a href="#">ASII</a>	PT Astra International Tbk	321,844,247,463,000
6	<a href="#">ASRI</a>	PT Alam Sutera Realty Tbk	18,273,953,055,840
7	<a href="#">BBCA</a>	PT Bank Central Asia Tbk	268,493,050,320,000
8	<a href="#">BBNI</a>	PT Bank Negara Indonesia Tbk	84,925,981,507,800
9	<a href="#">BBRI</a>	PT Bank Rakyat Indonesia Tbk	230,792,345,091,000
10	<a href="#">BBTN</a>	PT Bank Tabungan Negara Tbk	16,875,779,570,000
11	<a href="#">BDMN</a>	PT Bank Danamon Tbk	59,779,420,665,300
12	<a href="#">BHIT</a>	PT Bhakti Investama Tbk	18,201,006,126,570
13	<a href="#">BKSL</a>	PT Sentul City Tbk	9,262,086,977,950
14	<a href="#">BMRI</a>	PT Bank Mandiri (Persero) Tbk	232,154,999,989,950
15	<a href="#">BMTR</a>	PT Global Mediacom Tbk	32,126,310,415,000
16	<a href="#">BSDE</a>	PT Bumi Serpong Damai Tbk	27,995,194,547,200
17	<a href="#">BUMI</a>	PT Bumi Resources Tbk	17,034,188,000,000
18	<a href="#">BWPT</a>	PT BW Plantation Tbk	5,510,324,718,720
19	<a href="#">CPIN</a>	PT Charoen Pokphand Indonesia Tbk	72,151,200,000,000
20	<a href="#">EXCL</a>	PT Excelcomindo Pratama Tbk	46,468,207,529,950
21	<a href="#">GGRM</a>	PT Gudang Garam Tbk	92,933,450,400,000
22	<a href="#">GIAA</a>	PT Garuda Indonesia (Persero) Tbk	14,943,057,360,000
23	<a href="#">HRUM</a>	PT Harum Energy Tbk	14,869,910,000,000
24	<a href="#">ICBP</a>	PT Indofood CBP Sukses Makmur Tbk	49,563,109,000,000
25	<a href="#">IMAS</a>	PT Indomobil Sukses Internasional Tbk	14,932,503,424,800
26	<a href="#">INCO</a>	PT Vale Indonesia Tbk	26,828,114,544,000
27	<a href="#">INDF</a>	PT Indofood Sukses Makmur Tbk	64,097,113,450,000
28	<a href="#">INDY</a>	PT Indika Energy Tbk	7,294,268,800,000
29	<a href="#">INTP</a>	PT Indocement Tungal Prakasa Tbk	80,803,035,793,050
30	<a href="#">ITMG</a>	PT Indo Tambangraya Megah Tbk	45,479,481,250,000
31	<a href="#">JSMR</a>	PT Jasa Marga (Persero) Tbk	37,740,000,000,000
32	<a href="#">KLBF</a>	PT Kalbe Farma Tbk	65,506,293,021,900
33	<a href="#">LPKR</a>	PT Lippo Karawaci Tbk	26,077,789,269,470

34	<a href="#">LSIP</a>	PT PP London Sumatera Indonesia Tbk	14,157,442,727,375
35	<a href="#">MAIN</a>	PT Malindo Feedmill Tbk	5,127,375,000,000
36	<a href="#">MAPI</a>	PT Mitra Adiperkasa Tbk	12,948,000,000,000
37	<a href="#">MNCN</a>	PT Media Nusantara Citra Tbk	41,170,573,175,000
38	<a href="#">PGAS</a>	PT Perusahaan Gas Negara Tbk	116,359,239,340,800
39	<a href="#">PTBA</a>	PT Tambang Batubara Bukit Asam (Persero) Tbk	34,792,390,935,000
40	<a href="#">SMCB</a>	PT Holcim Indonesia Tbk	28,161,157,500,000
41	<a href="#">SMGR</a>	PT Semen Indonesia (Persero) Tbk	102,911,872,000,000
42	<a href="#">SSIA</a>	PT Surya Semesta Internusa Tbk	7,057,874,160,000
43	<a href="#">TLKM</a>	PT Telekomunikasi Indonesia Tbk	216,719,992,260,000
44	<a href="#">UNTR</a>	PT United Tractors Tbk	71,991,608,124,800
45	<a href="#">UNVR</a>	PT Unilever Indonesia Tbk	174,345,500,000,000

Source: (Sumber: indeks books of BEI)

**Appendix B**  
**Stock Price Stock Price 1 Apr 2013 - 1 Mei 2013 (Case of PT. Astra International Tbk.)**

(ASII.JK  
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	Prices		1 Apr 2013 - 1 Mei 2013				
	Date	Open	High	Low	Close	Volume	Adj Close*
1	Apr 1, 2013	7,850.00	7,950.00	7,800.00	7,850.00	12,344,500	7,708.03
2	Apr 2, 2013	7,950.00	7,950.00	7,850.00	7,950.00	14,088,500	7,806.22
3	Apr 3, 2013	7,950.00	7,950.00	7,850.00	7,950.00	14,088,500	7,806.22
4	Apr 4, 2013	7,700.00	7,950.00	7,700.00	7,700.00	26,627,000	7,560.74
5	Apr 5, 2013	7,650.00	7,850.00	7,650.00	7,650.00	24,102,000	7,511.65
6	Apr 8, 2013	7,700.00	7,700.00	7,550.00	7,700.00	22,390,500	7,560.74
7	Apr 9, 2013	7,700.00	7,700.00	7,550.00	7,700.00	26,725,000	7,560.74
8	Apr 10, 2013	7,550.00	7,700.00	7,550.00	7,550.00	29,609,500	7,413.46
9	Apr 11, 2013	7,750.00	7,800.00	7,600.00	7,750.00	25,817,000	7,609.84
10	Apr 12, 2013	7,650.00	7,800.00	7,650.00	7,650.00	20,196,500	7,511.65
11	Apr 15, 2013	7,600.00	7,700.00	7,550.00	7,600.00	16,098,500	7,462.55
12	Apr 16, 2013	7,750.00	7,800.00	7,500.00	7,750.00	28,746,000	7,609.84
13	Apr 17, 2013	7,650.00	7,800.00	7,650.00	7,650.00	32,533,000	7,511.65
14	Apr 18, 2013	7,750.00	7,750.00	7,650.00	7,750.00	23,069,500	7,609.84
15	Apr 19, 2013	7,700.00	7,800.00	7,700.00	7,700.00	16,755,500	7,560.74
16	Apr 22, 2013	7,800.00	7,800.00	7,700.00	7,800.00	16,702,000	7,658.94
17	Apr 23, 2013	7,800.00	7,800.00	7,800.00	7,800.00	0	7,658.94
18	Apr 24, 2013	7,800.00	7,800.00	7,700.00	7,800.00	21,364,500	7,658.94
19	Apr 25, 2013	7,350.00	7,700.00	7,300.00	7,350.00	97,916,500	7,217.07
20	Apr 26, 2013	7,200.00	7,350.00	7,200.00	7,200.00	48,420,500	7,069.79
21	Apr 29, 2013	7,400.00	7,400.00	7,200.00	7,400.00	27,028,000	7,266.17
22	Apr 30, 2013	7,350.00	7,400.00	7,150.00	7,350.00	55,863,500	7,217.07

23	May 1, 2013	7,350.0 0	7,350.0 0	7,200.0 0	7,350.0 0	19,838,50 0	7,217.0 7
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### Appendix C

#### Results of forecasting stock price (Empirical Case of PT. Astra International, Tbk (ASII) using Smoothing Moving Average on 1 April 2013 - 1 Mei 2013)

Day	Adj Close	Forecast 5 days	MAD	TS	MAPE	Forecast 3 days	MAD	TS	MAPE	Date
1	7,708.03									Apr 1, 2013
2	7,806.22									Apr 2, 2013
3	7,806.22									Apr 3, 2013
4	7,560.74									Apr 4, 2013
5	7,511.65									Apr 5, 2013
6	7,560.74	7678.57	19.639	-6.0	0.003	7626.2	10.911	-6	0.001	Apr 8, 2013
7	7,560.74	7649.11	29.458	-7.0	0.004	7544.4	11.690	-4.2	0.002	Apr 9, 2013
8	7,413.46	7600.02	49.095	-8.0	0.006	7544.4	26.593	-6.8	0.003	Apr 10, 2013
9	7,609.84	7521.47	53.460	-5.7	0.007	7511.6	34.549	-2.4	0.005	Apr 11, 2013
10	7,511.65	7531.29	50.077	-6.5	0.007	7528.0	32.730	-3.0	0.004	Apr 12, 2013
11	7,462.55	7531.29	51.774	-7.6	0.007	7511.7	34.218	-4.3	0.004	Apr 15, 2013
12	7,609.84	7511.65	55.642	-5.3	0.007	7528.0	38.186	-1.7	0.005	Apr 16, 2013
13	7,511.65	7521.47	52.117	-5.8	0.007	7528.0	36.507	-2.2	0.005	Apr 17, 2013
14	7,609.84	7541.11	53.304	-4.4	0.007	7528.0	39.744	0.0	0.005	Apr 18, 2013
15	7,560.74	7541.11	51.059	-4.2	0.007	7577.1	38.186	-0.4	0.005	Apr 19, 2013
16	7,658.94	7550.92	54.619	-2.0	0.007	7560.7	41.936	2.0	0.005	Apr 22, 2013
17	7,658.94	7590.20	55.450	-0.7	0.007	7609.8	42.358	3.1	0.006	Apr 23, 2013
18	7,658.94	7600.02	55.642	0.4	0.007	7626.2	41.823	3.9	0.005	Apr 24, 2013
19	7217.07	7629.48	74.419	-5.3	0.010	7658.9	62.878	-4.4	0.008	Apr 25, 2013
20	7069.79	7550.93	94.755	-9.2	0.012	7511.7	81.827	-8.8	0.011	Apr 26, 2013
21	7266.17	7452.74	99.127	-10.7	0.013	7315.3	80.269	-9.6	0.010	Apr 29, 2013

22	7217.07	7374.18	101.763	-12.0	0.013	7184.3	78.108	-9.4	0.010	Apr 30, 2013
23	7217.07	7285.81	100.327	-12.8	0.013	7184.3	76.135	-9.2	0.010	May 1, 2013
	Average	7536.742	61.207	-6.3	0.008	7504.4	44.925	-3.5	0.006	

## Appendix D.

**Stock Price Forecasting Results of PT. Astra International, Tbk (ASII) using the Method of Exponential Moving Average on 1 April 2013 - 1 Mei 2013**

0.4						0.2				Date
Day	Adj Close	Forecast 5 day	MAD	TS	MAPE	Forecast 3 day	MAD	TS	MAPE	
1	7,708.03									Apr 1, 2013
2	7,806.22									Apr 2, 2013
3	7,806.22									Apr 3, 2013
4	7,560.74									Apr 4, 2013
5	7,511.65									Apr 5, 2013
6	7,560.74	7611.80	8.511	-6.000	0.001	7603.3	7.092	-6.000	0.001	Apr 8, 2013
7	7,560.74	7591.38	11.672	-7.000	0.002	7594.8	10.942	-7.000	0.001	Apr 9, 2013
8	7,413.46	7579.12	30.920	-8.000	0.004	7588.0	31.389	-8.000	0.004	Apr 10, 2013
9	7,609.84	7512.86	38.261	-3.930	0.005	7553.1	34.209	-5.681	0.005	Apr 11, 2013
10	7,511.65	7551.65	38.435	-4.953	0.005	7564.4	36.065	-6.852	0.005	Apr 12, 2013
11	7,462.55	7535.65	41.586	-6.336	0.006	7553.9	41.088	-8.237	0.005	Apr 15, 2013
12	7,609.84	7506.41	46.740	-3.424	0.006	7535.6	43.851	-6.025	0.006	Apr 16, 2013
13	7,511.65	7547.78	45.924	-4.272	0.006	7550.5	43.462	-6.972	0.006	Apr 17, 2013
14	7,609.84	7533.33	48.109	-2.488	0.006	7542.7	45.154	-5.223	0.006	Apr 18, 2013
15	7,560.74	7563.93	45.114	-2.723	0.006	7556.1	42.452	-5.447	0.006	Apr 19, 2013
16	7,658.94	7562.66	48.312	-0.550	0.006	7557.0	46.167	-2.802	0.006	Apr 22, 2013
17	7,658.94	7601.17	48.869	0.638	0.007	7577.4	48.246	-0.991	0.006	Apr 23, 2013
18	7,658.94	7624.28	48.079	1.370	0.006	7593.7	49.189	0.353	0.007	Apr 24, 2013
19	7,217.07	7638.14	67.711	-5.246	0.009	7606.8	67.110	-5.548	0.009	Apr 25, 2013
20	7,069.79	7469.71	84.321	-8.956	0.011	7528.8	86.707	-9.588	0.012	Apr 26, 2013

21	7,266.17	7309.74	82.381	-9.695	0.011	7437.0	90.714	-11.048	0.012	Apr 29, 2013
22	7,217.07	7292.31	82.057	-10.651	0.011	7402.9	95.035	-12.501	0.013	Apr 30, 2013
23	7,217.07	7262.22	80.452	-11.424	0.011	7365.7	97.365	-13.728	0.013	May 1, 2013
	Average	7516.3	49.858	-5.202	0.007	7539.5	50.902	-6.738	0.007	

Source; Results of Data Processing

**Appendix E. Summary Calculation MAD and MAPE in 3 days**

	3 days		3 days	
	Simple Moving Average		Exponential Moving Average	
	MAD	MAPE	MAD	MAPE
ASII	44.925	0.006	50.902	0.007
BBCA	115.479	0.011	110.290	0.010
BMRI	73.654	0.007	111.333	0.011
BBRI	63.433	0.007	91.020	0.011
GGRM	916.133	0.018	897.653	0.017
BBNI	94.964	0.018	104.387	0.021
INTP	235.381	0.009	244.613	0.010
CPIN	37.810	0.008	50.755	0.011
KLBF	11.737	0.009	15.049	0.012
INDF	63.977	0.009	51.624	0.007
Average	165.749	0.010	172.763	0.012

Source: Analysis MAD &amp; MAPE in 3 days