

# Stock Price Prediction Using Formula From Data Scale Analysis Extrapolation Method

Stephanus Ivan Goenawan<sup>1</sup>, Kumala Indriati<sup>2\*</sup>, Christine Natalia<sup>1</sup>, Jesslyn Fabrianne<sup>1</sup>

<sup>1</sup>Department of Industrial Engineering, Faculty of Engineering, Atma Jaya Catholic University of Indonesia, Jakarta 12930, INDONESIA

<sup>2</sup>Department of Electrical Engineering, Faculty of Engineering, Atma Jaya Catholic University of Indonesia, Jakarta 12930, INDONESIA

## Article Info

## Abstract

### Article history:

Received  
15 Mei 2023

Accepted  
2 Juli 2023

### Keywords:

*Analysis of Data Scales,  
DSA, Average Data,  
Extrapolation.*

Public awareness about stocks is increasing every year. This needs to be balanced with advances in science to help investors make more measurable and systematic decisions. This study aims to apply the Extrapolation of Data Scale Analysis (DSA) in predicting stock prices. The DSA Extrapolation method will produce a new formula called JIC-FLY 3 which is used to process big data in predicting prices at a specific time. This study's population is the telecommunications sub-sectors share price with EXCL (PT XL Axiata Tbk.) as a sample. The error value measurement method is the Mean Absolute Percentage Error (MAPE). The result of this study is that the DSA 19 extrapolation method using the JIC-FLY 3 formula is able to predict the share price of the telecommunication subsector with the best error giving the smallest error value of 0.193%.

## 1. INTRODUCTION

Shares are proof of equalization of ownership of capital or funds for a person or business entity in a company which can be a means of investing both in the long and short term. By owning shares, it can be interpreted that the individual or business entity has the right to income, assets, company financial reports and can even attend the General Meeting of Stockholders (Fakhrudin dan Hendy 2008). Stocks are able to provide various levels of profit according to the company chosen and the period (Artha *et al.*, 2014). The greater the profit of the company invested, the greater the profit obtained (Baresa *et al.*, 2013). The profit these investors obtain apart from dividends (company profit sharing) is also in the form of capital gains (the difference between the selling price and the buying price of shares due to stock trading movements).

According to the Indonesia Stock Exchange, stocks in Indonesia can be divided into 12 sectors starting January 25, 2021. This classification is carried out based on similarities and similarities to the products or services produced by these companies. The sectors in the Indonesia Stock Exchange include energy, raw goods, industry, primary consumer goods, non-primary consumer goods, health, finance, property and real estate, technology, infrastructure, transportation and logistics, and listed investment products (Christina., *et al.*, 2020).

Currently, the development of technology has become a necessity in human life, especially in big cities. According to coverage from Detikinet (Haryanto 2021), it was noted that internet users in Indonesia increased drastically by 15.5%, or an increase of 27 million people in January 2021 compared to the same period in 2020. The total population of Indonesia is approximately 275.9 million, compared to internet users of 202.6 million, indicating that around 73.7% of Indonesians have used the internet as a tool in their daily lives.

Besides technological developments, the COVID-19 pandemic has caused most community activities to be online (Haryanto 2021). Activities carried out online require an internet network to connect to cyberspace. Using facilities such as social media for video calls, sharing messages, doing tasks together, and others help people carry out their activities effectively even without meeting face to face.

The work-from-home scheme can become a new culture that emerged after the COVID-19 pandemic. This possibility arises because working from home has many advantages, especially related to the efficiency and effectiveness of working time, and can even help reduce environmental pollution (Mungkasa, 2020). Today's society is accustomed to using technology for various activities. Therefore, it is possible that after the pandemic is over, the use of the Internet and telecommunication networks will

\*Corresponding author. Kumala Indriati  
Email address: [kumala.indriati@atmajaya.ac.id](mailto:kumala.indriati@atmajaya.ac.id)

remain stable and even tend to increase (Haryanto 2021).

The field of telecommunications will always exist and tends to increase because it has become part of human needs in this modern era. Thus, issuers in the telecommunications sector are also an attractive choice of stocks to consider. This is because public demand will remain high for quite a long time. Based on these considerations, this research was conducted in the infrastructure sector, especially telecommunication issuers. This study only uses company stocks included in the LQ 45 indicator and the top 10 infrastructure sectors according to the IDX because of their high level of liquidity and capitalization. Thus the company's stock price is not easy to fall or suddenly rise.

The research method that will be chosen is Data Scale Analysis, a new analytical method to become a decision-making tool. This Data Scale Analysis Method (DSA) has the rationale in the form of a scale that tends to be heavier to the left or right side in making decisions (Goenawan 2021). This Data Scales Analysis method uses the principle of high-order averaging to determine trends (trends) from a set of data, making it suitable for use in analyzing large amounts of data. The ability of the Data Scales Analysis method to process large amounts of various types of data causes this method to be a decision-making technique for the financial or economic sectors such as stocks, forex, money markets, commodities, bonds, and others. However, because DSA is still a newly developed method, it has not been tested, especially in its ability to forecast closing prices (Goenawan 2021).

**2. METHODS**

This study applies the DSA method, which uses a new formula from the previously known definition that the value of the data scale is the difference between the first and second-order data mean,  $1K2_{(t;n)} = 1K2_{(t)} = Ro_1(t) - Ro_2(t)$ , where a variable is the sequence number of 1K2, which will be used to produce the JIC-FLY 3 data extrapolation weight formula in forecasting stock prices in the capital market.

JIC-FLY3 formula

$$D_{(t+1)} = \frac{(1K2_{(t+1)} \cdot t_1 \cdot t_2 - \sum D_t \cdot t_2 + \sum D_t \cdot t_1 + \sum D^2_t \cdot t_1)}{t_2 - t_1}$$

Below is the proof of the JIC-FLY 3 formula, previously from the HKI-2022 paper entitled "Proof of Data Scales Analysis (DSA) and Dynamic Meta Data Scales" by Stephanus Ivan Goenawan, can be obtained the average equation between the first and second order on sequence number t+ 1, namely:

$$Ro_1(t + 1) = \frac{D_{(t+1)} + \sum D_t}{t_1} \dots \dots \dots (1)$$

$$Ro_2(t + 1) = \frac{D_{(t+1)} + \sum D_t + \sum D^2_t}{t_2} \dots \dots \dots (2)$$

The equation for the value of the data scales at level t + 1 is the difference in the average of the first-order data with the second-order data, namely:

$$1K2_{(t+1)} = Ro_1(t + 1) - Ro_2(t + 1) \dots \dots \dots (3)$$

$$1K2_{(t+1)} = \frac{D_{(t+1)} + \sum D_t}{t_1} - \frac{D_{(t+1)} + \sum D_t + \sum D^2_t}{t_2} \dots \dots \dots (4)$$

$$1K2_{(t+1)} = \frac{(D_{(t+1)} + \sum D_t) t_2 - (D_{(t+1)} + \sum D_t + \sum D^2_t) t_1}{t_1 \cdot t_2}$$

$$1K2_{(t+1)} = \frac{D_{(t+1)} \cdot t_2 + \sum D_t \cdot t_2 - D_{(t+1)} \cdot t_1 - \sum D_t \cdot t_1 - \sum D^2_t \cdot t_1}{t_1 \cdot t_2}$$

$$1K2_{(t+1)} \cdot t_1 \cdot t_2 = D_{(t+1)} \cdot t_2 + \sum D_t \cdot t_2 - D_{(t+1)} \cdot t_1 - \sum D_t \cdot t_1 - \sum D^2_t \cdot t_1$$

$$1K2_{(t+1)} \cdot t_1 \cdot t_2 - \sum D_t \cdot t_2 + \sum D_t \cdot t_1 + \sum D^2_t \cdot t_1 = D_{(t+1)} \cdot t_2 - D_{(t+1)} \cdot t_1$$

The above equation can be rewritten as

$$D_{(t+1)} \cdot t_2 - D_{(t+1)} \cdot t_1 = 1K2_{(t+1)} \cdot t_1 \cdot t_2 - \sum D_t \cdot t_2 + \sum D_t \cdot t_1 + \sum D^2_t \cdot t_1 \dots \dots \dots (5)$$

then the JIC-FLY 3 formula is proven:

$$D_{(t+1)} = \frac{(1K2_{(t+1)} \cdot t_1 \cdot t_2 - \sum D_t \cdot t_2 + \sum D_t \cdot t_1 + \sum D^2_t \cdot t_1)}{t_2 - t_1} \dots \dots \dots (6)$$

where

$$D_{(t+1)} = Listofstockpricest + 1$$

$1K2_{(t+1)} = DSA$  extrapolated value from the IN series

$$t_1 = t + 1$$

$$t_2 = \frac{t_1(t_1 + 1)}{2}$$

**3. LITERATUR REVIEW**

Data Scale Analysis (DSA) is a method that can be used in making decisions for various fields, including financial areas such as stocks, cryptocurrencies, forex, and others. This DSA was created by Stephanus Ivan Goenawan (Goenawan 2019), who had previously created a new calculation method, namely the horizontal (Metris) method. Data Scale Analysis is a quantitative measurement method that determines trends from a data group.

This Data Scales Analysis adopts the principle of scales so that the analysis process is carried out by determining whether a group of data is heavier to the right or the left based on weighting through the principle of a stratified data average. DSA itself, there are two methods, namely data weighting and stratified average. At DSA, with data weighting, the calculation uses the weighted value in percentage. In DSA with multilevel data averages, calculations are performed using the difference between the

first-order mean and the second-order average (Goenawan et al., 2021).

**3.1 DSA Weighting Method**

DSA with data weighting, calculations are carried out using weighted values in percentage (Goenawan et al., 2021). DSA with this data weighting can be used for calculations with not too much data. One example of the application of DSA with this weighting is the calculation of data trends for conclusion. An example of weighting data on stock price using DSA in eleven days is shown in Table 1.

**Table 1.**  
Weighting in DSA

Make the transaction process more efficient											
Symbol	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
<i>bD</i>	5	5	3	2	1	0	1	2	3	4	5
<i>f</i> (10 <sup>3</sup> Rp)	0	0	0	0	0	5	2	0	8	10	

DSA calculation with weighting is:

1. Calculating the value of the weight of the scales (bT)

$$bT = bD \times f \dots\dots\dots (7)$$

Where :

- bT* : Weight of scales
- bD* : Data weight
- f* : Frequency

2. Calculating the value of data results (d)

$$d = bD \times f \dots\dots\dots (8)$$

Where:

- d* : Data result value
- bD* : Data weight
- f* : Frequency

3. Calculating the value of data results after weighting (D)

$$D = d \times bT \dots\dots\dots (9)$$

Where :

- D* : Value of data results after weighting
- d* : Data result value
- bT* : Weight of scales

4. Calculating DSA value (*K*<sub>2</sub><sup>1</sup>)

$$K_2^1 = [d \times bT(\%)] \dots\dots\dots (10)$$

Where:

- K*<sub>2</sub><sup>1</sup> : DSA value
- d* : Data result value
- bT* : Weight of scales

**3.2 MEAN DSA METHOD**

In its development, DSA with data weighting becomes difficult and complicated when used to calculate large amounts of data. This resulted in the emergence of DSA with a stratified average of data to perform big data calculations. Calculations are made using the difference between the first-order and second-order averages (Goenawan et al., 2021).

DSA calculation with the principle of average is:

1. Calculates the average value of order 1

$$\bar{D}^1 = \frac{\Sigma^1(d_j)}{t} \dots\dots\dots (11)$$

Where :

- $\bar{D}^1$  : Average value of order 1
- $\Sigma^1(d_j)$ : Number of order 1 data
- t* : Period

2. Calculates the 2nd-order mean value

$$\bar{D}^2 = \frac{\Sigma^2(d_j)}{\frac{t(t+1)}{2}} \dots\dots\dots (12)$$

Where:

- $\bar{D}^2$  : Average value of order 2
- $\Sigma^2(d_j)$  :Number of order 2 data
- t* : Period

3. Calculating DSA value (*K*<sub>2</sub><sup>1</sup>)

$$K_2^1 = \bar{D}^1 - \bar{D}^2 \dots\dots\dots (13)$$

**4. IVAN NEWTON SERIES (IN)**

One forecasting method for processing large amounts of data is the Newton Series. The Newton series is a process for managing data to obtain a certain formula that can be used to predict data after historical data (extrapolation) or between historical data (intrappolation). The Ivan Newton (IN) series is a development of the Newton series, which simplifies the Newton series to be more efficient. In the IN series, the sum of extrapolated data that was previously more complicated and repeated is simplified to create a formula that is easier to use (Goenawan, 2019). Calculations with the IN series can be done by:

1. Determine the value of t

The x value is the time value of the data used and starts from 0. The t value is obtained from the transformed x (time) value. The last x value in t is changed to 0 and continued with -1, so the first x (1) becomes -x. An example of forming a t value is shown in Table 2.

**Table 2.**

Establishing a t value

<i>x</i>	<i>t</i>	Data
0	-4	32,5
1	-3	2,6
2	-2	3,9
3	-1	5,1
4	0	0,3

2. Become a constant bj using Pascal's Triangle

The formula for the Non-Linear function of the IN Series is as follows.

$$f(t) \cong b_0 + b_1 \cdot t + b_2 \cdot \frac{t(t+1)}{2!} + b_3 \cdot \frac{t(t+1)(t+2)}{3!} + \dots + b_\beta \cdot \frac{\prod_{k=0}^{\beta-1} (t+k)}{\beta!} \dots (14)$$

Based on the equation of the IN series, to find the value of bj, equation (15) can be used as follows:

$$b_0 = + f(t = 0)$$

$$b_1 = - f(t = -1) + b_0$$

$$\begin{aligned}
 b_2 &= +f(t = -2) - b_0 + 2 \cdot b_1 \\
 b_3 &= -f(t = -3) + b_0 - 3 \cdot b_1 + 3 \cdot b_2 \\
 b_4 &= +f(t = -4) - b_0 + 4 \cdot b_1 - 6 \cdot b_2 + 4 \cdot b_3 \dots\dots(15)
 \end{aligned}$$

The coefficients of the equation to find the bj value have a pattern like Pascal's Triangle. In addition, the value + or - for each bj equation changes alternately between + and -. Therefore, to make it easier to calculate the bj constant, you can use the pattern from Pascal's Triangle, as shown in Figure 1.

1.
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

**Figure 1.**  
**Number of Pascal's Triangle**

3. Determine the value of the selected bj

The selected b0 value must be greater than b1 (b0 <b1). If the b0 value does not meet the requirements, then no b value is automatically selected so that the prediction result is the same as the price on the previous day. If the value of b0 meets the requirements, an examination can be conducted for the next bj.

4. Recheck the equations obtained

After obtaining the bj constant according to equation 15, calculations are carried out to check the correctness of the equation obtained. The process is carried out by entering the bj constant in equation 14. If the results are similar to the initial data, the equation is correct and can be processed further.

Calculation of DSA values , as in equations (7), (8), and (9), can be done based on a certain period. The period in this DSA is not standard, so it can be adjusted to each individual's needs and preferences. In this study, DSA calculations will be carried out based on several periods. Later DSA calculations from these several periods are used to find the best period to forecast the closing price of issuers in the telecommunication sub-sector.

After obtaining the predicted DSA 1K2(t+1) value using the In Series method, then proceed with using the JIC-FLY 3 formula to produce the predicted closing price of the stock. In order to prove that the calculation of the prediction results is correct, an induction proof process will be carried out, which produces a value of 1K2(t+1), the same as the result obtained from the extrapolation of the IN series.

In this study, trials were carried out using several DSA methods. It aims to get the best DSA method that can be used to predict the stock price of

the issuer. DSA variations used in this study were DSA 10-19.

Combined DSA: averaged the value of the predicted stock price (JICFLY) from DSA 10-19, which has a positive error, with those that have a negative error. Three combined DSA combinations with the smallest error are then calculated combined DSA for other dates.

**5. RESULTS AND ANALYSIS**

**5.1 DATA COLLECTION**

The data used in this study is the closing price of shares. The share price data used for EXCL issuers is shown in Table 3 below (BEI 2021).

**Table 3.**  
*Data Closing Price Emiten EXCL*

Date	Price	Date	Price	Date	Price
2020-08-27	2540	2020-10-08	2200	2020-11-23	2430
2020-08-28	2550	2020-10-09	2200	2020-11-24	2500
2020-08-31	2440	2020-10-12	2210	2020-11-25	2490
2020-09-01	2420	2020-10-13	2190	2020-11-26	2540
2020-09-02	2410	2020-10-14	2210	2020-11-27	2530
2020-09-03	2340	2020-10-15	2130	2020-11-30	2410
2020-09-04	2300	2020-10-16	2130	2020-12-01	2450
2020-09-07	2250	2020-10-19	2130	2020-12-02	2460
2020-09-08	2240	2020-10-20	2090	2020-12-03	2420
2020-09-09	2190	2020-10-21	2050	2020-12-04	2450
2020-09-10	2040	2020-10-22	2110	2020-12-07	2520
2020-09-11	2190	2020-10-23	2070	2020-12-08	2480
2020-09-14	2270	2020-10-26	2040	2020-12-10	2420
2020-09-15	2200	2020-10-27	2030	2020-12-11	2460
2020-09-16	2130	2020-11-02	2010	2020-12-14	2620
2020-09-17	2090	2020-11-03	2010	2020-12-15	2700
2020-09-18	2150	2020-11-04	1985	2020-12-16	2900
2020-09-21	2060	2020-11-05	2110	2020-12-17	2790
2020-09-22	2030	2020-11-06	2180	2020-12-18	2790
2020-09-23	1985	2020-11-09	2130	2020-12-21	2900
2020-09-24	1930	2020-11-10	2190	2020-12-22	2760
2020-09-25	1965	2020-11-11	2340	2020-12-23	2710
2020-09-28	2010	2020-11-12	2290	2020-12-28	2810
2020-09-29	1990	2020-11-13	2290	2020-12-29	2850
2020-10-01	2200	2020-11-16	2320	2020-12-30	2730
2020-10-02	2100	2020-11-17	2300	2021-01-04	2840
2020-10-05	2090	2020-11-18	2300		
2020-10-06	2120	2020-11-19	2300		
2020-10-07	2180	2020-11-20	2300		

**5.2 DATA PROCESSING**

Data processing is done statically by DSA (Data Scale Analysis). Forecasting is carried out from 18 November 2020 to 5 January 2021. Perform calculations to get level 1 and 2 sums for periods 10 to 19. Table 4 shows an example of calculating level 1 and level 2 sums for period 10.

**Table 4.**  
*The sum of Levels 1 and 2 Period 10*

ERO 1	RO 1	RO 2	1K2
20990	2099	2123,090909	-24,09090909
20790	2079	2099,272727	-20,27272727
20670	2067	2087,818182	-20,81818182
20525	2052,5	2073,727273	-21,22727273
20505	2050,5	2059,272727	-8,772727273
20595	2059,5	2053,727273	5,772727273
20675	2067,5	2056,909091	10,59090909
20755	2075,5	2050,636364	24,86363636
21025	2102,5	2056,545455	45,95454545
21275	2127,5	2072,454545	55,04545455
21535	2153,5	2094,909091	58,59090909
21845	2184,5	2126,636364	57,86363636
22135	2213,5	2163,636364	49,86363636

Then, calculate using the IN Series formula to get the selected  $b_j$  value according to the applicable conditions. An example of calculations for period 10 is shown in Table 5.

**Table 5.**  
Calculation of  $b_j$  values for period 10

$j$	$1K2(j)$	$b_j$	$ b_j $	selecte d $b_j$
0	49,864	49,864	b0	49,864
-1	57,864	-57,864	b1	-8,000
-2	58,591	58,591	b2	-7,273
-3	55,045	-55,045	b3	3,000
-4	45,955	45,955	b4	4,273
-5	24,864	-24,864	b5	0,909
-6	10,591	10,591	b6	31,364
-7	5,773	-5,773	b7	103,273
-8	-8,773	-8,773	b8	211,000
-9	-21,227	21,227	b9	296,091
-10	-20,818	-20,818	b10	215,227
-11	-20,273	20,273	b11	-269,364
-12	-24,091	-24,091	b12	-1445,318

After getting the selected  $b_j$  value, then a calculation is carried out to get the value  $K_2^1(t+1)$  by adding up the selected  $b$  values. Calculation example  $K_2^1(t+1)$  for period 10:

$$K_2^1(t+1) = 49,864 + (-8,0) + (-7,273) + (-3,0) = 31,591$$

Then do the induction of the value  $K_2^1(t+1)$  to get the predicted stock price ( $D_{(t+1)}$ ) using the JICFLY 3 formula. The data used to calculate ( $D_{(t+1)}$ ) as in Table 6.

**Table 6.**  
Sigma D9 Data for Calculating Predicted Prices

Date	Sigma D 9	
	Stock Data	J01
2020-11-05	2110	2110
2020-11-06	2180	4290
2020-11-09	2130	6420
2020-11-10	2190	8610
2020-11-11	2340	10950
2020-11-12	2290	13240
2020-11-13	2290	15530
2020-11-16	2320	17850
2020-11-17	2300	20150
SIGMA D	20150	99150

Calculation with the JICFLY formula 3 percent.(6) to get the predicted price value as follows:

$$D_{(t+1)} = \frac{(1K2_{(t+1)} \cdot t_1 \cdot t_2 - \sum D_t \cdot t_2 + \sum D_t \cdot t_1 + \sum D^2_t \cdot t_1)}{t_2 - t_1}$$

$$D_{(t+1)} = \frac{17375 - 1108250 + 201500 + 991500 + 102125}{45}$$

$$D_{(t+1)} = \frac{102125}{45}$$

$$D_{(t+1)} = 2269,444$$

After knowing the value of the predicted price, a re-examining of the calculations that have been carried out through induction proof is carried out.

Evidence of this induction is by calculating the DSA by adding the value of the stock price successfully predicted so that DSA 10 is calculated, as shown in Table 7.

**Table 7.**  
Calculation of DSA 10 for Examination of Forecasting Values

Sigma D 10		
Date	Stock Data	J01
2020-11-05	2110	2110
2020-11-06	2180	4290
2020-11-09	2130	6420
2020-11-10	2190	8610
2020-11-11	2340	10950
2020-11-12	2290	13240
2020-11-13	2290	15530
2020-11-16	2320	17850
2020-11-17	2300	20150
2020-11-18	2269,444	22419,444
ERO	2241,944	121569,444
RO	2241,944	2210,354
1K2(t+1)	31,591	

When the predicted value is put back into the DSA calculated value, it is known that the DSA value ( $K_2^1(t+1)$ ) from the induction proof, as shown in Table 7, is the same as the DSA value ( $K_2^1(t+1)$ ) from the IN series results, as shown in Table 5. Thus, it has been proven that the calculation formula is correct and the calculation can be continued.

The following calculation is to calculate the value of the difference between the predicted value and the reality (error). This calculation is done using the MAPE formula (Bhukkavesaand Sakunasingha 2018). The actual data for November 18, 2020, is 2300.

$$MAPE = \frac{|actual\ data - prediction\ data|}{actual\ data} \times 100\%$$

$$MAPE = \frac{|2300 - 2269,444|}{2300} \times 100\%$$

$$MAPE = \frac{30,556}{2300} \times 100\% = 1,329\%$$

Thus, it is known that the percentage error (MAPE) for predicting November 18, 2020, with a DSA of 10, is 1.329%. The summary table of forecasting results and error values from DSA 10 to DSA 19 is shown in Table 8.

**Table 8.**  
DSA 10-19 recapitulation

Date	Data	JICFLY 3	Error	MAPE	Periode DSA
2020-11-18	2300	2304,44444	-4,444	0,193%	DSA 19
2020-11-18	2300	2322,35294	-22,353	0,972%	DSA 18
2020-11-18	2300	2282,5	17,5	0,761%	DSA17
2020-11-18	2300	2265,33333	34,667	1,507%	DSA 16
2020-11-18	2300	2382,85714	-82,857	3,602%	DSA 15

**Table 8.1**  
DSA 10-19 recapitulation (lanjutan)

Date	Data	JICFLY 3	Error	MAPE	Periode DSA
2020-11-18	2300	2370	-70	3,043%	DSA 14
2020-11-18	2300	2355	-55	2,391%	DSA 13
2020-11-18	2300	2372,72727	72,727	3,162%	DSA 12
2020-11-18	2300	2358	-58	2,522%	DSA 11
2020-11-18	2300	2269,44444	30,556	1,329%	DSA 10
Selected DSAMethod					DSA 19

## 6. DISCUSSION

The Data Scale Analysis Method (DSA) is a method that can help to analyze large amounts of data (big data), one of which is stocks. The DSA method combined with the In Series is able to predict stock prices with certain historical data. This study tested various types and combinations of DSA methods to determine the best method for predicting stock prices. The DSA method and the In Series with the smallest error value can be used as a reference for predicting the issuer's stock price or even the sub-sector in the future. The use of the DSA method can be applied to predict the stock price of the telecommunications subsector, especially EXCL because it has an error value of around 5%. However, to anticipate various types of data, a more diverse DSA method is needed to obtain smaller errors by adding variations to the existing prediction results. The best DSA method on 18/11/2020 gives the smallest error value of 0.193%, namely DSA 19. The DSA 17, 18, and 19 methods can be used to predict the stock prices of other telecommunications subsectors at different times.

Based on the predicted error value in this study, it can be seen that each DSA method can produce a relatively small average error value when used at stock prices, which is quite volatile. The various DSA methods used provide various error values, and of course, they are different when used on other data. This shows that if more accurate prediction results are desired, the method can be determined by analyzing the historical data first.

## 7. CONCLUSION

Based on the research and analysis that has been done, several conclusions can be drawn through this research. The DSA method with the In Series can be used to predict the share price of the telecommunications subsector, especially EXCL issuers. The best DSA method on 11/18/2020 gives the smallest error value of 0.193%, namely DSA 19. The DSA 17 method ranks 2nd with an error of

0.761%, and the DSA 18 method ranks 3rd with an error of 0.972% and can also be used to predict stock prices in the telecommunication subsector EXCL at another period.

## REFERENCE

- Artha, D. R., Achسانی, N. A., dan Sasongko, H. (2014). Analisis Fundamental, Teknikal, dan Makroekonomi Harga Saham Sektor Pertanian. *Jurnal Manajemen dan Kewirausahaan*, 16(2):175-184.
- Baresa, S., Bogdan, S., and Ivanovic, Z. (2013). Strategy of Stock Valuation by Fundamental Analysis. *UTMS Journal of Economics*, 4(1):45-51.
- Bursa Efek Indonesia. (2021). *Saham*. <https://www.idx.co.id/produk/saham/> (diakses 22 Oktober 2021).
- Bhukkavesa, K. and Sakunasingha, B. (2018). *Effectiveness of Investment Strategies Based on MACD Indicators : Evidence from the Stock Exchange of Thailand*. *Journal of Global Business Review*, 20(1):1-12.
- Christina, Halim, S., Angrensia, V., dan Putri, A. P. (2020). Analisis Fundamental dan Teknikal Terhadap Harga Saham Pada Perusahaan Utilitas dan Transportasi. *E-Jurnal Akuntansi*, 3(2):499-512.
- Fakhrudin dan Hendy, M. (2008). *Teori Portofolio dan Analisis Investasi*. Yogyakarta: BPFE.
- Goenawan, S.I. (2019). *Comparison Simulation Analysis Of The Gradual Summation Of A Function With Recognition Of Direct Extrapolation Via In Series*. *International Journal of Applied Science and Smart Technologies*, 2(1), 59-66.
- Goenawan, S.I., Natalia, C., Sejahtera, F., & Angela. (Agustus 2021). Analisa Timbangan Data Dampak Positif dan Negatif Dompot Digital. Prosiding Seminar Nasional Riset dan Teknologi Terapan (RITEKTRA), A2.1-A2.8.
- Goenawan, S.I., Indriati, K. (Agustus 2022). Penggunaan Deret In Untuk Menentukan Rerata Orde Tinggi Fungsi Polinomial Dengan Cara Langsung. Prosiding Seminar Nasional Matematika, Geometri, Statistika, dan Komputasi SeNa-MaGeStiK Universitas Jember.
- Haryanto, A. T. (2021). *Pengguna Internet Indonesia Tembus 202,6 Juta*. Detikinet. <https://inet.detik.com/cyberlife/d-5407210/pengguna-internet-indonesia-tembus-2026-juta> (diakses 22 Oktober 2021).
- IDX. (2021). *IDX Stock Index Handbook v1.2*. Diakses dari [https://www.idx.co.id/media/9816/idx-stock-index-handbook-v12-\\_-januari-2021.pdf](https://www.idx.co.id/media/9816/idx-stock-index-handbook-v12-_-januari-2021.pdf) (2 November 2021).